

**COLLEGE OF DUPAGE
REGULAR BOARD MEETING**

BOARD APPROVAL

1. **SUBJECT**

Berg Instructional Center (BIC) Adjunct Renovation Project General Contractor

2. **REASON FOR CONSIDERATION**

Construction projects that exceed the statutory limit of \$50,000 must be approved by the Board of Trustees.

3. **BACKGROUND INFORMATION**

Current huddle space in BIC 2A07 (two conference rooms) is insufficient for faculty to meet privately with students. This project will create additional huddle rooms in which adjunct faculty can schedule time to meet and work with students. A campus architect (Bailey Edward) was hired and prepared construction drawings. Construction will commence in late May 2018 upon completion of classes and will be complete in August 2018.

A legal notice for an Invitation for Bids was published on March 9, 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-three (53) vendors were solicited. Fifty-eight (58) vendors downloaded the bid documents. A Pre-Bid meeting and site visit was held on March 15, 2018 at 1:00 p.m. in the College of DuPage Purchasing Department Conference Room (BIC 1B03A). A public opening of the bids was held on March 27, 2018 at 1:00 p.m. in the College of DuPage Purchasing Department Conference Room (BIC 1B03A). The following individuals were in attendance: Jacoby Radford (COD Purchasing Manager), Susan Castellanos (COD Buyer/Recorder), John McGarry (COD Buyer/Facilitator), Robert Hayley (COD Budget Manager/Agent of the Board), Don Inman (COD Senior Project Manager) and representatives from five (5) companies. Four (4) bids were received. One (1) women/minority owned business submitted a bid.

The following is a recap of the bid tabulation:

Vendor	Total Base Bid
Integral Construction, Inc.	\$89,320.00
Rafalo Corporation	\$146,400.00
Troop Contracting, Inc.	\$159,922.00
**Builders Land, Inc.	\$207,900.00

Recommended award in bold.

**Women/minority owned business

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

<u>GL Account</u>	<u>FY2017</u>	<u>FY2018</u>		
	<u>Prior Year Spend</u>	<u>Annual Budget</u>	<u>YTD Spend</u>	<u>Available Balance</u>
03-90-39009-5804001	\$ -	\$ 226,800	\$ 228	\$ 226,572
<i>BIC Addition-Adjunt Offices : Building Remodeling Exps</i>				
			FY2018 Request	\$ 89,320

**YTD Spend equals actuals plus committed as of 04/03/2018.*

This purchase supports Goal #8 Infrastructure of the Strategic Long Range 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 Berg Instructional Center (BIC) Adjunct Renovation Project to the lowest responsible bidder, Integral Construction, Inc., 320 Rocbaar Drive, Romeoville, IL 60446 for the lump sum bid amount of \$89,320.00.

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

BOARD APPROVAL

SIGNATURE PAGE FOR

Berg Instructional Center (BIC) Adjunct Renovation Project General Contractor

ITEM(S) ON REQUEST

That the Board of Trustees awards the Berg Instructional Center (BIC) Adjunct Renovation Project to the lowest responsible bidder, Integral Construction, Inc., 320 Rocbaar Drive, Romeoville, IL 60446 for the lump sum bid amount of \$89,320.00.


BOARD CHAIR

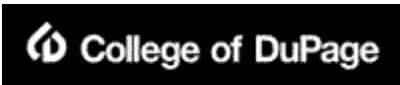
4/19/18

DATE


BOARD SECRETARY

4/19/18

DATE



Purchasing Department

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

2018-B0040 Berg Instructional Center (BIC) Adjunct Office Expansion

ADDENDUM # 1

March 20, 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 March 27, 2018 no later than 1:00 p.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. General questions and responses:

Question 1 – Please confirm the final design intent for opening #2A07. Is the existing frame to be reversed and therefore mismatched to adjacent corridor openings? Or is a new frame/slab to be included in the base bid?

ANSWER 1: The bidder should include purchasing a new frame and door slab. Old frame and door to be salvaged and offered to the College with rights to first refusal.

Question 2 – Please confirm the final scope for the door hardware on opening #2A07. Is it to be repurposed in either scenario of existing frame reuse or new frame/door?

ANSWER 2: The bidder should include new hardware to match existing in their bid. Existing hardware to be turned over to the College.

Question 3 - The design drawings specifications indicate CPT2-Constantine 61-550-4201K (IPY) custom quadratic carpet. This item is discontinued with no substitution available. Please clarify.

ANSWER 3: Contractor should anticipate pulling up existing carpet tiles in the project area and reinstalling them when walls are in place, turning them 90 degrees from their orientation so that these re-used tiles are laid in the pattern in the adjoining existing space. Where fill in carpet squares are needed, the College will provide those carpet tiles from existing attic stock.

Question 4 - Is the Contractor to remove and replace carpet in the work area and reinstall to match the direction of the carpet in room 2A07?

ANSWER 4: Yes, see answer to question #3

Question 5 – Should the door frames match the 1-3/8” existing or be 2”?

ANSWER 5: The door frames should match the existing.

Question 6 – Should the door frame side light go down to the floor or be 6” above the floor to match existing?

ANSWER 6: The door frame light should match existing.

Question 7 – Which existing ceiling tile is to be reused, ACT1 or ACT2?

ANSWER 7: The ceiling tile in the hallway is to be re-used. The ceiling tile in the offices is new.

Question 8 – Can existing badge swipe on door 2A07 be reused or does the contractor need an electronic strike in existing frame?

ANSWER 8: The bidder should include new lockset and strike, see answer to question #2.

Section 2. Revisions:

Additional Drawing:

Included in this addendum #1 is drawing SK-1 which adds power data drops to future furniture location in existing Berg Instructional Center Adjunct area.

END OF SECTION

2018-B0040 Berg Instructional Center (BIC) Adjunct Office Expansion

ADDENDUM # 1

March 20, 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 # _____

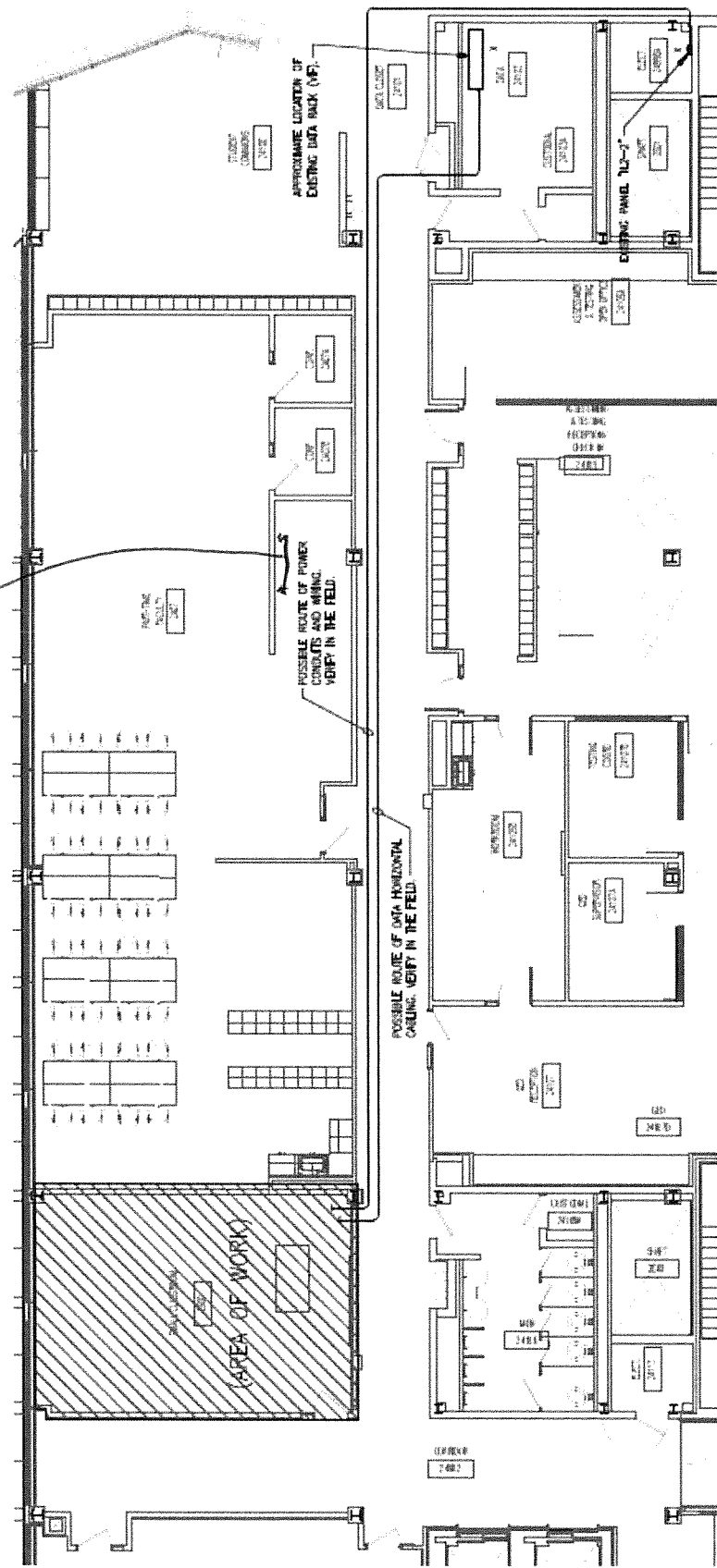
Company Name: _____

Address: _____

Authorized Signature: _____

IN ADDITION TO POWER & DATA
 WORK SHOWN OTHER PLACES IN
 THE DOCUMENTS, CONTRACT
 SHALL INCLUDE ONE QUAD
 POWER OUTLET AND ONE
 DATA OUTLET WITHIN
 THE SPACE INDICATED
 BELOW

POWER & DATA
 FOR FUTURE
 WORK STATION



BIG ADJUNCT EXPANSION

SK-1




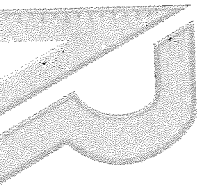
COLLEGE OF DUPAGE

PRE BID ATTENDEES

Title: 2018-B0040 BIC Adjunct Office Expansion

DATE: March 15, 2018 1:00 p.m.

LOCATION: Purchasing Conference Room 1B03A

Name	Company	Phone	E-mail
John McGarry	College of DuPage	630-942-2355	mcgarryj1755@coll.edu
CHRISTIAN HERNANDEZ	BAILEY EDWARD	630 890 2970	CHERNANDEZ@BAILEYEDWARD.COM
Matt Montalbano	Bailey Edward	630-860-7626	mmontalbano@BaileyEdward.com
M.KEGEMER ROSTEIN	TRAPP	630 560-5252	mkegem@trappconstructing.com
Don Inman	CBD	630 942 4041	inmand@cbcd.com
Remedios Cobián	Pafalo Construction	847-581-1111	remy@pafalogroup.com
CHRIS OSINSKI	INTEGRAL CONSTRUCTION	844-317-7403	estimating@buildintegral.com
KENNETH RODGERS	 RODGERS CONSTRUCTION CORP.		
	23310 S US HIGHWAY 52 MANHATTAN, IL 60442 T 815.740.1652 C 815.351.1652 RODGERS@RODERS-CONSTRUCTION.COM WWW.RODERS-CONSTRUCTION.COM		

BIDDER: _____



COMMUNITY COLLEGE DISTRICT NO. 502

BID NUMBER: 2018-B0040

Berg Instructional Center (BIC) Adjunct Office Expansion

BIDS DUE: Tuesday, March 27, 2018 at 1:00 p.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**

ISSUED BY THE COLLEGE OF DUPAGE PURCHASING DEPARTMENT

Purchasing Department

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

PHONE (630) 942-2217

March 9, 2018

INVITATION TO BID

Sealed bids for **Berg Instructional Center (BIC) Adjunct Office Expansion** 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 **1:00 p.m. Central Time, Tuesday, March 27, 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 **Thursday, March 15, 2018 at 1:00 p.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-B0040

The College of DuPage is accepting sealed bids for **Berg Instructional Center (BIC) Adjunct Office Expansion**. 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 **1:00 p.m. Central Time, Tuesday, March 27, 2018**, at which time they will publicly opened. 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.

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 Thursday, March 15, 2018 at 1:00 p.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

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.

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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 – 3/9/18
 - Pre-Bid Meeting – 3/15/18
 - Questions Due – 3/16/18
 - Bids Due – 3/27/18 at 1:00 p.m.
 - Target Board Approval Date – 4/19/18

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	\$1,000,000 / \$2,000,000
2. Explosion, Underground and Collapse Hazard	
3. Products/Completed Operations	
4. Contractual Insurance	
5. Broad Form Property Damage	
6. Independent Contractors	
7. Bodily Injury	

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/prevaling-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 **March 16, 2018 at 2:00 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 1:00 p.m. on March 15, 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 **1:00 p.m. Central Time on Tuesday, March 27, 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:

Purchasing Manager
College of DuPage
BIC Building - Room 1B03
425 Fawell Blvd.
Glen Ellyn, Illinois 60137

ATTN: Bid No. 2018-B0040

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, a specimen of which is provided herein. 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 – BIC Adjunct Expansion Project

All work as indicated on Bailey Edwards drawings and specifications and as noted below. Refer to the Project Manual in Exhibit A and Drawings in Exhibit C for detailed information.

This project is intended to be awarded in the Spring of 2018, with contracts, submittals and coordination to occur which allows demolition to begin the last week in May and complete the second 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 and . Review and Inspection fees for those two trades are paid by the contractor, who will be reimbursed by the College.

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

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

Drawing Clarifications –

D100- Note 2.03 – Change verbiage from remove and salvage to existing carpet to remain in place.

D100 – Note 2.08 applies to all vinyl wall guard in the space, that's the three walls without windows.

A100 – Note 8.01 Change verbiage to read, relocate existing card reader in the existing door to new door. Wiring, programming and functional checkout is included in this contractor's scope.

A300 – Included in this scope is connection from power or data source (see electric drawings) to outlets in the loose (rectangular table only) furniture.

END OF SECTION

4.0 BID FORM

2018-B0040 Berg Instructional Center (BIC) Adjunct Office Expansion

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.

Berg Instructional Center (BIC) Adjunct Office Expansion	
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.

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 **Berg Instructional Center (BIC) Adjunct Office Expansion, Bid Number 2018-B0040**. 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, 720ILCS 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 to purchasing@cod.edu 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.

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

Vendor Address: _____ City, State, Zip: _____

Phone Number: _____ Fax Number: _____

Email Address: _____

Signature

Bidder/Company Official: _____ Date: _____

EXHIBIT A PROJECT MANUAL



SPECIFICATIONS

College of DuPage
BIC Adjunct Area Reconfiguration
Project No. 15044-17-09

ISSUED FOR PERMIT AND BID

February 19, 2018

College of DuPage
Health and Science Center
425 Fawell Blvd.
Glen Ellyn, IL 60137

BY:
Bailey Edward Design
35 E Wacker Drive, Suite 2800
Chicago, IL 60601-2314
t 312.440.2300
f 312.440.2303



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SPECIFIERS:

- General: Christian Hernandez, Bailey Edward (312) 789-4003, chernandez@baileyedward.com
- Mechanical: Matt Montalbano, Bailey Edward
- Electrical: Celilito Penas, Bailey Edward

END OF TABLE OF CONTENTS

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. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Work by Owner.
 - 4. Owner-furnished products.
 - 5. Contractor-furnished, Owner-installed products.
 - 6. Access to site.
 - 7. Work restrictions.
 - 8. Specification and drawing conventions.
 - 9. Miscellaneous provisions.

1.3 PROJECT INFORMATION

- A. Project Identification: College of DuPage BIC Adjunct Area Reconfiguration
 - 1. Project Location: HSC Building, 425 Fawell Boulevard, Glen Ellyn, IL 60137.
- B. Owner: College of DuPage 425 Fawell Boulevard, Glen Ellyn, Illinois 60137.
 - 1. Owner's Representative: Don Inman.
- C. Architect: Bailey Edward Design, 35 East Wacker Drive, Suite 2800, Chicago Illinois, 60601.
- D. Other Owner Consultants: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - a. None

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. The project includes the demolition of a 582-square foot Classroom to expand an existing 2259 square foot Adjunct Faculty Room in the Berg Instructional Center (BIC). A revised furniture layout, built out office and four conference rooms will be included in expansion. The scope includes, but not limited to: partial demolition, partitions, interior finishes, furnishings, and mechanical ventilation, controls, electrical power, data, and fire alarm.
- B. Type of Contract:

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

1.5 WORK UNDER SEPARATE CONTRACTS

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

1.6 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products.
- B. Owner-Furnished Products:
 1. Furniture
 2. Miscellaneous Equipment
 3. As indicated in the Drawings and Specifications.

1.7 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Limits: Confine construction operations to the single room renovation.
 2. Driveways, Walkways and Entrances: Keep driveways and entrances serving site clear and available to emergency vehicles at all times. Do not use these areas for parking or storage of materials.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to acceptable hours for the C.O.D.
- C. Nonsmoking Building: Smoking is not permitted within the building or within 100 feet of entrances, operable windows, or outdoor-air intakes.

- D. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations as scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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 administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. 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.
- B. Key Personnel Names: Within 15 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 home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.

- c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
 - C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
 1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Preparation Format: DWG, Version AutoCAD 2013 , operating in Microsoft Windows operating system.
 3. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in AutoCAD 2013.
 - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106.
- 1.6 REQUESTS FOR INFORMATION (RFIs)
- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor 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 information or interpretation and the following:

1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect and Construction Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms:
1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Construction Manager after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 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 Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

1.7 PROJECT MEETINGS

- A. General: General Contractor will 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: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within 5 days of the meeting.
- B. Preconstruction Conference: General Contractor will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, , Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises and existing building.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager, and Owner's Commissioning Authority of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
 6. Work proceeding in advance of a pre-installation meeting, or without resolution of the minuted issues, may be subject to removal and reinstallation at no charge to the Owner.
- D. Project Closeout Conference: General Contractor will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 30 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, Owner's Commissioning Authority, 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 operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - 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: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: General Contractor will conduct progress meetings at weekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 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) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.

- 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - 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.
- F. Coordination Meetings: General Contractor will conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.

- 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 2. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. 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 revisions to submittals noted by Architect and Construction Manager 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 startup 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 and Construction Manager's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD Rev 2013.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
 - d. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.
 - 3) Other Drawings as specifically requested.
- B. 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. 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 and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow 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 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager 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 10 business 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 15 business 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 10 business days for review of each submittal. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include 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 and Construction Manager.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.

- g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively (paper submittals must be included in numbering system).
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Electronic submittals are preferred.
 2. Indicate name of firm or entity that prepared each submittal on label or title block.
 3. 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 and Construction Manager.
 4. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - 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. Other necessary identification.
 5. Copies:

- a. Submit four copies of submittal to Construction Manager for concurrent review.
6. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Construction Manager will return without review submittals received from sources other than Contractor.
- a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Architect.
 - 6) Name of Construction Manager.
 - 7) Name of Contractor.
 - 8) Name of firm or entity that prepared submittal.
 - 9) Names of subcontractor, manufacturer, and supplier.
 - 10) Category and type of submittal.
 - 11) Submittal purpose and description.
 - 12) Specification Section number and title.
 - 13) Specification paragraph number or drawing designation and generic name for each of multiple items.
 - 14) Drawing number and detail references, as appropriate.
 - 15) Indication of full or partial submittal.
 - 16) Transmittal number, numbered consecutively, in same numbering system as electronic submittals.
 - 17) Submittal and transmittal distribution record.
 - 18) Remarks.
 - 19) Signature of transmitter.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. 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 with approval notation from Architect's and Construction Manager's action stamp.
- I. 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.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Post electronic submittals as PDF electronic files directly to General Contractor's system.
 - a. Architect, through General Contractor, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect, through General Contractor, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 3. Action Submittals: Submit four paper copies of each submittal unless otherwise indicated. Architect, through General Contractor, will return two copies to General Contractor, with one for Contractor.
 4. Informational Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect and General Contractor will not return copies.
 5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- 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 published 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 in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. 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. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Four opaque (bond) copies of each submittal. Architect, through Construction Manager, will return two copies, one of which goes to Contractor.
- 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 applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. 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.
 5. 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 four full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through General Contractor, will return submittal with options selected.
 6. 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 five sets of Samples. Architect and General Contractor will retain two (one for office and one to keep on site) Sample sets; one set will be returned.
 - 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 five sets of paired units that show approximate limits of variations.
- E. Product Schedule: 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 indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- H. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- K. Installer Certificates: Submit 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.
- L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- O. Material Test Reports: Submit 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.
- P. Product Test Reports: Submit written reports indicating that 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.
- Q. Research Reports: Submit 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.
- R. Preconstruction Test Reports: Submit 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.
- S. Compatibility Test Reports: Submit 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.
- T. Field Test Reports: Submit written reports 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.

- U. Design Data: Prepare and submit 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 SERVICES

- 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 Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file of certificate, 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. Action and Informational Submittals: 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 and General Contractor.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "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 AND CONSTRUCTION MANAGER'S ACTION

- A. Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect and General Contractor will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect and General Contractor will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.

- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and General Contractor.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SUBMITTAL LOG

PROJECT: 10544-17-09 College of DuPage BIC Adjunct Area Reconfiguration
OWNER: College of DuPage

PROJECT NO:
CONTRACTOR:

DATE REC'D.	SPECIFICATION SECTION NO.	SUBMITTAL ITEM	NO. RECEIVED	OTHER REVIEWER					ACTION				DATE RETURNED	COPIES TO						
				DATE SENT	RECIPIENT	NO. COPIES	DUE DATE	DATE REC'D.	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	NOT APP'D.		CONTRACTOR	OWNER	FIELD	FILE			
	081213	HOLLOW METAL FRAMES																		
		Product Data																		
		Shop Drawings																		
		Schedule																		
	081416	FLUSH WOOD DOORS																		
		Product Data																		
		Shop Drawings																		
		Samples																		
		Warranty																		
		Quality Standard Compliance Certificates																		
	087100	DOOR HARDWARE																		
		Product Data																		
		Shop Drawings																		
		Warranty																		
		Door Hardware Schedule																		
		Keying Schedule																		
	088000	GLAZING																		
		Product Data																		
		Sample Warranties for Special Warranties																		
	092216	NON-STRUCTURAL METAL FRAMING																		
		Product Data																		
	092900	GYPSUM BOARD																		
		Product Data																		
	095113	ACOUSTICAL CEILINGS																		
		Product Data																		
		Samples																		
	096513	RESILIENT BASE AND ACCESSORIES																		
		Product Data																		
		Samples																		
		Material Test Reports																		
	099123	INTERIOR PAINTING																		
		Product Data																		
		Samples																		
	210553	IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPEMNT																		

SUBMITTAL LOG

PROJECT: 10544-17-09 College of DuPage BIC Adjunct Area Reconfiguration
OWNER: College of DuPage

PROJECT NO:
CONTRACTOR:

DATE REC'D.	SPECIFICATION SECTION NO.	SUBMITTAL ITEM	NO. RECEIVED	OTHER REVIEWER					ACTION					COPIES TO					
				DATE SENT	RECIPIENT	NO. COPIES	DUE DATE	DATE REC'D.	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	NOT APP'D.	DATE RETURNED	CONTRACTOR	OWNER	FIELD	FILE		
		Product Data																	
	211313	WET-PIPE SPRINKLER SYSTEMS																	
		Product Data																	
		Shop Drawings																	
		Delegated Design																	
		Qualification Data																	
		Approved Sprinkler Piping Drawings																	
		Field Quality-Control Reports																	
		Closeout Submittals																	
		Maintenance Material Submittals																	
	230593	TESTING, ADJUSTING AND BALANCEING FOR HVAC																	
		Certified TAB Reports																	
	230713	DUCT INSULATION																	
		Product Data																	
		Material Test Reports																	
		Field Quality Control Reports																	
	233113	METAL DUCTS																	
		Product Data																	
		Shop Drawings																	
		Delegated-Design Submittal																	
		Welding Certificates																	
	233300	AIR DUCT ACCESSORIES																	
		Product Data																	
		Operation and Maintenance Data																	
	233113	METAL DUCTS																	
		Product Data																	
		Shop Drawings																	
		Delegated Design Submittal																	
		Welding Certificates																	
	233300	AIR DUCT ACCESSORIES																	
		Product Data																	
		Operation and Maintenance Data																	
	260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES																	

SUBMITTAL LOG

PROJECT: 10544-17-09 College of DuPage BIC Adjunct Area Reconfiguration
OWNER: College of DuPage

PROJECT NO:
CONTRACTOR:

DATE REC'D.	SPECIFICATION SECTION NO.	SUBMITTAL ITEM	NO. RECEIVED	OTHER REVIEWER					ACTION				DATE RETURNED	COPIES TO					
				DATE SENT	RECIPIENT	NO. COPIES	DUE DATE	DATE REC'D.	APPROVED	APPROVED AS NOTED	REVISE & RESUBMIT	NOT APP'D.		CONTRACTOR	OWNER	FIELD	FILE		
		Product Data																	
		Qualification Statements																	
		Field Quality-Control Reports																	
	260526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS																	
		Product Data																	
	260529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS																	
		Product Data																	
		Coordination Drawings																	
		Seismic Qualification Certificates																	
		Welding Certificates																	
	260533	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS																	
		Product Data																	
		Seismic Qualification Data																	
		Coordination Drawings																	
		Qualification Statements																	
	260544	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING																	
		Product Data																	
	260553	IDENTIFICATION FOR ELECTRICAL SYSTEMS																	
		Product Data																	
		Delegated-Design Submittal																	
	262816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS																	
		Product Data																	
		Operation & Maintenance Data																	
		Warranty																	

PART 1 - GENERAL

1.1 WORK INCLUDED:

- A. Furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section and herein specified, including:
 - 1. Schedule elements of remodeling and renovation work to expedite completion.
 - 2. In addition to demolition, cut, move or remove existing construction to provide access or to allow remodeling and new work to proceed. Include:
 - a. Repair or remove hazardous or unsanitary conditions.
 - b. Remove abandoned piping, conduit and wiring.
 - c. Remove unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metals and deteriorated concrete.
 - d. Clean surfaces. Remove surface finishes to install new work and finishes.
 - 3. Patch, repair and refinish existing items to remain, to the specified condition for each material, with a neat transition to adjacent new construction.
 - 4. Note or record existing project conditions before beginning work to minimize later disputes.

1.2 RELATED REQUIREMENTS

- A. Specified elsewhere:
 - 1. 01 74 19 - Construction Waste Management and Disposal
 - 2. 01 77 00 - Closeout Procedures

1.3 SEQUENCE AND SCHEDULES

- A. Submit separate detailed sub-schedule for alterations work, coordinated with Construction Schedule. Show:
 - 1. Each stage of work; occupancy dates of areas.
 - 2. Date of Substantial Completion for each area of alteration work.
 - 3. Crafts and subcontractors employed in each stage.

1.4 ALTERATIONS, CUTTING AND PROTECTION

- A. Cut finish surfaces such as masonry, tile, plaster or metals, by methods to terminate surfaces in a straight line at a natural point of division.
- B. Protect existing and new work from weather and temperature extremes.
 - 1. Maintain existing interior work above (*60) degrees F.
 - 2. Provide weather protection, waterproofing, heat and humidity control to prevent damage to remaining existing work and to new work.
- C. Provide temporary enclosures to separate work areas from existing building and from areas occupied by Using Agency, and to provide weather protection.

PART 2 - PRODUCTS

2.1 SALVAGED MATERIALS

- A. Salvage sufficient quantities of cut or removed materials to replace damaged work, when material is not readily obtainable on current market.
 - 1. Use particular care in removal and salvage of:
 - a. Doors/Frames
 - b. Equipment Mounts
 - c. Any items indicated to be salvaged on Drawings and Specifications.
 - 2. Store salvaged items in a dry, secure place on site.
 - 3. Designated items not specified for use in repair work remain College of DuPage's property.
 - 4. Do not use salvaged or used material in new construction except with prior written authorization from Architect/Engineer.

2.2 MATERIALS FOR PATCHING, EXTENDING AND MATCHING

- B. Ensure that work is complete:
 - 1. Provide same materials or types of construction as that in existing structure, to patch, extend or match existing work.

PART 3 - EXECUTION

3.1 REMOVE EXISTING CONSTRUCTION

- A. Temporary Removals:
 - 1. Remove existing pencil sharpeners, signage, etc
 - 2. Store all items indicated to be removed.
 - 3. Recondition items damaged by removal.
 - 4. Recondition items as designated.
 - 5. Reinstall in locations indicated.
- B. Remove and relocate: doors and hardware designated for reuse.
 - 1. Remove and dispose of: Dispose of items noted to be demolished.

3.2 PERFORMANCE.

- A. Patch and extend existing work using skilled craftsmen capable of matching existing quality of workmanship. For patched or extended work, provide quality equal to that specified for new work.

3.3 ADJUSTMENTS

- A. Where partitions are removed, patch floors, walls and ceilings with finish materials to match existing as closely as possible.
 - 1. Where removal of partitions results in adjacent spaces becoming one, rework floors and ceilings to provide smooth planes without breaks, steps or bulkheads.

2. Where extreme change of plane of (*two inches) or more occurs, request instructions from Architect/Engineer.

B. Trim and refinish existing doors to clear new floors.

3.4 DAMAGED SURFACES

- A. Patch and replace all portions of existing finished surfaces found to be damaged, lifted, discolored or showing other imperfections, with matching material.
 1. Provide adequate support prior to patching the finish.
 2. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.
 3. When existing surface cannot be matched, refinish entire surface to nearest logical break as determined by Architect.

3.5 TRANSITION FROM EXISTING TO NEW WORK

- A. When new work abuts or finishes flush with existing work, make a smooth transition. Patched work shall match existing adjacent work in texture and appearance as closely as possible.
 1. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

3.6 CLEANING

- A. Perform construction cleaning as specified.
 1. Clean User occupied areas daily.
 2. Clean all spillage, overspray or heavy dust collections in User occupied areas immediately.
- B. At completion of work of each craft, clean area and make surfaces ready for work of successive crafts.
- C. At completion of alterations work in each area, provide final cleaning and return space to a condition suitable for use of User.

END OF SECTION 01 35 16

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Contractor: Supervise and perform construction procedures to promote adequate indoor air quality during and after construction.

1.2 RELATED WORK

1.3 DESCRIPTIONS

- A. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- B. Airborne Contaminants:
 - 1. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.4 SUBMITTALS

- A. Submit Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA IAQ Guideline for Occupied Buildings Under Construction.
 - 1. Submit IAQ Plan at pre-construction meeting.
 - 2. Identify potential sources of odor and dust.
 - 3. Identify construction activities likely to produce odor or dust.
 - 4. Identify areas of project potentially affected, especially occupied areas.
 - 5. Evaluate potential problems by severity and describe methods of control.
 - 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
 - 7. Describe cleaning and dust control procedures.
 - 8. Describe coordination with commissioning procedure.
- B. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to absorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- C. Provide a Letter Template, signed by the General Contractor declaring that a Construction IAQ Management Plan has been developed and implemented, and listing each air filter used during construction and at the end of construction. Include the MERV value, manufacturer name and model number.
- D. Provide 18 photographs – six photographs taken on three different occasions during construction – along with identification of the SMACNA approach featured by each photograph, in order to show consistent adherence to the credit requirements.
 - 1. As an alternative of providing photographs, declare the five Design Approaches of SMACNA IAQ Guideline for Occupied Buildings under Construction, Chapter 3, which were used during building construction. Include a brief description of some of the important design approaches employed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials required by the Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases.

PART 3 - EXECUTION

3.1 IMPLEMENTATION

- A. Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
 - 1. During construction, meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, Chapter 3.
 - 2. Protect stored on-site or installed absorptive materials from moisture damage.
 - 3. If air handlers must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grill.
 - 4. Replace all filtration media immediately prior to occupancy. Provide filtration media having a Minimum Efficiency Reporting Value as scheduled.
- B. Prevent the absorption of moisture and humidity by absorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
 - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
 - 3. Provide sufficient ventilation for drying within reasonable time frame.
- C. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.
- D. HVAC equipment and supply air ductwork may not be used for ventilation during construction without meeting the following criteria as specified in the IAQ.
 - 1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 - 2. Ensure that air filters are correctly installed prior to starting use; replace filters when they loss efficiency.
 - 3. Do not use return air ductwork for ventilation.
 - 4. Seal return air inlets or otherwise positively isolate return air system to prevent recirculation of air; provide alternate return air pathways to the maximum extent possible.
- E. Do not store construction materials or waste in mechanical or electrical rooms.
- F. Prior to permanent use of return air ductwork without intake filters, clean up and remove dust debris generated by construction activities using a HEPA vacuum cleaning system.
- G. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- H. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

END OF SECTION 01 73 40

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 administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 02 41 19 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
 - 1. Demolition Waste:
 - a. Gypsum board.

- b. Acoustical tile and panels.
- c. Plumbing fixtures.
- d. Piping.
- e. Supports and hangers.
- f. Lighting fixtures.
- g. Lamps.
- h. Ballasts.

2. Construction Waste:

- a. Wood sheet materials.
- b. Metals.
- c. Gypsum board.
- d. Piping.
- e. Electrical conduit.
- f. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 30 days from Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator and refrigerant recovery technician.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in specifications.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with specifications for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site and off-site as designated by Owner.
 - 5. Protect items from damage during transport and storage.
- C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- E. Plumbing Fixtures: Separate by type and size.
- F. Lighting Fixtures: Separate lamps by type and protect from breakage.
- G. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
- B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- C. Metals: Separate metals by type.
 1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- E. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- F. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- G. Carpet Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- H. Carpet Tile: Remove debris, trash, and adhesive.
 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- I. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- J. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 74 19

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 administrative and procedural requirements for contract closeout, including, but not limited to, the following:

- 1. Substantial Completion procedures.
- 2. Final completion procedures.
- 3. Warranties.
- 4. Final cleaning.
- 5. Repair of the Work.

- B. Related Requirements:

- 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
- 2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.

8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and General Contractor 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. Re-inspection: Request re-inspection 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.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and General Contractor 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. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization 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 and Construction Manager.
 - d. Name of Contractor.
 - e. Page number.

4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect, through Construction Manager, will return annotated file.
 - b. PDF electronic file. Architect, through Construction Manager, will return annotated file.
 - c. Three paper copies. Architect, through Construction Manager, will return one copy.

1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: 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, or when delay in submittal of warranties might limit Owner's rights under warranty.

- B. Partial Occupancy: Submit properly executed warranties within 15 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 Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-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.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

- 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.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform 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 designated 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; clean according to manufacturer's recommendations 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. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements. Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
- 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

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 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. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

- b. Enable inserted reviewer comments on draft submittals.
2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, through General Contractor, will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. 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 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- 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: 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 and contact information for Contractor.
 6. Name and contact information for General Contractor.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. 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.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-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 content, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. 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 storage media 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. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has 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. Use designations for products indicated on Contract Documents.
 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 MANUALS

- 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 and drawing or schedule designation or identifier where applicable.
- 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 MANUALS

- 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 and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard 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 video recording, 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 Section 017839 "Project Record Documents."

- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

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 administrative and procedural requirements for project record documents, including the following:
1. Record Drawings.
 2. Record Specifications.
 3. Record Product Data.
 4. Miscellaneous record submittals.
- B. Related Requirements:
1. Section 017700 "Closeout Procedures" for general closeout procedures.
 2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
1. Number of Copies: Submit one set(s) of marked-up record prints.
 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one of file prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 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 provide information for preparation of corresponding 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 acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 - 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 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 and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 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. 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 and General Contractor 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.

- C. 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. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data 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 digital data file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and General Contractor.
 - 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.

- B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

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.
- B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

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.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

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 revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 01 78 39

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Base Bid: General Contractor shall furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section as shown on the drawings and herein specified, including:
 - 1. Selective demolition.
 - 2. Salvage of finish materials for reuse in new layout.

1.2 PROTECTION

- A. Protect adjacent materials and surfaces to remain.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Dust control barriers.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Proper coordination for the shut-off of utility services and control measures for dust and noise must occur prior to commencement of any demolition work. In confined areas of selective demolition, install and maintain dust and noise control barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove these protection measures after demolition operations are complete. Where placed adjacent to new finishes in contract, protect new finishes, and repair any damage to like-new condition.
- B. Maintain and protect existing building services which transit the area affected by selective demolition.
- C. Completely remove all equipment noted on the drawings for removal including all associated devices, controls, conduit, wiring, etc. Remove all exposed conduit and wiring back to the panel from which it is served. Provide flush, clean termination where conduit extends into existing wall or floor construction. Mark all disassociated breakers "spare". Unless otherwise noted, the General Contractor shall fill and patch all wall, floor, and ceiling openings resulting from this demolition work with materials and finishes identical to adjacent materials and finished.
- D. Unless otherwise noted, remove all wiring devices, fixtures, controls, circuitry (conduit and wiring), etc., made obsolete by the demolition within or around the building.
- E. The respective Contractor shall relocate all existing piping, circuitry (conduit and wiring), ductwork, etc., which impedes the installation of new materials and equipment of their own trade, unless otherwise noted.
- F. Demolish, remove, demount, and disconnect the following:
 - 1. Inactive and obsolete piping, fitting and specialties, equipment, ductwork, controls, fixtures, and insulation.
 - 2. Piping and ducts embedded in floors, wall, and ceiling may remain if such materials do not interfere with new installation. Remove materials above accessible ceilings. Drain and cap piping and ducts allowed to remain.

3.2 DISPOSAL OF EQUIPMENT AND MATERIALS

- A. The Contractor shall remove all generated trash, recyclables and debris from site, and dispose of in an environmentally friendly manner. The Contractor may not place this trash and debris in building-related dumpsters. The Contractor will comply with all requirements as outlined in 01 35 16 Remodeling Project Procedures and 01 74 19 Construction Waste Management and Disposal.

3.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Using Agency ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

3.4 REMOVED AND SALVAGED ITEMS:

- A. Clean salvaged items.
- B. Pack or crate items after cleaning. Identify contents of containers.
- C. Store items in a secure area until delivery to Using Agency.
- D. Transport items to storage area designated by Using Agency.
- E. Protect items from damage during transport and storage.

3.5 REMOVED AND REINSTALLED ITEMS:

- A. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
- B. Pack or crate items after cleaning and repairing. Identify contents of containers.
- C. Protect items from damage during transport and storage.
- D. 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.

3.6 EXISTING ITEMS TO REMAIN:

- A. Protect construction indicated to remain against damage and soiling during selective demolition.
- B. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

END OF SECTION 02 41 19

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 hollow-metal frames.
- B. Related Requirements:
 - 1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 2. Locations of reinforcement and preparations for hardware.
 - 3. Details of each different wall opening condition.
 - 4. Details of anchorages, joints, field splices, and connections.
 - 5. Details of moldings, removable stops, and glazing.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking. Provide minimum 1/4-inch space between each unit to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steelcraft – Ingersoll Rand
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR FRAMES

- A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Hollow-Metal Frames: NAAMM-HMMA 860.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Materials: Uncoated steel sheet, minimum thickness of 16 gage.
 - 3. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
 - 4. Construction: Full profile welded.
 - 5. Exposed Finish: Prime.

2.3 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.5 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Four anchors per jamb.
 - 5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

- C. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce frames to receive nontemplated, mortised, and surface-mounted hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- D. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
 - 3. Provide loose stops and moldings on inside of hollow-metal work.
 - 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.6 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap frames to receive nontemplated, mortised, and surface-mounted hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors and sidelites of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 4. 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.
- C. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.

- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.
- F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 12 13

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. Solid-core doors with wood-veneer faces.
- B. Related Requirements:
 - 1. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Requirements for veneer matching.
 - 6. Doors to be factory finished and finish requirements.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish.
 - 2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

- B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries
 - 3. Poncraft Door Company
 - 4. VT Industries, Inc.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
 - 1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
 - 2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
- B. WDMA I.S.1-A Performance Grade: Heavy Duty.
- C. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.

- a. Screw Withdrawal, Face: 700 lbf.
- b. Screw Withdrawal, Edge: 400 lbf.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors :
 1. Provide doors to match existing building standard.
 2. Grade: Premium, Grade A faces.
 3. Veneer: Maple veneer with clear finish. Book match and balance equal width pieces of fill flitch to match veneer across faces of doors. Grain to run horizontally.
 4. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 1. Wood Species: Same species as door faces.
 2. Profile: Manufacturer's standard shape.

2.5 FABRICATION

- A. Openings: Factory cut and trim openings through doors.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 14 16

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Base Bid: General Contractor shall furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section and herein specified, including:
1. Door hardware for wood
 2. Key bond.
 3. Jobsite visit necessary for keying conference(s).

1.2 REFERENCES

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.
- B. AWI - Architectural Woodwork Institute; current edition.
- C. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).
- D. BHMA A156.5 - American National Standard for Auxiliary Locks & Associated Products; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.5).
- E. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.6).
- F. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).
- G. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2005 (ANSI/BHMA A156.8).
- H. BHMA A156.13 - American National Standard for Mortise Locks & Latches; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.13).
- I. BHMA A156.16 - American National Standard for Auxiliary Hardware; Builders Hardware Manufacturers Association; 2002 (ANSI/BHMA A156.16).
- J. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).
- K. BHMA A156.21 - American National Standard for Thresholds; Builders Hardware Manufacturers Association; 2006 (ANSI/BHMA A156.21).
- L. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- M. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.

- N. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.
- O. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- P. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- Q. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 2007.
- R. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2006.
- S. SDI - Steel Door Institute.
- T. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- U. WHI - Warnock Hersey Incorporated; current edition.

1.3 SPECIFIED ELSEWHERE:

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Convey Owner's keying requirements to manufacturers.
- D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.
- E. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Details of electrified door hardware.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final

door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

- a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents. Use DHI vertical format.
 - b. Content: Include the following information:
 - i. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - ii. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - iii. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - iv. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
2. Keying Schedule: Prepared by owner. Contractor to furnish Medeco vendor contact information for coordination of keying.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying. Installers to have a minimum of two years of experience.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
 1. For door hardware, an Architectural Hardware Consultant (AHC) or Architectural Openings Consultant (AOC).
 2. Supplier shall provide a copy of the AHC or AOC certificate in conjunction with the submittals.
- C. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

- G. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines, ICC/ANSI A117.1 and HUD's "Fair Housing Accessibility Guidelines".
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 - 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- I. Coordination Meetings.
 - 1. Preinstallation Meeting: Prior to the start of hardware installation, the hardware manufacturer's representative will be scheduled to conduct a pre-installation meeting with the hardware installers, supplier, lock, exit device, and door closer manufacturer's representatives and related trades to coordinate materials and techniques.
 - 2. Contractor shall provide signed and executed Key Bond in the penal sum of \$250,000 (Two hundred and fifty thousand dollars, U.S.) naming the College of DuPage as Obligee, payable upon Contractor's failure to return to the College of DuPage the core removal key(s) and great great grand master key(s), in original form and loaned by the College of DuPage to the Contractor for use during construction. A sample copy of required Key Bond may be obtained from the College of DuPage.
 - 3. Keying Conference: Conducted by Owner at Project site to comply with requirements in Section 013100 "Project Management and Coordination."
 - 4. Post installation inspection to be performed by Hardware manufacturer's representative with a copy of the report to be forwarded to the contractor and to C.O.D.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys.
 - 1. All keys, key blanks, and cores are shipped directly from Medeco to C.O.D. Lockshop.
- B. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.8 SEQUENCING AND COORDINATION

- A. Reinforce walls for wall stops.

- B. Coordinate finish floor materials and floor-mounted hardware.
- C. Coordinate conduit and raceways as needed for electrical and electronic hardware items, fire and life safety system interfacing, point-to-point wiring diagrams, and riser diagrams to related other Trade Contractors.
- D. Furnish manufacturer templates to door and frame fabricators.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion, unless otherwise indicated.
 - a. Provide ten years mechanical, two years electrical warranty for door closers.
 - b. Provide three year warranty for mortise locksets.
 - c. Provide three year warranty for exit devices.
 - d. Provide lifetime warranty for hinges.
 - e. Provide two year warranty for all other hardware not listed above.

1.10 COMMISSIONING

- A. Test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
- B. Test electrical hardware systems for satisfactory operation.
- C. Test hardware interfaced with Fire/Life Safety, Access Control, and Handicapped Operator systems for proper operation and release.
- D. Perform final completion inspection with hardware manufacturer's representative. Submit report of inspection.

1.11 MAINTENANCE

- A. Instruct Owner in proper adjustments and maintenance of door hardware and hardware finishes during final adjustment phase of hardware installation.
- B. Key biting list in "blind code" form and letter of authorization shall be delivered by the College of DuPage to Contractor for coordination of keying. Contractor is to provide the College of DuPage with total quantity and description of all Medeco KeyMark product prior to obtaining biting list and letter of authorization from the College of DuPage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

ITEM	MANUFACTURER	ACCEPTABLE SUBSTITUTE
Hinges	(HAG) Hager	McKinney, Stanley

Continuous Hinges	(HAG) Hager	No Substitutions
Key System	(MED) Medeco	No Substitution
Locks	(SCH) Schlage	No Substitution
Integrated Locks	(SAR) Sargent	No Substitution
Exit Devices	(VON) Von Duprin	No Substitution
Closers	(LCN) LCN	No Substitution
ADA Door Operators	(REC) Record USA	No Substitutions
Flush Bolts	(IVE) Ives	Rockwood
Coordinators	(IVE) Ives	No Substitutions
Push & Pull Plates	(ROC) Rockwood	No Substitutions
Kickplates	(ROC) Rockwood	Hiawatha, Ives
Stops & Holders	(IVE) Ives	Hiawatha, Rockwood, Trimco
Overhead Stops	(GLY) Glynn Johnson	No Substitution
Thresholds	(PEM) Pemko	No Substitution
Seals & Bottoms	(PEM) Pemko	Reese, Zero

A. Provide hardware items required to complete the work in accordance with these specifications and manufacturers' instructions.

1. Include items inadvertently omitted from this specification, where such items are typically provided as industry standard practice, are required for proper door operation, or are necessary for compliance with Life Safety Codes, Fire Codes, and/or applicable Building Codes. Note these items in submittal for review. There will not be any extras allowed for items that should have been included during bidding.
2. Where scheduled item is now obsolete, bid and furnish updated item at no additional cost to the project.

2.2 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:

1. Applicable provisions of federal, state, and local codes.
2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
3. Applicable provisions of NFPA 101, Life Safety Code.
4. Fire-Rated Doors: NFPA 80.
5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
6. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.
7. Finishes: As indicated.

2.3 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated. See example, last page of this section.
3. Coordinate all electronic locks and switches into building controls, reporting to
4. Glen Ellyn campus, with override for lockdown at reception desk. See 28 13 00.

- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by descriptive titles corresponding to requirements specified in Part 2.

2.4 HANGING MEANS

- A. Conventional Hinges: Hinge open widths minimum, but, of sufficient throw to permit maximum door swing. Steel or stainless steel pins and standard ball bearings.
1. Three hinges per leaf to 7 feet, 6 inch height. Add one for each additional 30 inches in height, or any fraction thereof.
 2. Extra heavy weight hinges on doors over 3 feet, 5 inches in width.
 3. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins; outswinging lockable interior doors to have non-removable (NRP) pins.
 4. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
 5. Provide shims and shimming instructions for proper door adjustment.
 6. Scheduled Hinges are Hager.
 7. Finish of hinges: ferrous satin chrome plates, US26D; non-ferrous satin stainless steel, US32D.
 8. Accepted substitutions: Hager, McKinney, Stanley.

2.5 LOCKS, LATCHES, DEADBOLTS

A. Mortise Locksets and Latchsets:

1. Chassis: cold-rolled steel, handing field changeable without disassembly.
2. Latchbolts: 3/4 inch throw stainless steel anti-friction type.
3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded type levers as scheduled. Filled hollow tube design unacceptable.
 - a. Spindles: security design independent break-away. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
 - b. Thumbturns: L583-363 accessible design not requiring pinching or twisting motions to operate.
 - c. Deadbolts: stainless steel 1-inch throw.
 - d. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
 - e. Scheduled Mechanical Lock Series and Design: Schlage L9000 series, 06N design.
 - f. Scheduled Integrated Locks Series and Design: Sargnet H1 8200 series, LNL design.
 - g. Certifications:
 - i. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
 - ii. ANSI/ASTM F476-84 Grade 31 UL Listed.
 - h. Accepted Substitutions: No substitutions allowed.
 - i. Vertical clearance between latch tongue and strike plate shall be 1/8" (min.)
 - i. Strike filing is not an acceptable adjustment.

2.6 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Medeco Security Locks, Inc.; an ASSA ABLOY Group company.
 - b. No Substitutions.
 - c. Model Medeco KeyMark SFIC core #33K700007 – 9G – 26 x MK x (SL-Stamp-Lok)
- B. High-Security Lock Cylinders: BHMA A156.30; Grade 1; permanent cores that are SFIC removable; face finished to match lockset.
1. Number of Pins: Seven.
 2. Type: Mortise and Rim type.
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
1. Owner will send Letter of Authorization to Medeco supplier (Contractor to provide contact info) and the key schedule and biting list to Medeco. Medeco to send all cut keys, key blanks, and keyed cores directly to Owner. Owner will release cores to contractor after they have been checked and prepared for install. Receipt of the Key Bond (see 3.1) is also required for release of cores.

2.7 KEYING

- A. Key System: Medeco KeyMark 7-pin patented keyway, small format interchangeable core throughout.
1. Existing factory registered master key system.
 2. Provide 7-pin SFIC thick head cores, factory keyed to the existing Medeco KeyMark great-grand-masterkey system.
 3. Key blanks available only from factory-direct sources, not available from after-market key blank manufacturers.
 4. For estimate, use factory Keyway 26 MK and SL-STAMP-LOK charges, number 33K700007.
 5. Initiate and conduct meetings with Owner to determine systems keyways and structure.
 6. Furnish Owner's written approval of the system.
 7. Owner's Lockshop will apply Medeco KeyMark nomenclature to approved keying schedule and forward to Medeco.
- B. The following specialty items must be furnished with Medeco KeyMark 7-pin SFIC ext. face cores. Consult Owner for specific details:
1. Elevators with Keyed Switches
 2. Built-in Cabinets and Audio / Visual Equipment Cabinets
- C. Construction Keying: Furnish temporary keyed-alike cylinder cores.
1. Remove at substantial completion and install permanent cylinder cores in Owner's presence.
 2. Demonstrate that construction key no longer operates.
 3. Provide Owner with two (2) copies of keys used in each type/keyset of temporary cylinder cores at the time of temporary cylinder core installation.
 4. Temporary cylinder cores remain Supplier's property.
 5. Furnish 5 construction keys.
 6. Furnish 2 construction control keys.
 7. Re-combine entire project at no expense to the Owner if missing any of the project keys.
- D. Cylinder Cores: Keyed at factory of core manufacturer where permanent records are maintained.

- E. Supply two (2) original Medeco KeyMark cut keys per keyset. Supply two (2) Custom Coined Medeco KeyMark keyblanks for each Medeco KeyMark core provided. All keyblanks are to be custom coined to the College of DuPage existing coining die.
 - 1. Provide key blanks in full box quantities. If project requires less than full box quantity, provide full box quantity.
- F. All "SL" stamped (face stamp lock) cores, keys, and coined keyblanks are to be shipped, each under separate cover, via registered mail with delivery receipt required, directly from Medeco to:
College of DuPage
Facilities Operations and Maintenance - Lock Shop 425 Fawell Boulevard
Glen Ellyn, IL 60137-4599
- G. Instruct cylinder and key manufacturer to clearly label keys, boxed key blanks, and keyed cylinders per order and with keying instructions included. Each type of key shall be tagged and bagged for easy identification.
- H. Core boxes are to be tagged by the manufacturer with both SL_STAMP LOK and Door numbers and not tagged in any other way. Installation of cylinder cores will be by the appropriate Trade Contractor.
- I. Factory is to be instructed to stamp all cut keys with appropriate key set.
- A. Identification and Delivery: All key blanks and cylinders/cores shall be shipped direct from Medeco to the following address:

College of Dupage
Facilities Operations & Maintenance – Lock Shop
425 Fawell Boulevard
Glenn Ellyn, IL. 60137-6599

2.8 MECHANICAL STOPS AND HOLDERS

- A. Provide stops to protect walls, casework or other hardware .
- B. Wall-Stops: BHMA A156.16; wrought steel base metal.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Scheduled concave wall stops: Ives WS406CVX or WS407CVS.
 - b. Schedule convex wall stops: Ives WS406CCV or WX407CCV.
- C. Wall Bumpers: Grade 1; with rubber bumper; 2-1/2-inch (64-mm) diameter, minimum 3/4-inch (19-mm) projection from wall; with backplate for concealed fastener installation; with convex bumper configuration.

2.9 OTHER HARDWARE

- A. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression. Provide manufacturers' thru bolts for exit devices and door closers without exception.

- B. Silencers: Interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.
- C. Key Bond: Contractor shall provide signed and executed Key Bond in the penal sum of \$250,000 (Two Hundred and Fifty Thousand Dollars, U.S.) naming College of DuPage as Obligee, payable upon Contractor's failure to return to College of DuPage the core removal key(s) and great grand master key(s), in original form and quantity loaned by College of DuPage to the Contractor for use during construction. A sample copy of required Key Bond may be obtained from College of DuPage.

2.10 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - i. Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - ii. Strike plates to frames.
 - iii. Closers to doors and frames.
 - b. Steel Through Bolts: For the following:
 - i. Surface hinges to doors.
 - ii. Closers to doors and frames.
 - iii. Surface-mounted exit devices.
 - 3. Spacers for Bolts: For through bolting of hollow-metal doors.
 - 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 - 5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.11 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

- A. Provide products that comply with the following:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 - 3. Applicable provisions of NFPA 101, Life Safety Code.
 - 4. Fire_Rated Doors: NFPA 80.
 - 5. All Hardware on Fire_Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.

6. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.
7. Finishes: As indicated.

2.12 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- D. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
 2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- E. Door Closers: Take note on the degree of swing and type of arm installation as well as other hardware that may interfere if not properly templated. All door closers shall receive sex nuts and bolts (SNB).
- F. Wall Stops: All wall stops shall be installed and the substrate wall reinforced so as to prevent knob/lever from striking or damaging wall. For block walls use rawl or plastic plugs; for gypsum board walls use full threaded fastener applicable for substrate reinforcement.
- G. Fastening: Furnish hardware complete with all screws, through bolts and other fastenings of suitable type and size to ensure a permanent concealed attachment, with the finish to match the hardware.
- H. Thresholds: Install in one continuous piece, full width of opening. Set in full bed of mastic and fasten with countersunk anchors at manufacturer's recommended spacing. Apply clear sealant to outside edges to prevent water infiltration.

- I. Fitting: Fit all hardware accurately and properly. Remove exposed parts until after painter's finishing is completed then reinstall (this includes door frame silencers). Securely fasten all fixed parts. Fit faces of mortised parts snug and flush. Make sure operating parts move freely and smoothly without binding, sticking, or excessive clearance.
- J. Adjustment:
 - 1. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit.
 - 2. Replace units that cannot be adjusted to operate as intended.
 - 3. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 4. Strike filling is not an acceptable adjustment.

3.3 FIELD QUALITY CONTROL

- A. Provide an Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

- A. Adjust work per specifications.
- B. Adjust hardware for smooth operation.
- C. Adjust each operating item of hardware to manufacturer's recommendations. Check each door to ensure proper operation and function of every unit. Adjust door control devices to proper speed and power.
- D. Lubricate moving parts with type of lubrication recommended by manufacturer.
- E. Clean all exposed surfaces.
- F. Replace unit that cannot be adjusted and lubricated to operate freely, smoothly, and quietly within manufacturers' specifications as intended for the application.
- G. Filing or strike plates or any other hardware component is an unacceptable adjustment method.
- H. Trade Contractor shall be responsible to replace a mis-templated door if there is an adjustment or and alignment issue.

3.5 DOOR HARDWARE SCHEDULE

- A. Furnish products as listed in the following hardware sets:
- B. Manufacturers, finish and their abbreviations used in the schedule:

HAG	Hager
LCN	LCN
MED	Medeco High Security

ROC	Rockwood
SCH	Schlage Locks
600	Primed Coat
630	Satin Stainless Steel
652	Steel/Satin Chrome
689	Aluminum
SP28	Aluminum

HARDWARE SET 1

3 EA HINGES	TA2714 4.5 X 4.5	652	MCK
1 EA PASSAGE	L9010	626	SCH
1 EA WALL STOP	409	630	ROC

HARDWARE SET 2

3 EA HINGES	TA2714 4.5 X 4.5	652	MCK
1 EA OFFICE	L9070L X 06N	626	SCH
1 EA CYLINDER	MEDECO KEYMARK SFIC	626	MED
1 EA WALL STOP	409	630	ROC

HARDWARE SET 3

2 EA HINGES	BB1279 4.5 X 4.5	652	MCK
1 EA ELECTRIC HINGE	TA2714 4.5 X 4.5 QC-12	652	MCK
1 EA ELECTRIC LOCK	LC-H1 82271 LNL	626	SAR
1 EA CYLINDER	MEDECO KEYMARK SFIC	626	MED
1 EA CLOSER	4040XP EDA	689	LCN
1 EA KICK PLATE	8" X 2" LDW	630	ROC
1 EA WALL STOP	409	630	ROC

END OF SECTION 08 71 00

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. Glass for interior doors and sidelites.
 - 2. Glazing accessories.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

2.2 GLASS PRODUCTS

- A. Clear Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3. Single 1/4" pane.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Minimum required face and edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- D. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- E. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.4 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 80 00

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 WORK INCLUDES

- A. Base Bid: General Contractor shall furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section as shown on the drawings and herein specified, including: Work includes all labor and material for the following:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Wall reinforcement backing plates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Studs and Runners: Provide documentation that framing members' certification is according to SIFA's "Code Compliance Certification Program for Cold-Formed Steel Structural and Non-Structural Framing Members."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 10 lbf/sq. ft..

2.2 FRAMING SYSTEMS

- A. Steel studs from North America conforming to the requirements of this section.
- B. 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: hot-dip galvanized unless otherwise indicated.
- C. Studs and Runners: ASTM C 645.
 - 1. Steel Studs and Runners:

- a. Minimum Base-Metal Thickness: 0.0329 inch.
 - b. Depth: As indicated on Drawings 3-5/8 inches, minimum.
- D. Slip-Type Head Joints: Where indicated, provide the following:
- 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing for support of mounted casework and equipment.
- 1. Minimum Base-Metal Thickness: 0.0598 inch.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
- 1. Minimum Base-Metal Thickness: 0.0329 inch.
 - 2. Depth: As required for application: 7/8 inch and 1-1/2 inches.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
- 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
- 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
- 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: As required by horizontal deflection performance requirements minimum 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: As required by horizontal deflection performance requirements minimum 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. 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.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- E. Direct Furring:
 - 1. Screw to framing.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.
- G. Install wall backing plates to studs to support wall-supported items where indicated.

- H. Install multiple-stud, built-up stud and nested stud post sections where indicated.
- I. Install studs anchored to miscellaneous steel sections, where indicated.

END OF SECTION 09 22 16

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 WORK INCLUDES

- A. Base Bid: General Contractor shall furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section as shown on the drawings and herein specified, including: Work includes all labor and material for the following:

- 1. Interior gypsum board.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install 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.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Gypsum.
 - 2. CertainTeed Corp.
 - 3. Georgia-Pacific Gypsum LLC.

4. National Gypsum Company.
5. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch unless noted otherwise.
2. Long Edges: Tapered for prefilling.

2.2 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.

2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, beveled panel edges, 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.

D. 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.

E. Acoustical 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 E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- 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 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. 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.
- C. 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.
- D. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- E. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side. Install sound insulation blankets to infill existing to match where existing partitions patched.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 - 1. 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.
 - 2. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 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. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where required.
5. U-Bead: Use at exposed panel edges.

3.5 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, beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated and typically unless noted otherwise.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Transitions to existing Gypsum board:
 1. Float both new and existing exposed surfaces full-height to align and make level. Transition outward from joint and feather finish to make un-noticeable.

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- 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 09 29 00

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Base Bid: General contractor shall furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section as shown on the drawings and herein specified, including:
1. Acoustic panels provided in exposed grid suspension system.
 2. Exposed grid suspension systems.
 3. Reuse existing ceiling grid and tile to the greatest extent possible. New grid and tile to match existing.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical component and suspension.
- B. Samples: Submit samples, in triplicate, of the following:
1. 6" square samples of each acoustical panel pattern and color.

1.3 QUALITY ASSURANCE

- A. Surface Burning Characteristics: As follows, tested per ASTM E 84:
1. Flame Spread: 25 or less
 2. Smoke Developed: 50 or less
- B. Coordination of Work: Coordination layout and installation of acoustical ceiling units and suspension system components with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, partition system and similar elements.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

- A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet work in space is completed and nominally dry, construction above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 4 percent of quantity installed, minimum six (6) panels.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 4 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL

- A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated, which are prepared for the mounting method designated, and which comply with FS SS-S-118 requirements, including those indicated by reference to type, form, pattern, grade, light reflectance coefficient, edge detail and joint detail.
- B. Colors, Textures and Patterns: Provide products matching appearance characteristics of items selected or approved by the A/E, of quality designed.

2.2 ACOUSTICAL TILES AND SUSPENSION SYSTEM

- A. Provide manufacturer's tile units suspension system complying with the following requirements under type and prepared for mounting system indicated.
- B. Acoustical panel ceilings and exposed grid suspension system:
 - 1. Acoustic Ceiling Tile:
 - a. Acoustic Ceiling Tile
 - b. Rigid board of mineral fiber wet felted with binders and fillers, conforming to ASTM E 1264, Form 2, Type III, Pattern CE, Class 25, NRC 0.50, LR 0.83 and CAC 35.
 - c. Size: 24" x 24"
 - d. Thickness: 5/8"
 - e. Edge Profile: Tegular
 - 2. Suspension System:
 - a. Provide manufacturer's standard metal suspension system to match existing system within space.
 - b. Runners and cross runners shall be double thickness web, bulb section design of hot dipped-galvanized steel conforming to ASTM A 366, web height 1-1/2" and have 9/16" bottom flange. Painted white to match existing grid.
- C. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips or other supports required to be installed by other trades for support of acoustical ceiling systems.
- B. Measure each ceiling area and establish layout of acoustical units to balance border width at opposite edges of each ceiling. Avoid use of less-than-half-widths units at borders, and comply with reflected ceiling plans carefully.

3.2 INSTALLATION

- A. Install anchors, wires and exposed grid to match existing system. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations. Marry new replacement grid with existing grid construction to make a seamless installation. Provide new structural tees, components and miscellaneous hardware as required.
- B. Prior to the beginning of ceiling work, the ceiling contractor and other contractors whose work is related to the ceiling installation shall identify all areas of potential interference between ceiling components and components from other trades. The ceiling contractor shall coordinate layout requirements with plumbing, heating, and ventilating and electrical contractors.
- C. All areas of the interference which arise following the beginning of ceiling construction shall be reported by the contractor involved to the general contractor as soon as the interference is observed. Such interference shall be resolved by the general contractor with the assistance of the contractors involved.
- D. In instances where unauthorized modification and/or loading of the ceiling causes unsatisfactory ceiling performance, the responsible party, as determined by the general contractor, will be financially responsible for correction of the condition in an acceptable manner.
- E. All mechanical equipment shall be self-supporting and shall not exert any detrimental loads on the ceiling assembly.
- F. Where duct work occurs, making it impossible to maintain spacing of hangers, provide additional hangers as required to support larger runners necessary for longer spans. Punching of ducts and extending hangers through ducts will not be permitted. Re-hang existing grid as may be required for new duct installations.

3.3 CLEANING

- A. Clean exposed surfaces of ceiling systems specified in this Section, including trim, edge moldings, and suspension members. Comply with manufacturers' instructions for cleaning and touch-up of minor finish damage. Remove and replace components which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. General Contractor shall provide all labor, materials, equipment and supplies necessary.
 - 1. Resilient base indicated and as specified.

1.2 RELATED DOCUMENTS

- A. Drawings.
- B. General provisions of the contract including General and Supplemental Conditions.
- C. Division 01 Specifications.

1.3 SUBMITTALS

- A. Product Data: Product data for each type of product specified.
- B. Samples: Submit samples in manufacturer's standard sizes, but not less than 4 inches long, of each different color and pattern of product specified.

1.4 QUALITY ASSURANCE

- A. Conform to all recommendations for materials and installation from all authorities having jurisdiction. The references below are the current editions of the American Society for Testing and Materials, unless otherwise noted.
- B. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- C. Fire Performance Characteristics: Provide products with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
 - 2. Smoke Density: Less than 450 per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- C. Move products into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

- A. Do not install products until they are at the same temperature as that of the space where they are to be installed.
- B. Close spaces to traffic during installation of products specified in this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Roppe
- B. Johnsonite
- C. Burke Mercer.

2.2 RESILIENT BASE

- A. 4" Rubber Wall Base: Complying with ASTM F 1861, Type TS, Group I, solid.
- B. Provide and install inside and outside corner pieces by same manufacturer.
- C. Colors: To match existing within space.

2.3 ACCESSORIES

- A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient flooring product and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.
- B. Use trowelable patching compounds per manufacturer's directions to fill cracks, holes, and depressions in substrates.
- C. Clean substrates to be covered immediately before installing products specified in this Section. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.3 INSTALLATION

- A. General: Install products specified in this Section using methods indicated according to manufacturer's installation directions.
- B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - 1. On irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 - 2. Install inside and exterior corners before installing straight pieces.
 - 3. Use manufacturer's inside and outside corner pieces.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.
 - 2. Damp-mop resilient accessories to remove black marks and soil.
- B. Protect against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 09 65 13

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 WORK INCLUDES

- A. Base Bid: General Contractor shall furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section as shown on the drawings and herein specified, including: Work includes all labor and material for the following:
 - 1. Surface preparation and application of paint systems on interior substrates:
 - a. Steel.
 - b. Gypsum board.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Color Samples: 9x10 pant draw-downs.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide all products by one of the following:
1. Benjamin Moore & Co.
 2. PPG Architectural Finishes, Inc.
 3. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. Colors: To match existing within space.
- C. Paint at gypsum board substrates:
1. First coat: interior latex base primer coat (FS TT P 650).
 - a. Sherwin Williams, Harmony Interior Latex Primer
 - b. Or approved equal.
 2. Second Coat: Interior eggshell finish latex base paint.
 - a. Sherwin Williams, Harmony Interior Egshell
 - b. Or approved equal.
- D. Pant at Hollow Metal Door Frames: Interior PreCatalyzed Epoxy Semi-Gloss Finish:
1. Prime Coat: Acrylic Metal Primer (FS TT-P-86). (Prime coat is not required on items delivered shop primed or pre-painted, but prime coats shall be touched up as required.)
 - a. Sherwin Williams: Pro Industrial ProCryl Primer
 - b. Or Approved Equal
 2. First Coat: Interior PreCatalyzed Epoxy
 - a. Sherwin Williams: Pro Industrial PreCatalyzed WB Epoxy, SemiGloss
 - b. Or Approved Equal
 3. Second Coat: Interior PreCatalyzedSemi-Gloss Enamel (FS TT-E-509).
 - a. Sherwin Williams: Pro Industrial PreCatalyzed WB Epoxy, Semi-Gloss
 - b. Or Approved Equal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
 - 1. SSPC-SP 5.
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 3. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 4. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for completed and future testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

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

END OF SECTION 09 91 23

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Interior ADA-Compliant Room Signs to match existing signage in building.

1.3 DEFINITIONS

- A. "Room Sign": Sign identifying a single room or space with a tactile header that is compliant with current ADA standards.
- B. "Tactile Header": The room number component of a room sign with ADA-compliant tactile characters and Grade II Braille. The tactile header message contains the building acronym immediately followed by the room numbers/letters.

1.4 OWNER-SUPPLIED SAMPLES

College will provide a physical sample of each sign type for the awarded sign contractor for comparison purposes. Sign contractor will return college-provided samples with as-built documents.

1.5 PERFORMANCE REQUIREMENTS

- A. Interior ADA-Compliant Room Sign
 1. Match current, in-use ADA-compliant room signs installed in the **Berg Instructional Center** in size, shape, color, materials and message style.
 2. Meet current requirements of the Americans with Disability Act Accessibility Guidelines (ADAAG) and local codes, amendments and modifications.
 3. Character spacing (kerning)—Tactile characters to be spaced evenly between characters.

1.6 SUBMITTALS

- A. Shop Drawings: Submit fabrication and installation drawings
 1. Provide shop drawings of all work included in the designated scope of work. Shop drawings to include dimensions, detailed construction drawings, materials, and technical data for each sign type required.
- B. Proofs—Provide full-size proofs of all artwork, characters, and symbols for approval before fabrication.
- C. Upon completion of the project, sign contractor is required to furnish in print and electronic format all close out documents. i.e. Project Manual, as-built drawings, and all

technical installation information. Electronic format must be compatible with College software programs.

1. As-built drawings will be submitted as two complete printouts as well as an electronic version, upon completion of work. Final payment will not be processed until drawings have been received and verified as complete. All drawings submitted shall become property of College of DuPage.

D. Warranty Documents:

1. Provide a five (5) year written warranty from date of final acceptance for all signage components, labor, and material.
2. Provide a (5) five year written warranty on all finishes for all signage.
3. Sign contractor shall submit or obtain from subcontractor (s) or manufacturers on corporate letterhead the same warranty requirements from the company supplying the Warranty/Guarantee.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Sign contractor company must be an Architectural Sign Manufacturing and Installation company in business for more than 10 consecutive years, and must utilize a minimum of 75% of their work force to complete the scope of work.
2. Sign contractor company must have successfully completed five (5) architectural interior sign manufacturing and installation projects similar in scope for higher education (community college and four-year colleges), and/or corporate and/or institutional organizations.

B. Regulatory Requirements: Comply with current requirements of the Americans with Disability Act Accessibility Guidelines (ADAAG) and local codes, with amendments and modifications.

C. Supplier:

1. Tactile headers: Obtain all products from a single supplier.
2. Photopolymer: Obtain all products from a single supplier.
3. Clear polymer must be from a single source manufacturer.

D. Field verify all site conditions, field measurements, site locations, and wall and ceiling finishes in connection with the work. Sign contractor will notify the College in writing of any discrepancies prior to commencement of work.

E. Discrepancies with sign size, color, materials and available space will be responsibility of the sign company contractor.

1.8 DELIVERY, STORAGE AND HANDLING

A. Transport products by methods to avoid product damage.

B. Photopolymer signs:

1. Deliver product packaged in groups determined by:
 - a. Floor level
 - b. Hallway sequence, i.e. "BIC2A07-BIC2A07G"

1.9 PROJECT CONDITIONS

A. Existing tactile header components have been sourced from several sign suppliers in the past. This has resulted in a number of tactile header variations, primarily with typeface and the curved photopolymer shape.

1.10 SEQUENCING AND SCHEDULING

A. ADA-compliant room signs to be delivered to the college by **July 31, 2018**.

1.11 WARRANTY

A. Provide a five (5) year written warranty from date of final acceptance for all signage components, labor, and material.

B. Provide a (5) five year written warranty on all finishes for all signage.

C. Sign contractor shall submit or obtain from his subcontractor on corporate letterhead the same warranty requirements from the company supplying the Warranty/Guarantee.

D. Provide a (5) five year written warranty for tactile headers against delamination of tactile components and Grade II Braille.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Photopolymer manufacturer: Nova Polymers Inc. or approved equivalent;
P.O. Box 1305; West Caldwell, NJ 07007.

B. Paint manufacturer: Matthews Paint—NO SUBSTITUTIONS 760 Pittsburgh Drive;
Delaware, OH 43015; phone: 1-800323-6593

2.2 MATERIALS

A. Photopolymer

1. Tactile headers shall consist of a light-sensitive coating (photopolymer) on a polyester backing.

2. All polymers to be Nova Polymer or equivalent other.
3. Clear polymer must be from a single source manufacturer.
4. All surfaces to be primed, painted, and sealed with Matthews Paint Company products. Include: manufacturer recommended primer, matte finish acrylic polyurethane paint and sealed with a matte finish, vandal-resistant clear polyurethane overcoat. All paints and sealers to have a finish warranty of five (5) years or greater against peeling, cracking, fading, delamination, and other finish deficiencies.
5. Photopolymer component finishes, including but not limited to tactile and Grade II Braille elements, will have a five (5) year written warranty.

B. Paint

1. Use products and application process as recommended by Matthews Paint Company.
2. Apply products evenly and without pinholes, scratches, peeling, application marks, and dust particles.
3. All paints, sealers and clear coats to have a finish warranty of 5 years or greater against peeling, cracking, fading, and other deficiencies.

C. Reproductive Process

1. All fonts are to be provided by the sign contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine existing conditions of the Project, including elements affecting the installation of products, or performance of the work.
- B. Report unsatisfactory or questionable conditions to the College in writing; do not proceed with the work until the College provides further instructions.

3.2 FIELD QUALITY CONTROL

- A. Any sign that does not match current signage or shows other defects will be returned.

- B. Corrective actions: Replace or repair sign type to eliminate defects, deficiencies and irregularities.

3.3 CLEANING

- A. Remove all labels and protective coverings from completed Work.
- B. Thoroughly clean the Work and adjoining surfaces and areas affected by installation.

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 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
 - 2. Brady Corporation.
 - 3. Brimar Industries, Inc.
 - 4. Carlton Industries, LP.
 - 5. Champion America.
 - 6. Craftmark Pipe Markers.
 - 7. Emedco.
 - 8. Kolbi Pipe Marker Co.
 - 9. LEM Products Inc.
 - 10. Marking Services Inc.
 - 11. Seton Identification Products.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.
- C. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. 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 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.
- E. Pipe-Label Colors:
 - 1. Background Color: Safety Red.
 - 2. Letter Color: White.

PART 2 - PRODUCTS – Not used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 PIPE LABEL INSTALLATION

- A. Pipe-Label Locations: Locate pipe labels where piping is above accessible ceilings in finished spaces as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to in areas of congested piping and equipment.
 - 5. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

END OF SECTION 21 05 53

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 DEFINITIONS

- A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175-psig maximum.

1.3 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, attachment details, and hydraulic calculations.
 - 2. Provide minimum 1/8" = 1'-0" scale shop drawings for all piping systems.
- 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 a qualified professional engineer, a licensed architect, or a holder of a valid NICET level 3 or 4 certification in fire protection technology automatic sprinkler system layout, who is responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- 1. Domestic water piping.
- 2. Plumbing vent.
- 3. Items penetrating finished ceiling include the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
- 4. HVAC Ductwork.
- 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. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

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 fire-hydrant flow test.

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, Construction Manager or Owner no fewer than seven days in advance of proposed interruption of sprinkler service.
- B. All existing equipment affected by this project shall be treated as new.

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 to design wet-pipe sprinkler systems.
 - 1. 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) Classrooms, Laboratories Office and Public Areas: Light Hazard.
2. Minimum Density for Automatic-Sprinkler Piping Design:
 - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft.
3. Maximum Protection Area per Sprinkler: According to UL listing.
4. Maximum Protection Area per Sprinkler:
 - a. Classrooms, Laboratories 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, 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. Galvanized and Black Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- C. Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- D. Malleable- or Ductile-Iron Unions: UL 860.

2.3 SPRINKLER PIPING SPECIALTIES

- A. Branch Outlet Fittings:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International.
 - b. National Fittings, Inc.
 - c. Shurjoint Piping Products.
 - d. Tyco Fire & Building Products LP.
 - e. Victaulic Company.
 2. Standard: UL 213.
 3. Pressure Rating: 175-psig minimum.
 4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 5. Type: Mechanical-tee and -cross fittings.
 6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 8. Branch Outlets: Grooved, plain-end pipe, or threaded.
- B. Branch Line Testers:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Elkhart Brass Mfg. Co., Inc.
 - b. Fire-End & Croker Corporation.
 - c. Potter Roemer LLC.
2. Standard: UL 199.
 3. Pressure Rating: 175 psig.
 4. Body Material: Brass.
 5. Size: Same as connected piping.
 6. Inlet: Threaded.
 7. Drain Outlet: Threaded and capped.
 8. Branch Outlet: Threaded, for sprinkler.
- C. Adjustable Drop Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aegis Technologies, Inc.
 - b. CECA, LLC.
 - c. Corcoran Piping System Co.
 - d. Merit Manufacturing.
 2. Standard: UL 1474.
 3. Pressure Rating: 250-psig minimum.
 4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
 5. Size: Same as connected piping.
 6. Length: Adjustable.
 7. Inlet and Outlet: Threaded.
- D. Flexible Sprinkler Hose Fittings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fivalco Inc.
 - b. FlexHead Industries, Inc.
 - c. Gateway Tubing, Inc.
 - d. Victaulic Company.
 2. Standard: UL 1474.
 3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
 4. Pressure Rating: 175-psig minimum 300 psig.
 5. Size: Same as connected piping, for sprinkler.

2.4 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Globe Fire Sprinkler Corporation.
 2. Reliable Automatic Sprinkler Co., Inc. (The).
 3. Venus Fire Protection Ltd.

4. Victaulic Company.
 5. Viking Corporation.
- B. Listed in UL's "Fire Protection Equipment Directory" or FM Global's "Approval Guide."
- C. Sprinkler Finishes: Chrome plated.
- D. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: Steel, one piece, flat, White enamel, two piece, with 1-inch vertical adjustment.
- E. Sprinkler Guards:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Reliable Automatic Sprinkler Co., Inc. (The).
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - d. Viking Corporation.
 2. Standard: UL 199.
 3. Type: Wire cage with fastening device for attaching to sprinkler.

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 piping. 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 unions adjacent to each valve in pipes NPS 2 and smaller.

- E. Install sprinkler piping with drains for complete system drainage.
- F. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- G. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- H. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- I. Fill sprinkler system piping with water.

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. 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 pipes, tubes, and fittings before assembly.
- D. 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.
- E. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.
- B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.

3.5 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

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. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
3. Energize circuits to electrical equipment and devices.

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, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

3.9 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms with Suspended Ceilings: Pendent sprinklers

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
2. Pendent Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 21 13 13

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. Thermal-hanger shield inserts.
 - 3. Fastener systems.
 - 4. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. 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.

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. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers 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. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze 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: Pregalvanized or 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.

2.2 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Buckaroos, Inc.
 2. Carpenter & Paterson, Inc.
 3. Clement Support Services.
 4. ERICO International Corporation.
 5. National Pipe Hanger Corporation.
 6. Pipe Shields Inc.
 7. Piping Technology & Products, Inc.
 8. Rilco Manufacturing Co., Inc.
 9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig ,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 Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

- D. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated 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.

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. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- C. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- F. 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.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. 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.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

- J. 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.
- K. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. 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 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 inches.

3.4 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 carbon-steel pipe hangers and supports and attachments for general service applications.
- 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 non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- I. 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.
- J. 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.
- K. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Equipment labels.
 2. Warning signs and labels.
 3. Pipe labels.
 4. Duct labels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. Seton Identification Products.
 2. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 3. Letter Color: White.
 4. Background Color: Black.
 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-quarters 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. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 3. Letter Color: White.
 4. Background Color: Black.
 5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 7. 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-quarters the size of principal lettering.
 8. Fasteners: Stainless-steel rivets or self-tapping screws.
 9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- D. 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) and 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Brady Corporation.
 2. Kolbi Pipe Marker Co.
 3. Seton Identification Products.
 4. MIFAB, Inc.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include 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: Size letters according to ASME A13.1 for piping.

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. Pipe Label Locations: 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 and on both sides of 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:
 - 1. Heating Water Piping: White letters on a safety-green background.

END OF SECTION 23 05 53

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:

1.2 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 independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

- A. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.4 INFORMATIONAL SUBMITTALS

- A. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
 - 2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
- B. TAB Specialists Qualifications: Certified by NEBB.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB.
 - 2. TAB Technician: Employee of the TAB specialist and certified by NEBB as a TAB technician.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

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 installed systems for 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 applicable for intended purpose and 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 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.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- I. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- K. Examine operating safety interlocks and controls on HVAC equipment.
- L. 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 for balancing the systems.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Duct systems are complete with terminals installed.
 - b. Dampers are open and functional.
 - c. Clean filters are installed.
 - d. Fans are operating, free of vibration, and rotating in correct direction.
 - e. Variable-frequency controllers' startup is complete and safeties are verified.
 - f. Automatic temperature-control systems are operational.
 - g. Ceilings are installed.
 - h. Windows and doors are installed.
 - i. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" ASHRAE 111 NEBB's, "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" , and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- 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 233300 "Air Duct Accessories."
- 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. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Adjust the variable-air-volume systems as follows:
 - 1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
 - 2. Verify that the system is under static pressure control.
 - 3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 - 4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
 - a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
 - b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
 - c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
 - d. Adjust controls so that terminal is calling for minimum airflow.
 - e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
 - f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
 - g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.
 - 5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

- a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
 - c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
6. Measure fan static pressures as follows:
- a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
- a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
 - b. Verify that terminal units are meeting design airflow under system maximum flow.
8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:
- a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
 - b. Re-measure and confirm that total airflow is within design.
 - c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
 - d. Mark final settings.
 - e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
 - f. Verify tracking between supply and return fans.

3.6 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 5 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.7 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.
 - 3. Certify validity and accuracy of field data.

- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Field test reports prepared by system and equipment installers.
 - 2. 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 specialist.
 - 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.

- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 - 1. Quantities of outdoor, supply, return, and exhaust airflows..
 - 2. Duct, outlet, and inlet sizes.
 - 3. Terminal units.
 - 4. Balancing stations.
 - 5. Position of balancing devices.

- E. 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. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.

3.8 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Owner.
- B. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 1. TAB specialists shall 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 specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 3. If the second verification also fails, Owner or Architect may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.9 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 23 05 93

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Base Bid: General Contractor shall furnish all labor, materials, equipment and services necessary or incidental to the completion of all work of this section and herein specified.

1.2 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).

1.3 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.

1.4 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.

1.5 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.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. 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.
- C. Coordinate installation and testing of heat tracing.

1.7 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. Mineral-Fiber Blanket Insulation: Mineral or 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.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.

- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. 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.; Commercial Board.
 - b. Johns Manville; 800 Series Spin-Glas.
 - c. Knauf Insulation; Insulation Board.
 - e. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

- A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F. Comply with ASTM C 656, Type II, Grade 6. Tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Super Firetemp M.

- B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; FlameChek.
 - b. Johns Manville; Firetemp Wrap.
 - c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
 - d. Thermal Ceramics; FireMaster Duct Wrap.
 - e. 3M; Fire Barrier Wrap Products.
 - f. Unifrax Corporation; FyreWrap.

2.3 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. Knauf Insulation: www.knaufusa.com.
 - b. Johns Manville Corporation: www.jm.com
 - c. Owens Corning Corp: www.owenscorning.com d.
www.certainteed.com

- 1) Maximum Thermal Conductivity:

- a) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - b) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. 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.
 3. 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. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Knauf Insulation: www.knaufusa.com.
 - b. Johns Manville Corporation: www.jm.com
 - c. Owens Corning Corp: www.owenscorning.com
 - d. Certain Teed Corporation: www.certainteed.com
 2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
 - a. 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).
- C. Insulation Pins and Washers:
1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-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.
- D. 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.

2.4 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. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aero seal.
 - b. Armacell LLC; Armaflex 520 Adhesive.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.K-Flex USA; R-373 Contact Adhesive.
 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."

- C. Mineral-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."
- D. 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."

2.5 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-mil dry 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-mil dry 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-mil dry 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.

2.6 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.

2.7 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."
- B. ASJ Flashing Sealants, and Vinyl and PVC 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.
 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."

2.8 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.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.9 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, provide one of 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.
- B. 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, provide one of 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.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of 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 or Type 316; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
3. 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, 0.135-inch- diameter shank, length to suit depth of insulation indicated.
 - a. Products: Subject to compliance with requirements, provide one of 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, 0.135-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, provide one of 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, provide one of 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, 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, provide one of 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, provide one of 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, 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, 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, provide one of 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, provide products by one of 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: 0.080-inch nickel-copper alloy.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C & F Wire.
- 2.11 CORNER ANGLES
- A. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316.

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. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct 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. Install multiple layers of insulation with longitudinal and end seams staggered.
- 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.
- 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. 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.
- 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.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. 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 078413 "Penetration Firestopping" firestopping and fire-resistant joint sealers.
- D. 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.

3.5 INSTALLATION OF MINERAL-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, for 100 percent coverage 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.
- B. Board 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, for 100 percent coverage 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, space 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. 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. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. 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 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.

3.7 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.

3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 1. Indoor, concealed supply air.

2. Indoor, concealed return located in unconditioned space.
3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
4. Outdoor supply and return ductwork.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round, supply-air duct insulation shall be the following:
 1. Mineral-Fiber Blanket: 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. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Concealed, rectangular, transfer-air duct insulation shall be one of the following:
 1. Sound lining: 1.5 inches thick and 3-lb/cu. ft. nominal density.

END OF SECTION 23 07 13

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. Condensate drain piping, indoors and outdoors.
 - 2. Heating hot-water piping, indoors.

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.

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 230529 "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.

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.

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. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Knauf Insulation.
 - b. Johns Manville Corporation.
 - c. Owens Corning Corporation.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Board Insulation: ASTM C 552, Type IV.
 - 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

2.2 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

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. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

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. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- 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.
 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.
- 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. 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 4 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.
- 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 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.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of 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 services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, 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 cut sections of cellular-glass block insulation of same thickness as pipe 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. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.7 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 pipe, fittings, strainers, and valves, 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 three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. 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 12 and Smaller: Insulation shall be the following:
 - a. Cellular Glass: 2 inches thick.
- B. Heating-Hot-Water Supply and Return, above 200 Deg F:
 - 1. NPS 3/4 and Smaller: Insulation shall be the following:
 - a. Cellular Glass: 3 inches thick.
 - 2. NPS 1 and Larger: Insulation shall be the following:
 - a. Cellular Glass: 3 inches thick.

3.10 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Piping, Concealed:

1. PVC: 30 mils thick.

END OF SECTION 23 07 19

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.

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 SYSTEM PERFORMANCE

- A. Comply with the following performance requirements:
 - 1. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
 - 2. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
 - a. Water Temperature: Plus or minus 1 deg F (0.5 deg C).
 - b. Water Flow: Plus or minus 5 percent of full scale.
 - c. Ducted Air Temperature: Plus or minus 1 deg F (0.5 deg C).
 - d. Airflow (Terminal): Plus or minus 10 percent of full scale.

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.
- 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 valves including flow characteristics.
 7. 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.
 8. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
 9. 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.
- C. Samples for Initial Selection: For each color required, of each type of thermostat or sensor cover with factory-applied color finishes.
- D. Samples for Verification: For each color required, of each type of thermostat or sensor cover.

1.6 INFORMATIONAL SUBMITTALS

- A. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.
- B. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with LonWorks.

- C. Qualification Data: For Installer.
- D. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.
- E. 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 017823 "Operation and Maintenance Data," include the following:
 - 1. Maintenance instructions and lists of spare parts for each type of control device.
 - 2. Interconnection wiring diagrams with identified and numbered system components and devices.
 - 3. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

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.

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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONTROL SYSTEM

- A. Extend existing controls.
- B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.
- C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

2.3 ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
- B. Thermistor Temperature Sensors and Transmitters:
 - 1. Manufacturers:
 - a. Honeywell International Inc.
 - 2. Accuracy: Plus or minus 0.5 deg F (0.3 deg C) at calibration point.
 - 3. Wire: Twisted, shielded-pair cable.
 - a. Set-Point Adjustment: Exposed.
 - b. Set-Point Indication: Exposed.
 - c. Thermometer: Concealed.
 - d. Color: White
 - e. Orientation: Vertical.

2.4 ACTUATORS

- A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
 - 1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
 - 2. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).
 - 3. Spring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65): Size for running and breakaway torque of 150 in. x lbf (16.9 N x m).
 - 4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).
 - 5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running and breakaway torque of 150 in. x lbf (16.9 N x m).

- B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
 - 1. Manufacturers:
 - a. Honeywell International 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. Temperature Rating: Minus 22 to plus 122 deg F.
 - 8. Run Time: 120 seconds.

2.5 CONTROL VALVES

- A. Manufacturers:
 - a. Honeywell International Inc.
- 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 (860 kPa) and 250 deg F (121 deg C) operating conditions.
 - 2. Sizing: 3-psig (21-kPa) maximum pressure drop at design flow rate, to close against pump shutoff head.
 - 3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that conditioned power supply is available to control units and operator workstation.
- B. Verify that pneumatic piping and duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.2 INSTALLATION

- A. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- B. Install labels and nameplates to identify control components according to Section 23 05 53 "Identification for HVAC Piping and Equipment."
- C. Install hydronic instrument wells, valves, and other accessories according to Section 23 21 16 Hydronic Piping Specialties."

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. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- D. 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, and loop or leak checks.
 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 instrument tubing for proper fittings, slope, material, and support.

5. Check installation of air supply for each instrument.
 6. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
 7. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
 8. Check temperature instruments and material and length of sensing elements.
 9. Check control valves. Verify that they are in correct direction.
 10. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
 11. 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. Flow:
 - a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
 - b. Manually operate flow switches to verify that they make or break contact.
6. 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.
7. 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.
8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
 9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
 10. Provide diagnostic and test instruments for calibration and adjustment of system.
 11. 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.

END OF SECTION 23 09 00

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
1. Steel pipe and fittings.
 2. Joining materials.
 3. Transition fittings.
 4. Dielectric fittings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
1. Pipe.
 2. Fittings.
 3. Joining materials.
- B. Delegated-Design Submittal:
1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
 2. Locations of pipe anchors and alignment guides and expansion joints and loops.
 3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

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: 100 psig, 200 deg F..

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. DWV Copper Tubing: ASTM B 306, Type DWV.
- D. 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.

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.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

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:

- a.
 2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 150 psig.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 1-1/2 and smaller, shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.
- B. Hot-water heating piping, aboveground, NPS 2-, shall be the following:
 1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical 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. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- D. Install piping to permit valve servicing.
- E. Install piping free of sags and bends.
- F. Install fittings for changes in direction and branch connections.
- G. Install piping to allow application of insulation.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- J. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- K. 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.
- L. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- M. Install shutoff valve immediately upstream of each dielectric fitting.
- N. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

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 unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

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. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
- H. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

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.

3.7 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.
 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- 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 pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. 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).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 232113

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Strainers.
 - 2. Connectors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product:
 - 1. Include construction details and material descriptions for hydronic piping specialties.
 - 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
 - 3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 STRAINERS

- 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, 40 mesh strainer, or perforated stainless-steel basket.
 - 4. CWP Rating: 125 psig.

2.2 CONNECTORS

A. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- #### A.
- Install shut-off-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

END OF SECTION 23 21 16

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round ducts and fittings.
2. Sheet metal materials.
3. Sealants and gaskets.
4. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 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" and ASCE/SEI 7.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ANSI/ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

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, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.

9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. 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.
5. Design Calculations: Calculations for selecting hangers and supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 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/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 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, provide products by one of the following:
 - a. Ductmate Industries, Inc.
 - b. Elgen Manufacturing.
 - c. Linx Industries (formerly Lindab).
 - d. McGill AirFlow LLC.
 - e. MKT Metal Manufacturing.
 - f. SEMCO LLC.
 - g. Sheet Metal Connectors, Inc.

- h. Spiral Manufacturing Co., Inc.
 - i. Stamped Fittings 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."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- 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."
 - 1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.
- 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."

2.2 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: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. 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.
- E. 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 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. 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.

C. 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."

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. 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.

2.4 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. 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."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

- E. 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.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:

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 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. 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.
- J. 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 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 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 at a minimum 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. Conditioned Space, Exhaust Ducts: Seal Class B.

3.4 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. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- 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 a 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.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Mechanical Cleaning Methodology:
 - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
 - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
 - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
 - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
 - 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
 - 6. Provide drainage and cleanup for wash-down procedures.
 - 7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.7 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

- a. Pressure Class: Negative 3-inch wg.
- b. Minimum SMACNA Seal Class: C.
- c. SMACNA Leakage Class for Round and Flat Oval: 6.

B. 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. 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.

END OF SECTION 23 31 13

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Flexible connectors.
 - 3. Duct accessory hardware.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

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: G60.
- 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 one of the following:
 - a. Louvers and Dampers, Inc..
 - b. Nailor Industries Inc.
 - c. Ruskin Company.
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. 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 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Elgen Manufacturing.
5. Hardcast, Inc.
6. JP Lamborn Co.
7. Ventfabrics, Inc.
8. Ward Industries; a brand of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

2.5 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 duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
- G. Install flexible connectors to connect ducts to equipment.
- H. Connect flexible ducts to metal ducts with draw bands.
- I. 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.

END OF SECTION 23 33 00

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 air terminal unit.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For air terminal units.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
 - 4. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Delegated-Design Submittal:
 - 1. Materials, fabrication, assembly, and spacing of hangers and supports.

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.

PART 2 - PRODUCTS

2.1 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.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

2.2 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Krueger.
 - 3. Price Industries.
 - 4. Titus.
- B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
- C. Casing: 0.034-inch thick galvanized steel, single wall.
 - 1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
 - 2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
 - 3. Air Outlet: S-slip and drive connections, size matching inlet size.
 - 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: AHRI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
 - 2. Damper Position: Normally open.
- E. Attenuator Section: [0.034-inch steel] [0.032-inch aluminum] sheet.

1. Attenuator Section Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- F. Multioutlet Attenuator Section: With three inch diameter collars, each with locking butterfly balancing damper.
- G. Hydronic Heating 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.
- H. Control devices shall be compatible with temperature controls system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
1. Electric Damper Actuator: 24 V, powered open return.
 2. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) 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 230923 "Direct Digital Control (DDC) System for HVAC."
 3. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.
- I. Control Sequences:
1. Occupied:
 - a. In a call for cooling, airflow will increase as the damper opens towards maximum setting to satisfy set point.
 - b. In a call for less cooling, airflow will decrease as the damper closes towards minimum setting to satisfy set point.
 2. Unoccupied:
 - a. Damper closes to minimum maximum setting.

2.3 CASING LINER

- A. Casing Liner: Fibrous-glass duct liner, complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Minimum Thickness: 1/2 inch.
 - a. Maximum Thermal Conductivity:

- 1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. 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.
 3. Solvent Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. Adhesive VOC Content: 80 g/L or less.
 - b. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Casing Liner: Flexible elastomeric duct liner fabricated of preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
1. Minimum Thickness: 3/4 inch.
 2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
 3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
 - a. Adhesive VOC Content: 50 g/L or less.
 - b. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 SOURCE QUALITY CONTROL

- A. Factory Tests: Test assembled air terminal units according to AHRI 880.
1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and AHRI certification seal.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

3.2 TERMINAL UNIT 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.
- C. Install wall-mounted thermostats.

3.3 CONNECTIONS

- A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.
- B. Hot-Water Piping: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties," and 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. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.
- D. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "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 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative]:
 - 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.
- C. Air terminal unit will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. [Engage a factory-authorized service representative to perform] [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. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 23 36 00

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. Rectangular and square ceiling diffusers.
 - 2. Fixed face grilles.
 - 3. Linear bar 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. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carnes Company.
 - b. Krueger.
 - c. Price Industries.
 - d. Titus.
 - e. Tuttle & Bailey.
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: Single cone.
7. Mounting: Surface.
8. Pattern: Fixed.
9. Dampers: Radial opposed blade.

B. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carnes Company.
 - b. Krueger.
 - c. Price Industries.
 - d. Titus.
 - e. Tuttle & Bailey.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
5. Core Construction: Removable.
6. Frame: 1-1/4 inches wide.
7. Mounting: Countersunk screw.
8. Accessory: Filter.

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 23 37 13

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Electrical contractor to provide:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alpha Wire Company.
 - 2. Belden Inc.
 - 3. Cerro Wire LLC.
 - 4. Cooper Industries, Inc.
 - 5. Encore Wire Corporation.
 - 6. General Cable Technologies Corporation.
 - 7. General Cable; General Cable Corporation.
 - 8. Senator Wire & Cable Company.

9. Service Wire Co.
10. Southwire Company.
11. Thomas & Betts Corporation, A Member of the ABB Group.

- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. 3M.
 2. AFC Cable Systems; a part of Atkore International.
 3. Gardner Bender.
 4. Hubbell Power Systems, Inc.
 5. Ideal Industries, Inc.
 6. ILSCO.
 7. NSi Industries LLC.
 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 9. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 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.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND WIRING METHODS

- A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. 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.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 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-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 26 05 19

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Electrical contractor to provide:
 - 1. Equipment grounding conductor.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. Dossert; AFL Telecommunications LLC.
 - 3. ERICO International Corporation.
 - 4. Fushi Copperweld Inc.
 - 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - 6. Harger Lightning & Grounding.
 - 7. ILSCO.
 - 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 9. Robbins Lightning, Inc.
 - 10. Siemens Power Transmission & Distribution, Inc.
 - 11. Thomas & Betts Corporation, A Member of the ABB Group.

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.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. 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. Armored and metal-clad cable runs.
- C. 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.

2.6 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

END OF SECTION 26 05 26

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Electrical contractor to provide:
 - 1. Hangers and supports for electrical equipment and systems.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Hangers.
 - b. Steel slotted support systems.
 - c. Trapeze hangers.
 - d. Clamps.
 - e. Sockets.
 - f. Eye nuts.
 - g. Saddles.
 - h. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) 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. Suspended ceiling components.
 - 2. Structural members to which hangers and supports will be attached.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Items penetrating finished ceiling, including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Projectors.

- B. Seismic Qualification Certificates: For hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
 - 2. Component Importance Factor: 1.5.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame Rating: Class 1.
 - 2. Self-extinguishing according to ASTM D 635.

2.2 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; a part of Atkore International.
 - b. B-line, an Eaton business.
 - c. ERICO International Corporation.
 - d. Flex-Strut Inc.
 - e. GS Metals Corp.
 - f. G-Strut.
 - g. Haydon Corporation.

- h. Metal Ties Innovation.
 - i. Thomas & Betts Corporation, A Member of the ABB Group.
 - j. Unistrut; Part of Atkore International.
 - k. Wesanco, Inc.
2. Material: Galvanized steel.
 3. Channel Width: 1-5/8 inches.
 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
 8. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored 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 made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. 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; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 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 where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) B-line, an Eaton business.
 - 2) Empire Tool and Manufacturing Co., Inc.

- 3) Hilti, Inc.
- 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
- 5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are 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.

2.3 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 Section 055000 "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 unless requirements in this Section are stricter.
- B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other 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.
- E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

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, EMTs, IMCs, and RMCs may be supported by openings through structure members, according to NFPA 70.
- C. 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 200 lb.
- D. 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 SP-58, 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[by means that comply with seismic-restraint strength and anchorage requirements].
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "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.

3.4 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. Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Metal conduits and fittings.
 2. Boxes, enclosures, and cabinets.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
1. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. GRC: Comply with ANSI C80.1 and UL 6.
 3. ARC: Comply with ANSI C80.5 and UL 6A.
 4. IMC: Comply with ANSI C80.6 and UL 1242.
 - a. Comply with NEMA RN 1.

- b. Coating Thickness: 0.040 inch, minimum.
 - 5. EMT: Comply with ANSI C80.3 and UL 797.
 - 6. FMC: Comply with UL 1; zinc-coated steel.
 - 7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Conduit Color
- 1. Manufacturers: Setmark Semi-rigid plastic identification markers or equal.
 - 2. Spacing: 20 feet on center.
 - 3. Identify all conduit using coded identifying bands.
 - a. Spacing:
 - 1) Minimum every 20'.
 - 2) Within 1' of each junction box.
 - 4. For 208/120V:
 - a. A-Phase – Black.
 - b. B-Phase – Red.
 - c. C-Phase – Blue.
 - d. Neutral – White.
 - 5. For 277/408V:
 - a. A-Phase – Brown.
 - b. B-Phase – Orange.
 - c. C-Phase – Yellow.
 - d. Neutral – Gray.
 - 6. Conductor colors shall apply to all conductor sizes and apply to entire insulation. No exceptions for larger cables. Identifying colored tape shall not be allowed. Other colors allowed for branch circuits and switch leg conductors.
 - 7. Fire Alarm System: Red
- C. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
- 1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 3. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
 - 4. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Compression.
- D. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- D. Metal Floor Boxes:
 - 1. Material: Cast metal.
 - 2. Type: Fully adjustable.
 - 3. Shape: Rectangular.
 - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- J. Gangable boxes are prohibited.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- L. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors: Apply raceway products as specified below unless otherwise indicated.
 - 1. Exposed, Not Subject to Physical Damage: EMT. (Do not use as surface raceway).
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT. (Do not use as surface raceway).
 - 3. Exposed and Subject to Severe Physical Damage: IMC.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. 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. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use compression or steel fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof.
- E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- F. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.

- H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- K. Support conduit within 12 inches of enclosures to which attached.
- L. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 1 inch.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- M. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- N. Threaded Conduit Joints: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Install raceway sealing fittings at accessible locations according to NFPA 70 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.

- T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Conduit extending from interior to exterior of building.
 - 4. Conduit extending into pressurized duct and equipment.
 - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6. Where otherwise required by NFPA 70.
 - U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches] of flexible conduit for recessed equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
 - V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
 - W. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
 - X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
 - Y. Locate boxes so that cover or plate will not span different building finishes.
 - Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
 - AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by
- 3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS
- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
- 3.4 FIRESTOPPING
- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Electrical contractor to provide:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.

- b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Carbon steel.
 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. HOLDRITE.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: 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 that are not fire rated.
 - 2. Sealant shall have VOC content of when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. 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."
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install 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.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to Provide:

- a. Identification for raceways.
- b. Identification of power and control cables.
- c. Identification for conductors.
- d. Underground-line warning tape.
- e. Warning labels and signs.
- f. Instruction signs.
- g. Equipment identification labels, including arc-flash warning labels.
- h. Miscellaneous identification products.
- i. Update all panel directories affected by demolition and new work per COD standards and NEC 408.4 at the completion of work.

B. Alternates Bid: None

1.2 SUMMARY

A. Section Includes:

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Delegated-Design Submittal: For arc-flash hazard study.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Raceways and Cables Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage.
- B. Warning labels and signs shall include, 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."

2.3 LABELS

- A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
 - d. Grafoplast Wire Markers.
 - e. HellermannTyton.
 - f. LEM Products Inc.
 - g. Marking Services, Inc.
 - h. Panduit Corp.
 - i. Seton Identification Products.
- B. Self-Adhesive Labels:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. emedco.
 - e. Grafoplast Wire Markers.
 - f. Ideal Industries, Inc.
 - g. LEM Products Inc.
 - h. Marking Services, Inc.
 - i. Panduit Corp.
 - j. Seton Identification Products.
 - 2. Preprinted, 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.

3. Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
 - a. Nominal Size: 3.5-by-5-inch.

2.4 TAPES AND STENCILS:

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. HellermannTyton.
 - d. Ideal Industries, Inc.
 - e. Marking Services, Inc.
 - f. Panduit Corp.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
- C. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. Seton Identification Products.
- D. Underground-Line Warning Tape
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Ideal Industries, Inc.
 - c. LEM Products Inc.
 - d. Marking Services, Inc.
 - e. Reef Industries, Inc.
 - f. Seton Identification Products.
 2. Tape:

- a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
- a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".
4. Tag: Type I:
- a. Pigmented polyolefin, bright colored, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Thickness: 4 mils. Weight: 18.5 lb/1000 sq. ft..
 - d. Tensile according to ASTM D 882: 30 lbf and 2500 psi.
5. Tag: Type ID:
- a. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, compounded for direct-burial service.
 - b. Width: 3 inches.
 - c. Overall Thickness: 5 mils.
 - d. Foil Core Thickness: 0.35 mil.
 - e. Weight: 28 lb/1000 sq. ft..
 - f. Tensile according to ASTM D 882: 70 lbf and 4600 psi.
6. Tag: Type IID:
- a. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, compounded for direct-burial service.
 - b. Width: 3 inches
 - c. Overall Thickness: 8 mils.
 - d. Foil Core Thickness: 0.35 mil.
 - e. Weight: 34 lb/1000 sq. ft..
 - f. Tensile according to ASTM D 882: 300 lbf and 12,500 psi.
- 2.5 Tags
- A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.

- b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
 - e. Seton Identification Products.

- B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory screened permanent designations; punched for use with self-locking cable tie fastener.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Grafoplast Wire Markers.
 - e. LEM Products Inc.
 - f. Marking Services, Inc.
 - g. Panduit Corp.
 - h. Seton Identification Products.

- C. Write-On Tags:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. LEM Products Inc.
 - c. Seton Identification Products.

 - 2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to raceway, conductor, or cable.
 - 3. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 4. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.6 Signs

- A. Baked-Enamel Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal Size: 7 by 10 inches.

 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. emedco.
 - d. Marking Services, Inc.

- B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. emedco.
 - d. Marking Services, Inc.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:
 - a. For signs up to 20 sq. inches, minimum 1/16-inch-.
 - b. For signs larger than 20 sq. inches, 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Self-adhesive.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.

2.7 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. HellermannTyton.
2. Ideal Industries, Inc.
3. Marking Services, Inc.
4. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

D. 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.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. 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. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- D. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- E. 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.
- F. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive vinyl label. Install labels at 10-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 containing the wiring system legend and system voltage. System legends shall be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use industry standard colors for ungrounded feeder and branch-circuit conductors.
 - a. 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. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags with the conductor or cable designation, origin, and destination.
- E. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive, self-laminating polyester labels with the conductor designation.
- F. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- G. 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 operation and maintenance manual.
- H. 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 direct-buried cables and cables in raceways.
- I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- J. 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.
- K. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
1. Comply with NFPA 70E and ANSI Z535.4.
 2. Comply with Section 260574 "Overcurrent Protective Device Arc-Flash Study" requirements for arc-flash warning labels.
- 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 used for power transfer.
- N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine plastic 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.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 26 05 53

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Base Bid:

1. Electrical Contractor to Provide:
 - a. Fusible switches.
 - b. Nonfusible switches.
 - c. Molded-case circuit breakers (MCCBs).
 - d. Molded-case switches.
 - e. Enclosures.

B. Alternates Bid: None

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. 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.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- D. Comply with NFPA 70.

2.3 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ABB Inc.
 2. Eaton.
 3. General Electric Company.
 4. Siemens Industry, Inc.
 5. Square D; by Schneider Electric.
- B. Type HD, Heavy Duty:
 1. Single throw.
 2. Three pole.
 3. 240 600-V ac.
 4. 200 A and smaller.
 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
 6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. 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. Service-Rated Switches: Labeled for use as service equipment.

2.4 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. Siemens Industry, Inc.
 - 4. Square D; by Schneider Electric.
- 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. Service-Rated Switches: Labeled for use as service equipment.

2.5 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company.
 - 3. Siemens Industry, Inc.
 - 4. Square D; by Schneider Electric.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be 100 percent rated. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."
- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 140 deg F rated wire on 125-A circuit breakers and below.
- G. Standards: Comply with UL 489 and NEMA AB 3, with interrupting capacity to comply with available fault currents.

- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal 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.
- I. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
- J. Enclosure Finish: The enclosure shall be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250 Type 1).
- K. Conduit Entry: NEMA 250 Types 4, 4X, and 12 enclosures shall contain no knockouts. NEMA 250 Types 7 and 9 enclosures shall be provided with threaded conduit openings in both endwalls.
- L. Operating Mechanism: The circuit-breaker operating handle shall be directly operable through the front cover of the enclosure (NEMA 250 Type 1). The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 4X.
 - 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

3.2 INSTALLATION

- A. 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 Construction Manager no fewer than 24 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 Construction Manager's written permission.
 - 4. Comply with NFPA 70E.
- B. 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.

- C. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- D. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- F. Install fuses in fusible devices.
- G. Comply with NFPA 70 and NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "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. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Perform tests and inspections.
- D. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that the unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
 - e. Verify that fuse sizes and types match the Specifications and Drawings.
 - f. Verify that each fuse has adequate mechanical support and contact integrity.
 - g. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
 - i. Verify correct phase barrier installation.
 - j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
2. Electrical Tests:
- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Measure contact resistance across each switchblade fuseholder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
 - d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - e. Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."
- E. Tests and Inspections for Molded Case Circuit Breakers:
1. Visual and Mechanical Inspection:
- a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and clearances.
 - d. Verify that the unit is clean.
 - e. Operate the circuit breaker to ensure smooth operation.
 - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

- a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
 - h. Perform adjustments for final protective device settings in accordance with the coordination study.
2. Electrical Tests:
- a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
 - c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - d. Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two megohms.
 - e. Determine the following by primary current injection:
 - 1) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 2) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 3) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
 - 4) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
 - f. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
 - g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
 - h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
 - i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.
1. Test procedures used.
 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
 3. List deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 28 16

System Description:

- A. The Owner has in place a state of the art cabling system that is supportive of the mission to provide voice, high speed data, video and multimedia services to the College of DuPage Main Campus and Satellite sites well into the future. The requirements for this cabling, its installation and termination equipment are very stringent to support these goals.
- B. This document describes the product and execution requirements relating to new Telecommunications Cabling System for the College of DuPage and Regional Campus Locations. If exceptions or changes to these requirements are desired by A/E, A/E shall discuss proposed changes and exceptions with Owner's Information Department.

Specifications:

- A. The communications cabling system installation work detailed in these standards shall be carried out by a specialist installer, trained and certified by PANDUIT and capable of providing a system warranty as described herein.
- B. The Cabling Contractor shall have a Registered Communications Distribution Designer (RCDD) or equal as a permanent member of staff. The RCDD shall be in good standing with the Building Industry Consulting Service International (BICSI) and shall have a current registration.
- C. The Contractor shall hold a valid State Contractors License for the duration of the project. The installer shall be responsible for obtaining permits and other requirements for performing work on this project.
- D. The Cabling Contractor shall provide an on-site manager responsible for all Communication work. This individual shall be the single point of contact for the duration of the project.
- E. The Air Blown Fiber®, each bidder must submit current documentation signed by Sumitomo Electric Lightwave representative stating the Contractor is authorized and certified by Sumitomo Electric Lightwave to provide the FutureFLEX® Air Blown Fiber® cable products installation and warranty certification. Each bidder must also submit documentation with the bid, listing the names of employees that will be used on this project indicating their experience, level of expertise, and certificates of training signed by Sumitomo Electric Lightwave representatives.
- F. The Contractor shall furnish and install all Tube Cables, Tube Couplings, Tube Distribution Units (TDUs), Fiber Bundles, connectors, and equipment as shown on the drawings and per Sumitomo Recommended Procedures (SRP's).

Definitions

- A. Telecommunications Closet (TC): The generic term, this refers to the equipment rooms in which telecommunications cabling terminates. These rooms also house network, video and telephone electronics.
- B. Building Distribution Facility (BDF): The "Main wiring switching for the building
- C. Intermediate Distribution Facility (IDF): A secondary wiring switching room
- D. Horizontal Cabling: Cabling runs from Work Station to IDF or BDF.
- E. Backbone: Linkage from BDF to IDF.

- F. House Count: The Contractor shall cross-connect the first (BLUE) pair of each new workstation cable to the riser backbone to link the telecommunications closet to the next closet in the hierarchy. The cross connects wire of colors matching the color of the station cabling conductors (BLUE) shall be used for each cross connect.
- G. Backbone transmission media may be:
 - 1. Traditional and Air Blown Optical fiber
 - 2. Twisted-pair copper
 - 3. Coaxial copper
 - 4. A combination of the above
 - 5. Miscellaneous support facilities
- H. Material needed for the proper termination and installation of the backbone cables:
 - 1. Cable support hardware
 - 2. Firestopping equipment and supplies
 - 3. Grounding hardware (TIA/EIA-607)
 - 4. Protection and security
- I. Inter-Building Cabling – First Level Backbone: provides the transmission path between adjacent buildings. Includes Fiber Optic and copper cabling.
- J. Intra-Building Cabling – Second Level Backbone: Provides the transmission path to join the main Telecommunications Closet (or BDF) with other TC's (or IDF) located within the building. Includes Fiber Optic and copper cabling.
- K. Horizontal cabling and Work Station Cabling: Provides the link from offices, classrooms and common areas to the Telecommunications Closet (TC) serving the area and includes the following transmission media:
 - 5. 4-pair 100 Ohm Unshielded Twisted Pair (UTP) Category 6
 - 6. Fiber Optic Cable (Multi-Mode and Single-Mode)
 - 7. RG-6 Coax

Work shall be in accordance with the following:

- A. Equipment and material shall be Underwriters Laboratories listed and labeled. The latest editions of the following codes, standards and guidelines are minimum requirements:
 - 1. City, State, and Federal codes.
 - 2. NFPA 70 National Fire Protection Agency
 - 3. National Electric Code (NEC 1999)
 - 4. Institute of Electrical and Electronic Engineers (IEEE)
 - 5. TIA/EIA-568-B.1 Commercial Building Telecommunication Cabling Standard.
 - 6. TIA/EIA-568-B.2 Commercial Building Telecommunication Cabling Standard.
 - 7. TIA/EIA-568-B-2.1 Commercial Building Telecommunication Cabling Standard Category 6.
 - 8. TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.
 - 9. TIA/EIA-606 the Administration Standard for Telecommunications Infrastructure of Commercial Buildings.
 - 10. TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - 11. TIA/EIA TSB-67 Transmission Performance specifications for Field Testing of Unshielded Twisted Pair Cabling Systems
 - 12. TIA/EIA TSB-72 Centralized Optical Fiber Cabling Guidelines.
 - 13. TIA/EIA TSB-75 Additional Horizontal Cabling Practices for Open Offices.
 - 14. Telecommunications Distribution Methods Manual, (BICSI).
 - 15. Manufacture's recommendations and installation guidelines.

General Requirements

Specifications:

- A. The Cabling Contractor shall examine all drawings and specifications to familiarize themselves with the type of construction to be used, and the nature and extent of work provided by other trades.
- B. Beginning installation means Contractor accepts existing conditions.
- C. Contractor shall verify dimensions and the correct locations of hardware before proceeding with the installation of hardware, cabling and/or connections.
- D. The Cabling Contractor shall be responsible for identifying and reporting to the Owner any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage caused by the cable, raceway, or miscellaneous material to the interior surfaces during the communication installation shall be repaired by the Contractor. The repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor damaged ceiling tiles are to be replaced to match color, size, style and texture and shall not be taken from Owner's attic stock.
- E. The Cabling Contractor shall be responsible for securing all Telecommunications Rooms and offices when not in use. At no time shall the Telecommunications Room be unattended if unsecured.
- F. Contractor should assume that all installation work including cable placement, termination and testing shall be performed between the hours of 7:00 a.m. to 5:00 p.m. Monday through Friday unless stated otherwise in the bid.
- G. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work.
 - 1. The Cable system will be tested and documented upon completion of the installation as defined in the section below.
 - 2. Products selection, installation plans and termination layouts must be reviewed and approved by the Owner prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.

Submittals

Specifications

- A. At A/E option, Contractor shall submit a two-foot section of cable(s) of the type(s) to be sent to the site for final approval by the College. This two-foot section shall have the manufacturer's cable markings visible. Upon request, samples from every reel sent to the site shall be provided.
- B. At A/E option, Contractor shall submit if requested, a full mockup of the proposed Information Outlet and Jack configuration with appropriate cabling for each of the installation environments described below. A/E shall discuss full mockup requirements with Owner prior to specifying.
- C. Contractor shall submit house count table in spreadsheet/tabular format with shop drawing submittals. House count table shall include house count and location ID's.

Delivery, Storage and Handling

Requirements:

- A. The Cabling Contractor shall be responsible for all deliveries of material construction site. The Owner will not accept deliveries.
- B. For purposes of bidding, it is to be assumed that the Owner will not provide storage facilities for material. Pending availability, however, this may be arranged subsequent to award.
- C. Cable shall be stored according to manufacturer's recommendations at a minimum. Cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. Manufacturer's storage specifications - in particular, those relating to temperature - shall be followed. All storage costs shall be included in Contract price.
- D. Tools, materials and equipment shall be confined to area designated by the Owner. The Contractor shall clean up and dispose of all debris and rubbish resulting from work on a daily basis.
- E. The Contractor is responsible for the cleanup of the dust, debris, shipping and packaging material associated with their installation. The Owner's disposal containers, shall not to be utilized without written authorization.

END OF SECTION 27 00 01

Data/Voice UTP Station Cable

Requirements:

1. Transmission characteristics of the cable shall meet full Category 6 performance as defined by TIA/EIA-568-B-2.1. Cable shall be UL and/or ETL verified Category 6.
2. Cables shall be Underwriters Laboratory (UL) listed, comply with Article 800 (Communications Circuits) of the National Electrical Code and shall meet the specifications of NEMA (low loss), UL 444, and ICEA.
3. The jacket color for Data Station Cables shall be BLUE.
4. Data Station Cables shall meet a CMR (Riser) or CMP (Plenum) rating depending on the particulars of the installation and be suitable for installation in the environments defined including free-air, in conduit, in cable tray and in modular furniture.
5. Cable shall be packaged in a way that minimizes tangling and kinking of the cable during installation. Examples are open reels or packages, which incorporate a rotating reel.
6. Data UTP Station Cables shall be Panduit PUP6004BU-UY High Performance Category 6 plenum (CMP) Twisted 4-pair UTP copper cable or Panduit PUR6004BU-UY High Performance Category 6 riser (CMR) Twisted 4-pair UTP copper cable.

Telecommunications Outlet

Requirements:

1. At the workstation location, Station Cables shall each be secured in a housing, which shall also accommodate the termination assemblies for those cables. The combined assembly, referred to as the Telecommunications Outlet (TO), shall be modular in design and allow for flexibility in integrating the different configurations required at the site.
2. There shall be one (1) basic Telecommunications Outlet configuration:
 - o The "Copper-Only" Communication outlet that is capable of supporting only UTP and Coaxial Cabling.
3. In addition, provision of a separate, "Voice Only" outlet that is installed to accommodate a wall-mounted Telephone Set shall be considered. This configuration, referred to as "Split Voice", can be used in concert with either of the above configurations.
4. The color and material of the frame cover and inserts (if applicable) shall be Electric Ivory Plastic.
5. The cover of the telecommunications outlet shall be secured to the base with a screw. The screw(s) shall, in turn, be hidden from view by a label or other covering to discourage casual access.

Copper Only Outlet

Requirements:

1. The Copper-Only Outlet shall comply with the general requirements defined above and with the following *additional* requirements:
 - A. The Copper-Only Outlet shall provide adequate capacity to accommodate the following maximum configurations:
 - i. Two (2), four (4) or six (6) modular jacks (Voice or Data)
 - ii. The same as above but one (1) "F" Connector substituted for one (1) modular jack.
 - B. All jacks and couplings shall mount on either the base of the unit or the cover.
 - C. The Copper-Only Outlet shall be available in both "flush" and surface mount designs and shall be adaptable to mounting on cellular floor presets or posttests poke thru or under floor wiring.
 - D. Where flush mounting is not possible, a Surface box shall be used. Surface Box shall be Panduit Single Gang One-piece Deep Box.
2. Wall-Mounted Copper-Only Outlets

- A. Wall mounted Copper-Only Telecommunications Outlets shall be Panduit CFPL2 2 Port CFPL4 4 Port and CFPL6 6 Port.
3. Floor-mounted Copper Only Outlets
 - A. Floor-mounted Copper-only Outlets shall comply with the above general requirements plus the following:
 - i. Floor-mounted Copper-only Outlets shall be mounted in an aluminum floor "monument".
 - ii. Communications jack assemblies shall mount on one side of the assembly and be sideways facing (parallel floor). Mounting plates shall be designed to accommodate the modular jack type installed.
 - iii. A protective bracket shall be available to guard against damage to the jack assemblies or patch cord plugs.
 - iv. "Copper-Only" Telecommunications Outlets shall be Walker 500HB (Monument) and 500B back plate, with 500DR front plate. Monument shall be fitted with adapter(s) appropriate for the floor-type being accessed.
 - v. Jack assemblies shall be mounted on Panduit CF1062 for 2 port and CF1064 for 4 port access. Bracket shall be 500-GUARD.
4. Wall mounted Voice Only Outlet
 - A. Wall-mounted "Voice Only" Outlets shall consist of a mounting plate on which a telephone set may be mounted.
 - B. The Wall Plate shall be of Stainless Steel construction, mount on a standard single gang outlet box or bracket and include mating lugs for wall phone mounting.
 - C. The wall plate shall be Panduit KWP6PY or equivalent and be fitted with one (1) voice jack meeting the criteria defined below.
5. Station Voice Copper Termination at Media Outlet
 - A. Station Voice Copper Cables shall each be terminated at the Media Outlet in an Eight-pin Modular Jack, Panduit CJE88T.
 - B. Jacks are to be pinned per TIA/EIA-568B with the pairing as follows:
 - i. Pair 1 - Pins 5&4
 - ii. Pair 2 - Pins 1&2
 - iii. Pair 3 - Pins 3&6
 - iv. Pair 4 - Pins 7&8
 - C. The interface between the jack and the station cable shall be a 110-Style block. Blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.
 - D. Voice Termination hardware shall meet Category 6 performance specifications as defined by TIA/EIA-A-5 and TSB40 specifications for connecting hardware.
6. Station Data Copper Termination at Outlet
 - A. Station data copper cables shall each be terminated at the Media Outlet in an Eight-pin Modular Jack. Jack contacts shall have a minimum of 50-micro-inches of gold plating. Panduit CJ688T3.
 - B. Jacks are to be pinned per EIA 568B with the pairing as follows:
 - i. Pair 1 - Pins 5&4
 - ii. Pair 2 - Pins 1&2
 - iii. Pair 3 - Pins 3&6
 - iv. Pair 4 - Pins 7&8
 - C. The interface between the jack and the station cable shall be a 110-Style block. Blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination
 - D. Data Termination hardware shall meet full Category 6 performance specifications as defined by TIA/EIA-568-B-2.1 and TSB-40A specifications for connecting hardware. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. The Jack

must be UL verified and listed. All pair combinations must be considered with the worse case measurement being the basis for compliance.

- E. The color of the Data Jack shall be BLACK.
- F. Data Jack shall be Panduit CJ688T3.

Miscellaneous Materials

Requirements:

1. Equipment Rack and Associated Hardware
 - A. Communications equipment rack and cabinets shall be properly anchored at top and bottom.
 - B. Racks shall be anchored to floor with properly sized drop-in anchors with appropriately sized bolts and washers. All racks and cabinets shall be attached to ladder rack system. If ladder rack system does exist, coordinate with project manager.
 - C. Horizontal cable management hardware shall be positioned on the equipment racks to allow for an orderly routing of copper and fiber optic jumpers.
 - D. Jumper Management Panels shall incorporate Horizontal and Vertical distribution rings to accommodate a defined routing of individual jumper cables. Horizontal distribution rings shall be 3" x 3.5" (minimum dimension) and mounted on a 3.5" painted steel plate.
 - E. Each Jumper Management Panel shall be supplied with a minimum of ten (10) releasable cable support ties. Ties shall be minimum 6-inches in length
 - F. Vertical Jumper Rings shall be positioned on each rack upright equidistant between each Horizontal Management Panel installed.
 - G. There shall not be more than (3) three Panduit 48 port patch panels per rack.
 - H. Relay Racks Panduit NetFrame NFR84 Jumper Management Panels shall be Panduit CMPHH2. Vertical Jumper rings shall be Panduit CMVDRC or equivalent. Releasable cable support ties shall be Panduit HLT2I-X0 (BLACK).
2. 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*.
3. Bonding and Grounding
 - A. All bonding conductors shall have green insulation and be copper. The minimum bonding conductor size shall be No. 6 AWG (TIA/EIA-607 5.1.3).

END OF SECTION 27 00 02

Data Patch Panel

Requirements:

- A. Copper Data Station Cables shall each be terminated at their designated TC to a Panduit patch panel.
- B. Category 6 performance per TIA/EIA T568B.2.1 must be maintained by the panel as a system and include this interface. All pair combinations must be considered, with the worst-case measurement being the basis for compliance.
- C. Jacks are to be pinned per TIA/EIA T568B with the pairing as follows:
 1. Pair 1 - Pins 5&4
 2. Pair 2 - Pins 1&2
 3. Pair 3 - Pins 3&6
 4. Pair 4 - Pins 7&8
- D. Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to insure that all manufacturers minimum bend radius specifications are adhered to.
- E. When multiple floors are being serviced in a closet, each floor should have separate patch panels. Each patch panel should start with lowest sequential number starting with one per each floor, per each closet and then increment by one until each panel is full or no more drops available on that floor with its closet. If possible the patch panel for each floor should be installed on a separate rack.
- F. Contractor shall discuss the use of 24 port patch panel with the owner before usage. Use of 24 port patch panel is discouraged.

END OF SECTION 27 00 03

Requirements:

- A. The installation shall follow recognized industry recommendations including those defined by the:
 1. TIA/EIA-568-B.1 Commercial Building Wiring Standard
 2. TIA/EIA-568-B.2 Commercial Building Wiring Standard
 3. TIA/EIA-568-B.2.1 Commercial Building Wiring Standard
 4. TIA/EIA-569 Commercial Building Standard for Pathways and Spaces
 5. TIA/EIA-606 Labeling Guidelines
 6. TIA/EIA-607 Grounding
 7. National Electrical Code (NEC; 1999)
 8. BICSI TDM Manual
 9. Applicable State and Local Codes
 - 10.
- B. Cable Pathways (Renovation Projects)
 1. Renovation Projects: The Contractor is responsible for verifying the availability of riser access between floors. Where required, the contractor shall core new risers.
 2. All Projects: All new riser holes shall be fitted with sleeves. All riser holes used for the installation, both new and existing, shall be firestopped upon completion of cable installation.
 - 3.
- C. Cable Installation
 1. All cables, termination components and support hardware shall be furnished, tested, installed and wired by the Contractor.
 2. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
 3. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Recommended pulling tensions shall not be exceeded.
 4. Manufacturers minimum bend radius specifications shall followed in handling, installation and securing of all cables. Any cable bent or kinked to radius less than recommended dimension shall not be installed.
 5. All cables shall be installed splice-free.
 6. Cable sheaths shall be protected from damage from sharp edges during and after installation.
 7. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.
 8. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellem grips may be used to spread the strain over a longer length of cable.
 9. Ventilation of buildings on the Glen Ellen Campus includes both ducted and ceiling-plenum air return designs as follows:
 - Plenum Return Sites:
 - IC, SRC and PE
 - Ducted Return Sites:
 - M, K & L Buildings, OCC, and Arts Center
 - COD Satellite sites vary by location.
 10. The contractor is responsible for verifying cabling requirements prior to construction to insure that the installation is compliant with all code restrictions.
 11. All openings made to accommodate the installation of any cable shall be sleeved and fire stopped per prevailing code requirements upon completion of cable installation.
 12. At no time shall horizontal cabling share the same raceway or path with Backbone cabling.

Horizontal Cabling Station

Requirements:

- A. All Cables and Termination hardware shall be technically compliant with and installed in accordance with TIA-568A, TIA-568-B.2.1 (Standard for Commercial Building Wiring), TIA-569, TSB 36 and TSB-40.
- B. Where installed free-air, Station Cable shall run at right angles and be kept clear of other trades work. Cables shall be supported according to code utilizing Caddy type J-Hooks mountings and anchored to ceiling concrete, or structural steel beams. The Contractor shall not exceed the maximum cable limit of the cable supports. Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit. Supports should be spaced at a maximum 5-foot interval unless limited by building construction. Cable shall never be laid directly on the ceiling grid.
- C. The maximum Station Cable length shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the Telecommunications Closet to the Outlet and must include any slack required for the installation and termination. The Contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the College prior to installation. The College must approve any plan changes.
- D. Slack cable shall be left above each Work Station to allow for repair and/or future office rearrangements without re-cabling. These "service loops" shall be secured at the last cable support (e.g. Caddy type J-Hook) before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius. Slack lengths are as follows:
 1. At any location where cables are installed into movable partition walls or modular furniture via a service Pole, approximately 6 feet of slack shall be left for each station cable under 250-foot in length.
- E. To reduce or eliminate EMI, the following minimum distances shall be adhered to. In particular, regard must be paid to the routing of cable and avoidance of potentially disruptive sources of electrical noise such as motors and fluorescent lighting. The contractor shall notify the College if installation conditions inhibit these guidelines.
 1. No less than (5) five inches from power lines of 2kVa.
 2. No less than (30) thirty inches from high voltage lighting (including fluorescent lighting).
 3. No less than (39) thirty-nine inches from power lines of 5kVa or greater.
 4. No less than (39) thirty-nine inches from transformers and motors.
- F. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

Telecommunications Outlet

Requirements:

- A. Telecommunications Outlets shall be positioned at a height matching existing services. Where no guide is available, outlets shall be mounted with the center of the outlet 18-inches above floor height unless instructed otherwise by the College.

- B. Positioning of wall-mounted telephone outlets should be in compliance with the provisions of the Americans with Disabilities Act (ADA).
- C. Outlets shall be securely mounted and level.
- D. All unused slots or positions in the Telecommunications Outlet shall be covered with blank inserts.
- E. At the Outlet location, subsurface routing of cables inside "fishable" walls is preferred. Where this cannot be accommodated, however, station cable shall be routed via surface raceway. Raceway should be of adequate dimensions to allow for installation of the cable in compliance with the manufacturers specification including bend radius, crush and tensile limits. Exposed surface raceway should be paintable and fit the decor of the space. Telecommunication Outlet installation on sheetrock walls shall be preceded by the installation of a bracket which mounts securely to the sheetrock (e.g. "Caddy" or "MPLS" Bracket). The Outlet Frame shall, in turn, be secured to the bracket. Telecommunications Outlets shall not be screwed directly to the sheetrock.

Copper Termination Hardware

Requirements:

- A. Copper Termination Hardware at TC
 - 1. At the Telecommunications Closets, all Data and Voice Cables shall be positioned on termination hardware in sequence of the Outlet I.D. starting with the lowest number. All four pairs, terminating on each voice modular jack shall appear on the Telecommunications Closet 110 blocks. Termination Hardware (Blocks and Patch Panels) Positioning and Layout must be reviewed and approved by the College prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.
 - 2. Except in the IC PBX Room, Voice Termination Hardware shall be wall mounted on plywood board. The contractor shall neatly route and secure new cables via cable management hardware (e.g. D Rings and cable guides) from cable tray to the cable termination hardware. Old cable ties shall be removed and replaced with Velcro style cable wraps to maintain a tidy appearance. Cables shall be fed from below the Termination Hardware in a manner that will facilitate growth.
 - 3. The Height of the Voice Termination Field shall not exceed 6-feet (72-inches) above floor level to facilitate cable maintenance. Backbone Cabling should be positioned to the Left; Station cabling to the Right.
 - 4. Where multiple floors are served from a single TC, the Termination Field for each floor shall be segregated from each of the others. Following the standard established at the site, each cross connect field for a given floor is positioned in a separate vertical column (Voice). Spare capacity should be considered in the design and be provided for each grouping.
 - 5. At the Voice Termination Blocks (all 110-type interface), the installer shall insure that the twists in each Voice Cable pair are preserved to within 1.0-inch of the termination. The cable jacket shall be removed only to the extent required to make the termination.
 - 6. Where Voice Termination Hardware is wall mounted, Horizontal Troughs incorporating split plastic distribution rings shall be provided by the Contractor to accommodate routing of jumpers. Troughs shall be positioned at the top of each column of termination blocks and between each 300-pair wiring block. Troughs shall be Panduit P110JTW.
 - 7. The Contractor shall cross-connect the first 1st (BLUE) pair of each new workstation cable to the riser backbone to link the telecommunications closet to the next closet in the hierarchy. The cross-connects wire of colors matching the color of the station cabling conductors (BLUE) shall be used for each cross-connect.

8. In new installations, a jumper wire spool holder shall be installed at the Telecommunications Closet(s). One full (1000-foot) spool of 24-AWG one-pair jumper wires, one spool each white-blue/blue shall be supplied with the holder. The holder shall be designed for use as a spool holder and shall mount securely to the plywood or ladder rack (above the Voice Field).
9. The Contractor shall provide house count to Owner

B. Data Patch Panel

1. At the Data Patch Panel 110-type interface, the installer shall insure that the twists in each Data Cable pair are preserved to within 0.5-inch of the termination. The cable jacket shall be removed only to the extent required to make the termination.

Miscellaneous Materials Installation

Requirements:

A. Jumper Management Hardware

1. Horizontal cable management hardware shall be positioned on the equipment racks to allow for an orderly routing of copper and fiber optic jumpers. At minimum, these Jumper Management Panels shall be positioned:
 - i. Horizontal management shall be placed above and below each forty-eight (48) port Data Patch Panels.
 - ii. Horizontal management shall be placed above and below each fiber Optic HDC (Station fiber).
 - iii. Horizontal management shall be placed above and below each pair (2) of Fiber Optic Termination Panels (Backbone).

B. Surface Raceway

1. Where Outlets are installed in areas where the walls cannot be fished, the Station Cabling serving these outlets shall be covered with raceways. No exposed wire shall be permitted within offices, laboratories, conference rooms, classrooms, etc.
2. The base and cover of the raceway shall be of PVC have a screw applied base and have a snap on cover. Both the base and cover shall be manufactured of rigid natural PVC compounds. The raceway must be UL Listed and exhibit nonflammable self-extinguishing characteristics.
3. The raceway shall originate from a surface mounted Outlet box, have a screw-applied base and terminate above the ceiling. A fitting designed for the raceway shall be used to conceal the ceiling penetration.
4. Surface mounting of an outlet intended for flush-mount installation shall be preceded by the installation of a Surface Box ("Back-box") onto which the outlet frame is mounted.
5. The contractor shall be responsible for all penetrations required to accommodate the raceway in making any transitions between office areas and hallways or other common areas through which the raceway may be routed. All cut molding sections shall be patched and painted upon completion of the raceway installation.
6. All cuts and penetrations must be patched and painted. Upon completion of installation, raceways must be cleaned of all fingerprints, soil, etc.

C. Firestop Systems

1. All penetrations through fire rated building structures, walls, and floors; shall be sealed with an appropriate Firestop system. The requirements applies-to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating items i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.

2. All Firestop systems shall be installed in accordance with the manufacture's recommendations and shall be completely installed and available for inspection by the College.

D. Bonding, Grounding and Electrical Protection

1. All Telecommunications Equipment and raceways shall be properly grounded in accordance with TIA/EIA-607 the NFPA 70 (National Electrical Code), and all other applicable codes and regulations.
2. The major components of the telecommunications grounding and bonding infrastructure are as follows:
 - i. The bonding conductor for telecommunications
 - ii. The Telecommunications Main Grounding Busbar (TMGB)
 - iii. The Telecommunications Grounding Busbar (TGB)
 - iv. The Telecommunications Bonding Backbone (TBB)
 - v. The Telecommunications Bonding Backbone Interconnecting Bonding Conductor (TBBIBC). The conductors used to bond the components to the TMGB & the TGB's
1. All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).
2. Route ground conductors to provide the shortest, most direct path from point to point.
3. Splices in bonding or grounding conductors are not allowed. The minimum bend radius of the conductors shall be eight inches (8").
4. The TMGB and the TGB's shall be electro-tin plated and insulated from the supporting structure by at least two inches.
5. If an electrical sub-panel resides in a Telecommunications Room, that panel must have a #6 AWG bonding conductor from the TGB to electrical panel ground bar.
6. All Telecommunication Closets (TC) shall be equipped with a ground bus bar capable of terminating multiple #6 AWG ground cable conductors. All TC's ground bus bars shall be labeled TGB (Telecommunications Grounding Bulbar). TGB shall have a #6AWG cable conductor continuously run to the TMGB (Telecommunications Main Grounding Bulbar). The TMGB shall be bonded to the Main Building Grounding Electrode.
7. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, ladder racks, etc. entering or residing in all Telecommunications Rooms. Shall be grounded to the respective TGM or TMGB using a minimum #6 AWG stranded copper bonding conductor and 2 hole compression connectors. Provide a ground bar at the base of each rack for equipment connections.
8. All incoming outdoor cables shall be terminated on the appropriate sized protector, and all protectors shall be attached to the TMGB via a #6 AWG stranded conductor.
9. All ground cables shall be labeled with the proper FROM - TO (Origination Point to Destination Point) designation.

END OF SECTION 27 00 04

Requirements:

- A. The Telecommunications Administration System shall meet or exceed TIA/EIA-606-A standards.
- B. 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 COD 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 the owner.** This code, which will identify cabling and terminations at both IDF and Media Outlet locations, shall be as follows:
1. BB-XCC-F-###A
 - i. BB= the designation to identify the specific building
 - ii. 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.).
 - iii. F = the Floor on which the jack is located.
 - iv. ### = a sequential number assigned to that jack.
 - v. A = Alpha designation used ONLY if multiple jacks of a given type (e.g. Voice or Data) are housed in the same Outlet assembly.
 - vi. 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.
- C. 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:
1. Arts Center (MAC)= AR
 2. Instructional Center(BIC) = IC
 3. Physical Education(PEC) = PE
 4. Seaton Computing Center(SCC) = SC
 5. Student Resource Center (SRC) = SR
 6. Student Services Center (SSC) = SS
 7. WDCB Tower = JJ
 8. Westmont Center = WC
 9. Naperville Center = NC
 10. Addison = AD
 11. Lisle Center = LC
 12. Carol Stream Community Education Center = CC
 13. Early Childhood Education Center(ECC) = EC
 14. Technical Education Center(TEC) = TE
 15. Health and Science Center(HSC) = HS
 16. Culinary and Hospitality Center (CHC) = CH
 17. Homeland Security Education Center (HEC) = HE
 18. Homeland Training Center (HTC) = HT
- D. Where adding to an existing installation, cable identification numbering must be integrated into the established plan and must be approved by the Owner.
- E. Where adding to an installation, both voice and data numbering must remain in a "matched" sequence. Throughout the school, 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.

- F. ALL labeling shall be machine generated (Panduit) in black ink on white background tags and be permanent. NO HAND WRITTEN LABELS SHALL BE ALLOWED.

- G. Cables
 - 1. ALL Cables shall be identified AT BOTH ENDS 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.

- H. Telecommunications Outlets
 - 1. 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.
 - 2. 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.

- I. Data Patch Panels
 - 1. 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.
 - 2. The TC designator may be omitted on each jack position provided that the panel itself includes the TC designator.
 - 3. Station cables shall be labeled within 4-inches of the cable choke at Data Patch Panels.

- J. Voice Termination Block
 - 1. 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.
 - 2. 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
 - 3. 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.

Requirements:

- A. Upon completion of installation work, the contractor shall visually inspect all cabling and terminations to insure that they are complete and conform to the requirements defined herein.
- B. The contractor shall provide to the College a written certification that this inspection has been made.
- C. All cable sub-systems (e.g. Inter-building, Intra-Building and Station) must be tested independently. Testing of these sub-systems cannot be combined (e.g. through interconnection).
- D. Contractor shall conduct acceptance testing according to a schedule coordinated with the College. Representatives of the College may be in attendance to witness the test procedures. The contractor shall offer adequate advance notice to the College as to allow for such participation.
- E. The Contractor is responsible for supplying all test equipment and personnel to conduct acceptance test.
- F. If any link is found to be outside the specification defined herein, that cable and the associated terminations (if applicable) shall be replaced at the expense of the contractor. The applicable tests shall then be repeated.
- G. Data/Voice UTP Station Cable Testing
 - 1. Cat 6 Installation: field test requirements upon completion of the installation.
 - i. Every cabling link in the installation shall be tested in accordance with the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-B.1 (most current version) Length of the run must be given on test results.
 - 2. Optional Requirements:
 - 3. A representative of the end-user may select a random sample of 5% of the installed links. The Owner shall test these randomly selected links and the results shall be stored. Field Test Specifications to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

Test Result Documentation and Follow Up

Requirements:

- A. In system documentation, contractor shall provide test results and describe the conduct of the tests. Test documentation shall include a record of test frequencies or wavelengths, cable type, conductor pair and cable I.D. (e.g. Outlet I.D.), measurement direction, test equipment type, model and serial number, date, reference setup, and crewmember name(s) and the length of the run. Where applicable, printouts generated for each cable by the wire test instrument (e.g. *Fluke DSP4300*) shall be submitted as part of the documentation package.
- B. At the request of the Owner, the contractor shall provide copies of original test results.
- C. The Owner may request that a 10% random field re-test be conducted on the cable system - at no additional cost - to verify documented findings. If findings contradict the documentation submitted by the Contractor, additional testing can be requested to the extent determined necessary by the Owner, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

- D. Should it be determined by the Owner or A/E that the materials or any portion thereof furnished and installed fail to comply with the specifications defined herein, these materials and the related installation shall be rejected and replaced by the Contractor. All work disturbed by changes necessitated in consequence of said defects or imperfections shall be made good at the Contractor's expense. All replaced components shall be re-tested.

END OF SECTION 27 00 06

Requirements:

- A. Upon completion of cable plant installation, the contractor shall provide a complete set of cable records documentation including:
 1. Test Data as defined above
 2. As-Built Drawings (where applicable)
 3. Input Data for Facilities Management System

- B. As built drawings
 1. See also Division 01 of the Design and Engineering Criteria
 2. Contractor shall provide accurate as-built construction drawings.
 3. The drawing package shall include one or more of the following:
 - i. Floor plans showing (1) the location of all Telecommunications Outlets as installed and (2) paths by which all cables are routed.
 - ii. Cable lengths as obtained through review of sheath footage markings.
 - iii. Termination field, equipment rack and frame layouts.
 4. Numbering and drawing conventions used shall be consistent throughout all documentation provided and comply with established standards at the College. Telecommunications Outlet locations shall be identified by their sequential number as defined elsewhere in this document and include the Building Designator.
 5. All documentation, including hard copy and electronic forms (if applicable) shall become the property of the Owner.
 6. Documentation shall be submitted within ten (10) working days of the completion of testing.

END OF SECTION 27 00 07

The following products are acceptable to the Owner. Any variation shall be subject to review and acceptance by Owner.

Mfgr	Mfgr PN	Description
Panduit	PUP6004BU-UY	High performance Category 6 plenum (CMP) 4-pair UTP copper cable. Copper conductors are 23 AWG construction with FEP insulation. Conductors are twisted in pairs, separated by an integrated pair divider, and placed in a low smoke, flame-retardant PVC jacket.
Panduit	PUR6004BU-UY	High performance Category 6 riser (CMR) 4-pair UTP copper cable. Copper conductors are 23 AWG construction with HDPE insulation. Conductors are twisted in pairs, separated by an integrated pair divider, and placed in a flame-retardant PVC jacket.
Panduit	CFPL2EI	CLASSIC FACEPLATE W/LABEL
Panduit	CFPL4EI	CLASSIC FACEPLATE W/LABEL
Panduit	CFPL6EI	CLASSIC FACEPLATE W/LABEL
Panduit	CF1062EIY	106 FRAME - DATA - 2 PORT
Panduit	CF1064EIY	MINI-COM 106 FRAME
Panduit	JB1DEI-A	1 PCS DEEP JUNCTION BOX**
Panduit	CFPL4BL	FURN. FACEPLATE 4 POS. W/LABEL&LABEL COV
Panduit	CJ688TGEI	MINICOM CAT6 JACK MODULE
Panduit	P110BW300-X	110 WIRING BLOCK W/LEGS
Panduit	P110CB4-X	110 CONNECTING BLOCK 4PR
Panduit	P110CB5-X	110 CONNECTING BLOCK 5PR
Panduit	P110JTW-X	GIGA PUNCH JUMPER TROUGH
Panduit	DP48688TGY	48 PORT FLAT DP6 DATA
Panduit	DP24688TGY	24 PORT FLAT DP6 DATA
Panduit	CMPHH2	PANNET 2 RU HORZ. 3X5" D-RINGS FRONT
Panduit	NFR84	PANNET NETFRAME RACK, 7FT
Panduit	CMPH1	19" Manager, Front and Rear, 1 RU
Panduit	CMPH2	19" Manager, Front and Rear, 2 RU
Panduit	NFD884	Full length, dual hinged metal door
Panduit	NFD484	Full length, single hinged metal door
Panduit	NFBRFK	Bend Radius Fingers Kit
Panduit	NFEP	84" NetFrame End Panel

Panduit	HLT2I-X0	TAK-TY LOOP TIE
Mfgr	Mfgr PN	Description
Panduit	DPLF	KIT- FRONT LABEL HOLDER
Panduit	DPLT	KIT - TOP LABEL HOLDER
Panduit	FRME1	PANNET OPTICOM 1 RU BLACK ENCL
Panduit	FRME2	PANNET OPTICOM 2 RU BLACK ENCL
Panduit	FRME3	PANNET OPTICOM 3 RU BLACK ENCL
Panduit	FAPB	FIBER ADAPTER PANELS
Panduit	FAP6WBUDSCZ	FIBER ADAPTER PANEL W/6BU
Work Station Hardware		
Panduit	CFPL2EI	Single gang, vertical faceplate accepts two <i>Mini-Com</i> ® Modules
Panduit	CFPL4EI	Single gang, vertical faceplate accepts four <i>Mini-Com</i> ® Modules
Panduit	CFPL6EI	Single gang, vertical faceplate accepts six <i>Mini-Com</i> ® Modules
Panduit	CFFP12EI-2G	Double gang, vertical faceplate frame and six flat inserts (two module spaces each). Accepts twelve <i>Mini-Com</i> ® Modules.
Panduit	JB1EI-A	Single gang one-piece outlet box with adhesive backing
Panduit	KWP6PY	Stainless steel phone plate with <i>Giga-TX</i> ™ Style cat 6 Keystone Jack Module
Panduit	CFFP4BL	Faceplate snaps into industry standard knockouts found on modular furniture
Panduit	CMBEI-X	1-position, reserves space for future use

END OF SECTION 27 00 08

EXHIBIT B – PREVAILING WAGE FORM



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 C – DRAWINGS

COLLEGE OF DUPAGE

BIC ADJUNCT AREA RECONFIGURATION

425 FAWELL BLVD.
 GLEN ELLYN, IL 60137
 ISSUED FOR PERMIT AND BID
 FEBRUARY 6, 2018



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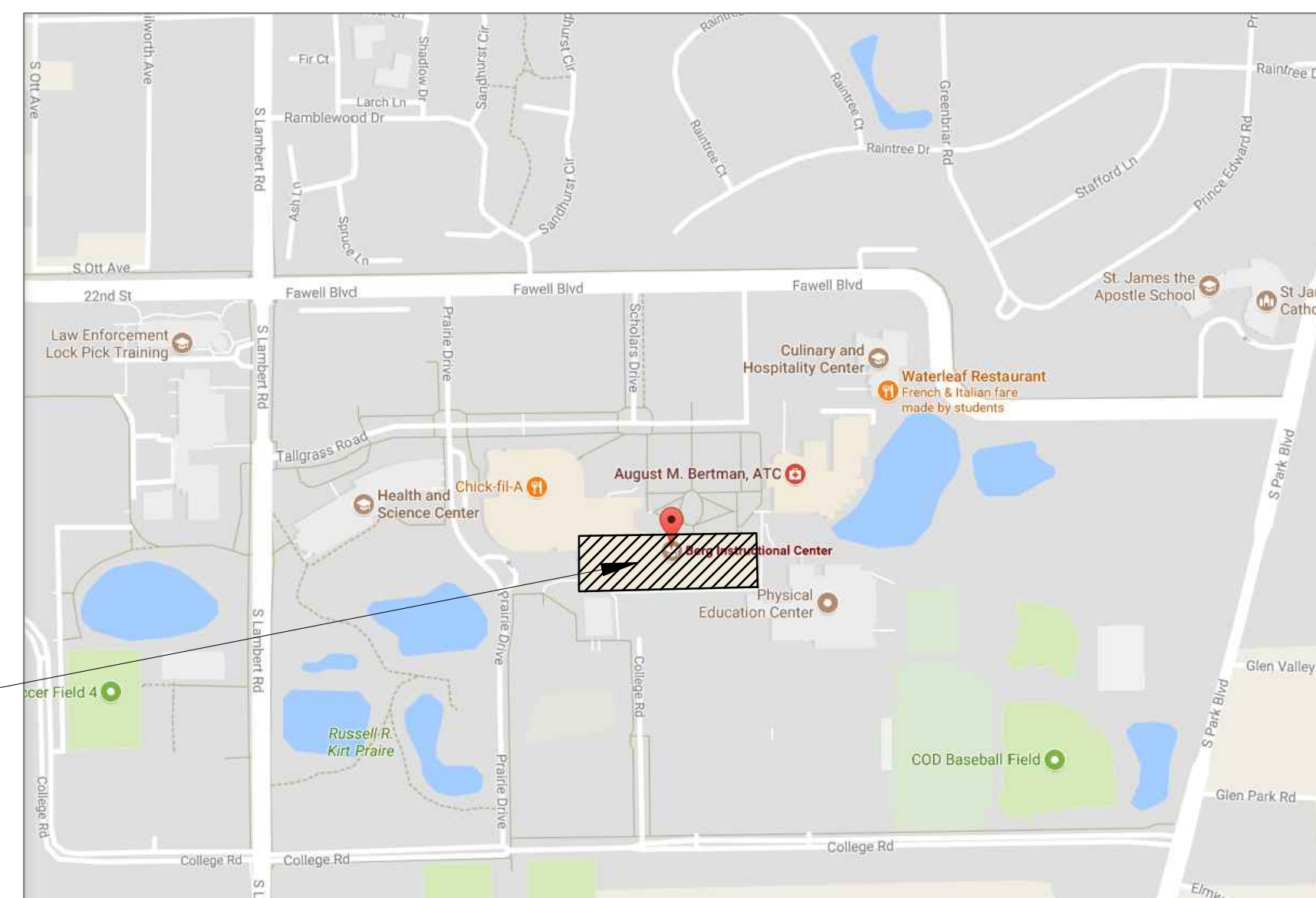
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 Glen Ellyn, IL 60137

LOCATION MAP



COLLEGE OF DUPAGE
 BERG INSTRUCTIONAL CENTER
 425 FAWELL BLVD
 GLEN ELLYN, IL 60137

DRAWING INDEX

GENERAL

- G000 COVER SHEET
- G001 GENERAL NOTES, SYMBOLS, ABBREVIATIONS AND ASSEMBLY TYPES

ARCHITECTURE

- D100 DEMOLITION FLOOR PLAN AND RCP
- A100 NEW WORK FLOOR PLAN AND RCP
- A300 SCHEDULES AND FINISHES

HEATING

- H100 HEATING PLAN

VENTILATION

- V000 VENTILATION SYMBOLS, SCHEDULES AND DETAILS
- V100 VENTILATION PLANS

FIRE PROTECTION

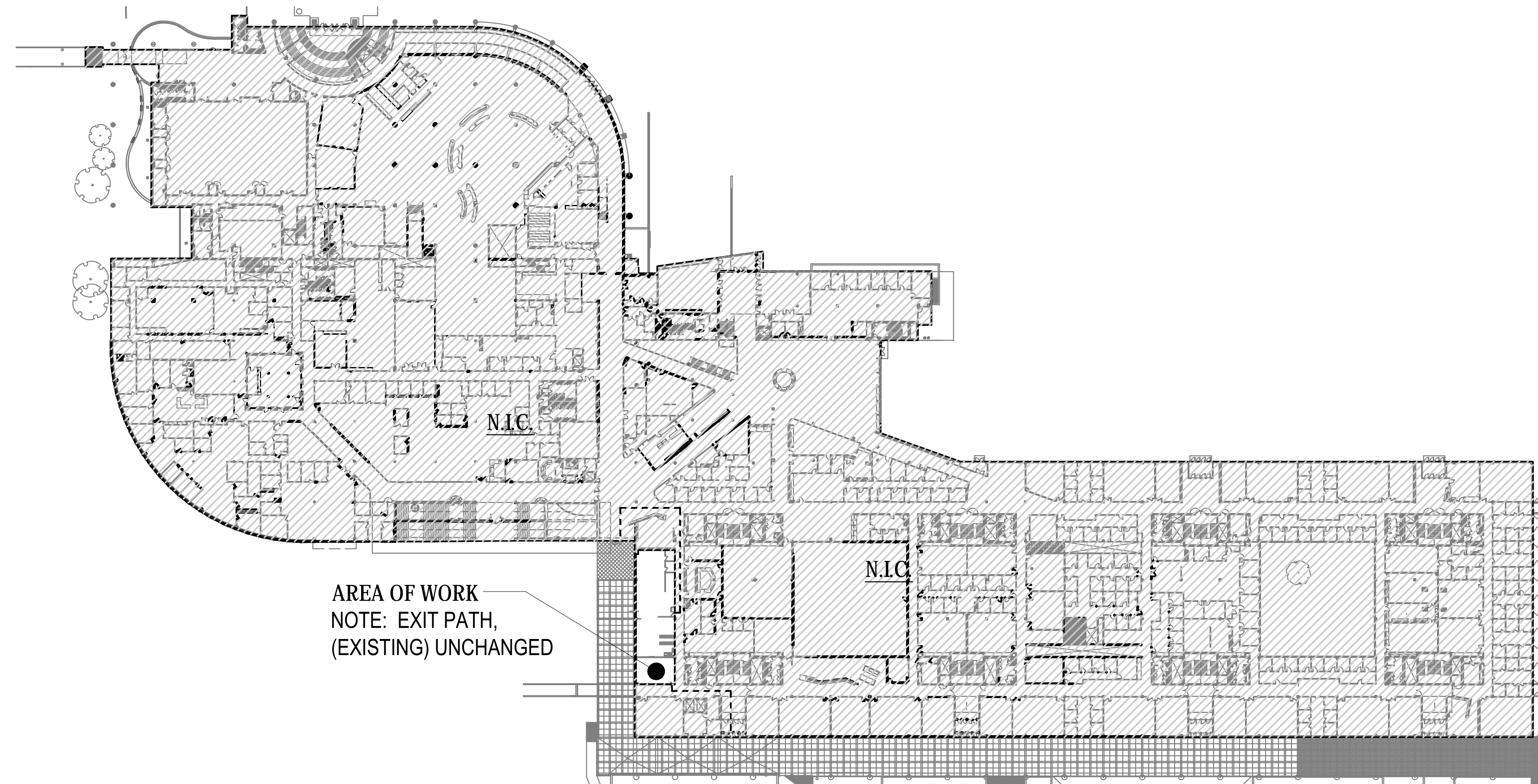
- FP000 FIRE PROTECTION SPECIFICATIONS
- FP100 FIRE PROTECTION PLAN

ELECTRICAL

- E000 NOTES, ABBREVIATIONS AND SYMBOL LISTS
- E100 LIGHTING PLANS
- E101 POWER AND SYSTEM PLANS

SCOPE OF WORK:

RENOVATE CLASSROOM TO PROVIDE 4 CONFERENCE ROOMS AND ONE OFFICE.



AREA OF WORK
 NOTE: EXIT PATH,
 (EXISTING) UNCHANGED

1 SECOND FLOOR OVERALL FLOOR PLAN
 SCALE: 1/64" = 1'-0"

CODE SUMMARY

EXISTING BUILDING TYPE I-B CONSTRUCTION

FLOOR CONSTRUCTION: 2 HR

ROOF CONSTRUCTION: 1 HR

FIRE WALLS AND PARTY WALLS: 3 HR

FIRE PARTITIONS: 1 HR

CORRIDOR WALLS: 0 HR

BEARING WALLS: 2 HR

APPLICABLE CODES:

- ICC 2009
- NEC 2011
- ILLINOIS STATE PLUMBING CODE, 2014
- NFPA 101 LIFE SAFETY CODE, 2009
- ILLINOIS ACCESSIBILITY CODE, 1997
- VILLAGE OF GLEN ELLYN IS AUTHORITY HAVING JURISDICTION, CONTRACTORS REQUIRED TO REGISTER WITH VILLAGE OF GLEN ELLYN

RENOVATION TO EXISTING BUILDING

OCCUPANCY B - BUSINESS

EXISTING BUILDING IS SPRINKLERED FULLY

NO CHANGES TO OCCUPANCY

NO CHANGE TO EXITING

NO CHANGE TO PLUMBING COUNT

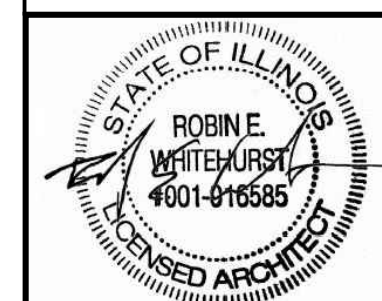
Issue Date	Title
02/19/18	ISSUED FOR PERMIT AND BID

COLLEGE OF DUPAGE
 BIC ADJUNCT AREA
 RECONFIGURATION

425 FAWELL BLVD
 GLEN ELLYN, IL 60137

COVER SHEET

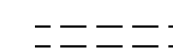







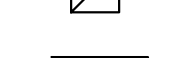
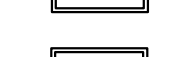
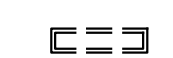
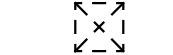

Expiration Date of Seal: 11-30-2018	BE Project No. 15044-1709
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Drawn By: CH

Drawing No. G000

DEMOLITION LEGEND

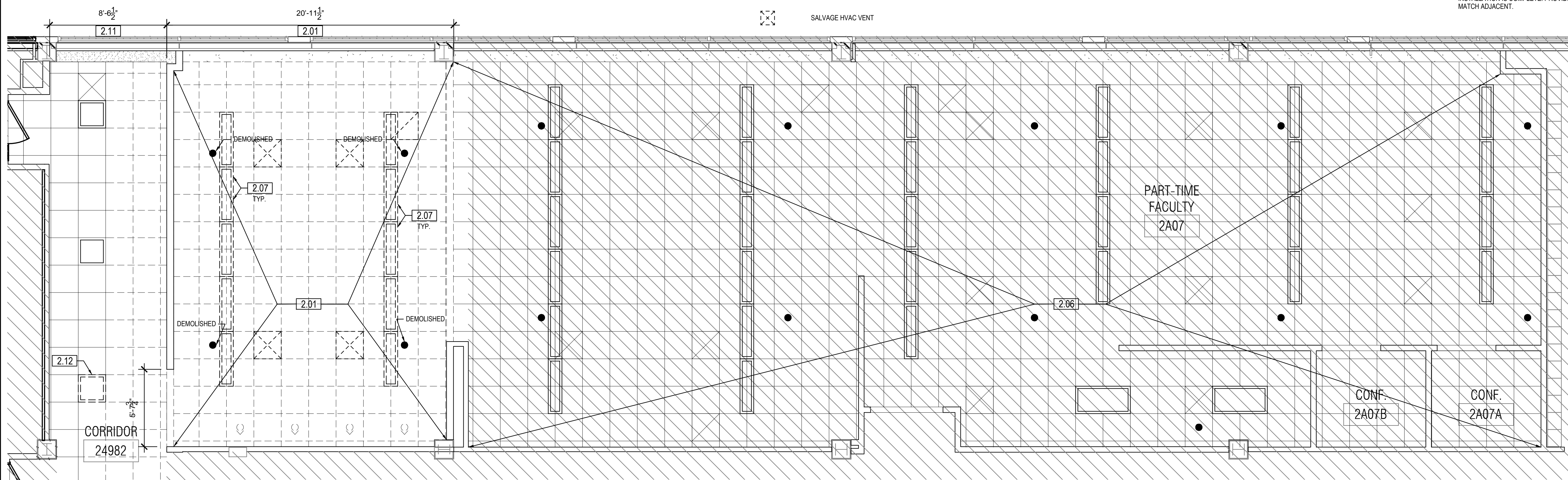
-  EXISTING - TO BE DEMOLISHED
-  EXISTING - TO REMAIN
-  EXISTING DOOR, FRAME, AND HARDWARE TO BE SALVAGED AND RELOCATED
-  EXISTING DOOR, FRAME AND HARDWARE TO REMAIN
-  AREA OF SCOPE FOR KEYNOTE
-  AREA N.I.C
-  SPRINKLER
-  MECH. SUPPLY
-  MECH. RETURN
-  CEILING LIGHT FIXTURES
-  PENDANT LIGHT FIXTURE
-  SALVAGE LIGHT FIXTURE
-  SALVAGE HVAC VENT

DEMOLITION GENERAL NOTES

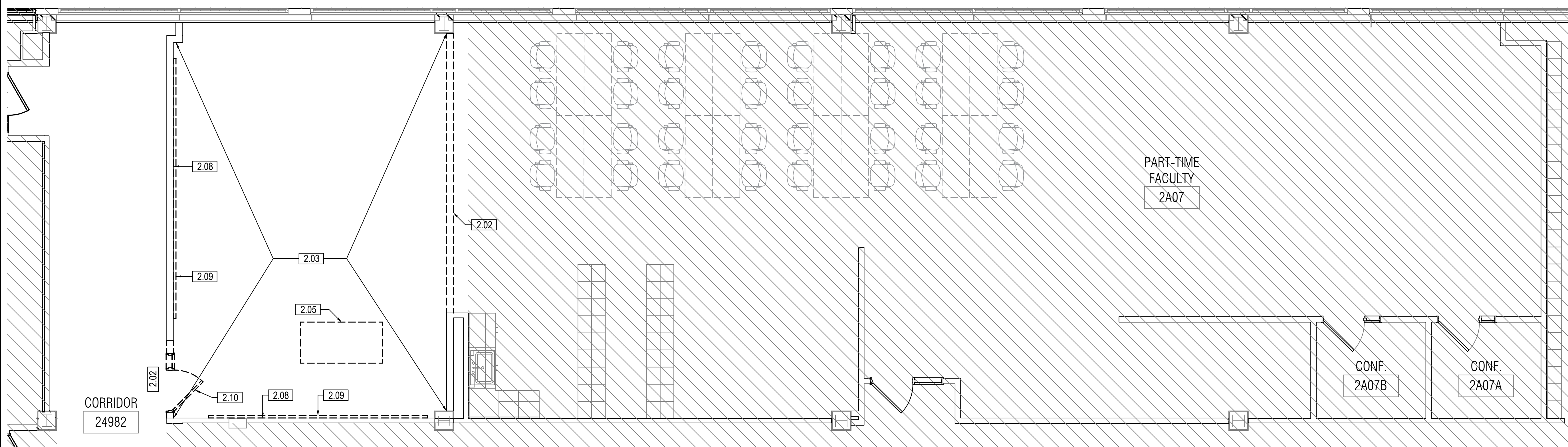
1. ALL BUILDING ELEMENTS AFFECTED BY WORK SHALL BE REMOVED AND SALVAGED FOR REINSTALLATION UNLESS NOTED OTHERWISE.
2. ALL BUILDING ELEMENTS NOT IN SCOPE OF WORK ARE EXISTING TO REMAIN AND SHALL BE PROTECTED FROM DAMAGE DURING ALL DEMOLITION ACTIVITIES.
3. REFER TO ENGINEERING DRAWINGS FOR ADDITIONAL DEMOLITION INFORMATION.
4. SEE G001 FOR PENETRATION FIRE STOPPING NOTES
5. SEAL ALL PENETRATIONS TO PREVENT SMOKE INFILTRATION
6. ALL EXISTING MOVABLE FURNITURE TO BE RELOCATED BY OWNER AS REQUIRED.

DEMOLITION KEYNOTES

- 2.01** DEMOLITION CEILING GRID AND ALL RELATED COMPONENTS, HANGERS, SUPPORTS, RETURN AND SUPPLY GRILLES, ETC. REFERENCE OTHER TRADES DRAWINGS FOR ADDITIONAL REQUIREMENTS. SALVAGE EXISTING ACOUSTICAL CEILING TILES FOR REINSTALLATION.
- 2.02** DEMOLISH EXISTING PARTITION, BASE AND OTHER ASSOCIATED SUPPORT, PATCH AND REFINISH TO MATCH ADJACENT FINISHES AND TO PROPERLY RECEIVE NEW WORK.
- 2.03** REMOVE AND SALVAGE CARPET TILES. OWNER HAS ATTIC STOCK.
- 2.04** EXISTING INSTRUCTION TABLE TO BE REMOVED BY THE COLLEGE AND DELIVERED TO #1700R BIC. ELECTRICAL WIRES TO BE REMOVED SEE ELECTRICAL, PATCH AND REFINISH
- 2.05** EXISTING CEILING SYSTEM TO REMAIN, PROTECT.
- 2.06** REMOVE AND SALVAGE EXISTING PENDANT LIGHT FIXTURES. OWNER RIGHT OF FIRST REFUSAL.
- 2.07** REMOVE WALL PROTECTION, PATCH AND REPAIR WALL.
- 2.08** REMOVE AND SALVAGE MARKER BOARDS, VINYL PROTECTION STRIPS, ECT. IN EXISTING CLASSROOM. OWNER TO HAVE FIRST RIGHT OF REFUSAL.
- 2.09** EXISTING DOOR, FRAME, AND HARDWARE TO BE SALVAGED AND RELOCATED.
- 2.10** REMOVE AND SALVAGE EXISTING CEILING TILES AND GRID FOR NEW VAV INSTALLATION. SEE MECHANICAL DRAWINGS FOR COORDINATION. REINSTALL GRID AND TILES WHEN COMPLETE.
- 2.11** REMOVE AND REINSTALL ELECTRICAL FIXTURE AFTER VAV INSTALLATION IS COMPLETE. PROVIDE NEW CEILING TILE TO MATCH ADJACENT.
- 2.12**



2 DEMOLITION - PARTIAL RCP
 SCALE: 1/4" = 1'
 NORTH



1 DEMOLITION - PARTIAL PLAN
 SCALE: 1/4" = 1'
 NORTH



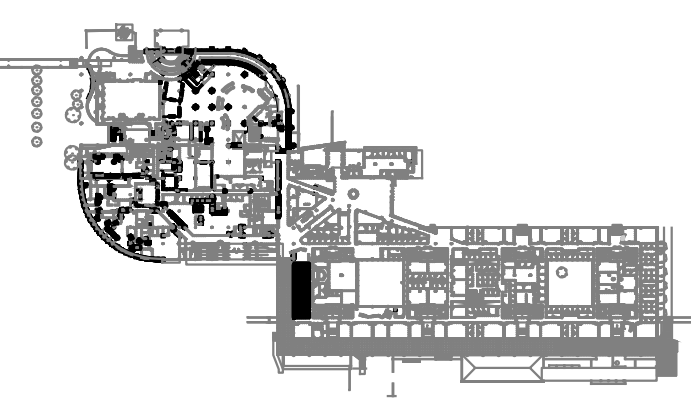
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KEY PLAN

Issue Date	Title
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**COLLEGE OF DUPAGE
 BIC ADJUNCT AREA
 RECONFIGURATION**

425 FAWELL BLVD
 GLEN ELLYN, IL 60137

**DEMOLITION FLOOR
 PLAN AND RCP**

Expiration Date of Seal: 11-30-2018
 BE Project No. 15044-1709



Drawn By: CH

Drawing No. D100

GENERAL NOTES

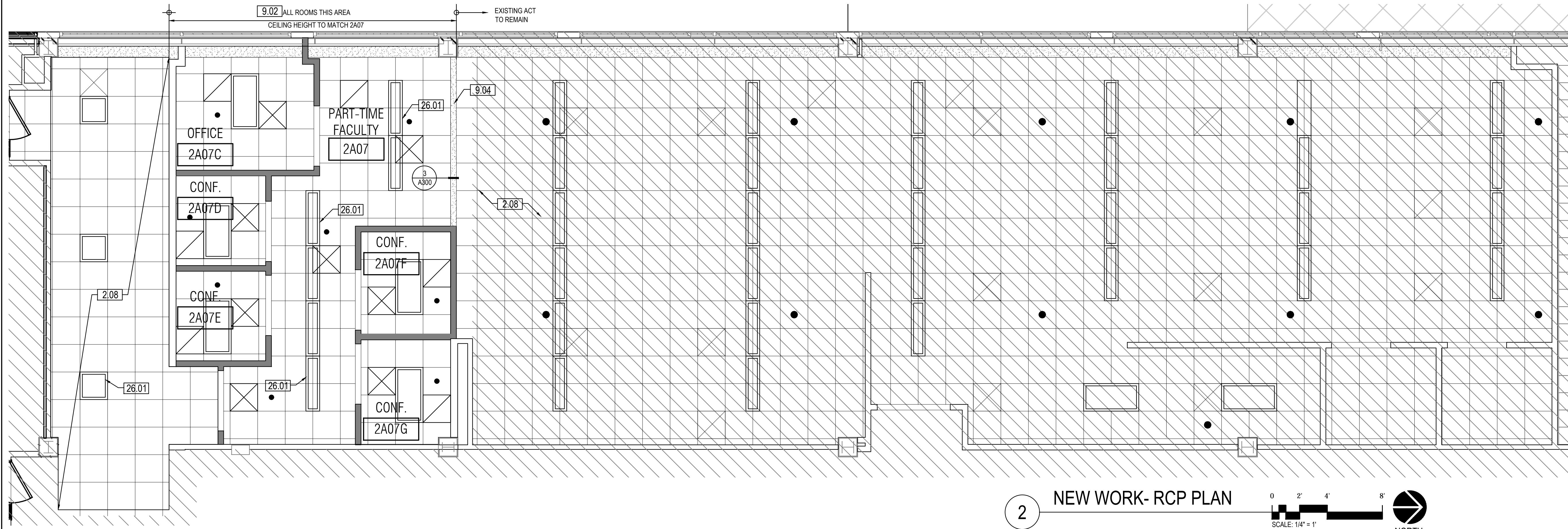
1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO COMMENCEMENT OF ANY WORK.
2. ALL SURFACES AFFECTED BY WORK SHALL BE PATCHED AND/OR REPAIRED AS REQUIRED TO CREATE A COMPLETE CONSTRUCTION ASSEMBLY.
3. ALL BUILDING ELEMENTS NOT IN SCOPE OF WORK ARE EXISTING TO REMAIN AND SHALL BE PROTECTED FROM DAMAGE DURING ALL DEMOLITION ACTIVITIES.

PLAN LEGEND

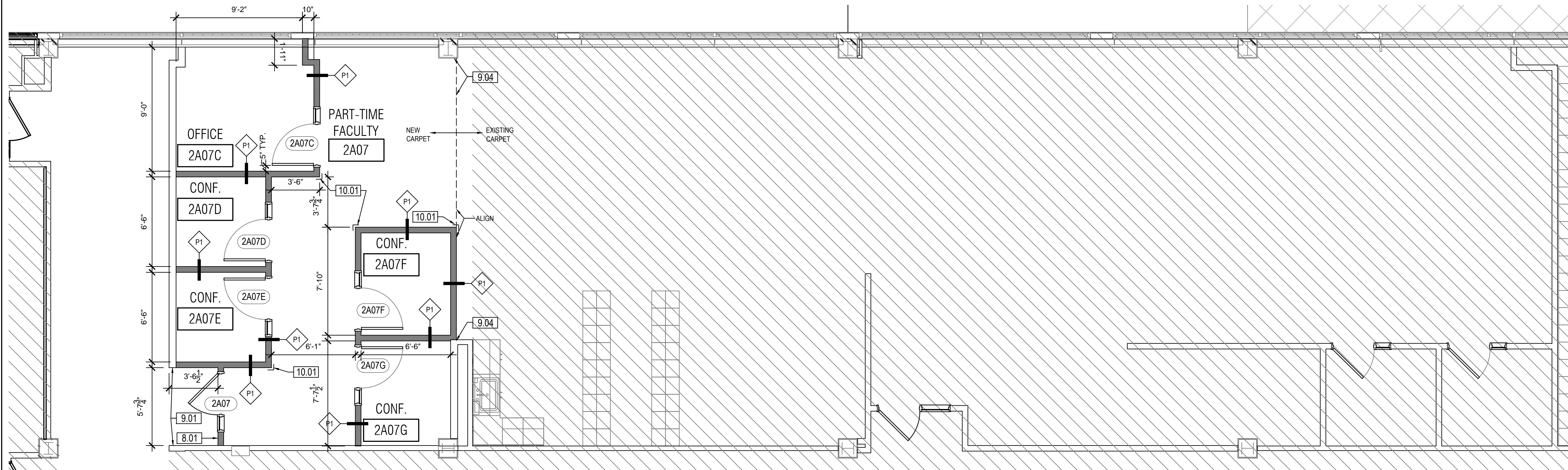
- AREA N.I.C.
- NEW WALL - REFER TO SHEET G001 FOR ASSEMBLY TYPES
- EXISTING WALL TO REMAIN
- NEW DOOR - REFER TO SHEET A900 FOR DOOR SCHEDULE
- EXISTING DOOR TO REMAIN
- ASSEMBLY TYPE - REFER TO SHEET G001
- DOOR TAG
- SPRINKLER
- MECH. SUPPLY
- MECH. RETURN
- CEILING LIGHT FIXTURES
- PENDANT LIGHT FIXTURE

NEW WORK KEYNOTES

- 2.08** EXISTING CEILING SYSTEM TO REMAIN, PROTECT.
- 8.01** INSTALL NEW BADGE SWIPE.
- 9.01** PATCH AND REPAIR WALL WHERE EXISTING WALL REMOVED
- 9.02** PROVIDE NEW CEILING GRID AND REINSTALL EXISTING TILE. REPLACE DAMAGED TILE. SEE SPEC 09 51 13.
- 9.04** PATCH AND REPAIR WALL / COLUMN, WHERE WALL REMOVED. PATCH, PRIME AND PAINT AREA TO MATCH ADJACENT FINISH.
- 10.01** NEW SS. CORNER GUARD TO 4'-0" AFF.
- 26.01** REINSTALL SALVAGED LIGHT FIXTURES SEE ELECTRICAL DRAWINGS.



2 NEW WORK- RCP PLAN
SCALE: 1/4" = 1'
NORTH



1 NEW WORK- PLAN
SCALE: 1/4" = 1'
NORTH

File Path
3/27/2009 10:28:24 AM

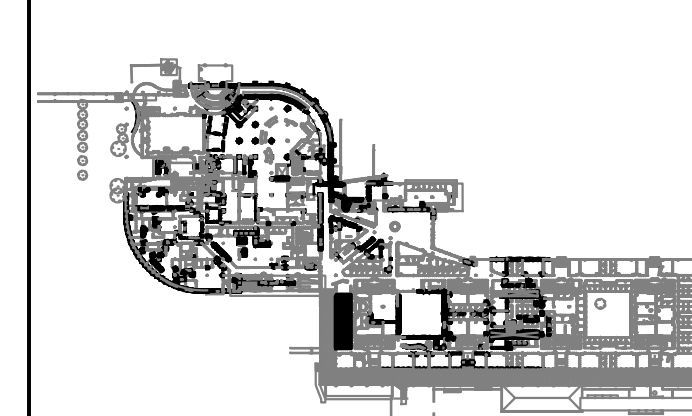


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KEY PLAN

Issue Date	Title
02/19/18	ISSUED FOR PERMIT AND BID

**COLLEGE OF DUPAGE
BIC ADJUNCT AREA
RECONFIGURATION**

425 FAWELL BLVD
GLEN ELLYN, IL 60137

**NEW WORK FLOOR
PLAN AND RCP**

Expiration Date of Seal: 11-30-2018
BE Project No. 15044-1709



Drawn By: CH
Drawing No.: A100



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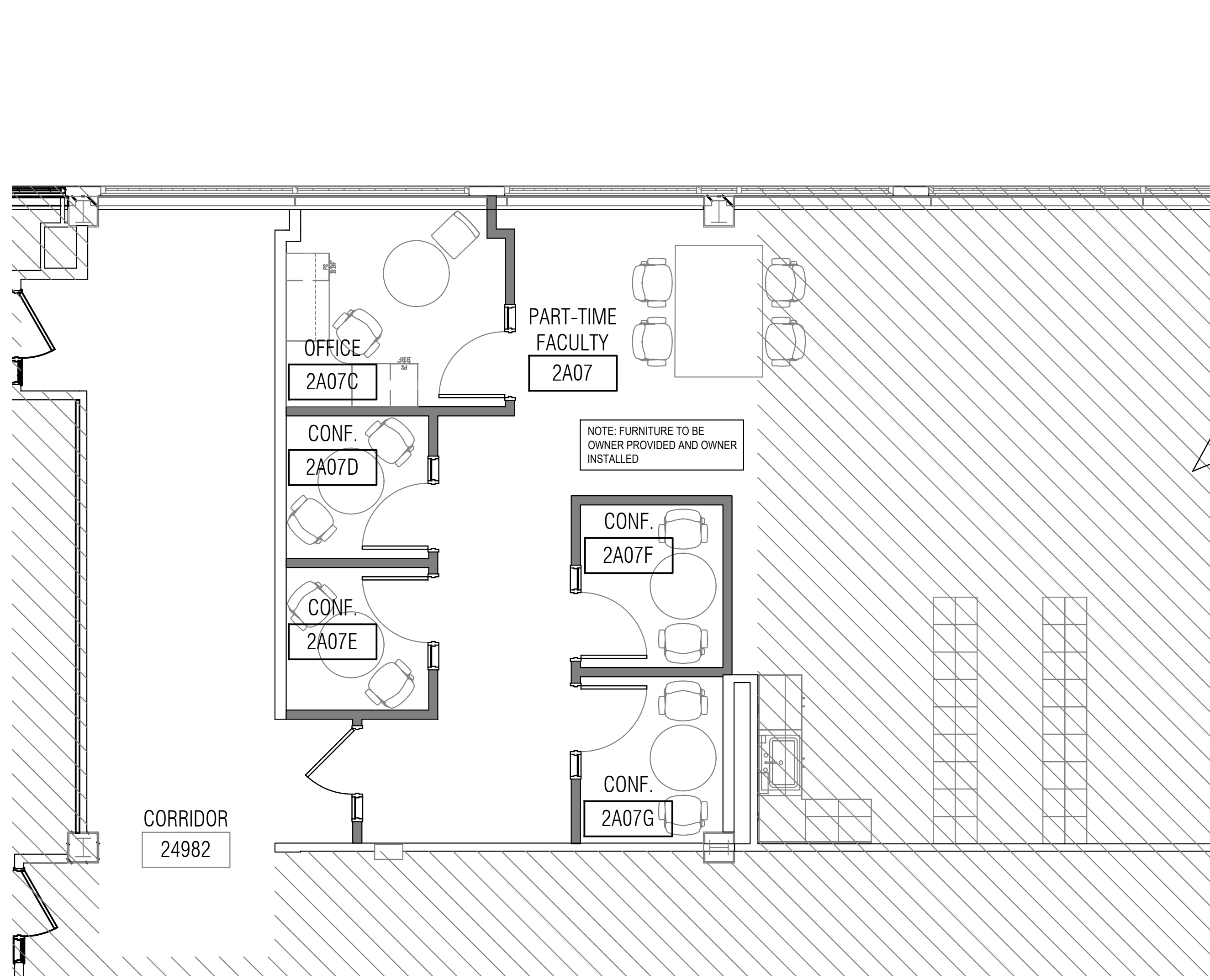
DOOR SCHEDULE																	
DOOR NO.	ROOM NO.	ROOM NAME	DOOR						FRAME				DETAILS		HARDWARE SET	FIRE RATING	COMMENTS
			WIDTH	HEIGHT	THICKNESS	DOOR TYPE	MATERIAL	FINISH	TYPE	HEIGHT	MATERIAL	FINISH	HEAD	JAMB			
2A07	2A07	PART-TIME FACULTY	3'-0"	7'-0"	1-3/4"	A	WD	PT-1	1	7'-2"	HM	PT-1	1/A300	2/A300	3	-	REINSTALL EXISTING FRAME
2A07C	2A07C	OFFICE	3'-0"	7'-0"	1-3/4"	A	WD	PT-1	1	7'-2"	HM	PT-1	1/A300	2/A300	2	-	
2A07D	2A07D	CONFERENCE RM	3'-0"	7'-0"	1-3/4"	A	WD	PT-1	1	7'-2"	HM	PT-1	1/A300	2/A300	1	-	
2A07E	2A07E	CONFERENCE RM	3'-0"	7'-0"	1-3/4"	A	WD	PT-1	1	7'-2"	HM	PT-1	1/A300	2/A300	1	-	
2A07F	2A07F	CONFERENCE RM	3'-0"	7'-0"	1-3/4"	A	WD	PT-1	1	7'-2"	HM	PT-1	1/A300	2/A300	1	-	
2A07G	2A07G	CONFERENCE RM	3'-0"	7'-0"	1-3/4"	A	WD	PT-1	1	7'-2"	HM	PT-1	1/A300	2/A300	1	-	

GENERAL NOTES:

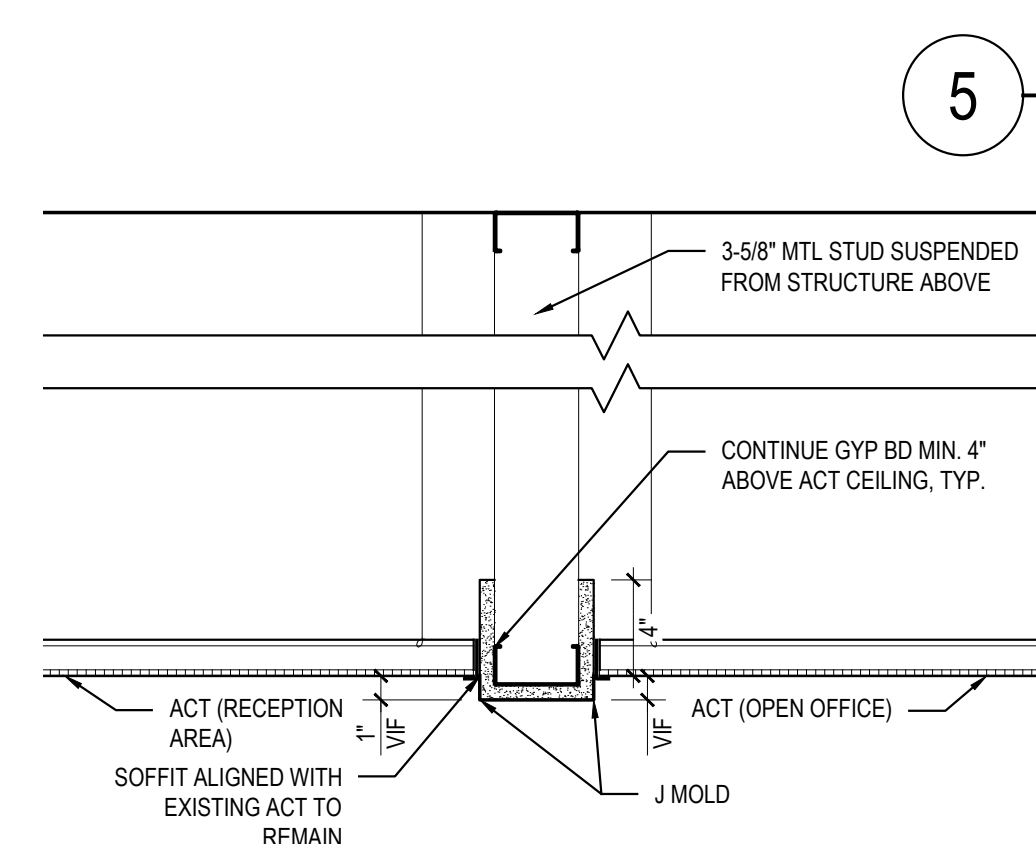
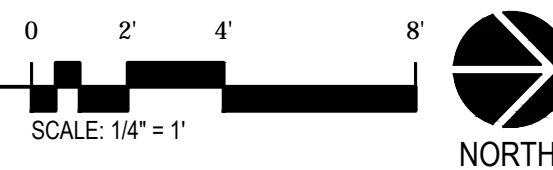
1. ALL FINISHES AND/OR PRODUCTS SHALL BE PROVIDED AS SPECIFIED OR AS A COLLEGE APPROVED EQUAL.
2. ALL DOOR HARDWARE FINISHES SHALL MATCH EXISTING FINISHES UNLESS NOTED OTHERWISE.
3. CONTRACTOR WILL PROVIDE PAINT DRAW DOWNS, CEILING TILE, CARPET AND BASE SAMPLES AT ONE TIME FOR SIDE BY SIDE COMPARISON TO EXISTING.

FINISH SCHEDULE									
ROOM NO.	ROOM NAME	CEILING FINISH	WALL FINISH				FLOOR FINISH	BASE FINISH	REMARKS
			NORTH	SOUTH	EAST	WEST			
2A07	PART-TIME FACULTY	EXISTING	PT-1	PT-1	PT-1	PT-1	CPT-2	WB-1	PAINT NEW WALLS WITHIN SPACE ADJACENT TO NEW WORK
2A07C	OFFICE	ACT 1	PT-1	PT-1	PT-1	PT-1	CPT-2	WB-1	
2A07D	CONFERENCE RM	ACT 1	PT-1	PT-1	PT-1	PT-1	CPT-2	WB-1	
2A07E	CONFERENCE RM	ACT 1	PT-1	PT-1	PT-1	PT-1	CPT-2	WB-1	
2A07F	CONFERENCE RM	ACT 1	PT-1	PT-1	PT-1	PT-1	CPT-2	WB-1	
2A07G	CONFERENCE RM	ACT 1	PT-1	PT-1	PT-1	PT-1	CPT-2	WB-1	
24982	CORRIDOR	ACT 2	PT-2	PT-2	PT-2	PT-2	CPT-1	WB-1	

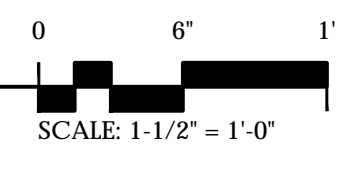
FINISH LEGEND				
NO.	MATERIAL	MANUFACTURER	TYPE	REMARKS
ACT-1	ACOUSTICAL TILE	ARMSTRONG	24 X 24 X 3/4 TEGULAR EDGE .7 NRC ULTIMA WHITE	
ACT-2	ACOUSTICAL TILE	ARMSTRONG	24 X 24 X 3/4 TEGULAR EDGE .6 NRC MESA, WHITE	
PT-1	PAINT	B MOORE	REGAL PREMIUM LATEX, PEARL FINISH, OC-18 DOVE WING	
PT-2	PAINT	B MOORE	REGAL PREMIUM LATEX, MATTE CERAMIC, OC-18 DOVE WING	
WB-1	RESILIENT BASE	JOHNSONITE	RUBBER 4" STRAIGHT TOE CARPET SURFACE	
CPT-1	CARPET TILE	TANDUS	ILLUSORY #10701 ENCHANTMENT	
CPT-2	CARPET TILE	CONSTANTINE	61-550-4201K (IPY) NSQ-7417 CUSTOM QUADRATIC	



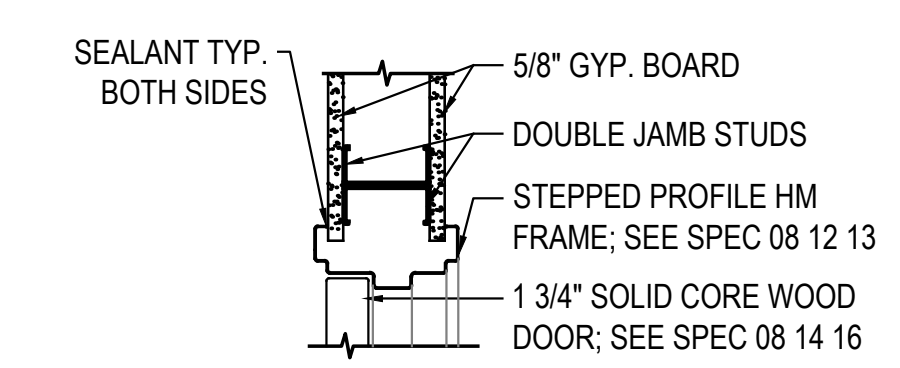
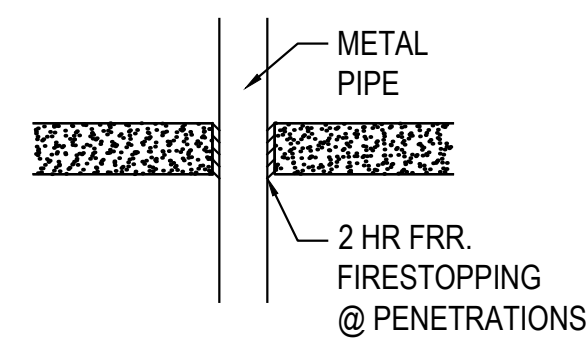
4 FURNITURE PLAN (FOR REFERENCE ONLY)



3 SOFFIT DETAIL

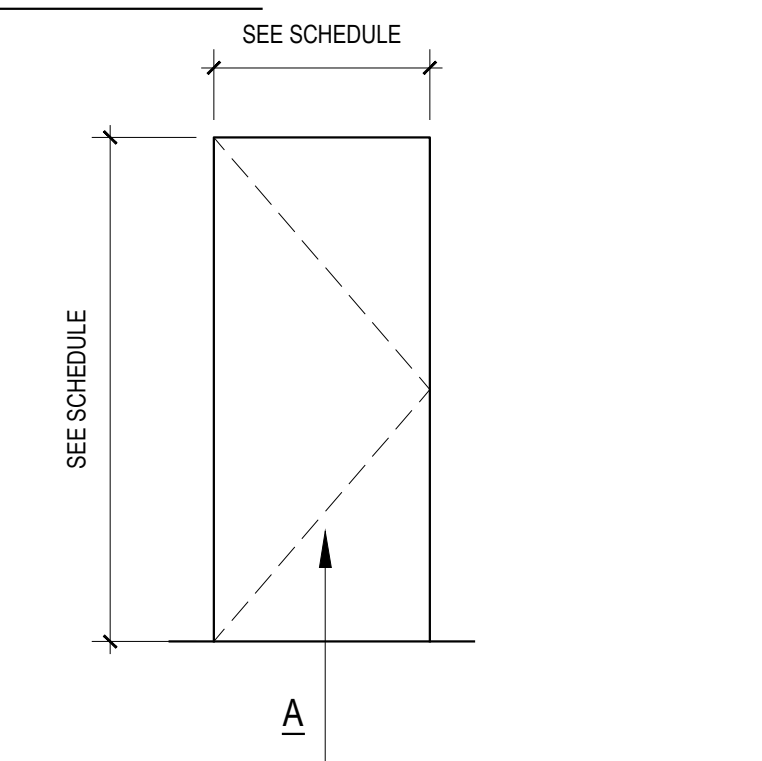


5 FIRE STOPPING DETAIL

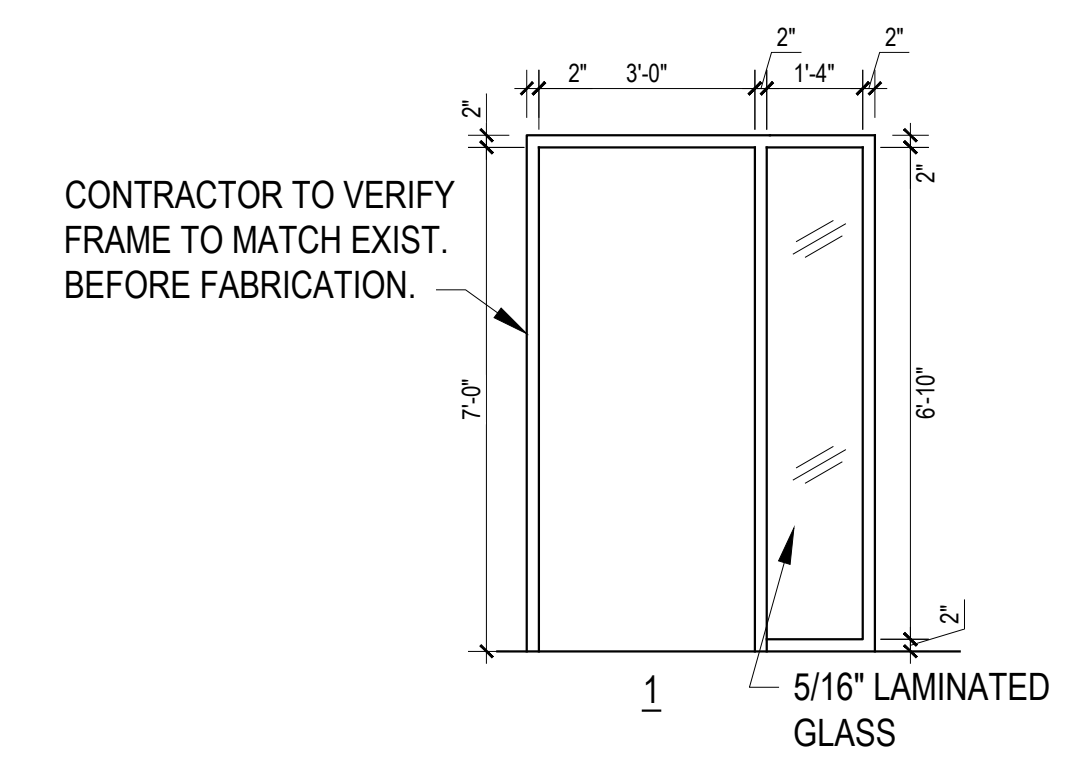


2 DOOR JAMB DETAIL, TYP.

DOOR TYPES



FRAME TYPES



1 DOOR HEAD DETAIL, TYP.

Issue Date	Title
02/19/18	ISSUED FOR PERMIT AND BID

COLLEGE OF DUPAGE
BIC ADJUNCT AREA
RECONFIGURATION

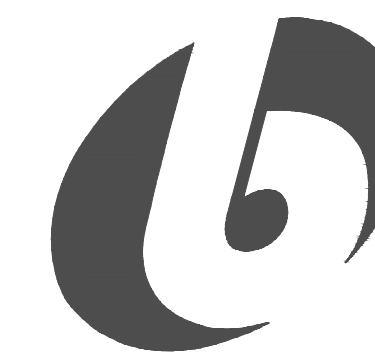
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GLEN ELLYN, IL 60137

SCHEDULES AND FINISHES

Expiration Date of Seal: 11-30-2018
Project No. 15044-1709



Drawn By: CH
Drawing No. A300



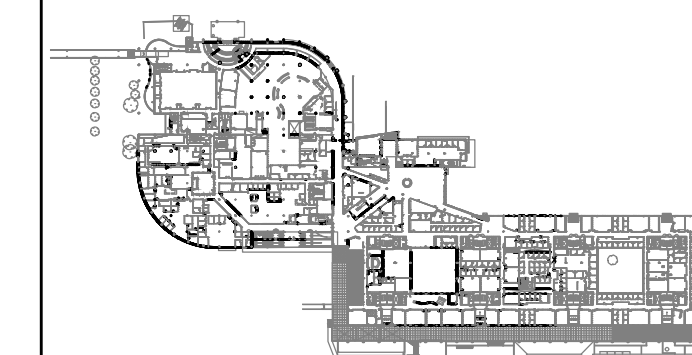
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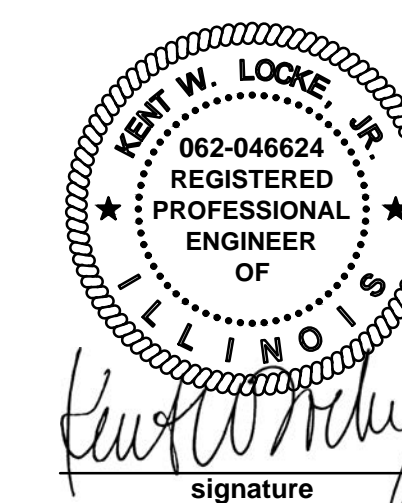
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KEY PLAN



signature
date
license expires on 11-30-2019
Design Firm Registration
No.: 184-001962

Issue Date: FEB 19, 2018 Title: ISSUED FOR PERMIT AND BID

COLLEGE OF DUPAGE
BIC ADJUNCT AREA
RECONFIGURATION

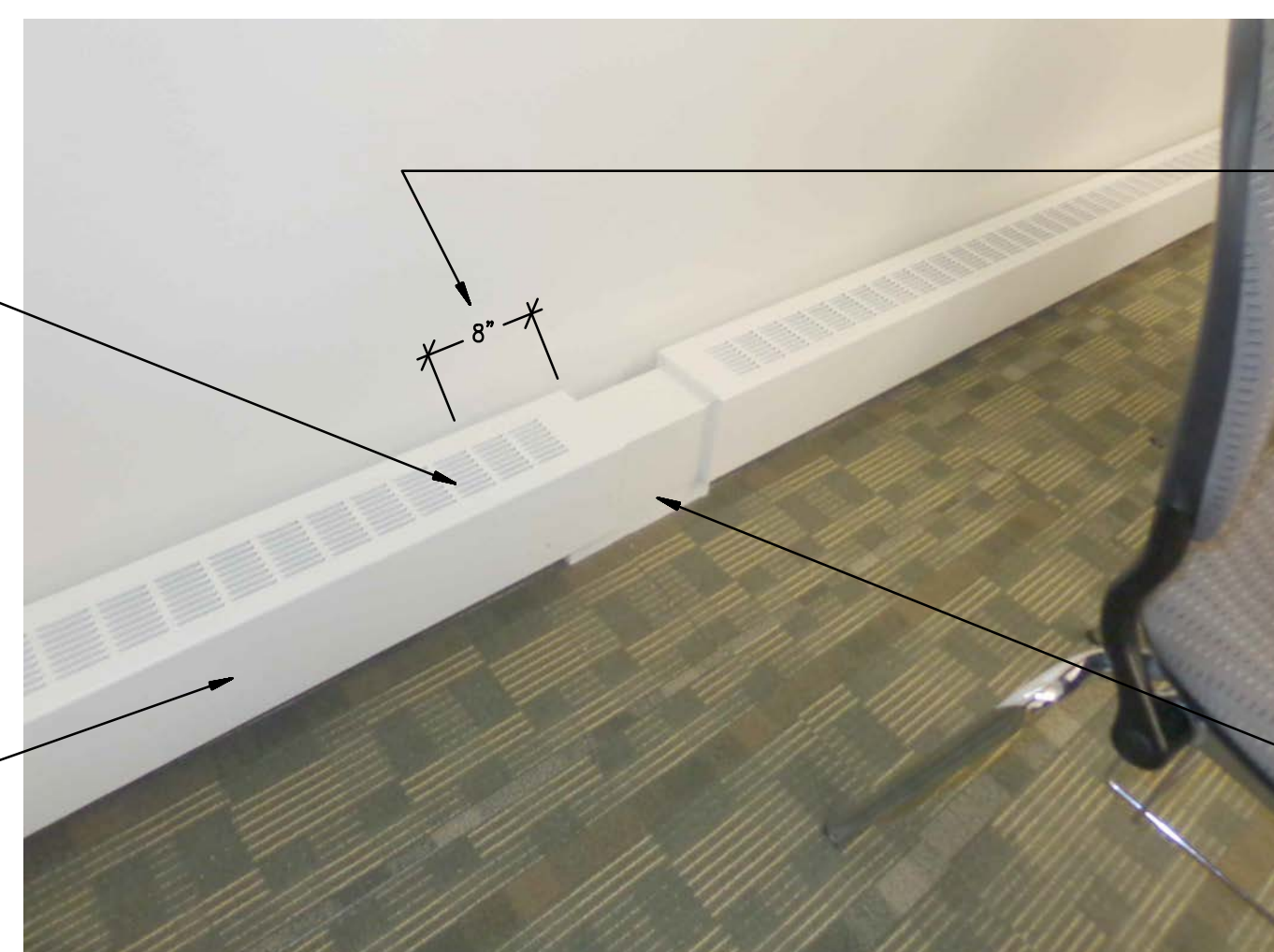
425 FAWELL BLVD
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HEATING
PLAN

Expiration Date of Seal: 11-30-2019 BE Project No: 15044-1709

Drawn By: MM/CP

Drawing No: H100

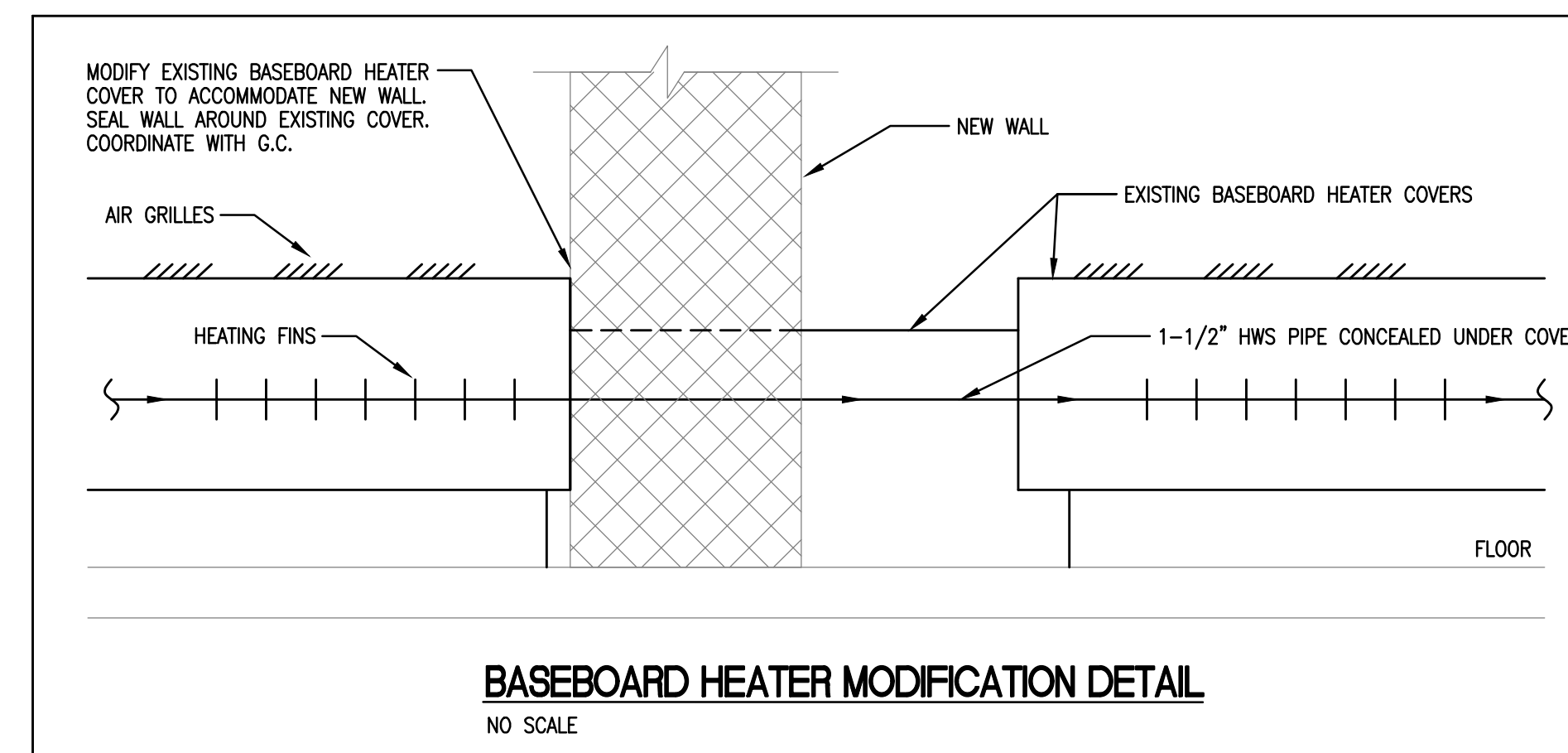


END OF HOT WATER FINS.
NEW COVER SHALL EXTEND
BEYOND FINS AND NOT
PROHIBIT AIR FLOW.

MODIFY AND REPLACE
EXISTING BASEBOARD
HEATER COVER. ADD
END CAP/TRIM AT END
-MATCH EXISTING COLOR.

CUT EXISTING BASEBOARD
HEATER COVER BY ~8"
FOR NEW WALL.
COORDINATE WITH GENERAL
CONTRACTOR.

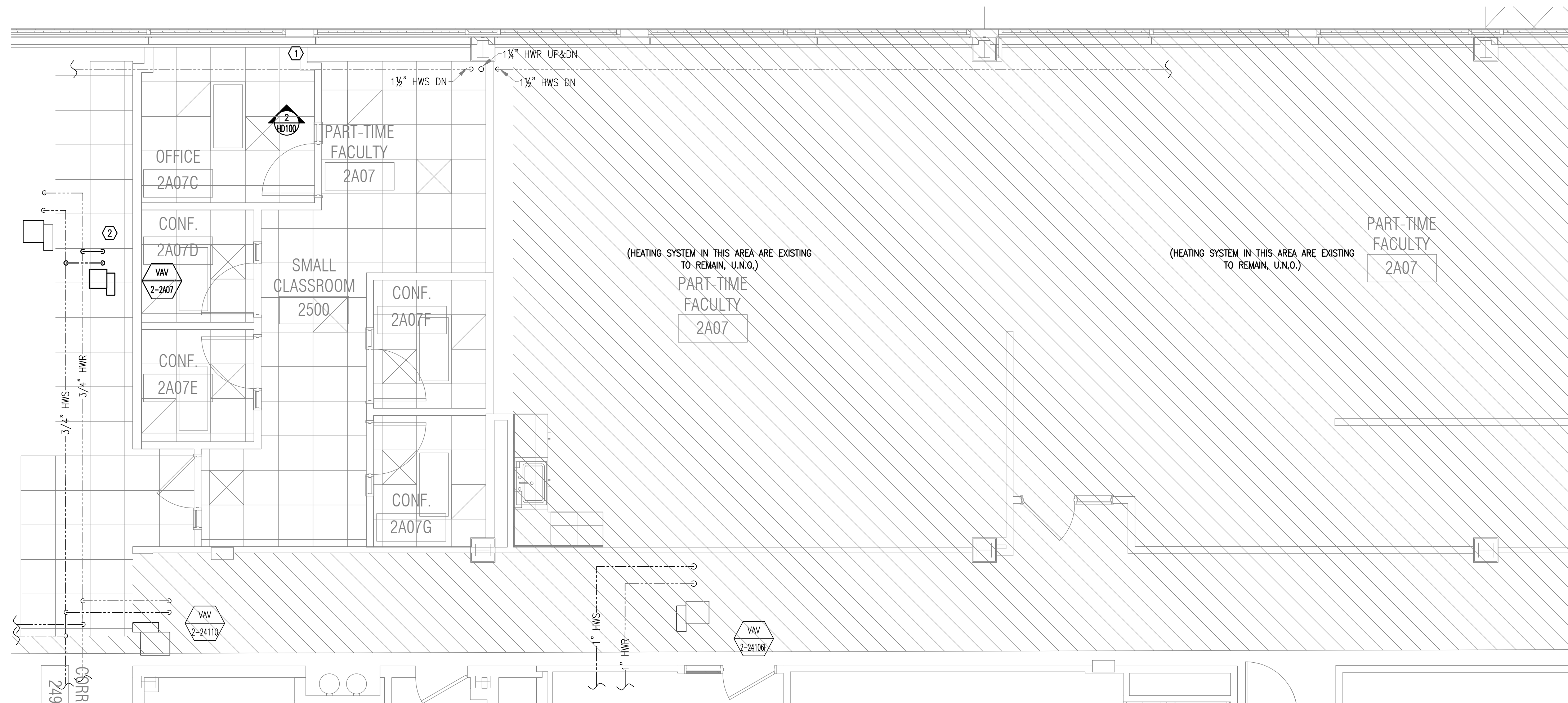
EXISTING PIPE COVER
TO REMAIN.



BASEBOARD HEATER MODIFICATION DETAIL

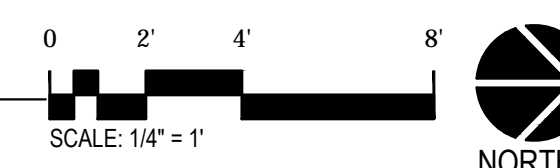
NO SCALE

2 EXISTING BASEBOARD HEATER



1 HEATING NEW WORK PLAN

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



- HEATING NEW WORK KEY NOTES:**
- ① MODIFY EXISTING BASEBOARD HEATER COVER PLATE TO FIT WITHIN NEW WALL. COORDINATE WITH GENERAL CONTRACTOR.
 - ② PROVIDE NEW 3/4" HWS&R AND VALVES TO NEW VAV BOX. CONNECT TO EXISTING PIPING. INSULATE NEW PIPING AND VALVES AND SEAL TO EXISTING.

- HEATING SYMBOLS + ABBREVIATIONS:**
- - - - - DEMOLITION
 - D DRAIN
 - HWS— HOT WATER SUPPLY
 - - - - -HWR- - - - - HOT WATER RETURN



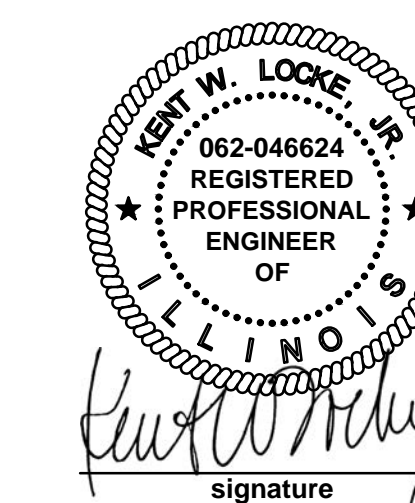
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Issue Date: FEB 19, 2018 Title: ISSUED FOR PERMIT AND BID

COLLEGE OF DUPAGE
BIC ADJUNCT AREA
RECONFIGURATION

425 FAWELL BLVD
GLEN ELLYN, IL 60137

Drawing Title

VENTILATION
SYMBOLS, SCHEDULES,
& DETAILS

Revision Date of Seal: 11-30-2018 BE Project No: 15044-1709

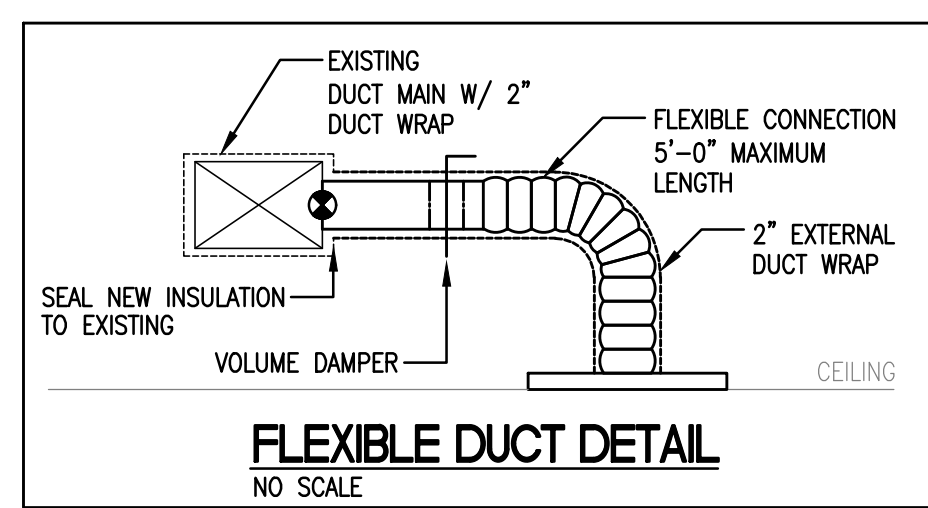
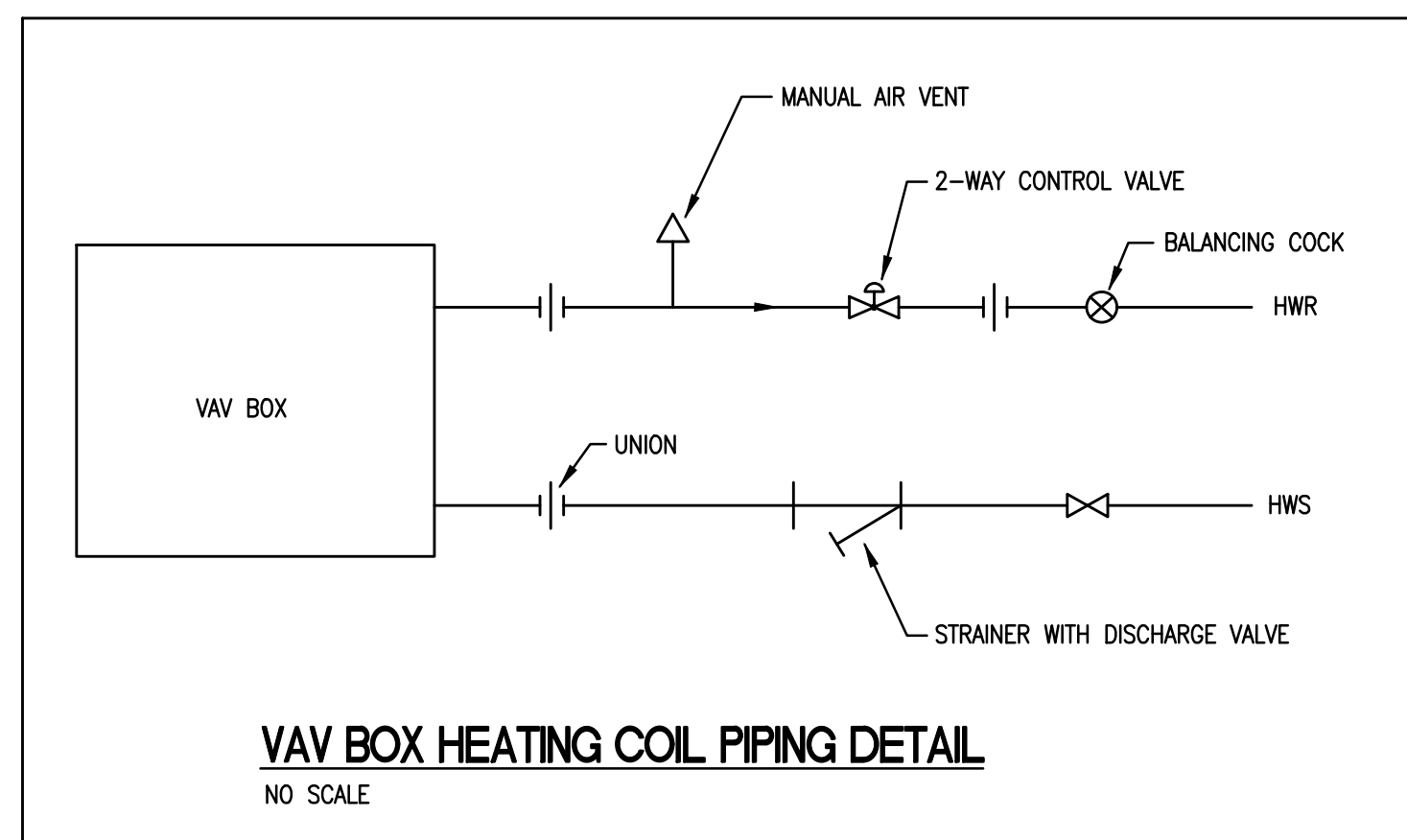
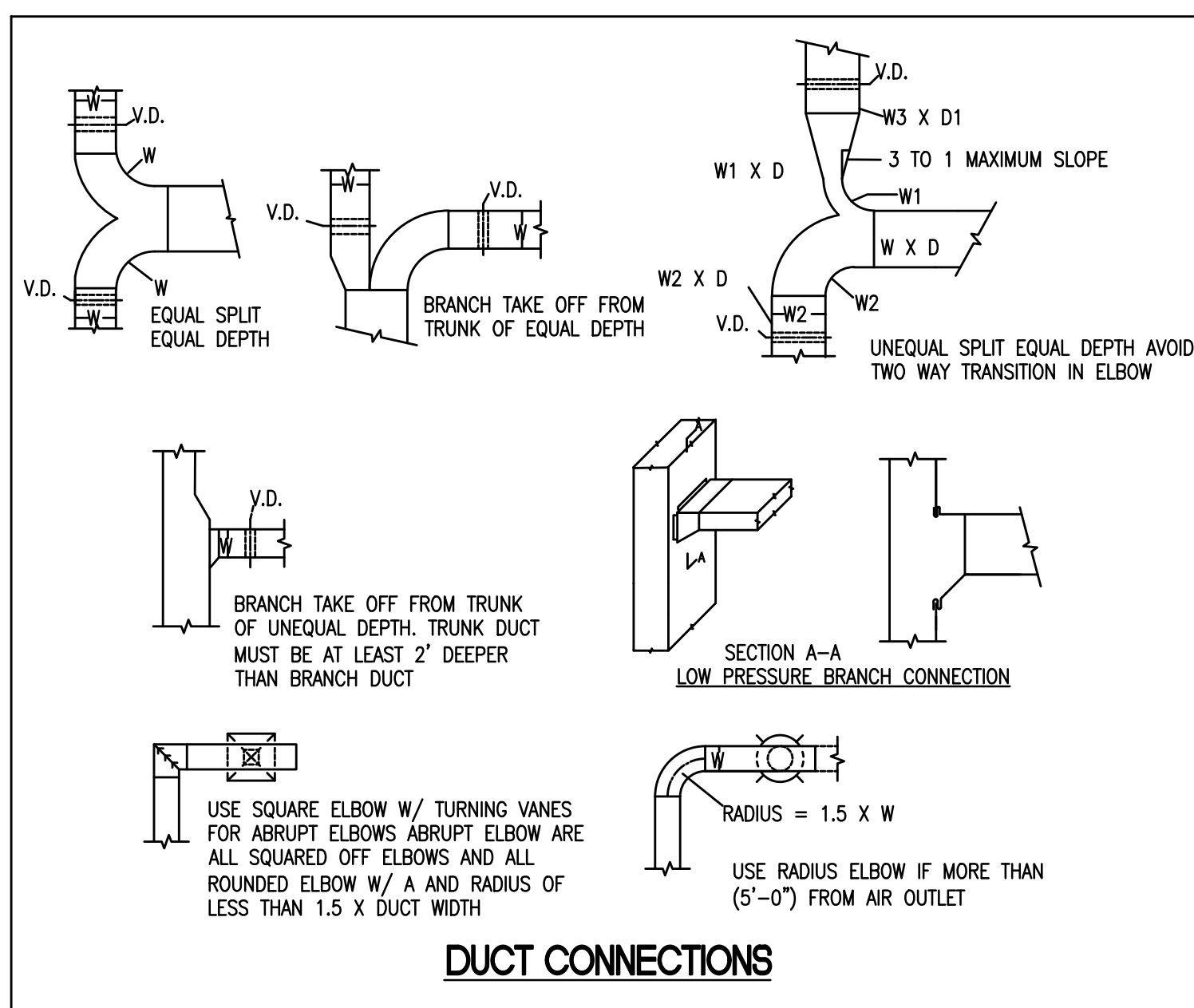
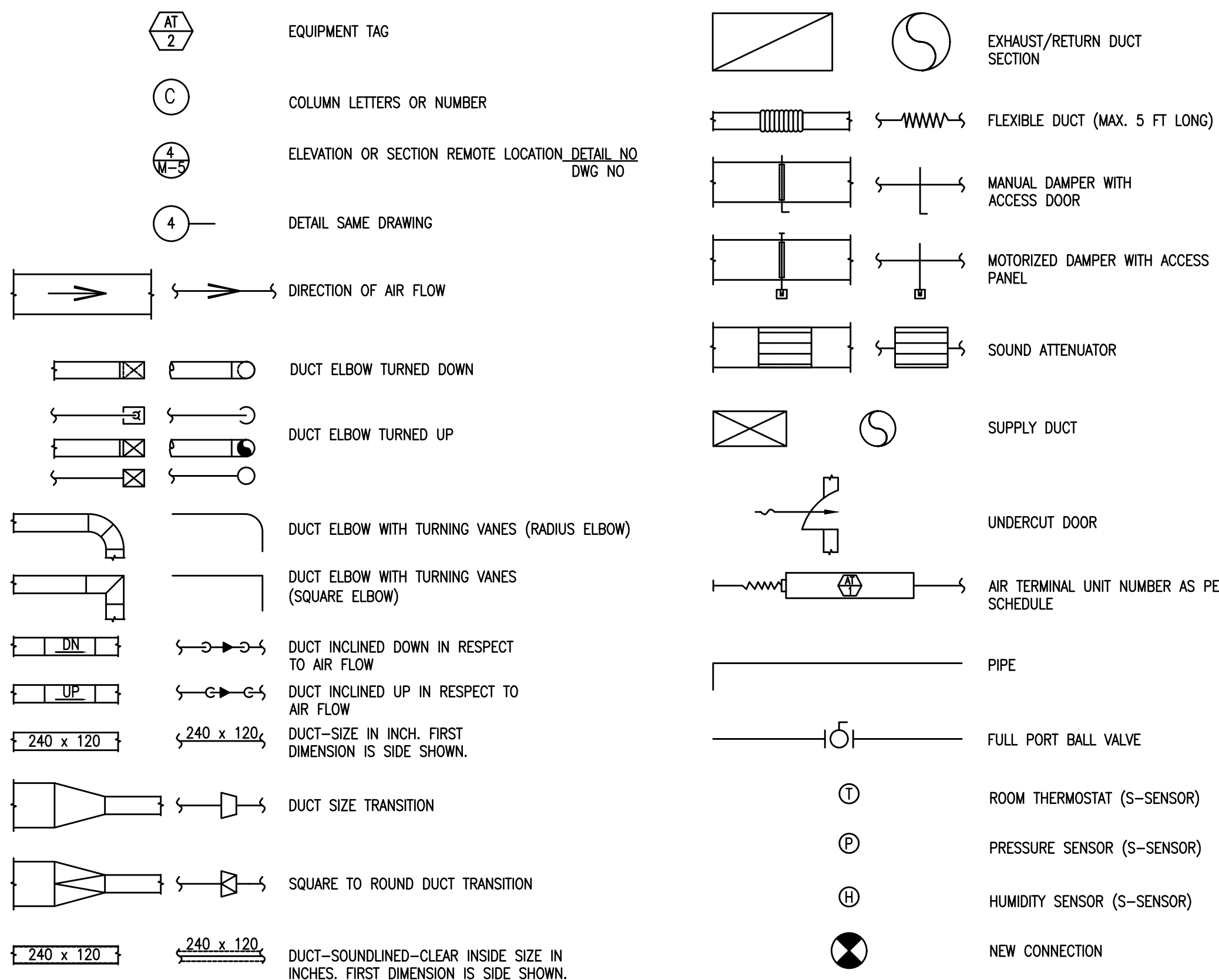
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SYMBOLS + ABBREVIATIONS

HVAC CONTROL SYMBOLS

Table of abbreviations: AD ACCESS DOOR, AH AIR HANDLING SYSTEM, AMP AMPERE, AT AIR TERMINAL UNIT, BDD BACK DRAFT DAMPER, BHP BRAKE HORSEPOWER, etc.



DIFFUSERS, GRILLES, AND REGISTERS
TYPE (TYP.)
S-50 AIR QUANTITY (TYP.)
FLEXIBLE CONNECTION (TYP.)
VOLUME DAMPER (TYP.)
SQUARE CEILING DIFFUSER, CONSTRUCTED OF STEEL, SINGLE CONE, REMOVABLE FACE PANEL, WHITE FINISH, 24x24, MATCH EXISTING IN FIELD, TITUS MODEL OMNI.

VENTILATION DATA table with columns: ROOM NUMBER, ROOM USE, VENTILATION AREA (SQ. FT.), OCCUPANT DENSITY (PEOPLE PER 1,000 SQ. FT.), etc.

VAV TERMINAL UNIT SCHEDULE table with columns: UNIT NO., VARIABLE VOLUME PRIMARY AIR CFM, AIR PRESSURE DROP INCHES, OVERALL TERM UNIT SIZE INCHES, etc.

1 PROVIDE CONTROLS COMPARABLE WITH EXISTING BAS SYSTEM (COORDINATE WITH HONEYWELL), STERI-LOC LINER, VELOCITY SENSOR, INTEGRAL SILENCER, ACCESS DOOR.
2 EXISTING TO REMAIN.



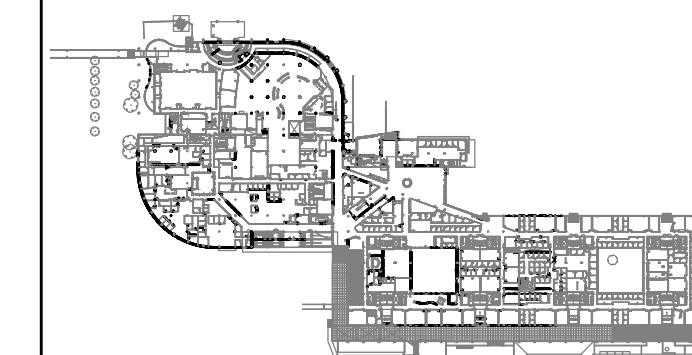
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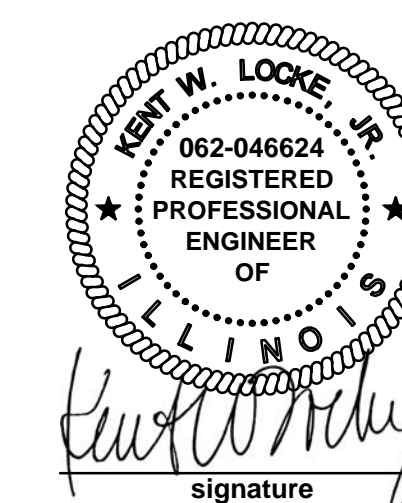
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Issue Date: FEB 19, 2018 Title: ISSUED FOR PERMIT AND BID

COLLEGE OF DUPAGE
BIC ADJUNCT AREA
RECONFIGURATION

425 FAWELL BLVD
GLEN ELLYN, IL 60137

VENTILATION
PLANS

Expiration Date of Seal: 11-30-2019 BE Project No: 15044-1709

Drawn By: MM/CP

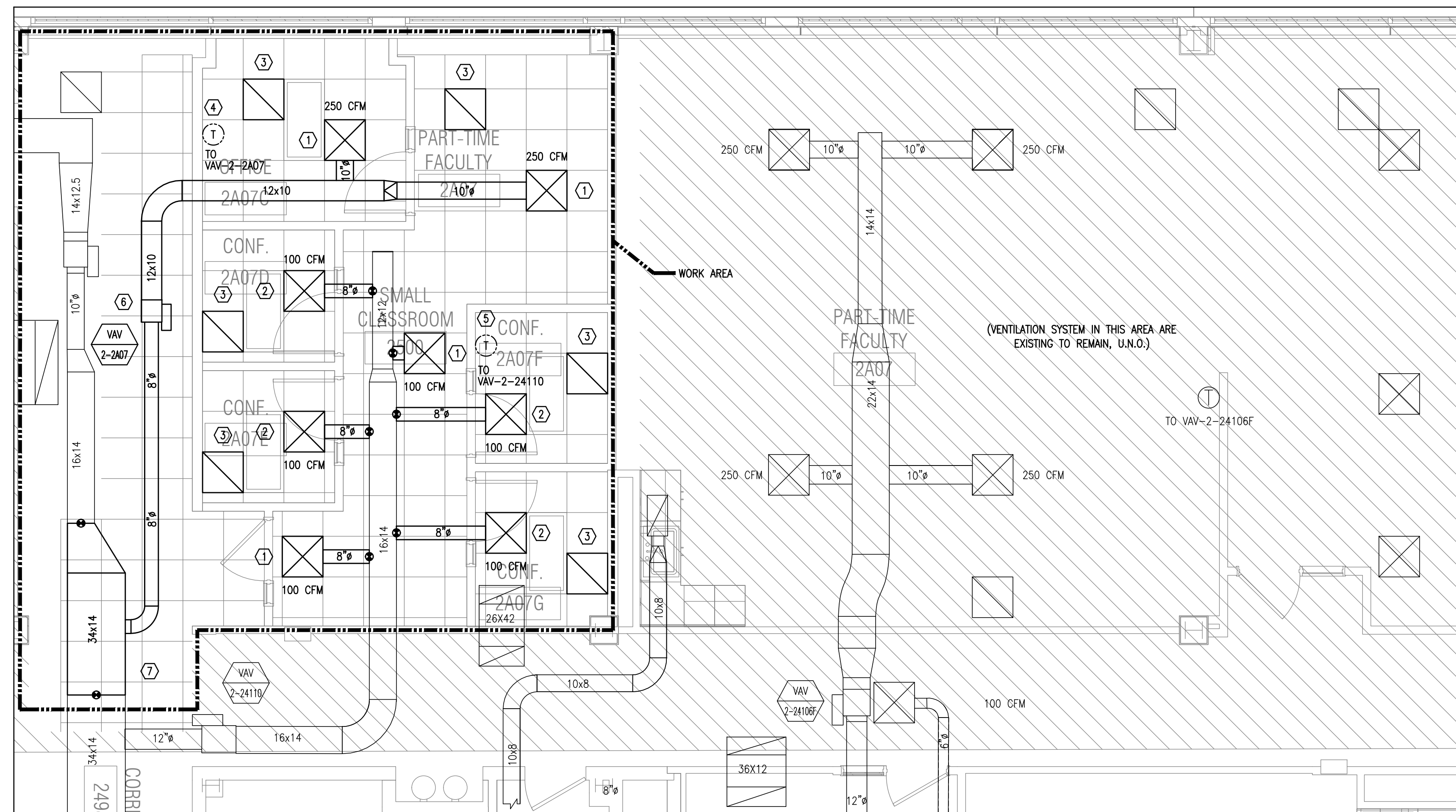
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- VENTILATION NEW WORK KEY NOTES**
1. PROVIDE NEW DIFFUSER, VOLUME DAMPER, AND ASSOCIATED DUCTWORK. INSULATE NEW DUCTWORK WITH 2" WRAP.
 2. REINSTALL EXISTING DIFFUSER. PROVIDE NEW VOLUME DAMPER, AND ASSOCIATED DUCTWORK. INSULATE NEW DUCTWORK WITH 2" WRAP.
 3. PROVIDE RETURN GRILLE IN CEILING GRID.
 4. PROVIDE NEW THERMOSTAT AND PROGRAM.
 5. PROVIDE EXISTING THERMOSTAT IN NEW LOCATION. EXTEND WIRING.
 6. PROVIDE NEW VAV BOX LOCATED ABOVE CEILING IN CORRIDOR 2498.
 7. PROVIDE NEW MEDIUM PRESSURE SUPPLY DUCTWORK, FITTINGS, AND INSULATION. CONNECT TO EXISTING.

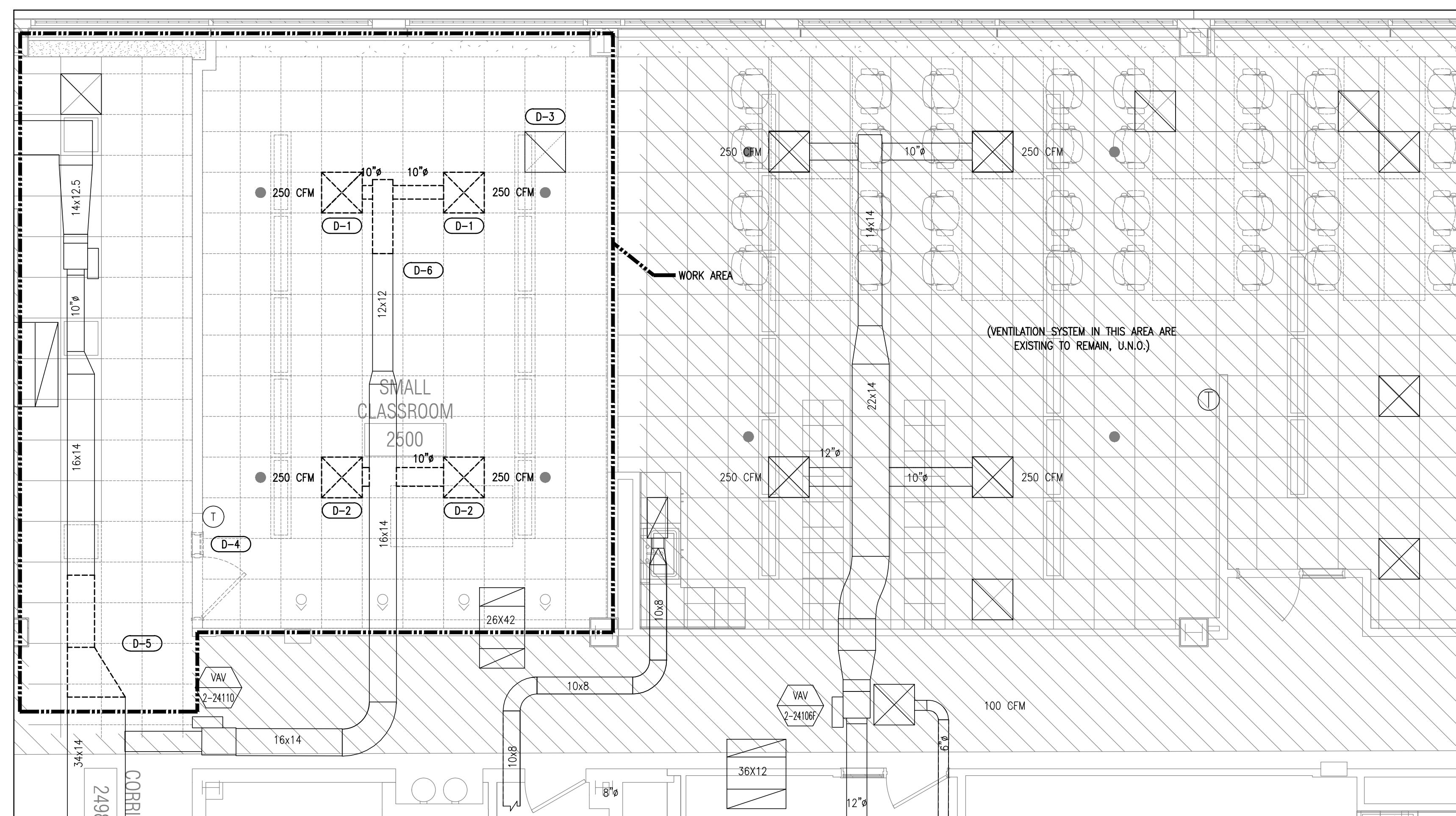
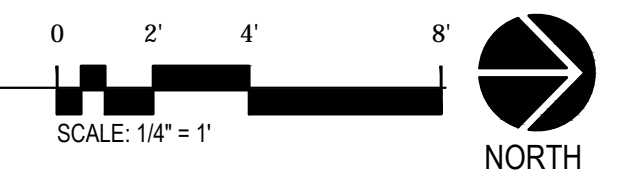
- GENERAL NOTES**
1. PROVIDE POST-CONSTRUCTION FINAL TEST AND BALANCE REPORT FOR NEW AIR QUANTITIES SHOWN IN WORK AREA. BALANCE DIFFUSERS TO NEW VALUES. BALANCE DIFFUSERS WHILE VAV BOX CONTROL DAMPERS ARE FULLY OPEN AT MAX COOLING SETPOINT.
 2. THIS SPACE UTILIZES A RETURN AIR PLENUM.
 3. CONTRACTOR SHALL CONTACT BAS VENDOR REPRESENTATIVE (HONEYWELL: MIKE RYAN 847-391-3140) FOR INTERCONNECTING NEW EQUIPMENT TO EXISTING BAS.

- DEMOLITION KEY NOTES:**
- D-1 REMOVE DIFFUSER AND ASSOCIATED BRANCH DUCTWORK. STORE DIFFUSER FOR REINSTALLATION. VERIFY DIFFUSER IS STILL FUNCTIONING PROPERLY. OWNER HAS FIRST RIGHT OF REFUSAL.
 - D-2 REMOVE DIFFUSER AND ASSOCIATED BRANCH DUCTWORK. PROVIDE INSULATED CAP ON MAIN DUCT. STORE DIFFUSER FOR REINSTALLATION. VERIFY DIFFUSER IS STILL FUNCTIONING PROPERLY. OWNER HAS FIRST RIGHT OF REFUSAL.
 - D-3 REMOVE EXISTING CEILING GRILLE AND TEMPORARILY STORE FOR REINSTALLATION IN NEW LOCATION.
 - D-4 REMOVE EXISTING THERMOSTAT AND STORE FOR REINSTALLATION IN NEW LOCATION.
 - D-5 REMOVE EXISTING MEDIUM PRESSURE SUPPLY DUCT. TEMPORARILY CAP AT BOTH ENDS.
 - D-6 REMOVE EXISTING LOW PRESSURE SUPPLY DUCT. PROVIDE INSULATED CAP AT END.

- GENERAL NOTES**
1. PROVIDE PRE-CONSTRUCTION TEST REPORT TO VERIFY EXISTING AIR QUANTITIES FOR DIFFUSERS SHOWN IN WORK AREA.
 2. OWNER HAS FIRST RIGHT OF REFUSAL FOR ALL EQUIPMENT REMOVED FROM EXISTING PROJECT SPACE.
 3. THIS SPACE UTILIZES A RETURN AIR PLENUM.

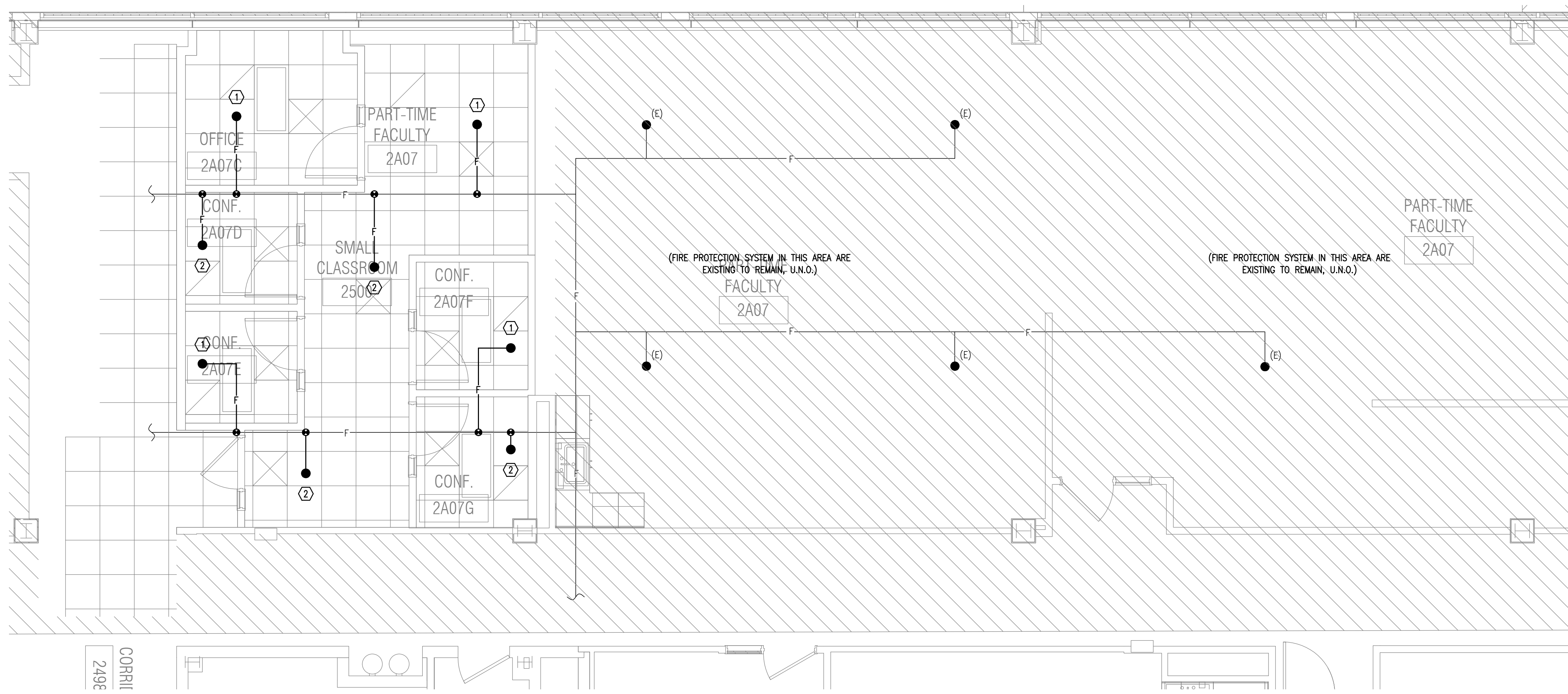


2 VENTILATION NEW WORK PLAN

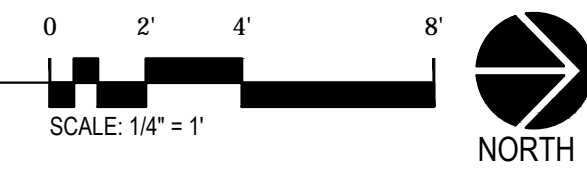


1 VENTILATION DEMOLITION PLAN

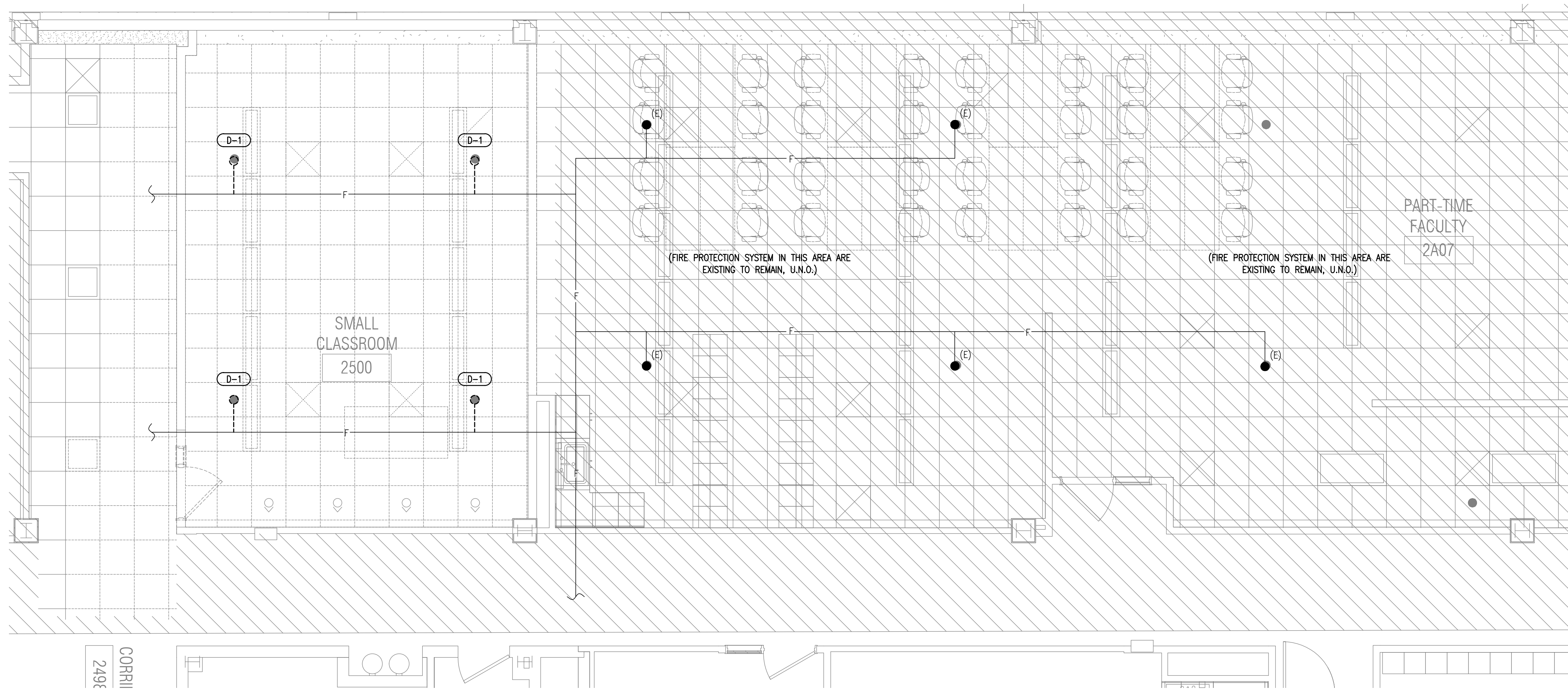




2 FIRE PROTECTION NEW WORK PLAN
SCALE: 1/4" = 1'-0"



- FIRE PROTECTION NEW WORK NOTES:**
- ① PROVIDE NEW CONCEALED SPRINKLER HEAD WITH WHITE ESCUTCHEONS. EXTEND EXISTING PIPING AS REQUIRED TO NEW HEAD.
 - ② PROVIDE NEW CONCEALED SPRINKLER HEAD WITH WHITE ESCUTCHEONS. PROVIDE NEW CONNECTION AT MAIN AND EXTEND PIPING TO NEW HEAD.



1 FIRE PROTECTION DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



- DEMOLITION KEY NOTES:**
- D-1 REMOVE SPRINKLER HEAD AND PIPING.

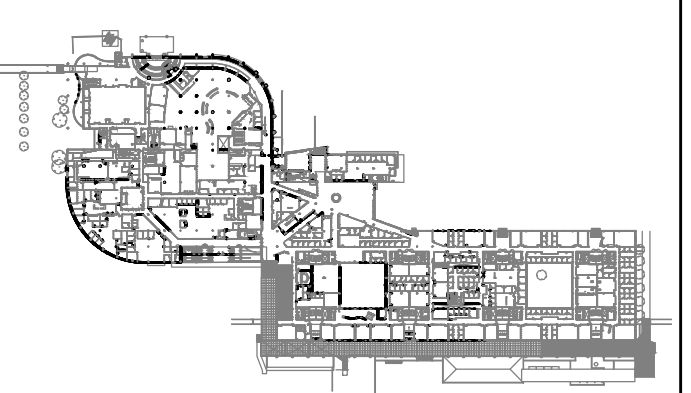
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**FIRE PROTECTION
PLANS**

Expiration Date of Seal: 11-30-2019	BE Project No. 15044-1709
Drawn By: MM/CP	
Drawing No. FP100	

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LIGHTING FIXTURE SCHEDULE							
TYPE	LAMP QTY.	LAMP TYPE	MOUNTING	VOLTAGE	WATTS	MANUFACTURER AND MODEL	DESCRIPTION
F1	2	T8 FL	RECESSED	UNV	62	FOCAL POINT: LUNA 2X4 FLU SERIES	RECESSED 2X4 FLUORESCENT WITH PERFORATED CENTER BASKET, MATTE WHITE FINISH, 3966 LUMENS.
⊗	N/A	RED LED	RECESSED	UNV		PHILIPS LIGHTOUIER / LG SERIES	6" EXIT PANEL, ELEG LIT RED LED EMERGENCY EXIT SIGN, ALUMINUM HOUSING, SINGLE/DOUBLE FACE AND ARROWS AS INDICATED.

EXISTING PANEL "1L3" "SECTION 2"											
DESCRIPTION	LOAD (VA)			PROTECTIVE DEVICES			LOAD (VA)			DESCRIPTION	
	A	B	C	C.B.	C.B.	A	B	C			
CLERK P.P.	720			43	20A1P	20A1P	44			SPARE	
RM 2500 OFFICE RECEPS		1200		45	20A1P	20A1P	46		540	VONDUPRIN #2	
RM 2500 OFFICE RECEPS			1200	47	20A1P	20A1P	48		540	VONDUPRIN #3	
RM 2500 OFFICE RECEPS	1200			49	20A1P	20A1P	50			SPARE	
RM 2500 FURNITURE RECEPS		1200		51	20A1P	20A1P	52			SPARE	
RM 2500 FURNITURE RECEPS			1200	53	20A1P	20A1P	54			SPARE	
SPARE				55	20A1P	20A1P	56	540		VONDUPRIN #1	
SPARE				57	20A1P	20A1P	58			SPARE	
SPARE				59	20A1P	20A1P	60			HAND DRYER ROOM 2529	
SPARE				61	20A1P	60A3P	62	5764		US BANK PANEL	
SPARE				63	20A1P	---	64		5764	---	
SPACE				65		---	66		5764	---	
SPACE				67		---	68			SPACE	
SPACE				69		---	70			SPACE	
SPACE				71		---	72			SPACE	
SPACE				73		---	74			SPACE	
SPACE				75		---	76			SPACE	
SPACE				77		---	78			SPACE	
SPACE				79		---	80			SPACE	
SPACE				81		---	82			SPACE	
SPACE				83		---	84			SPACE	
TOTAL	1920	2400	2400	TOTAL A	TOTAL B	TOTAL C	6304	6304	6304	TOTAL	
PANEL TYPE: EXISTING				8,224			8,704			8,704	
VOLTAGE: 120 / 208 3Ø, 4-WIRE				CONNECTED VA			25,632				
MAINS: 225A M.L.O.				CONNECTED AMPS.			71				
MOUNTING: SURFACE				MAX. DEM. AMPS.			71			LOCATION: ELECTRICAL ROOM 24998A (2402)	
A.I.C. SYM.: EXISTING				AVAILABLE FAULT CURRENT :			EXISTING				
* FIRST 10KVA AT 100%, REMAINDER AT 50%				25% OF LARGEST MOTOR (VA) :			0				
LOAD BREAKDOWN	CON. VA	DEM. FACT.	MAX. DEM. (VA)	NEUTRAL LOAD BREAKDOWN	CON. VA (1-POLE)	DEM. FACT.	MAX. DEM.(VA)				
LIGHTING	0	125%	0	LIGHTING	0	125%	0				
RECEPTACLES	8,340	*	8,340	RECEPTACLES	8,340	*	8,340				
VENTILATION	0	100%	0	VENTILATION	0	100%	0				
COOLING	0	100%	0	COOLING	0	100%	0				
HEATING	0	0%	0	HEATING	0	0%	0				
WATER HEATER	0	100%	0	WATER HEATER	0	100%	0				
PUMPS/MOTORS	0	100%	0	PUMPS/MOTORS	0	100%	0				
MISC.	17,292	100%	17,292	MISC.	0	100%	0				
TOTAL	25,632		25,632	TOTAL POLES:	42	TOTAL	8,340	8,340			

NOTE: ITALIC MEANS EXISTING

SYMBOLS

- ⊕ DUPLEX 20A RECEPTACLE, MOUNTED AT 18" AFF U.N.O.
- ⊕ DUPLEX 20A RECEPTACLE, MOUNTED 6" ABOVE COUNTER
- ⊕_{2USB} DUPLEX 20A RECEPTACLE WITH TWO USB CHARGER PORT, MOUNTED 18" ABOVE COUNTER
- ⊕ DUPLEX 20A GFI RECEPTACLE, MOUNTED 18" AFF U.N.O.
- ⊕ DUPLEX 20A GFI RECEPTACLE, MOUNTED 6" ABOVE COUNTER
- ⊕₂ QUADPLEX 20A RECEPTACLE, MOUNTED 18" AFF U.N.O.
- ⊕₃ SPECIAL USE RECEPTACLE, 208V, 1ø, 3W SIZED AS INDICATED OR AS REQUIRED
- ⊕₄ SPECIAL USE RECEPTACLE, 208V, 3ø, 4W SIZED AS INDICATED OR AS REQUIRED
- ⊕ FLUSH MOUNTED FLOOR BOX, WITH DEVICES AS INDICATED
- ⊕ DUPLEX 20A RECEPTACLE, CEILING-MOUNTED
- ⊕ DUPLEX 20A SWITCHED RECEPTACLE, MOUNTED AT 18" AFF U.N.O.
- ⊕_W WALL MOUNTED JUNCTION BOX, SIZED AS REQUIRED (4"x4" MIN.)
- ⊕ JUNCTION BOX, SIZED AS REQUIRED
- ⊕ FLEXIBLE METAL CONDUIT CONNECTION (WHIP)
- ⊕ MOTOR CONNECTION, 1ø OR 3ø AS INDICATED
- ⊕ PANEL BOARD, SIZED AS INDICATED
- ⊕₁ NON-FUSED DISCONNECT SWITCH, SIZED AS INDICATED OR AS REQUIRED
- ⊕₂ FUSED DISCONNECT SWITCH, SIZED AS INDICATED OR AS REQUIRED
- ⊕ VOICE/DATA OUTLET, MOUNTED AT 18" AFF U.N.O. PROVIDE 4x4 JUNCTION BOX WITH 3/4" STUBBED INTO ACCESSIBLE CEILING SPACE. DEVICES AND WIRING BY OTHERS.
- ⊕ VOICE OUTLET, MOUNTED AT 18" AFF U.N.O. PROVIDE 4x4 JUNCTION BOX WITH 3/4" STUBBED INTO ACCESSIBLE CEILING SPACE. DEVICES AND WIRING BY OTHERS.
- ⊕ DATA OUTLET, MOUNTED AT 18" AFF U.N.O. PROVIDE 4x4 JUNCTION BOX WITH 3/4" STUBBED INTO ACCESSIBLE CEILING SPACE. DEVICES AND WIRING BY OTHERS.
- ⊕ TOGGLE SWITCH, MOUNTED AT 44" AFF, U.N.O.
- ⊕_K KEY OPERATED TOGGLE SWITCH, MOUNTED AT 44" AFF, U.N.O.
- ⊕_T THERMAL OVERLOAD TOGGLE SWITCH
- ⊕_D TOGGLE SWITCH, DIMMABLE, MOUNTED AT 44" AFF, U.N.O. (3W DENOTES 3-WAY)
- ⊕_P TOGGLE SWITCH, ILLUMINATED TOGGLE OR WITH PILOT LIGHT WHEN IN "ON" POSITION
- ⊕_{OS1} TOGGLE SWITCH WITH INTEGRAL INFRARED OCCUPANCY SENSOR, MOUNTED AT 44" AFF, U.N.O. HUBBELL #LHR SERIES
- ⊕_{OS2} TOGGLE SWITCH WITH INTEGRAL DUAL-TECHNOLOGY OCCUPANCY SENSOR, MOUNTED AT 44" AFF, U.N.O. HUBBELL #LHD SERIES
- ⊕_{OS3} TOGGLE SWITCH WITH INTEGRAL ULTRASONIC OCCUPANCY SENSOR, MOUNTED AT 44" AFF, U.N.O. HUBBELL #LHUS SERIES
- ⊕_{3W} 3-WAY TOGGLE SWITCH, MOUNTED AT 44" AFF, U.N.O.
- ⊕ TOGGLE SWITCH, DIMMABLE, MOUNTED AT 44" AFF, U.N.O.
- ⊕₃₆₀ 360° CEILING MOUNTED INFRARED OCCUPANCY SENSOR HUBBELL #OMNI-IR SERIES WITH UV-PP POWER PACK
- ⊕₃₆₀ 360° CEILING MOUNTED DUAL-TECHNOLOGY OCCUPANCY SENSOR HUBBELL #OMNI-DT SERIES WITH UV-PP POWER PACK
- ⊕₃₆₀ 360° CEILING MOUNTED ULTRASONIC OCCUPANCY SENSOR HUBBELL #OMNI-US SERIES WITH UV-PP POWER PACK RELAY POWER PACK
- ⊕ LOW VOLTAGE THERMOSTAT (BY OTHERS), 4x4 BOX JUNCTION BOX WITH 3/4" CONDUIT STUBBED INTO ACCESSIBLE CEILING SPACE. COORDINATE LOCATIONS & BOX SIZE WITH MECHANICAL CONTRACTOR.
- ⊕ DUAL-ACTION MANUAL PULL STATION, MOUNTED AT 44" AFF
- ⊕ CEILING MOUNTED PHOTO-ELECTRIC SMOKE DETECTOR
- ⊕ CEILING MOUNTED HEAT DETECTOR
- ⊕ DUCT MOUNTED SMOKE DETECTOR, INSTALLED PER NFPA REQUIREMENTS
- ⊕ FAN SHUTDOWN RELAY
- ⊕_{AV} AUDIO-VISUAL DEVICE, MOUNTED AT 80" AFF, CANDELA RATING AS REQUIRED
- ⊕ VISUAL DEVICE, MOUNTED AT 80" AFF, CANDELA RATING AS REQUIRED
- ⊕_{FAA} FIRE ALARM ANNUNCIATOR PANEL
- ⊕_{FS} FLOW SWITCH
- ⊕_{TS} TAMPER SWITCH
- INDICATES COMPONENT TO BE REMOVED
- INDICATES EXISTING TO REMAIN
- INDICATES NEW
- ⊕ WALL MOUNTED BELL, MOUNTED AS REQUIRED
- ⊕ WALL MOUNTED CCTV DOME CAMERA, MOUNTED AS REQUIRED
- ⊕ WALL MOUNTED INTERCOM STATION, MOUNTED AS REQUIRED
- ⊕ WALL MOUNTED CLOCK, MOUNTED AS REQUIRED
- ⊕ DOOR CONTACT - FLUSH TYPE
- ⊕_{ES} ELECTRIC DOOR STRIKE
- ⊕_{VM} VIDEO MONITOR
- ⊕_{WAP} WIRELESS ACCESS PORT
- ⊕ CEILING MOUNTED SPEAKER
- ⊕_{IB} DESK MOUNTED INTERCOM MASTER STATION
- ⊕ EXIT SIGN

GENERAL DEMOLITION NOTES:

- EXISTING ELECTRICAL SYSTEMS SHOWN ON THE DRAWINGS ARE BASED ON VISUAL INSPECTION AND EXISTING DRAWINGS BUT, THEY MAY NOT REFLECT THE EXISTING CONDITION IN EVERY CASE. THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO STARTING WORK AND VERIFY EXISTING CONDITIONS.
- THE BUILDING WHERE THE WORK TO BE DONE IS IN USE. SCHEDULE ANY DISCONNECTION & RECONNECTIONS WITH THE CONTRACTING OFFICER, AT LEAST SEVENTY TWO (72) HOURS NOTICE IS REQUIRED. ARRANGE WORK SO AS NOT TO INTERRUPT ANY ELECTRICAL POWER, TELEPHONE, FIRE, COMMUNICATION, AND OTHER SYSTEMS DURING NORMAL WORKING HOURS.
 - WHERE CORE DRILLING AND CUTTING OF FLOOR OR WALLS IS REQUIRED. USE METAL DETECTORS OR OTHER APPROVED DEVICES TO DETERMINE AND AVOID INTERFERENCE WITH EXISTING CONCEALED CONDUITS & PIPES.
 - USE GREAT DILIGENCE AND CARE IN DISCONNECTING VARIOUS SYSTEMS. RECONNECT SYSTEMS THAT SERVE ADJACENT AREAS OR FLOOR ABOVE OR BELOW IF SUCH SYSTEMS HAVE BEEN INTERRUPTED DURING DEMOLITION WORK. EXTEND CONDUIT & WIRING AS REQUIRED TO MAINTAIN OPERATION WHEN REMOVING EQUIPMENT OR DEVICES.
 - COORDINATE ALL DEMOLITION WORK WITH OTHER TRADES AS REQUIRED.
- ELECTRICAL ITEMS REMOVED AND NOT TO BE REUSED OR RELOCATED SUCH AS LIGHTING FIXTURES (LUMINAIRES), SWITCHES, RECEPTACLES, BREAKERS, WIRE, ETC. REMAIN THE PROPERTY OF THE OWNER AND THE OWNER SHALL HAVE THE RIGHTS OF FIRST REFUSAL.
- ALL CONDUITS WHERE ELECTRICAL ITEMS ARE BEING REMOVED AND NOT TO BE REUSED SHALL HAVE ALL WIRING REMOVED BACK TO THE SOURCE OR FEEDER JUNCTION BOX SERVING THE DEVICE AND STUBS SHALL BE PLUGGED FLUSH WITH FLOOR, CEILING SLABS, OR WALLS. ALL EXPOSED CONDUITS AND FITTINGS, INCLUDING ABOVE DROP CEILING, WHICH ARE NOT GOING TO BE REUSED SHALL BE REMOVED UNLESS OTHERWISE NOTED.
- WHERE EXISTING EQUIPMENT, DEVICES AND FIXTURES ARE TO REMAIN BUT ARE AFFECTED BY NEW WORK SUCH AS, BUT NOT LIMITED TO REMOVAL OF WALLS, RECONDITIONING OF WALLS AND CEILINGS, DISCONNECT THESE ITEMS AND ADD EXTENSION RINGS, CLEAN AND REINSTALL SAME IN LINE WITH NEW WALLS AND CEILINGS. PROVIDE ALL NECESSARY MATERIALS AND LABOR AND REWIRE IN ACCORDANCE WITH PRESENT CODE REQUIREMENTS.
- LAMPS THAT CONTAIN MERCURY AND BALLASTS MANUFACTURED PRIOR TO 1980 THAT CONTAINS PCBs SHALL BE DISPOSED OF BY FEDERAL OR STATED E.P.A. APPROVED METHOD AND IN ACCORDANCE WITH SPECIFICATIONS.
- EXISTING FIRE ALARM SYSTEM IS TO BE EXTENDED, EXERCISE GREAT CARE IN SECURING CIRCUIT(S) DURING DEMOLITION STAGE. ALL FIRE ALARM WORKS (DEMOLITION/NEW WORK) SHALL BE DONE BY A COO-APPROVED FIRE ALARM CONTRACTOR. ELECTRICAL CONTRACTOR SHALL ARRANGE AND PAY FOR THE COO-APPROVED FIRE ALARM CONTRACTOR (WHOSE CONTACT INFORMATION APPEARS BELOW) TO DO ALL THE FIRE ALARM WORK. JAMES MCCOLLAM COMMERCIAL ALARM SYSTEMS, LLC (630) 832-2844 WORK (847) 553-7994 MOBILE jmcollam@coasystemllc.com

GENERAL NOTES:

- PAY FOR & OBTAIN ALL REQUIRED LICENSES, INSURANCES, PERMITS & SATISFY NECESSARY ORDINANCES TO UNDERTAKE & EXECUTE THE WORK UNDER THIS CONTRACT.
- CONTRACTOR TO FAMILIARIZE HIMSELF WITH THE EXISTING SITE CONDITIONS, CONDITIONS OF CONTRACT, THE SCOPE OF WORK & THE INTENT OF DESIGN BEFORE SUBMITTING A BID. REQUESTS FOR EXTRA PAYMENTS WILL NOT BE APPROVED AFTER CONTRACT AWARD. CONTRACTOR MUST VERIFY ALL BRANCH CIRCUITS AND ENSURE THAT THEY MEET NATIONAL AND LOCAL CODE REQUIREMENTS. SHOULD ANY DISCREPANCY BE IDENTIFIED, HE MUST BRING IT TO THE ATTENTION OF THE CONTRACTING OFFICER.
- ALL WORK SHALL BE PERFORMED IN COMPLIANCE WITH REQUIREMENTS OF THE LOCAL CODE AUTHORITY & OTHER CODES, STANDARDS & REGULATIONS REFERENCED BY SUCH AUTHORITY. IN CASE OF CONFLICT BETWEEN TWO CODES, THE REQUIREMENT OF THE LOCAL AUTHORITY SHALL BE FINAL.
- COORDINATE ELECTRICAL INSTALLATION WORK BY OTHER TRADES BEFORE STARTING WORK. PERFORM ALL WORK IN COOPERATION WITH LANDLORD, G.C. & OTHER TRADES.
- ALL NEW MATERIAL/EQUIPMENT SHALL BE, U.L. LISTED, WITHOUT DEFECT OR DAMAGE AND SHALL BE A STANDARD PRODUCT OF A MANUFACTURER WITH A WELL KNOWN BRAND NAME, U.N.O. WIRING DEVICES SHALL BE SPECIFICATION GRADE. FINISH OF ALL ITEMS INSTALLED IN FINISHED AREAS SHALL BE PER ARCHITECT.
- ELECTRICAL DRAWINGS ARE SCHEMATIC IN NATURE. THEY DO NOT INTEND TO SHOW EVERY DETAIL, LOCATION, SIZE, ROUTE ETC. FURNISH ALL MATERIAL, EQUIPMENT, INCIDENTALS & SERVICES TO PROVIDE A SATISFACTORY, COMPLETE & OPERATIONAL INSTALLATION IN CONFORMANCE WITH THE INTENT OF THE DESIGN. REFER TO ARCHITECTURAL DRAWINGS FOR DIMENSIONAL ACCURACY.
- PROVIDE TEMPORARY ELECTRICAL SERVICE, IF NECESSARY, PER G.C. TO PROVIDE LIGHTING & POWER FOR USE BY ALL TRADES DURING CONSTRUCTION.
- ARCHITECT MAY REVIEW SUBMITTAL OF AN ALTERNATE PRODUCT PROVIDED IT HIGHLIGHTS ALL THE FEATURES & DATA TO CLEARLY ILLUSTRATE THAT IT IS A BONAFIDE EQUIVALENT PRODUCT IN MAKE & PERFORMANCE BEFORE BIDS ARE SCHEDULED TO BE OPENED.
- ALL ENCLOSURES SHALL BE NEMA-1, IN GENERAL, U.N.O. GFCI RECEPTACLES SHALL BE USED IF SPECIFIED OR CODE REQUIRED. WIRING DEVICES SHALL BE SPECIFICATION GRADE. NAME PLATES SHALL BE PHENOLIC, WHITE LETTERS ON BLACK BACKGROUND, SECURED WITH SCREWS ON THE ENCLOSURES.
- USE MINIMUM 3/4" EMT. USE COMPRESSION FITTINGS. USE TYPE THWN, COPPER WIRE IN MINIMUM #12 AWG FOR BRANCH CCTS & #14 FOR CONTROLS. FLEXIBLE CONDUIT SHALL BE LIQUID-TIGHT.
- SEAL PENETRATIONS THROUGH VAPOR & FIRE BARRIERS CAUSED BY THE ELECTRICAL WORK WITH U.L. LISTED SEALS TO RETAIN THE INTEGRITY OF THE RESPECTIVE BARRIERS.
- INSTALLATION IN CEILING SPACE SHALL BE SUPPORTED FROM THE STRUCTURAL STEEL & NOT BY THE DROPPED CEILING MEMBERS. CONDUITS SHALL RUN SNUG UNDER STRUCTURAL CEILING EITHER PARALLEL OR PERPENDICULAR TO THE CEILING, COLUMNS & STRAIGHT WALLS. INSTALL PULL BOXES PER CODE. INSTALL PULL-LINES IN EMPTY RACEWAYS & CAP THEM.
- INSTALLATION SHALL BE PERFORMED IN A MANNER CONSISTENT WITH INDUSTRY STANDARD FOR GOOD WORKMANSHIP. PROVIDE NECESSARY CUTTING, PATCHING, & CLEANING FOR ELECTRICAL WORK TO LEAVE THE AREA READY FOR FINAL FINISH BY OTHERS.
- PROGRESS YOUR WORK IN TIMELY MANNER TO ENABLE THE OWNER TO FINISH THE WORK PER SCHEDULE. SAFEGUARD YOUR WORK & SUPPLIES. MAINTAIN ORDERLY & NEAT OPERATION. REMOVE DEBRIS GENERATED FROM YOUR WORK PER G.C. & OWNER. LEAVE THE SITE IN CLEAN, MOVE-IN CONDITION AT ACCEPTANCE.
- ORGANIZE ALL WARRANTIES, GUARANTEES & PRODUCT LITERATURE IN A FILE AND HAND OVER THESE TO THE OWNER AT THE TIME OF ACCEPTANCE. PROVIDE FULL & UNCONDITIONAL GUARANTEE OF YOUR WORK (MATERIAL PLUS LABOR) FOR A PERIOD OF 24 MONTHS FROM ACCEPTANCE. REFER TO ARCHITECT'S REQUIREMENTS FOR "WARRANTIES & GUARANTEES" AND "PROJECT CLOSE-OUT".
- EXISTING FIRE ALARM SYSTEM IS TO BE EXTENDED AND INTERFACED WITH NEW WORK. PROVIDE ALL MATERIALS, DEVICES, COMPONENTS AS REQUIRED SO THAT THE EXISTING AND NEW SYSTEM SHALL BE PROPERLY INTERFACED AND FUNCTION AS ONE SYSTEM.

ABBREVIATIONS

AF	ABOVE FINISHED FLOOR	NIC	NOT IN CONTRACT
AMP OR A	AMPERE	NL	NIGHT LIGHT
BDF	BUILDING DISTRIBUTION FACILITY	NTS	NOT TO SCALE
CCT(S)	CIRCUIT(S)	PH OR Ø	PHASE
CLG	CEILING	RECEP	RECEPTACLE
COD	COLLEGE OF DUPAGE	XFMR	TRANSFORMER
D	DIMMER	TC	TELECOMMUNICATIONS CLOSET
DISC	DISCONNECT	TYP	TYPICAL
DWG	DRAWING	U.N.O.	UNLESS NOTED OTHERWISE
EC	ELECTRICAL CONTRACTOR	V	VOLT
ELECT	ELECTRICAL	W	WATT OR WIRE
EM	EMERGENCY	WP	WEATHERPROOF
EXIST	EXISTING	X	DENOTES EXISTING COMPONENT TO REMAIN, NO CHANGES
FA	FIRE ALARM		
FLA	FULL LOAD AMPERE	XRN	DENOTES EXISTING COMPONENT TO BE REPLACED WITH NEW
GC OR G.C.	GENERAL CONTRACTOR		
GFI OR GFCI	GROUND FAULT CIRCUIT INTERRUPTER	XR	DENOTES EXISTING COMPONENTS TO BE REMOVED
GRD	GROUND, GROUNDING		
HP	HORSEPOWER	XRI	DENOTES EXISTING COMPONENTS TO BE REMOVED & REINSTALL IN SAME LOCATION
JB	JUNCTION BOX		
KVA	KILOVOLT AMPERE	XRR	DENOTES EXISTING TO BE REMOVED AND RELOCATED
KW	KILOWATT		
MC	MECHANICAL CONTRACTOR	N	DENOTES NEW COMPONENTS TO REPLACE EXISTING
MEP	MECHANICAL, ELECTRICAL, PLUMBING	XN	DENOTES EXISTING COMPONENT SHOWN IN NEW LOCATION
MFR	MANUFACTURER		
MIN	MINIMUM		



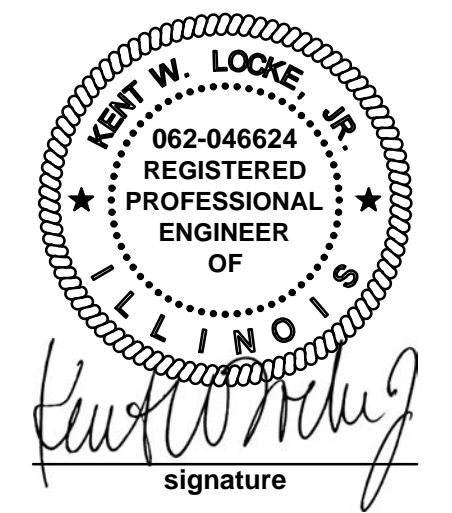
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Issue Date: FEB 19, 2018 Title: ISSUED FOR PERMIT AND BID

COLLEGE OF DUPAGE
BIC ADJUNCT AREA
RECONFIGURATION

425 FAWELL BLVD
GLEN ELLYN, IL 60137

Drawing Title:

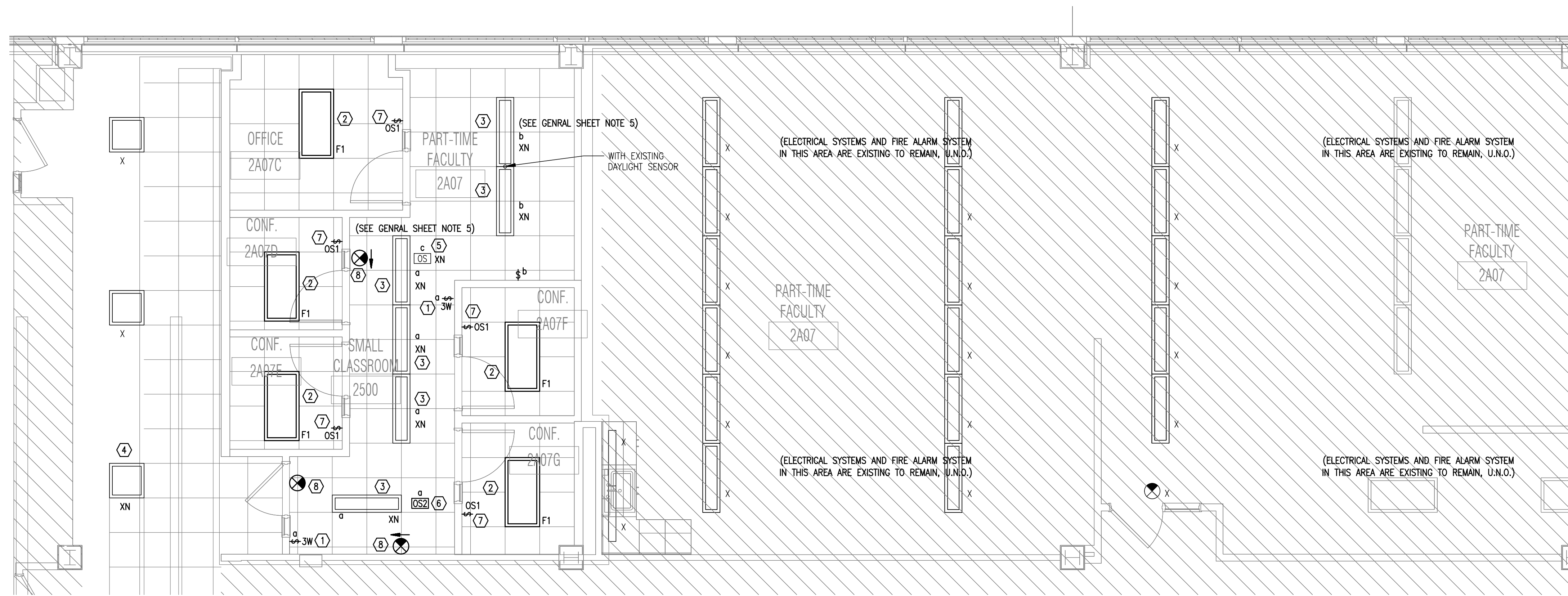
ELECTRICAL NOTES
ABBREVIATIONS
AND SYMBOL LIST

Expiration Date of Seal: 11-30-2018

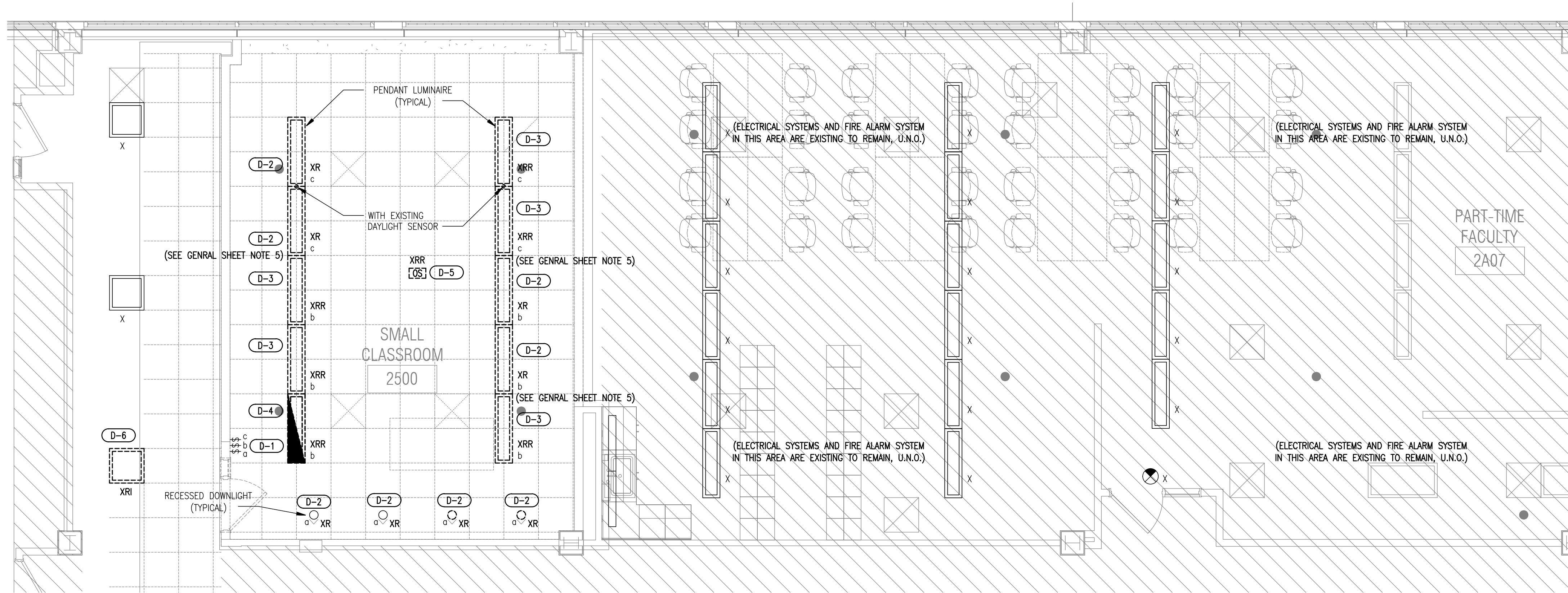
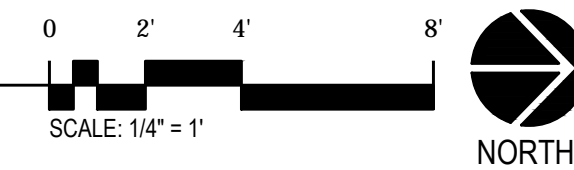
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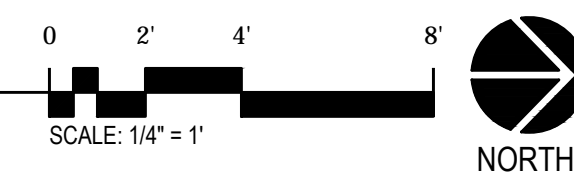
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2 LIGHTING NEW WORK PLAN
SCALE: 1/4" = 1'-0"



1 LIGHTING DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



GENERAL SHEET NOTES

- REFER ALSO TO GENERAL DEMOLITION NOTES ON SHEET E000. COORDINATE DEMOLITION WORK WITH OTHER TRADES.
- COORDINATE WITH ARCHITECTURAL AND MECHANICAL THE INSTALLATION OF ALL LIGHTING FIXTURES. VERIFY CEILING HEIGHT AND METHODS OF MOUNTING THE FIXTURES IN THE FIELD. PROVIDE ACCESSORIES AS REQUIRED.
- PROVIDE SEPARATE NEUTRAL CONDUCTOR FOR EACH CIRCUIT. SHARED NEUTRAL ON BRANCH CIRCUITS IS NOT PERMITTED.
- CONNECT NEW EXIT SIGNS TO THE EXISTING EXIT SIGN CIRCUIT SERVING THE AREA, E.C. TO FIELD VERIFY EXISTING EXIT SIGN CIRCUIT. EXTEND CIRCUIT AND PROVIDE CONDUIT AND WIRING AS REQUIRED.
- ELECTRICAL CONTRACTOR TO FIELD VERIFY AND CONFIRM THAT EXISTING PENDANT LUMINAIRES CAN BE DETACHED/DIVIDED AS SHOWN FOR RELOCATION/REUSE WITHOUT CUTTING THE FIXTURE. SHOULD A DISCREPANCY BE IDENTIFIED THAT WILL PREVENT THE EXISTING LUMINAIRES TO BE REUSED IN THE WAY AS LAID OUT IN THE NEW WORK PLAN THE E.C. MUST IMMEDIATELY BRING THE MATTER TO THE ATTENTION OF THE CONTRACTING OFFICER.

ELECTRICAL NEW WORK KEYNOTES

- PROVIDE MANUAL OVERRIDE 3-WAY SWITCH AS SHOWN TO BE ABLE TO MANUALLY TURN OFF LUMINAIRES CONTROLLED BY CEILING-MOUNTED OCCUPANCY SENSOR AS SHOWN. PROVIDE CONDUIT AND WIRING AS REQUIRED.
- PROVIDE NEW LUMINAIRE 'F1' AS SHOWN. REFER TO LUMINAIRE SCHEDULE ON SHEET 'E000'. CONNECT TO EXISTING LIGHTING BRANCH CIRCUIT SERVING THE AREA AND WIRE TO WALL-MOUNTED OCCUPANCY SENSOR AS INDICATED.
- RELOCATE EXISTING LUMINAIRE AS SHOWN. CONNECT TO EXISTING LIGHTING BRANCH CIRCUIT SERVING THE AREA AND WIRE TO CEILING-MOUNTED OCCUPANCY SENSOR AS INDICATED. PROVIDE SUPPORT AND OTHER DEVICES AS REQUIRED.
- RE-INSTALL EXISTING LUMINAIRE AFTER INSTALLATION OF VAV BOX. CLEAN LUMINAIRE PRIOR TO REINSTALLATION.
- RELOCATE AND WIRE EXISTING CEILING-MOUNTED OCCUPANCY SENSOR AS SHOWN. PROVIDE CONDUIT AND WIRING AS REQUIRED.
- PROVIDE NEW CEILING-MOUNTED OCCUPANCY SENSOR TO CONTROL LUMINAIRES AS INDICATED. PROVIDE OVERRIDE SWITCH(ES) AS SHOWN.
- PROVIDE NEW WALL-MOUNTED OCCUPANCY SENSOR SWITCH AS SHOWN.
- PROVIDE NEW EXIT SIGN. REFER AL SO TO GENERAL SHEET NOTE 4.

DEMOLITION KEYNOTES:

- DISCONNECT AND REMOVE EXISTING MANUAL OVERRIDE SWITCHES, ASSOCIATED BACKBOX, CONDUIT AND WIRING. ALL THE WAY BACK TO THE SERVING JUNCTION BOX NOT AFFECTED BY DEMOLITION. COORDINATE DEMOLITION WITH LIGHTING NEW WORK PLAN (SHEET 'E100'), WHERE FEASIBLE, REUSE EXISTING CONDUITS AND WIRING.
- DISCONNECT & REMOVE EXISTING LUMINAIRE. ALL ASSOCIATED CONDUITS AND WIRING BACK TO SOURCE OR SERVING JUNCTION BOX NOT AFFECTED BY DEMOLITION. SECURE BRANCH CIRCUIT AS REQUIRED TO BE REUSED AND/OR EXTENDED FOR THE INSTALLATION OF NEW TYPE OF LUMINAIRE(S) IN THE AREA. SEE SHEET 'E100' FOR NEW LOCATION OF NEW LUMINAIRE(S). WHERE FEASIBLE, REUSE EXISTING CONDUITS AND WIRING. REFER ALSO TO GENERAL DEMOLITION NOTES ON SHEET E000.
- DISCONNECT, REMOVE, SECURE AND STORE EXISTING LUMINAIRE FOR RELOCATION. SECURE BRANCH CIRCUIT AS REQUIRED TO BE REUSED AND/OR EXTENDED FOR THE RELOCATION OF SAME LUMINAIRE. SEE SHEET 'E100' FOR NEW LOCATION. WHERE FEASIBLE, REUSE EXISTING CONDUITS AND WIRING. REFER ALSO TO GENERAL DEMOLITION NOTES ON SHEET E000.
- DISCONNECT, REMOVE, SECURE AND STORE EXISTING LUMINAIRE (INCLUDING GENERATOR TRANSFER DEVICE) FOR RELOCATION. SECURE BRANCH CIRCUIT AS REQUIRED TO BE REUSED AND/OR EXTENDED FOR THE RELOCATION OF SAME LUMINAIRE. SEE SHEET 'E100' FOR NEW LOCATION. WHERE FEASIBLE, REUSE EXISTING CONDUITS AND WIRING. REFER ALSO TO GENERAL DEMOLITION NOTES ON SHEET E000.
- DISCONNECT, REMOVE AND RELOCATE EXISTING CEILING-MOUNTED OCCUPANCY SENSOR. SECURE BRANCH CIRCUIT AS REQUIRED TO BE REUSED AND/OR EXTENDED FOR THE RELOCATION OF SAME OCCUPANCY SENSOR. SEE SHEET 'E100' FOR NEW LOCATION. REFER TO GENERAL DEMOLITION NOTES ON SHEET E000.
- DISCONNECT, REMOVE AND STORE EXISTING LUMINAIRE FOR RE-INSTALLATION AFTER THE INSTALLATION OF VAV BOX. SECURE BRANCH CIRCUIT WIRING.



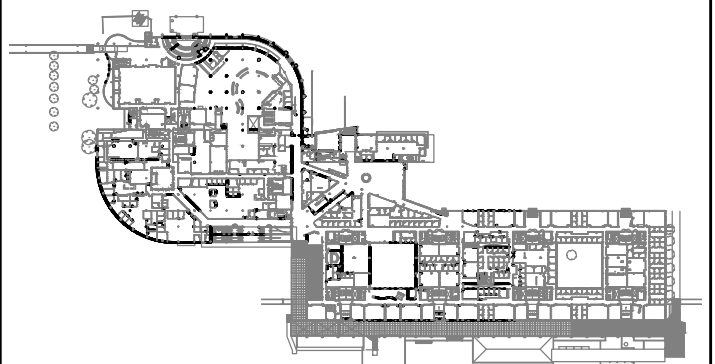
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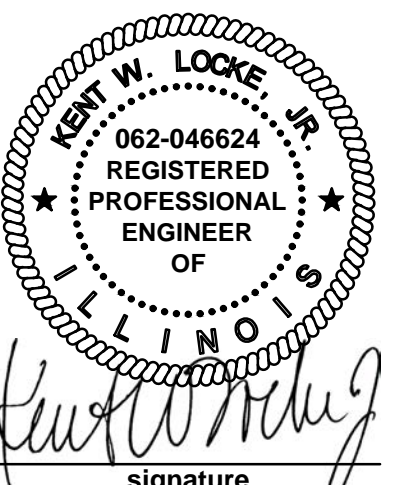
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KEY PLAN



Kent W. Locke
signature
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Issue Date: FEB 19, 2018 Title: ISSUED FOR PERMIT AND BID

**COLLEGE OF DUPAGE
BIC ADJUNCT AREA
RECONFIGURATION**

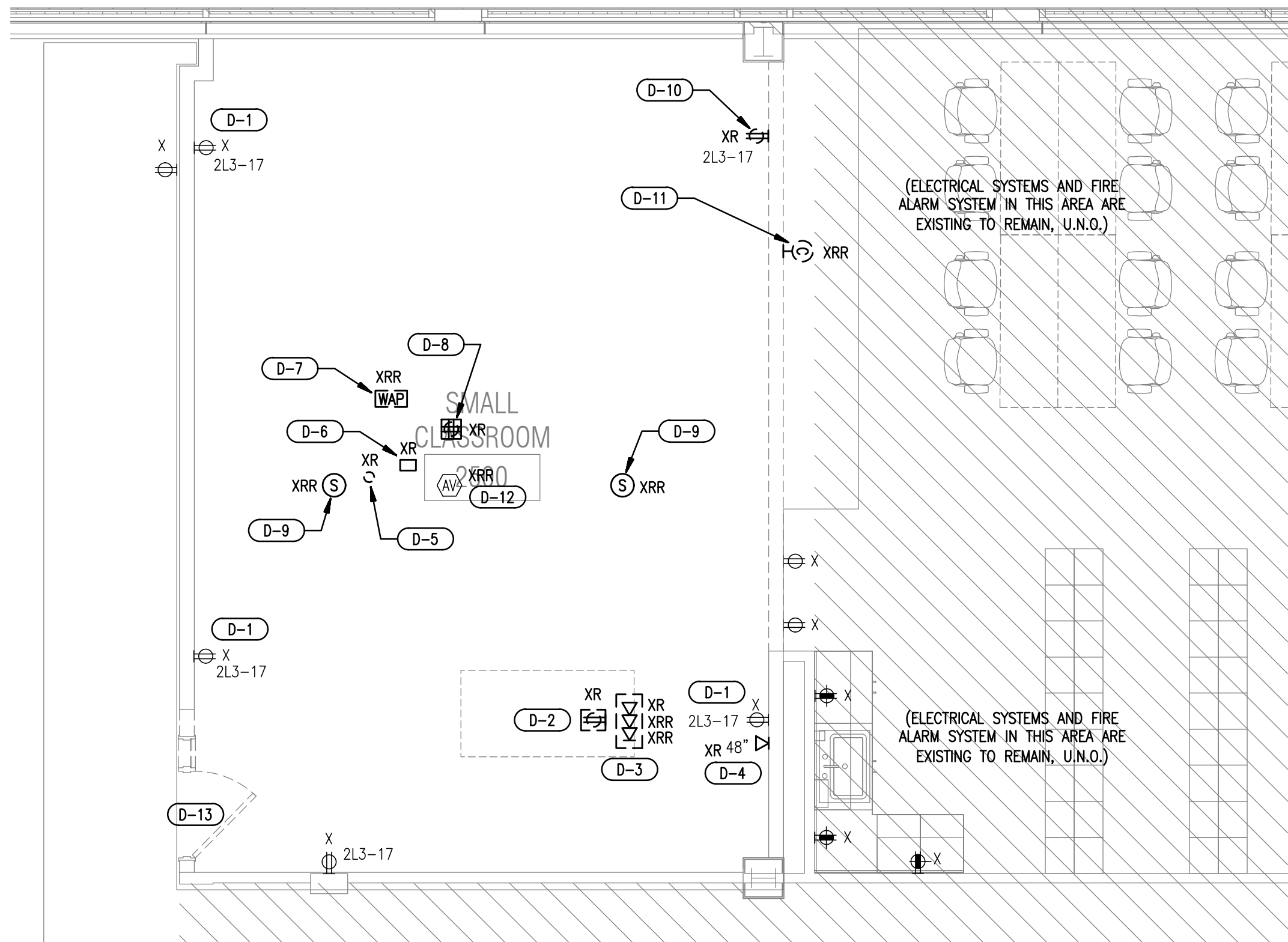
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**LIGHTING
PLANS**

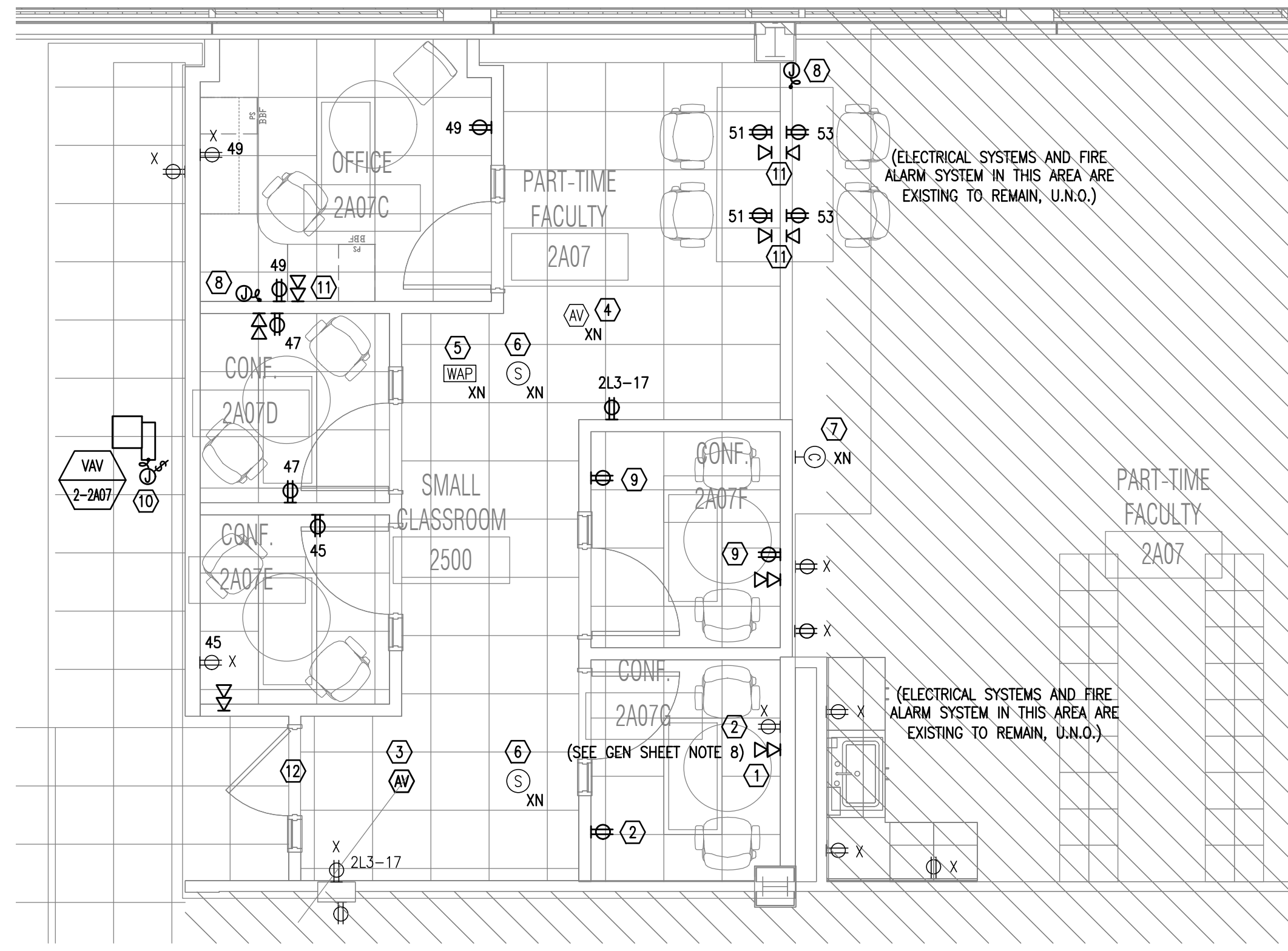
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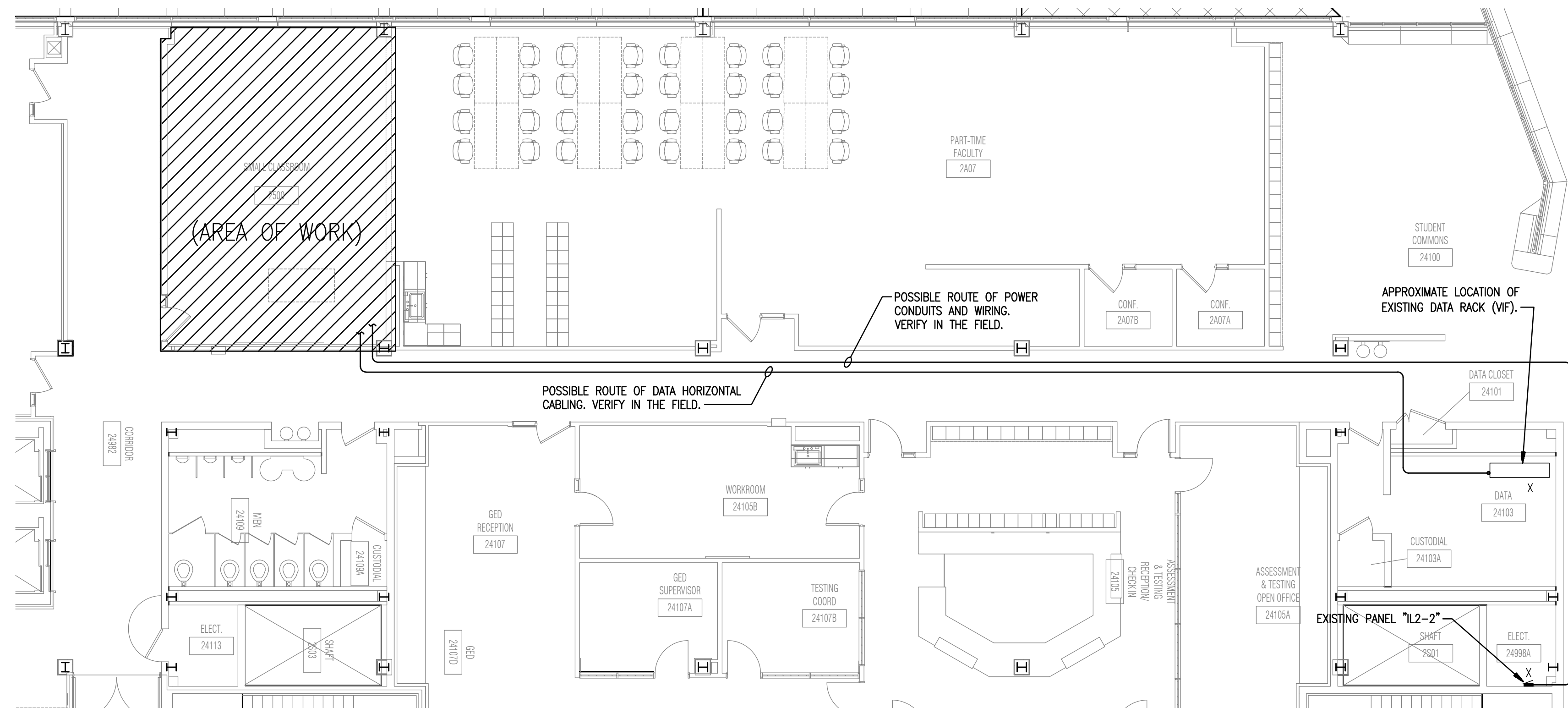
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1 POWER AND SYSTEM DEMOLITION PLAN
 SCALE: 1/4" = 1'-0"
 NORTH



2 POWER AND SYSTEM NEW WORK PLAN
 SCALE: 1/4" = 1'-0"
 NORTH



3 PARTIAL SITE POWER AND SYSTEM PLAN
 SCALE: 1/8" = 1'-0"
 NORTH

GENERAL SHEET NOTES

- REFER ALSO TO GENERAL DEMOLITION NOTES ON SHEET E000. COORDINATE DEMOLITION WORK WITH OTHER TRADES.
- FIELD COORDINATE EXACT LOCATION, MOUNTING HEIGHT AND CONNECTION TYPE OF ALL ELECTRICAL DEVICES, PROVIDE AS REQUIRED.
- PROVIDE SEPARATE NEUTRAL CONDUCTOR FOR EACH CIRCUIT. SHARED NEUTRAL ON BRANCH CIRCUITS IS NOT PERMITTED.
- PROVIDE LABEL ON ALL POWER AND DATA OUTLETS PER COD STANDARD DESIGN GUIDELINES. E.C. SHALL UPDATE THE PANEL DIRECTORIE(S) OF ALL ELECTRICAL PANELS AFFECTED BY DEMOLITION AND NEW WORK PER COD STANDARDS AND NEC 408.4 AT THE COMPLETION OF WORK.
- ALL FIRE ALARM WORKS (DEMOLITION/NEW WORK) SHALL BE DONE BY A COD-APPROVED FIRE ALARM CONTRACTOR. ELECTRICAL CONTRACTOR SHALL ARRANGE AND PAY FOR THE COD-APPROVED FIRE ALARM CONTRACTOR TO DO ALL THE FIRE ALARM WORK. COORDINATE WITH BUILDING ENGINEER. REFER ALSO TO GENERAL DEMOLITION NOTE #7 AND GENERAL NOTE #16 ON SHEET E000.
- ALL WORKS RELATED TO COMMUNICATIONS SHALL BE DONE BY PANDUIT-CERTIFIED INSTALLERS IN ACCORDANCE WITH DIVISION 27000 OF THE COD DESIGN GUIDELINES AND MUST BE COORDINATED WITH OWNER "IT".
- WIRE ALL NEW CIRCUIT NUMBERS ON THIS SHEET TO EXISTING PANEL "L13" "SECTION 2", U.N.O. THE EXISTING PANEL "L13" "SECTION 2" IS IN THE ELECTRICAL ROOM 24998A (2402). ELECTRICAL ROOM 24998A (2402) IS LOCATED ABOUT 125 FEET TO THE NORTH AND 35 FEET TO THE SOUTH FROM EXISTING DOOR OF WORK AREA. COORDINATE WITH BUILDING ENGINEER AND FIELD VERIFY EXISTING PANEL "L12" "SECTION 2". REFER ALSO TO PARTIAL SITE POWER AND SYSTEM PLAN ON THIS SHEET.
- DO NOT EXTEND DATA WIRING USING CONNECTORS. IF EXISTING DATA DROP(S) TO BE RELOCATED DOES NOT REACH THE NEW LOCATIONS AND/OR IF EXISTING LENGTH DOES NOT ALLOW FOR IT TO BE RELOCATED TO A SUITABLE LOCATION E.C. SHALL NOT CUT THE DATA WIRING BUT COIL IT AND SECURE IT IN THE CEILING. E.C. SHALL IMMEDIATELY NOTIFY THE BUILDING OWNER/OWNER "IT" OF ANY DATA WIRING THAT WILL NOT BE REUSED. E.C. SHALL ROUTE NEW DATA WIRING (BLUE PANDUIT CAT 6 CABLE) FROM THE SERVING IDF TO A NEW DATA OUTLET LOCATION THAT NEEDS TO BE SERVED BY A NEW DATA WIRING (SEE GEN. NOTE #6 ABOVE).
- BOTH DATA AND TELEPHONE OUTLETS TERMINATE IN THE SAME PATCH PANEL THE IDF (DATA ROOM) SERVING THE AREA OF WORK IS LOCATED IN DATA ROOM 24103 (2A04) ADJACENT TO DATA CLOSET 24101 (2A02). DATA ROOM 24103 (2A04) IS LOCATED ABOUT 125 FEET TO THE NORTH AND 25 FEET TO THE SOUTH FROM EXISTING DOOR OF WORK AREA. COORDINATE WITH OWNER "IT" AND FIELD VERIFY EXISTING IDF AND SPARES IN THE EXISTING PATCH PANEL(S). REFER ALSO TO PARTIAL SITE POWER AND SYSTEM PLAN ON THIS SHEET. HORIZONTAL CABLING WILL BE ROUTED THROUGH THE ADJACENT DATA CLOSET 24101 (2A02). PROVIDE PATCH PANEL AND OTHER DEVICES AS REQUIRED. ALL DATA JACKS TO BE USED MUST BE BLACK IN COLOR.

ELECTRICAL KEY NOTES

- PROVIDE TWO DATA OUTLET(S) AS SHOWN (BLACK DATA JACKS) BY REROUTING/USING TWO OF THE EXISTING DATA DROPS PREVIOUSLY SERVING THE LECTERN.
- CONNECT THIS DUPLEX RECEPTACLE TO THE EXISTING CIRCUIT PREVIOUSLY SERVING THE LECTERN, PROVIDE CONDUIT AND WIRING AS REQUIRED.
- PROVIDE NEW FIRE ALARM DEVICE AS SHOWN. REFER TO GENERAL NOTE #5 ON THIS SHEET.
- RELOCATE EXISTING FIRE ALARM DEVICE AS SHOWN. REFER TO GENERAL NOTE #5 ON THIS SHEET.
- RELOCATE EXISTING WIRELESS ACCESS PORT AS SHOWN, FIELD COORDINATE EXACT SUITABLE LOCATION WITH OWNER.
- RELOCATE EXISTING CEILING-MOUNTED SPEAKERS AS SHOWN, EXTEND CONDUIT AND WIRING AS REQUIRED.
- RELOCATE EXISTING WALL-MOUNTED CLOCK AS SHOWN, FIELD COORDINATE EXACT SUITABLE LOCATION WITH OWNER.
- E.C. TO PROVIDE POWER TO RECEPTACLE OUTLETS IN THE FURNITURE THROUGH A LIQUIDTIGHT WHIP. COORDINATE WORK WITH FURNITURE MANUFACTURER.
- CONNECT THIS RECEPTACLE TO THE CIRCUIT PREVIOUSLY SERVING THE QUAD OUTLET IN THE CEILING, EXTEND CIRCUIT, PROVIDE CONDUIT AND WIRING AS REQUIRED.
- PROVIDE POWER TO NEW VAV BOX, FIELD COORDINATE WITH MECHANICAL CONTRACTOR. EXTEND CIRCUIT FEEDING NEARBY EXISTING VAV BOX TO THIS UNIT, PROVIDE CONDUIT AND WIRING AS REQUIRED FOR A COMPLETE OPERATING SYSTEM.
- E.C. TO PROVIDE, INSTALL AND CONNECT DATA AND RECEPTACLE OUTLETS IN THE FURNITURE. PROVIDE MATERIALS NEEDED FOR A COMPLETE OPERATING SYSTEM, FIELD COORDINATE WORK WITH FURNITURE MANUFACTURER.
- COORDINATE DOOR ELECTRICAL REQUIREMENTS WITH DOOR CONTRACTOR, PROVIDE AS REQUIRED.

DEMOLITION KEY NOTES:

- EXISTING DUPLEX OUTLET TO REMAIN BUT TO BE RE-CIRCUITED. REFER TO SHEET 'E101' FOR NEW CIRCUITING SYSTEM.
- DISCONNECT AND REMOVE POWER PROVISION TO LECTERN INCLUDING ASSOCIATED CONDUIT AND WIRING BACK TO THE SERVING JUNCTION BOX IN THE AREA OF WORK NOT AFFECTED BY DEMOLITION. PROVIDE BLANK COVER TO FLOOR BOX AS REQUIRED.
- DISCONNECT, REMOVE AND RELOCATE TWO OF THE THREE DATA DROPS SERVING THE LECTERN. ELECTRICAL CONTRACTOR TO VERIFY AND CONFIRM NUMBER OF EXISTING DATA DROPS/OUTLETS SERVING THE LECTERN. ELECTRICAL CONTRACTOR TO COIL AND SECURE IN THE CEILING THE EXISTING DATA WIRING THAT WILL NOT BE RELOCATED. REFER TO SHEET 'E101' FOR NEW LOCATION OF TWO DATA OUTLETS. PROVIDE BLANK COVER TO THE DATA FLOOR BOX.
- DISCONNECT AND REMOVE EXISTING WALL-MOUNTED TELEPHONE OUTLET, COIL AND SECURE TELEPHONE WIRING IN THE CEILING. PATCH AND REWORK WALL AS REQUIRED TO MATCH EXISTING.
- ELECTRICAL CONTRACTOR TO REMOVE PROJECTOR MOUNT AFTER REMOVAL OF THE CEILING MOUNTED PROJECTOR BY COD. PATCH OR REWORK CEILING AS REQUIRED TO MATCH EXISTING.
- DISCONNECT AND REMOVE PROJECTOR WIRING, COIL AND SECURE THEM IN THE CEILING. COORDINATE DEMOLITION WITH OTHER TRADES.
- DISCONNECT, REMOVE AND RELOCATE WIRELESS ACCESS PORT (WAP). REFER TO SHEET 'E101' FOR NEW LOCATION.
- DISCONNECT AND REMOVE CEILING-MOUNTED QUAD OUTLET FOR PROJECTOR, SECURE BRANCH CIRCUIT TO BE EXTENDED AND REUSED FOR NEW FUNCTION OR LOAD.
- DISCONNECT, REMOVE AND RELOCATE EXISTING CEILING-MOUNTED SPEAKER. REFER TO SHEET 'E101' FOR NEW LOCATION.
- DISCONNECT AND REMOVE EXISTING DUPLEX OUTLET AND ASSOCIATED CONDUIT AND WIRING BACK TO SERVING JUNCTION BOX NOT AFFECTED BY DEMOLITION.
- DISCONNECT, REMOVE AND RELOCATE EXISTING WALL CLOCK AND ASSOCIATED CONDUIT AND WIRING. REFER TO SHEET 'E101' FOR NEW LOCATION OF WALL CLOCK.
- DISCONNECT, REMOVE AND RELOCATE EXISTING FIRE ALARM DEVICE. REFER TO SHEET 'E101' FOR NEW LOCATION OF DEVICE. REFER ALSO TO GENERAL DEMOLITION NOTE #7 ON SHEET 'E000'.
- DISCONNECT AND REMOVE EXISTING DOOR CARD SWIPE SYSTEM.

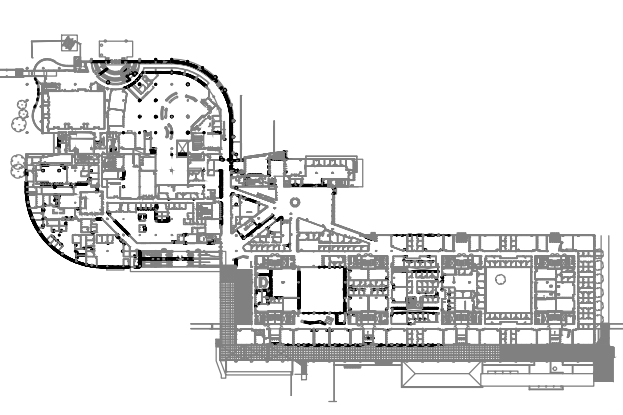
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**COLLEGE OF DUPAGE
 BIC ADJUNCT AREA
 RECONFIGURATION**

425 FAWELL BLVD
 GLEN ELLYN, IL 60137

**POWER AND
 SYSTEM
 PLANS**

Expiration Date of Seal: 11-30-2018 BE Project No. 15044-1709

Drawn By: MM/CP
 Drawing No. E101

EXHIBIT D – SMALL PROJECTS AGREEMENT

COLLEGE OF DUPAGE
SMALL PROJECTS AGREEMENT FOR BIC ADJUNCT EXPANSION Project
BETWEEN COMMUNITY COLLEGE DISTRICT 502 AND CONTRACTOR

THIS AGREEMENT (“**Agreement**”) is made as of MAY 2018 by and among Community College District 502 (COLLEGE OF DuPAGE), (“**COD**”) and General Trades (“**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 Aug 15. 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: _____

SCOPE OF WORK

[List BID Package and any addendums]

EXHIBIT 2

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.

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 | \$1,000,000 / \$2,000,000 |
| 2. Explosion, Underground and Collapse Hazard | |
| 3. Products/Completed Operations | |
| 4. Contractual Insurance | |
| 5. Broad Form Property Damage | |
| 6. Independent Contractors | |
| 7. Bodily Injury | |

Automobile Liability

Owned, Non-owned, or Rented	\$1,000,000 / \$2,000,000
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Workers' Compensation and Employers' Liability	As Required by Applicable Laws.
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Professional Liability	If Performance Specifications are Required by the Contract
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