



BID # 8160

CAFETERIA RENOVATIONS AT NEWARK CAMPUS

BUYER: Denise Williams, MBA, MS, QPA, RPPO, CPSM, CPSD
ADVERTISED DATE: November 28, 2022
PRE-BID CONFERENCE DATE: December 5, 2022 at 11:00 AM EST
LAST DAY FOR QUESTIONS: December 6, 2022 at 9:00 AM EST
BID DUE DATE AND TIME: December 13, 2022 at 10:00 AM EST

Issued by: Essex County College
Purchasing Department
303 University Ave.
6th Floor
Newark, NJ 07102
Purchasing@essex.edu
www.essex.edu

DIVISION 1: INTRODUCTION

DESCRIPTION OF ESSEX COUNTY COLLEGE

Essex County College is accredited by the Middle States Commission on Higher Education and is licensed by the State of New Jersey through the Office of the Secretary of Higher Education to operate and award Associate Degrees and Certificates.

MISSION

Essex County College is an open access community college that serves the diverse needs of students through comprehensive educational programs, training and continuing education. Essex County College is dedicated to academic excellence and the success of its students.

VISION

A Beacon for Education and Knowledge, Essex County College attracts people who seek a better life through education. We transform lives, broaden learning and empower students to achieve their full potential. Our College community and graduates are change agents and leaders who contribute to the health, vitality and advancement of society.

Essex County College Students First Strategic Plan 2019-2024 is available via <https://www.essex.edu/wp-content/uploads/2021/12/STUDENTS-FIRST-Ver.-2.0.pdf>

OVERVIEW

Essex County College reserves the right to reject any and all proposals and the right at its option to waive or refuse to waive any defect or informality in any proposals. All responsive proposals received will be subjected to an evaluation by qualified personnel. Respondents should submit sufficient information to enable the evaluation committee to fully ascertain each respondent's capability to perform the requirements contemplated by this solicitation. All commitments made in the proposals shall become a part of any resultant contract. Proposals will not be received after such date and time indicated in the solicitation. The College reserves the right to cancel this bid at any time without cost or obligation.

Only a purchase order authorizes the performance of services. Essex County College is not responsible for services performed without an authorized Purchase Order. This is being solicited through a Fair and Open process by N.J.S.A.19:44A-20 et seq. The College is exempt from any local, state or federal sales, use or excise taxes.

DESCRIPTION OF THE PROJECT

The scope of work for the Cafeteria Renovations at Essex County College includes, but is not limited to, modifications to the existing HVAC system, demolition and replacement of electrical outlets, receptacles and light fixtures, as well as the demolition of plumbing fixtures, domestic piping and sanitary lines.

The new scope of work includes, but is not limited to, the installation of new floor, ceiling and wall finishes, new light fixtures outlets and receptacles, new plumbing fixtures and gas piping, new doors and door hardware.

The Contractor shall be responsible to create a containment area around the immediate work site using plastic sheathing (with taped seams), masonite (or similar) to protect existing adjacent flooring and negative air machines (if possible) for the duration of the project. The Contractor shall keep the immediate work area clean and free of debris at all times.

EVALUATION AND CONSIDERATION OF BIDS

It is the intent of Essex County College to award a Contract to the lowest responsible bidder. Whenever two or more quotations or bids of equal amounts are the lowest quotations or bids submitted by responsible parties, the county college may award the contract to any one of such parties, as in its discretion, it may determine.

KEY DATES

Advertised Date:	November 28, 2022
Pre-Bid Conference:	December 5, 2022 at 11:00 AM EST Essex County College – Center for Learning and Teaching Conference Room, 3rd Floor, 303 University Avenue, Newark, New Jersey, 07102 (In-person attendance is not mandatory but is strongly recommended. Failure to attend does not relieve the bidder of any obligations or requirements)
Last Day for Questions:	December 6, 2022 at 9:00 AM EST
Bid Due Date and Time:	December 13, 2022 at 10:00 AM EST (Bid opening date will be conducted virtually via Zoom) (Zoom ID #998 5872 2120 , Password 612613)

PROPOSAL SUBMITTAL

Submission by **fax** or **e-mail** is NOT PERMITTED.

All responses shall be made in accordance with guidance received from the Purchasing Department and shall be returned to the address below in sealed envelopes bearing on the outside the name of the vendor:

For USPS/Hand delivery, the mailing address is:

Ms. Denise Williams
Essex County College
303 University Avenue,
Purchasing Department
6th Floor, Room #6108
Newark, New Jersey, 07102

RE: BID # 8160 – CAFETERIA RENOVATIONS AT NEWARK CAMPUS

CONTACT FOR ALL QUESTIONS

The specific section, bid number and page number to which each question refers to is to be indicated. The College will have reasonable amount of time to respond to questions or concerns. It is the College’s intent to respond to all appropriate questions and concerns; however, the College reserves the right to decline to respond to any question or concern.

Any response by the College to inquiries from one respondent will be furnished to all vendors as an amendment or clarification to this bid, if this information is necessary for submitting qualifications or if the lack of such information would be prejudicial to a uniform response.

Inquiries on matters requiring further clarification concerning the contents of this document should be directed in written form via email to:

Ms. Denise Williams
Director Purchasing
**RE: BID # 8160 – CAFETERIA RENOVATIONS AT NEWARK
CAMPUS**
E-mail: purchasing@essex.edu

CONTRACT PERIOD

The time for construction is approximately six (6) months. The awarded vendor will receive a notice to proceed once all documents requested are received.

BID FORMAT

Vendors must include one (1) original and one (1) hard copies of their bid and one (1) electronic copy on a portable USB flash drive.

INSURANCE AND INDEMNIFICATION

The insurance documents include but are not limited to the following coverages. The successful bidder shall provide coverage so that all insurance coverage must be in effect no later than 12:01 A.M. EST at the start of the day of the contract and remain in effect for the duration of the contract, including any extensions.

The General Contractor is required to purchase a Builder's Risk policy for the scope of the contract. The General Contractor is required to purchase an owner contractor protective liability policy with minimum limits of \$1M each occurrence-bodily injury and property damage with a \$2M General Aggregate- per location-per project.

1. The coverage maintained by the Contractor shall be written by companies licensed to do business in the State of New Jersey and maintaining and AM BEST rating of A- or better with a financial size rating of Class IX or larger. *All insurance shall contain a waiver of subrogation against the Owner.*

2. Commercial General Liability insurance written on an occurrence form including independent contractor liability, products/completed operations liability, contractual liability, covering but not limited to the liability assumed under the indemnification provisions of this contract. ***Coverage for bodily injury and property damage claims arising out of the professional acts of the general contractor and subcontractors shall also be included.*** The policy shall not include any endorsement that restricts or reduces coverage as provided by the ISO CG0001 form without the approval of the Owner. Commercial General Liability:

The minimum limits of liability shall not be less than a combined single limit of two million dollars (\$2,000,000) per occurrence, two million dollars (\$2,000,000) general aggregate, two million dollars (\$2,000,000) product/completed operations aggregate. The Products and Completed Operations insurance shall be maintained for five (5) years after final payment. A "per project endorsement" shall be included, so that the general aggregate limit applies solely to the project that is the subject of this contract.

3. Commercial Auto Liability: Liability covering owned, non-owned, and hired vehicles. The limits of liability shall not be less than a combined single limit of one million dollars (\$1,000,000) per occurrence.

4. Worker's Compensation: Worker's Compensation Insurance applicable to the laws of the State of New Jersey and other State or Federal jurisdiction required to protect the employees of the Contractor and any Subcontractor who will be engaged in the performance of this Contract. The certificate must so indicate that no proprietor, partner, executive officer, or member is excluded. This insurance shall include Employers' Liability Protection with a limit of liability not less than one million dollars (\$1,000,000) bodily injury, each occurrence, one million dollars (\$1,000,000) disease, each employer, and two million dollars (\$2,000,000) disease, aggregate limit. Including the employer's liability insurance under the umbrella insurance can satisfy the limit requirements.

5. Excess Liability applying excess of primary to the commercial general liability, commercial automobile liability and employer's liability insurance shall be provided with minimum limits \$3,000,000 per occurrence and a \$3,000,000 general aggregate.

6. The General Liability Insurance General Aggregate and Excess Liability limits shall apply and be written exclusively, in total, to this Project only. A per project endorsement for all coverage's and limits must be included in each policy.

- Bodily injury and property damage insurance policies shall be so written as to provide coverage for special hazards where such hazards will be incidental to subcontractors' work.

7. The Contractor is responsible for purchasing both a Builder's Risk policy for renovations and Owner Contractor Protective liability policy to be in force at the time the project begins and in effect under it has concluded. OCP coverage provides project owners with additional coverage beyond what they may receive if they are named as an additional insured on a contractor's commercial general liability policy. OCP coverage helps to reduce the project owner's liability on a construction project and includes:

- Dedicated coverage limits specifically for the project owner
- Primary coverage for the owner without contribution from the owner's other insurance or the contractor's general liability coverage

8. The contractor shall list, on the certificate of insurance, all additional insureds including:

- Essex County College
- Name of Architects and their consultants
- Name of Construction Manager & their consultants
- Owners consultants, other consultants, agents and employees, including its individual members.

**FORMS THAT MUST BE
COMPLETED AND SUBMITTED**

BIDDERS CHECKLIST SERVICES

Proposer is instructed to complete, sign, and return the following documents as a part of its proposal. **Initial next to the items and include the checklist in your submission.**

_____	Bid Pricing Form	
_____	Non-Collusion Affidavit	(Notarized)
_____	Statement of Ownership Disclosure	(Notarized)
_____	Affirmative Action Compliance Notice	
_____	Employee or Relative Disclosure Requirement Form	(Notarized)
_____	Mandatory Equal Employment Opportunity (EEO) Form	(Notarized)
_____	New Jersey Anti-Discrimination Provision	(Notarized)
_____	Americans with Disabilities Act of 1990	(Notarized)
_____	Political Contribution Disclosure Form	
_____	Contractor Questionnaire/Certification	
_____	Consent to Thirty-Day Extension	
_____	Addendum(s)	
_____	W9 Form (download from the IRS website and submit with package)	
_____	Trade Reference	
_____	Disclosure of Investment Activities in Iran	
_____	Vendor Information Form	
_____	Minority and Women Owned Business Declaration Form	
_____	Bidder's Certification	
_____	Certification	
_____	Prevailing Wage Qualification Form	
_____	Public Works Employers Form	
_____	Bid Bond	
_____	Consent of Surety	
_____	Surety Disclosure Statement and Certification	
_____	Equipment Certification	
_____	Subcontractor Certification	
_____	Small Business Enterprise Outreach Policy	
_____	Minority Business Enterprise Outreach Policy	

Bid Pricing Form
#8160 Cafeteria Renovations At Newark Campus

A: Written Base Bid price:

(To be written in full). **Note: If amount written differs from the numerical figure, only the written amount will be accepted as the correct bid.**

All price figures on the chart must match the amounts noted above.

DESCRIPTION	PRICE (in figures)
Base Bid Price	
Unforeseen Conditions Allowance	\$100,000.00
Total Lump Sum	

B: Other pricing

DESCRIPTION	PRICE (in figures)
Unit Price (EA): Provide & Install Additional Point of Sale Counter	
Total	

All sub-contractors are required to submit all of the same State required documentation as the bidding contractor.

_____ % of Project to be Completed by Contractor

_____ % of Project to be Completed by Sub-Contractor

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Drawings and other Contract Documents, including all Addenda. The failure or omission of any Bidder to receive or examine any form, instrument or document or to visit the site and acquaint himself with conditions there existing, shall not relieve any Bidder from obligation with respect to his bid.

Company Name

Company Representative

(sign)

Street Address

Company Representative

(print)

City

State

Zip Code

Date

Telephone#

Fax#

Tax ID#

E-Mail

NON-COLLUSION AFFIDAVIT

State of New Jersey
County of _____

I, _____ residing in _____
(name of affiant) (name of municipality)

in the County of _____ and State of _____, of full age,
being duly sworn according to law on my oath depose and say that:

I am _____ of the firm of _____ (name of
(title or position) firm)

_____ the bidder making this Proposal for the bid
entitled _____, and that I executed the said proposal with
(title of bid proposal)

full authority to do so; that said bidder has not, directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project; and that all statements contained in said proposal and in this affidavit are true and correct, and made with full knowledge that the Board of Trustees of Essex County College relies upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the contract for the said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by

(name of firm)

Authorized Bidder's Representative

Type or print name of representative

Subscribed and sworn before me this ____ day of _____, 2 ____.	_____ (Affiant/Notary)
My Commission expires: _____	_____ (Print name & title of affiant/Notary) (Corporate Seal)

STATEMENT OF OWNERSHIP DISCLOSURE

N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

This statement shall be completed, certified to, and included with all bid and proposal submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

Name of Organization: _____

Organization Address: _____

Part I Check the box that represents the type of business organization:

- Sole Proprietorship (skip Parts II and III, execute certification in Part IV)
- Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)
- For-Profit Corporation (any type) Limited Liability Company (LLC)
- Partnership Limited Partnership Limited Liability Partnership (LLP)
- Other (be specific): _____

Part II

The list below contains the names and addresses of all stockholders in the corporation who own 10% or more of its stock, of any class, or of all individual partners in the partnership who own a 10% or greater interest therein, or of all members in the limited liability company who own a 10% or greater interest therein, as the case may be. **(COMPLETE THE LIST BELOW IN THIS SECTION)**

OR

No one stockholder in the corporation owns 10% or more of its stock, of any class, or no individual partner in the partnership owns a 10% or greater interest therein, or no member in the limited liability company owns a 10% or greater interest therein, as the case may be. **(SKIP TO PART IV)**

(Please attach additional sheets if more space is needed):

Name of Individual or Business Entity	Home Address (for Individuals) or Business Address

PART III DISCLOSURE OF 10% OR GREATER OWNERSHIP IN THE STOCKHOLDERS, PARTNERS OR LLC MEMBERS LISTED IN PART II

If a bidder has a direct or indirect parent entity which is publicly traded, and any person holds a 10 percent or greater beneficial interest in the publicly traded parent entity as of the last annual federal Security and Exchange Commission (SEC) or foreign equivalent filing, ownership disclosure can be met by providing links to the website(s) containing the last annual filing(s) with the federal Securities and Exchange Commission (or foreign equivalent) that contain the name and address of each person holding a 10% or greater beneficial interest in the publicly traded parent entity, along with the relevant page numbers of the filing(s) that contain the information on each such person. **Attach additional sheets if more space is needed.**

Website (URL) containing the last annual SEC (or foreign equivalent) filing	Page #'s

Please list the names and addresses of each stockholder, partner or member owning a 10 percent or greater interest in any corresponding corporation, partnership and/or limited liability company (LLC) listed in Part II **other than for any publicly traded parent entities referenced above**. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. **Attach additional sheets if more space is needed.**

Stockholder/Partner/Member and Corresponding Entity Listed in Part II	Home Address (for Individuals) or Business Address

PART IV Certification

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge that the Board of Trustees of Essex County College is relying on the information contained herein and that thereby acknowledge that I am under continuing obligation from the date of this certification through the completion of any contracts with the College to notify the College in writing of any changes to answers and information contained herein. I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with Essex College and

that the College at its option may declare any contract(s) resulting from this certification void and unenforceable.

Name of Authorized Agent

Title

Signature

Date

Subscribed and sworn before me this ____ day of _____, 2 ____.	_____ (Affiant/Notary)
My Commission expires: _____	_____ (Print name & title of affiant/Notary) (Corporate Seal)

AFFIRMATIVE ACTION COMPLIANCE NOTICE
N.J.S.A. 10:5-31 and N.J.A.C. 17:27

This form is a summary of the successful vendor's requirement to comply with the requirements of N.J.S.A. 5-31 and N.J.A.C. 17:27-1 et seq.

The successful vendor shall submit to the public agency, after notification of award but prior to execution of this contract, one of the following three documents as forms of evidence:

A COPY OF AN EMPLOYEE INFORMATION REPORT (FORM AA302) PROVIDED BY THE DIVISION AND DISTRIBUTED TO THE PUBLIC AGENCY TO BE COMPLETED BY THE CONTRACTOR IN ACCORDANCE WITH N.J.A.C. 17:27-4;

OR

A COPY OF A VALID LETTER THAT THE CONTRACTOR IS OPERATING UNDER AN EXISTING FEDERALLY APPROVED OR SANCTIONED AFFIRMATIVE ACTION PROGRAM (GOOD FOR ONE YEAR FROM THE DATE OF THE LETTER);

OR

A COPY OF A CERTIFICATE OF EMPLOYEE INFORMATION REPORT (CEIR) APPROVAL, ISSUED IN ACCORDANCE WITH N.J.A.C. 17:27-4.

The successful vendor may obtain the Affirmative Action Employee Information Report (AA302) from the contracting unit during normal business hours.

The successful vendor(s) must submit the copies of the AA302 Report to the Division of Contract Compliance and Equal Employment Opportunity in Public Contracts (Division). The Public Agency copy is submitted to the public agency, and the vendor copy is retained by the vendor.

The undersigned vendor certifies that he/she is aware of the commitment to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27.1 et seq. and agrees to furnish the required forms of evidence.

The undersigned vendor further understands that his/her Bi/Proposal shall be rejected as non-responsive if said contractor fails to comply with the requirements of N.J.S.A. 10:5-31 and N.J.A.C. 17:27-1 et seq.

I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT AND AUTHORIZED BY THE FOLLOWING SIGNATURE FOR COMPLIANCE AS SPECIFIED IF AWARDED THIS CONTRACT.

COMPANY NAME: _____

PRINT NAME: _____

TITLE: _____

SIGNATURE: _____

DATE: _____ Bid/Proposal # _____

VENDOR: This form must be completed, signed and returned with your bid

EMPLOYEE OR RELATIVE DISCLOSURE REQUIREMENT

This form is to be completed by all bidders seeking the award of any contract. No bidder shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds by Essex County College, unless prior to the receipt of the bid or accompanying the bid, the bidder has submitted a statement setting for the information solicited below.

1. State if you or your employees (if known) are currently employed at Essex County College?

Yes _____ No _____

If so, please indicate name and position held at Essex County College.

2. State if any shareholder who owns 10% or more of your stock, if a corporation or partner who holds 10% or more of an interest, if a partnership, is currently employed at Essex County College. Yes _____ No _____
If so, please indicate name and position held at Essex County College

3. State if you, or any stockholder, who owns 10% or more of your stock, if a corporation, or any partner who owns 10% or more of an interest, if a partnership, as the case may be, has any relatives employed at the College?
Yes _____ No _____

If yes, please indicate their names and the nature of the relationship (e.g., brother, cousin, parent or child).

By: _____
(Name of Contractor)

(Address)

Subscribed and sworn to _____
(Type or print name of affiant along with signature)

Before me this _____ day of _____, 20____

Notary Public of
My Commission Expires

NOTE: THIS STATEMENT MUST BE COMPLETED SIGNED AND RETURNED WITH YOUR BID

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L. 1975, C. 127)
N.J.A.C. 17:27-1.1 et seq.

CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

- A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

- B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:
- (1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;
 - (2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;
 - (3) Prior to the commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;
 - (4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;
 - (5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;
 - (6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:
 - (i) The contractor or subcontractor shall interview the referred minority or women worker.
 - (ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprenticeship program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.
 - (iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.
 - (iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.
 - (7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.
- C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will

result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

- D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

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

Name	Signature
Attest:	
Secretary Name	Signature
(Seal)	(Seal)

Subscribed and sworn to _____
 (Type or print name of affiant along with signature)

Before me this _____ day of _____, 20__

 Notary Public of
 My Commission Expires

NOTE: THIS STATEMENT MUST BE COMPLETED, SIGNED, NOTARIZED, AND RETURNED WITH YOUR BID.

NEW JERSEY ANTI-DISCRIMINATION PROVISIONS
N.J.S.A. 10:2-1 ET SEQ.

Pursuant to N.J.S.A. 10:2-1, if awarded a contract, the contractor agrees that:

- a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;
- b. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;
- c. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and
- d. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

(name of firm)

Authorized Bidder's Representative

Type or print name of representative

Subscribed and sworn before me this ____ day of _____, 2 ____.	_____ (Affiant/Notary)
My Commission expires: _____	_____ (Print name & title of affiant/Notary) (Corporate Seal)

AMERICANS WITH DISABILITIES ACT OF 1990
Equal Opportunity for Individuals with Disability

The contractor and the owner do hereby agree that the provisions of Title 11 of the Americans with Disabilities Act of 1990 (the "Act") (42 U.S.C. S121 01 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant there unto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the owner pursuant to this contract, the contractor agrees that the performance shall be in strict compliance with the Act. In the event that the contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the contractor shall defend the owner in any action or administrative proceeding commenced pursuant to this Act. The contractor shall indemnify, protect, and save harmless the owner, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages, of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the owner's grievance procedure, the contractor agrees to abide by any decision of the owner which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the owner, or if the owner incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the contractor shall satisfy and discharge the same at its own expense.

The owner shall, as soon as practicable after a claim has been made against it, give written notice thereof to the contractor along with full and complete particulars of the claim, if any action or administrative proceeding is brought against the owner or any of its agents, servants, and employees, the owner shall expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or other process received by the owner or its representatives.

It is expressly agreed and understood that any approval by the owner of the services provided by the contractor pursuant to this contract will not relieve the contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the owner pursuant to this paragraph.

It is further agreed and understood that the owner assumes no obligation to indemnify or save harmless the contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the contractor's obligations assumed in this Agreement, nor shall they be construed to relieve the contractor from any liability, nor preclude the owner from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

(name of firm)

Authorized Bidder's Representative

Type or print name of representative

Subscribed and sworn before me this ____ day of _____, 2 ____.	_____ (Affiant/Notary)
My Commission expires: _____	_____ (Print name & title of affiant/Notary) (Corporate Seal)

C 271 POLITICAL CONTRIBUTION DISCLOSURE FORM

Contractor Instructions

Business entities (contractors) receiving contracts from a public agency that are NOT awarded pursuant to a "fair and open" process (defined at N.J.S.A. 19:44A-20.7) are subject to the provisions of P.L. 2005, c. 271, s.2 (N.J.S.A. 19:44A-20.26). This law provides that 10 days prior to the award of such a contract, the contractor shall disclose contributions to:

- any State, county, or municipal committee of a political party
- any legislative leadership committee¹
- any continuing political committee (a.k.a., political action committee)
- any candidate committee of a candidate for, or holder of, an elective office:
 - of the public entity awarding the contract
 - of that county in which that public entity is located
 - of another public entity within that county
 - or of a legislative district in which that public entity is located or, when the public entity is a county, of any legislative district which includes all or part of the county

The disclosure must list reportable contributions to any of the committees that exceed \$300 per election cycle that were made during the 12 months prior to award of the contract. See N.J.S.A. 19:44A-8 and 19:44A-16 for more details on reportable contributions.

N.J.S.A. 19:44A-20.26 itemizes the parties from whom contributions must be disclosed when a business entity is not a natural person. This includes the following:

- individuals with an "interest" ownership or control of more than 10% of the profits or assets of a business entity or 10% of the stock in the case of a business entity that is a corporation for profit
- all principals, partners, officers, or directors of the business entity or their spouses
- any subsidiaries directly or indirectly controlled by the business entity
- IRS Code Section 527 New Jersey based organizations, directly or indirectly controlled by the business entity and filing as continuing political committees, (PACs).

When the business entity is a natural person, "a contribution by that person's spouse or child, residing therewith, shall be deemed to be a contribution by the business entity." [N.J.S.A. 19:44A-20.26(b)] The contributor must be listed on the disclosure.

Any business entity that fails to comply with the disclosure provisions shall be subject to a fine imposed by ELEC in an amount to be determined by the Commission which may be based upon the amount that the business entity failed to report.

The enclosed list of agencies is provided to assist the contractor in identifying those public agencies whose elected official and/or candidate campaign committees are affected by the disclosure requirement. It is the contractor's responsibility to identify the specific committees to which contributions may have been made and need to be disclosed. The disclosed information may exceed the minimum requirement.

The enclosed form, a content-consistent facsimile, or an electronic data file containing the required details (along with a signed cover sheet) may be used as the contractor's submission and is disclosable to the public under the Open Public Records Act.

The contractor must also complete the attached Stockholder Disclosure Certification. This will assist the agency in meeting its obligations under the law. **NOTE: This section does not apply to Board of Education contracts.**

¹ N.J.S.A. 19:44A-3(s): "The term "legislative leadership committee" means a committee established, authorized to be established, or designated by the President of the Senate, the Minority Leader of the Senate, the Speaker of the General Assembly or the Minority Leader of the General Assembly pursuant to section 16 of P.L.1993, c.65 (C.19:44A-10.1) for the purpose of receiving contributions and making expenditures."

CONTRACTOR QUESTIONNAIRE/CERTIFICATION

Name of Company _____

Street Address _____ P.O. Box _____

City, State, Zip _____

Business Phone Number () _____ Extension _____

Emergency Phone Number () _____ Fax Number () _____

E-Mail _____

FEIN No. _____

QUESTIONNAIRE

1. How many years have you been engaged in the contracting business under your present firm or trading name?
_____ Years

2. Have you ever failed to complete any work awarded to your company?

Yes No

If yes, explain _____

3. Have you ever defaulted on a contract?

Yes No

If yes, explain _____

4. Have you or other principals of your company been debarred, suspended, proposed for debarment, declared ineligible, or voluntary excluded from participation in any public works projects by any federal, state, or local agencies?

Yes No

If yes, explain _____

CONSENT TO THIRTY-DAY EXTENSION FOR AWARDING OF BIDS

In accordance with the provisions of N.J.S.A. 18A:64a-25.18, Essex County College hereby requests that any bidder who so chooses consent to the extension and holding of its bid price from sixty (60) to ninety (90) days. The ninety-day period shall be computed commencing with the date designated as the final date for receipt of bid due date. The College, in its sole discretion may award a contract or reject all bids at any date up until the expiration date. If the bidder consents to the extension, it may not make any claim for an increase in its bid quote, whether based on materials, labor, extension of time or any other factor.

If your firm agrees to consent to hold its bid pricing, please sign the below acknowledgement.

Acknowledged for: _____
(Name of Bidder/Company)

(Signature of Authorized Representative)

Date

Name (Print)

Title

ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

NOTE: This form must be submitted whether or not addenda were issued. If no addenda were issued, check the “No Addenda were received box” and complete the signature section.

The undersigned Bidder hereby acknowledges receipt of the following Addenda:

<u>Addendum Number</u>	<u>Date</u>	<u>Acknowledge Receipt (initial)</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

_____ No Addenda were received or included with the bid package:

Acknowledged for: _____
(Name of Bidder/Company)

(Signature of Authorized Representative)

Date

Name (Print)

Title

TRADE REFERENCES – FOR PROJECTS OF A SIMILAR SCOPE AND NATURE TO BE PROVIDED BY EACH BIDDER FOR THE PROJECT CONTRACT

Bidders are to provide evidence of satisfactory completion of work of similar nature as outlined in the bid from a **minimum of three (3) similar contracts** with educational institutions, preferably in New Jersey, **within the past five (5) years.** (Attach additional pages as necessary)

NAME OF COMPANY: _____

#1: PROJECT TITLE: _____

LOCATION: _____ \$VALUE: _____

CLIENT NAME: _____

CLIENT ADDRESS: _____

CLIENT PHONE NUMBER: _____ E-MAIL: _____

#2: PROJECT TITLE: _____

LOCATION: _____ \$VALUE: _____

CLIENT NAME: _____

CLIENT ADDRESS: _____

CLIENT PHONE NUMBER: _____ E-MAIL: _____

#3: PROJECT TITLE: _____

LOCATION: _____ \$VALUE: _____

CLIENT NAME: _____

CLIENT ADDRESS: _____

CLIENT PHONE NUMBER: _____ E-MAIL: _____

#4: PROJECT TITLE: _____

LOCATION: _____ \$VALUE: _____

CLIENT NAME: _____

CLIENT ADDRESS: _____

CLIENT PHONE NUMBER: _____ E-MAIL: _____

#5: PROJECT TITLE: _____

LOCATION: _____ \$VALUE: _____

CLIENT NAME: _____

CLIENT ADDRESS: _____

CLIENT PHONE NUMBER: _____ E-MAIL: _____

Signature _____ Date: _____

Name of Company _____

Street Address _____ P.O. Box _____

City, State, Zip _____

Business Phone Number () _____ Extension _____

Emergency Phone Number () _____

Fax Number () _____ E-Mail _____

FEIN No. _____

DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

Part 1: Certification

Bidder Name:	
---------------------	--

BIDDERS ARE TO COMPLETE PART 1 BY CHECKING **EITHER BOX.**

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division's website at www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf. Bidders must review this list prior to completing the below certification. Failure to complete the certification may render a bidder's proposal non-responsive. If the Director finds a person or entity to be in violation of law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party

CHECK THE APPROPRIATE BOX:

I certify, pursuant to Public Law 2012, c. 25, that neither the bidder listed above nor any of the bidder's parents, subsidiaries, or affiliates is listed on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below.

OR

I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as nonresponsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

Part 2 – Additional Information

PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN. You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran on additional sheets provided by you.

Part 3: Certification

I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments there to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the *Essex County College* is relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with *Essex County College* to notify the College in writing of any changes to the answers of information contained herein. I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the *College* and that the College at its option may declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

VENDOR INFORMATION

MAILING ADDRESS FOR PURCHASE ORDERS:

Company Name (as recorded with IRS): _____ DBA: _____

Mailing Name: _____

Street Address: _____ Suite: _____ PO Box: _____

City: _____ State: _____ Zip: _____

MAILING ADDRESS FOR PAYMENTS (if different from above):

Company Name (as recorded with IRS): _____

Mailing Name: _____

Street Address: _____ Suite: _____ PO Box: _____

City: _____ State: _____ Zip: _____

SALES CONTACT INFORMATION:

Name: _____ Title: _____

Phone: _____ Fax: _____

E-mail: _____

Taxpayer Identification Number (TIN): _____

ACCOUNTS RECEIVABLE CONTACT INFORMATION:

Name: _____ Title: _____

Phone: _____ Fax: _____

E-mail: _____

This Section must be filled

Check those that apply:

- SBE Small Business Enterprise
- MBE Minority Business Enterprise
- WBE Woman Business Enterprise
- MWBE Minority Woman Business Enterprise
- SMBE Small Minority Business Enterprise
- SMWBE Small Minority Women Business Enterprise
- SWBE Small Woman Business Enterprise
- Non-SBE/MBE/WBE/MWBE/SMBE/SMWBE/SWBE

Ethnicity:

- African American
- Asian American
- Caucasian American
- Hispanic American
- Multiple Ethnicities
- Native American
- Unspecified

MINORITY AND WOMEN OWNED BUSINESS DECLARATION FORM

Essex County College is attempting to identify vendors who qualify as a minority or women business in accordance with New Jersey Executive Order #34. If your business falls into one of the categories below and you would like to answer the following questions voluntarily, please do so. If your business does not fall into one of these categories, please leave this form blank.

Please be advised that Essex County College will continue to award all bid and purchase orders in accordance with the established New Jersey Statutes for Bidding and Contracts N.J.S.A.18A:64A-25.1 et seq.

The decision to complete this form will be done strictly on a voluntary basis. Essex County College guarantees that your company will not be penalized in anyway if you choose not to participate.

COMPANY NAME: _____

Are you Minority-Owned business? **Yes** **No**

If yes, please check the item that best describes your business

- African American**
- Asian American**
- Hispanic American**
- Native American**
- Caucasian American**
- Other Minority**

Are you a Women-Owned business? **Yes** **No**

If yes, please check the item that best describes your business

- Caucasian Woman**
- Minority Woman**

Signature of Vendor

NOTE: All vendors are required to submit a New Jersey Business Registration Certification (P.L. 200, c.134 & P.L. 2004, c.57). Vendors conducting business with any State/County agency will be required to be registered with the New Jersey Division of Revenue. The vendor will be required to submit, as part of a public bid or prior to issuing a purchase order, a Business Registration Certificate issued by the Department of Treasury, Division of Revenue, with the State of New Jersey. If your business is not register, you can go to the following website, <http://www.state.nj.us/treasury/revenue/busregcert.shtml>, or contact the New Jersey Division of Revenue to obtain information regarding how to register your business.

BIDDERS'S CERTIFICATION

State of _____)

SS:

County of _____)

The undersigned, having knowledge of and authority to bind the BIDDER to the information herein, hereby swears, upon his oath, according to law,

1. I am the undersigned, who, on behalf of the BIDDER and with full authority to do so, has executed this Certification in connection with its Bid;
2. That the BIDDER is registered with the State of New Jersey, Department of the Treasury, Division of Revenue (ATTACH COPY OF BUSINESS REGISTRATION CERTIFICATE);
3. That the BIDDER is authorized by the New Jersey Department of the Treasury to perform work in New Jersey (ATTACH COPY OF CERTIFICATE OF AUTHORITY TO PERFORM WORK IN NEW JERSEY); and
4. The BIDDER has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the within Bid;
5. I further warrant that, no person or selling agency has been employed, or retained, to solicit, or secure, such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employee or bona fide established commercial or selling agencies identified as follows:

6. The BIDDER is not, as of this date, and has not been at any time within three (3) years immediately preceding the date on which Bids were received, included on the New Jersey State Treasurer's List of Debarred, Suspended or Disqualified Bidders; the BIDDER hereby acknowledges that it may be debarred, suspended or disqualified from contracting with the OWNER if it commits any of the acts listed in N.J.A.C. 7:1-5.2 and further acknowledges its obligation to notify the OWNER immediately if it appears that said BIDDER may be added to any such list.
7. All statements and representations contained in the BIDDER's Bid are true, complete and correct, and made with full knowledge that the OWNER shall rely upon same in awarding a public contract for the Work as defined in the Contract Documents.

BIDDER's Authorized Representative
(MUST BE PRINCIPAL OWNER OR OFFICER OF BIDDER):

Signature

Print or Type Name and Title

Notary Public: Sworn and Subscribed before me on this _____ day of _____, 200__:

Notary's Signature

Print or Type Notary's Name

Commission expires: _____ Notary's Seal: _____

The College hereby certifies that the NJ State Treasury Department debarment list has been checked by the issuing buyer and the successful bidder is not debarred.

Signature

Print or Type Name and Title

Certifications

- Debarment
I certify that the entity listed on the form or any person employed by this entity, are not presently on the following:
 - New Jersey Department of Treasury – Consolidated Debarment Report
 - New Jersey Department of Labor – Prevailing Wage Debarment List
 - Federal Debarred Vendor List – Excluded Parties List System

- Direct/Indirect Interest
I declare and certify that no member of the Essex County College, nor any officer or employee or person whose salary is payable in whole or in part by said College or their immediate family members are directly or indirectly interested in this bid or in the supplies, materials, equipment, work or services to which it relates, or in any portion of profits thereof. If a situation so exists where a College member, employee, officer of the College has an interest in the bid, etc., then please attach a letter of explanation to this document, duly signed by the president of the firm or company.

I certify that I am not an official or employee of the Essex County College.

- Gifts; Gratuities; Compensation
I declare and certify that no person from my firm, business, corporation, association or partnership offered or paid any fee, commission or compensation, or offered any gift, gratuity or other thing of value to any school official, College member or employee of the Essex County College.

- False Material Representation
I further certify that I understand that it is a crime in the second degree in New Jersey to knowingly make a material representation that is false in connection with the negotiation, award or performance of a government contract.

Name of Company

President or Authorized Agent

Signature

PREVAILING WAGE QUALIFICATION FORM

Bidder’s past record under the New Jersey Prevailing Wage Act (N.J.S.A. 34: 11-56.25 to 56.46 inclusive) and all acts amendatory thereof and supplemental thereto.

Special Instructions: Answer each question with a “yes” or “no” entered in the space provided and furnish additional information when required.

1. Has the bidder been notified by the Commissioner of Labor and Industry by notice issue pursuant to N.J.S.A. 34:11-56.37 that he or she has been blacklisted for failure to pay the prevailing wages as reacquired by the New Jersey Prevailing Wage Act? _____
2. Has any person having an “interest” in the Bidder within the meaning of N.J.S.A. 34: 11-56.38 been blacklisted as aforesaid? _____
3. Has any person having an interest in the Bidder within the meaning of N.J.S.A. 34: 11-56.38 had any “interest” as aforesaid, in any firm corporation or partnership been blacklisted as aforesaid? _____
4. If the answer to any of the aforesaid questions is “yes” annex a full statement showing the date of the action taken by the Commissioner of Labor and Industry, the subsequent action, if any, taken with respect to such action of the Commissioner, the name of the person, firm, corporation or partnership blacklisted by the Commissioner and nature, character and extent of the interest existing between the bidder and the name which was blacklisted as aforesaid.
5. If awarded this contract, (pursuant to N.J.A.C. 12:60-2.1 and 6.1 effective March 1, 1992) the bidder agrees to provide “Certified Copies” of all applicable “Payroll Records” for each pay period within ten (10) days of the payment of wages. All records shall be made available for inspection to all interested parties during normal business hours by the College.

“Payroll Record” means a form satisfactory to the Commissioner, wherein is shown employee information such as name, address, social security number, craft or trade, together with the actual hourly rate of pay, actually daily, overtime, and weekly hours worked in each craft or trade, gross pay, itemized deductions and net pay paid to the employee; such record shall also include:

- A Any fringe benefits paid to approved plans, funds, or programs on behalf of the employee; and
- B Fringe benefits paid in cash to the employee

NOTE: The College reserves the right to withhold progress and/or final payment(s) until all records have been received by the Purchasing Department.

Acknowledgment of the above:

By: _____

Firm: _____

Title: _____

PUBLIC WORKS EMPLOYERS FORM

NOTICE FOR CERTIFIED PAYROLL RECORDS

Please be advised that effective February 18, 1992, Regulation N.J.A.C. 12:60-2.1 and 6.1 of the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et. seq requires that all public works employers shall submit a certified Payroll record to the public body or lessor which contracted for the public work project each payroll period within ten (10) days of the payment of wages.

The public body shall receive, file, and make available for inspection during normal business hours the certified payroll records. A copy of the certified payroll form may be obtained by contacting the New Jersey Department of Labor, Division of Workplace Standards, Public Contracts Section, CN 389, Trenton, NJ 08625-0389, telephone number (609) 292-2259.

I have read the above statement and am aware of my responsibilities:

Contractor Signature **Date**

Payroll on this project will be on _____ **basis.**
Weekly *Bi-Weekly*

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ as
Principal, and _____ as
Surety, is _____

hereby held and firmly bound unto _____ as Owner, in the Penal
Sum of _____

(\$ _____) for the payment of which, well and
truly to be made, we hereby jointly and severally bind ourselves, successors, and assigns.

Signed this _____ day of _____ 20____

The condition of the above obligation is such that whereas the Principal has submitted to

a certain bid attached hereto and hereby made a part of hereof, to enter into a contract in writing for the

NOW, THEREFORE,

- A) If said bid shall be rejected or in the alternative,
- B) If said bid shall be accepted and the Principal shall execute and deliver a contract properly completed in accordance with the said bid and shall furnish a bond for his faithful performance of the said contract, and the payment of all persons performing labor or furnishing materials in the connection therewith, and shall in all other respects perform the agreement created by the acceptance of the said bid,

Then this obligation shall be void, otherwise the same shall remain in full force and effect; it is expressly understood and agreed that the liability of the surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such bid, and Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

BY: _____
Witness

Surety

BY: _____
Witness
Attorney-in-Fact

CONSENT OF SURETY

A performance bond will be required from the successful contractor on this project, and consequently, all bidders shall submit, with their bid, a consent of surety in substantially the following form:

To: _____
(Owner)

Re: _____
(Contractor)

(Project Description)

This is to certify that the _____
(Surety Company)

Will provide to _____ a
performance bond in _____
(Owner)

The full amount of awarded contract if the said contractor is awarded a contract for the above project.

(CONTRACTOR)

(Authorized Agent of Surety Company)

Date: _____

CONSENT OF SURETY MUST BE SIGNED BY AN AUTHORIZED AGENT OR REPRESENTATIVE OF A SURETY COMPANY AUTHORIZED TO DO BUSINESS IN NEW JERSEY AND NOT BY THE INDIVIDUAL OR COMPANY REPRESENTATIVE SUBMITTING THE BID/PROPOSAL.

PAYMENT BOND INCORPORATING THIS LANGUAGE

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____ hereinafter-called Principal,
(Corporation, Partnership or Individual)

and _____
(Name of Surety)

(Address of Surety)

Hereinafter called Owner, in the penal sum of _____
_____ Dollars, \$(_____)

In lawful money of the United States, for the payment of which sum will and truly be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with _____

Dated the _____ day of _____, 20____, a copy of which is hereto attached and made a part hereof for the construction of:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricant, oil gasoline, coal and coke repairs on machinery, equipment and tools consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor used to perform such work whether by the subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value, received hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder of the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, the extension of time, alteration or addition to the terms of the contract or the work or the specifications.

PROVIDED, FURTHER, that no final settlement between Essex County College and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts,
(Number)

each one of which shall be deemed an original, this the _____ day of _____, 20__

ATTEST:

(Principal Secretary)

(SEAL)

(Witness as to Principal)

(Address)

ATTEST:

(Surety Secretary)

(SEAL)

(Witness as to Surety)

(Principal)

BY: _____

(Address)

BY: _____
(Attorney-in Fact)

(Address)

NOTE: Date of Bond must not be before date of Contract. If Contractor is Partnership,
All partners should execute the bond.

IMPORTANT: Surety companies executing bonds and Consent of Surety Form herein must be licensed to transact
business in the State of New Jersey.

SURETY DISCLOSURE STATEMENT AND CERTIFICATION

_____, surety(ies) on the attached bond, hereby certifies (y) the following:

- (1) The surety meets the applicable capital and surplus requirements of R.S.17: 17-6 or R.S.17: 17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.
- (2) The capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, _____(most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

_____.

- (3) (a) Concerning each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury and certificate of authority pursuant to 31 U.S.C. §9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each such surety that surety's underwriting limitation and the effective date thereof):

_____.

(b) Concerning each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to R.S.17:18-9 as of (date on which such limitation was so established is as follows: (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established):

_____.

- (4) The amount of the bond to which this statement and certification is attached is \$ _____.

(5) If, under one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as outlined in items (3)(a) or (3)(b) above, or both, then for each such contract of reinsurance:

(a) The name and address of each such reinsurer under that contract and the amount of that reinsurer's participation in the contract is as follows:

_____;

(b) Each surety that is a party to any such contract of reinsurance certifies that each reinsurer listed under item (5) (a) satisfies the credit for reinsurance requirement established under P.L. 1993, c.243 (C.17:51B-1 et seq.) and any applicable regulations in effect as of the date on which the bond to which this statement and certification are attached shall have been filed with the appropriate public agency.

CERTIFICATE

(To be completed by an authorized certifying agent for each surety on the bond)

I _____, as _____
(Name of agent) (Title of agent)

for _____, a corporation/mutual
(Name of surety)

Insurance company/other (indicating type of business organization) (circle one) domicile

in _____, DO HEREBY CERTIFY that, to the
(State of domicile)

best of my knowledge, the foregoing statements made by me are true and
ACKNOWLEDGE that, if any of those statements are false, this bond is VOID.

**THIS STATEMENT AND CERTIFICATION SHALL BE COMPLETE IN ALL
RESPECTS AND DULY ACKNOWLEDGED ACCORDING TO LAW AND ATTACHED
TO THE PAYMENT OR PERFORMANCE BOND.**

EQUIPMENT CERTIFICATION

The undersigned Bidder hereby certifies as follows:

The bidder owns, controls, or has proof of lease of all the necessary equipment required to accomplish the work described in the specifications. To the extent that said equipment is not currently owned or under lease by the bidder, attached hereto is documentation from that owner or leasing organization that states the equipment will be available as required by the bidder upon award of a contract.

Name of Bidder: _____

By: _____
(Signature)

Name of above: _____
(Print)

Title: _____

Date: _____

SUBCONTRACTOR CERTIFICATION

NAME OF SUBCONTRACTOR: _____

ADDRESS: _____

SUBCONTRACT SPECIALTY: _____

I, the undersigned, do hereby certify that

(1) I am _____ of _____
(TITLE) (FIRM NAME)

(2) _____ is a
(FIRM NAME)
(CORPORATION, PARTNERSHIP, SOLE PROPRIETORSHIP)

(3) _____ is owned at
(FIRM NAME)

(4) _____
(SBE, MBE, WBE, MWBE, & NON-SBE/MBE/WBE/MWBE)

Small business, minority business, women business, minority women business, and non-small/minority/women/minority women business (choose one appropriate) must complete this form. **ALL of the above statements are true. I understand that if any are willfully false, I am subject to punishment.**

Subscribed and sworn to before me

This ____ day of ____, 20____.

(Seal) Notary Public of New Jersey
Specify Other State
My Commission expires _____, 20____.

Small Business Enterprise Outreach Policy

Policy Statement

It is the policy of Essex County College to promote equal business opportunity in connection with the College's contracting process by encouraging full and equitable participation by Small Business Enterprises (SBE's) in the provision of goods and services to the College on a contractual basis.

Small Business Enterprises (SBE's)

Any business that employs less than 10 people will be deemed an SBE.

Required Outreach Efforts

Each contractor is expected to engage in aggressive outreach efforts to small subcontractors. These efforts should include but not be limited to:

1. Contracting the NJ Commerce and Economic Growth Commission, Office of Business Services, for a list of certified SBE's.
2. Mail/Fax a bid solicitation letter including information on subcontracting opportunities to at least five (5) SBE subcontractors in each trade to be subcontracted at least two weeks before the bid submission deadline.
3. Complete Schedule B attachment verifying outreach efforts.

Each contractor must provide documentation to support that these minimum outreach efforts have been made. Failure to engage in the minimum outreach efforts outlined above may disqualify a prospective bidder from award consideration.

Listing of Certified SBE's

Prospective contractors can obtain a list of certified SBE's from New Jersey Selective Assistance Vendor Information (NJSAVI) found on the internet or by:

Division of Revenue & Enterprise Services
(609) 292-2146
www.business.nj.gov

SCHEDULE B (continued)

(1) List RESOURCES utilized to identify potential subcontractors that employ less than 100 people.

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

(2) List any other relevant outreach efforts utilized.

A. _____

B. _____

C. _____

D. _____

(3) Additional relevant information:

All of the above statements are true. I understand that if any are willfully false, I am subject to punishment.

Subscribed and sworn to before me

This ____ day of ___, 20____.

(Seal) Notary Public of New Jersey
Specify Other State
My Commission expires _____, 20____.

Minority Business Enterprise Outreach Policy

Policy Statement

It is the policy of Essex County College to promote equal business opportunity in connection with the College's contracting process by encouraging full and equitable participation by Minority Business Enterprises (MBE's) in the provision of goods and services to the College on a contractual basis.

Minority Business Enterprises (MBE's)

Any business whose management and daily business operations are controlled by one or more minorities who own it, and which is at least 51% owned by one or more minorities will be deemed an MBE.

Required Outreach Efforts

Each contractor is expected to engage in aggressive outreach efforts to minority subcontractors. These efforts should include but not be limited to:

1. Contracting the NJ Commerce and Economic Growth Commission, Division of Minority and Women Business Development, for a list of certified MBE's.
2. Mail/Fax a bid solicitation letter including information on subcontracting opportunities to at least five (5) MBE subcontractors in each trade to be subcontracted at least two weeks before the bid submission deadline.
3. Complete Schedule B attachment verifying outreach efforts.

Each contractor must provide documentation to support that these minimum outreach efforts have been made. Failure to engage in the minimum outreach efforts outlined above may disqualify a prospective bidder from award consideration.

Listing of Certified MBE's

Prospective contractors can obtain a list of certified MBE's from New Jersey Selective Assistance Vendor Information (NJSAVI) found on the internet or by:
:

Division of Revenue & Enterprise Services
(609) 292-2146
www.business.nj.gov

SCHEDULE B (continued)

(1) List RESOURCES utilized to identify potential subcontractors that employ less than 100 people.

A. _____

B. _____

C. _____

D. _____

E. _____

G. _____

(2) List any other relevant outreach efforts utilized.

A. _____

B. _____

C. _____

D. _____

(3) Additional relevant information:

All of the above statements are true. I understand that if any are willfully false, I am subject to punishment.

Subscribed and sworn to before me

This ____ day of ___, 20 ____.

(Seal) Notary Public of New Jersey
Specify Other State
My Commission expires _____, 20 ____.

Women Business Enterprise Outreach Policy

Policy Statement

It is the policy of Essex County College to promote equal business opportunity in connection with the College's contracting process by encouraging full and equitable participation by Women Business Enterprises (WBE's) in the provision of goods and services to the College on a contractual basis.

Women Business Enterprises (WBE's)

Any business whose management and daily business operations are controlled by one or more women who own it, and which is at least 51% owned by one or more women will be deemed a WBE.

Required Outreach Efforts

Each contractor is expected to engage in aggressive outreach efforts to women subcontractors. These efforts should include but not be limited to:

1. Contracting the NJ Commerce and Economic Growth Commission, Division of Minority and Women Business Development, for a list of certified WBE's.
2. Mail/Fax a bid solicitation letter including information on subcontracting opportunities to at least five (5) WBE subcontractors in each trade to be subcontracted at least two weeks before the bid submission deadline.
3. Complete Schedule B attachment verifying outreach efforts.

Each contractor must provide documentation to support that these minimum outreach efforts have been made. Failure to engage in the minimum outreach efforts outlined above may disqualify a prospective bidder from award consideration.

Listing of Certified WBE's

Prospective contractors can obtain a list of certified WBE's from New Jersey Selective Assistance Vendor Information (NJSAVI) found on the internet or by:

Division of Revenue & Enterprise Services
(609) 292-2146
www.business.nj.gov

SCHEDULE B (continued)

(1) List RESOURCES utilized to identify potential subcontractors that employ less than 100 people.

A. _____

B. _____

C. _____

D. _____

E. _____

H. _____

(2) List any other relevant outreach efforts utilized.

A. _____

B. _____

C. _____

D. _____

(3) Additional relevant information:

All of the above statements are true. I understand that if any are willfully false, I am subject to punishment.

Subscribed and sworn to before me

This ____ day of __, 20____.

(Seal) Notary Public of New Jersey

Specify Other State

My Commission expires _____, 20____.

DISCLOSURE OF INVESTIGATION AND ACTIONS INVOLVING BIDDER

The bidder shall provide a detailed description of any investigation, litigation, including administrative complaints or other administrative proceedings, involving any public sector clients during the past five years including the nature and status of the investigation, and, for any litigation, the caption of the action, a brief description of the action, the date of inception, current status, and, if applicable, disposition.

Investigation:

Indicate "NONE" in the "Person or Entity" field if no investigation where undertaken.

Person or Entity	
Date of Inception	
Caption of Action	
Brief Description of the action	
Current Status	
Disposition Status (if applicable)	

All Answers to the above shall be submitted and certified by the principal/partner of the bidding entity authorized to do so.

I certify that all answers submitted above are true and correct:

Name of Company _____

Officer of the Bidder's name _____

Officer of the Bidder's Signature _____

***Attach/Add Investigation Information**

LIST OF SUBCONTRACTORS PURSUANT TO N.J.S.A. 18A:64A-25.25

The Bidder confirms that the Subcontractors listed below will be awarded the subcontract for the work identified if the Bidder is awarded the contract for the Project.

*** Certification for all PRIME SUBCONTRACTORS and other subcontractors such as CAST-IN-PLACE CONCRETE/MASONRY, FIRE STANDPIPE, FIRE PROTECTION, ELEVATORS, where applicable, must include DPMC, DPMC 701, NJ Prevailing Wage Determination Form, Equal Employment Opportunity, NJ Anti-Discrimination, ADA.**

PLUMBING:

Company Name: _____

City/State: _____

Phone: _____

Contact: _____

Bid Amount: _____

HVAC:

Company Name: _____

City/State: _____

Phone: _____

Contact: _____

Bid Amount: _____

ELECTRICAL:

Company Name: _____

City/State: _____

Phone: _____

Contact: _____

Bid Amount: _____

STRUCTURAL STEEL:

Company Name: _____

City/State: _____

Phone: _____

Contact: _____

Bid Amount: _____



State of New Jersey

DEPARTMENT OF THE TREASURY
DIVISION OF PROPERTY MANAGEMENT AND
CONSTRUCTION
33 W. STATE STREET
PO BOX 034
TRENTON, NEW JERSEY 08625-0034

REPLY TO:
TEL: (609) 943-3400
FAX: (609) 292-7651

TOTAL AMOUNT OF UNCOMPLETED CONTRACTS

(This form is to be used with the NOTICE OF CLASSIFICATION when submitting bids to the Department of

Education.) I Certify that the amount of uncompleted work on contracts is \$_____.

The amount claimed includes uncompleted portions of all currently held contracts from all sources (public and private) in accordance with N.J.A.C. 17:19-2.13.

I further certify that the amount of this bid proposal, including all outstanding incomplete contracts does not exceed my prequalification dollar limit.



Respectfully submitted,

By _____
Name of Firm

Signature

Title

Business Address

Phone

Sworn to and
Subscribed before
Me This ____ day of 20__

**CONTRACT LANGUAGE YOU MUST
READ**

INSTRUCTIONS TO BIDDERS AND STATUTORY REQUIREMENTS

The Bidder and the Owner agree to the following terms and conditions. The bid documents and the contract terms and conditions constitute the agreement between the parties.

The word "bid" / "proposal" herein is intended to be all-inclusive of any and all types of bids, proposals, etc., to be submitted.

- A. It is the bidder's responsibility to present bids/proposals to the owner before or at the time and the place designated. Bids/Proposals may be hand-delivered or mailed; however, the owner disclaims any responsibility for bids/proposals forwarded by regular or overnight mail. Bids/Proposals sent by express mail or delivery service must either
1. Include the designation, above on the outside of the express mail or service envelope; or
 2. Must be in a separate envelope inside the delivery envelope and the envelope marked as required above. Bids/Proposals received after the designated time and date will be returned unopened.
- B. Sealed bids/proposals forwarded to the owner before the time of opening of bids/proposals may be withdrawn upon written application of the bidder who shall be required to produce evidence showing that the individual is or represents the principal or principals involved in the bid/proposal. Once bids/proposals have been opened, they shall remain firm for sixty (60) calendar days.
- C. More than one bid/proposal from an individual, any business entity, regardless of structure, or association under the same names shall not be considered.
- D. All prices and amounts must be written in ink or preferably machine-printed. Bids/Proposals containing any conditions, omissions, unexplained erasures or alterations, items not called for in the bid proposal form, attachment of additive information not required by the specifications, or irregularities of any kind, may be cause for rejection by the owner following applicable law. Any changes, whiteouts, strikeouts, etc. in the bid/proposal must be initialed in ink by the person signing the bid/proposal.
- E. Each bid proposal form must give the full business name and address, business phone, fax, e-mail, and the contact person of the bidder, and be signed by an authorized representative as follows:
1. Bids/Proposals by partnerships must be signed in the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the person signing.
 2. Bids/proposals by corporations must be signed in the legal name of the corporation, followed by the name of the State in which incorporated and must contain the signature and designation of the president, secretary, or other person authorized to bind the corporation in the matter.
 3. Bids/proposals by sole-proprietorship shall be signed by the proprietor.
 4. When requested, satisfactory evidence of the authority of the officer signing shall be furnished.
- F. Bidder should be aware of the following statutes that represent "Truth in Contracting" laws:
1. N.J.S.A. 2C:21-34, et seq. governs false contract payment claims and representations by bidders. It is a serious crime for the bidder to knowingly submit a false contract payment claim and/or knowingly make a material misrepresentation.
 2. N.J.S.A. 2C:27-10 provides that a public servant commits a crime if said public servant solicits or receives a benefit directly or indirectly, for an official act performed or to be performed by a public servant, which is a violation of official duty.
 3. N.J.S.A. 2C:27-11 provides that a bidder commits a crime if a said person, directly or indirectly, confers or agrees to confer any benefit not allowed by law to a public servant.
 4. The bidder should consult the statutes or legal counsel for further information.
- G. **LICENSING**
The contractor represents that it possesses any license or permits that may be required to perform its Contract work.
- H. **OSHA**
The contractor shall comply with all applicable requirements of the Occupational Safety and Health Act, 29 U.S.C. 15, in the performance of the work and services of this Contract.
- I. **APPLICABLE STATE LAW REGARDING CLAIMS**
This Contract is subject to all provisions of the New Jersey Tort Claims Act, N.J.S.A. 59:1-1 et seq., and the New Jersey Contractual Liability Act, N.J.S.A. 59:13-1 et seq.
- J. **Pay-to-Play Disclosure** - Business entities are advised of their responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44A-20.27 if they receive contracts in excess of \$50,000 from public entities in a calendar year. Business entities are responsible for determining if filing is necessary. Additional information on this requirement is available from ELEC at 888-313-3532 or www.elec.state.nj.us.

- K. Official Request for Bid/Proposal packages is available from the owner's website at purchasing@essex.edu with a non-refundable fee mentioned on the Legal Notice to Bidders to prospective respondents. All addenda are posted on this site. Potential respondents are cautioned that they respond at their own risk if a third party supplied the specifications that may or may not be complete. The owner is not responsible for the third-party-provided documents. Respondents are urged to register their contact information on the owner's website so that the college can send any addenda to these specifications to them.

BID SECURITY AND BONDING REQUIREMENTS

A. BID GUARANTEE

Bidder shall submit with the bid/proposal a certified check, cashier's check, or bid bond in the amount of ten percent (10%) of the total price bid, but not in excess of \$20,000, payable unconditionally to the owner. When submitting a Bid Bond, it shall contain Power of Attorney for the full amount of the Bid Bond from a surety company authorized to do business in the State of New Jersey and acceptable to the owner. *The check or bond of the bidder to whom the contract is awarded shall be retained until a contract is executed and the required performance bond or other security is submitted.* The check or bond of the successful bidder shall be forfeited if the bidder fails to enter into a contract pursuant to N.J.S.A. 18A:64A-25.16.

The Bid Bond shall include a valid Power of Attorney authorizing the Attorney-in-Fact to execute the documents. Failure to submit a bid guarantee shall result in rejection of the bid/proposal.

B. CONSENT OF SURETY

Bidder shall submit with the bid a Certificate (Consent) of Surety with Power of Attorney for the full amount of bid price from a Surety Company authorized to do business in the State of New Jersey, and acceptable to the owner stating that it will provide said bidder with a Performance Bond in the full amount of the bid. This certificate shall be obtained in order to confirm that the bidder to whom the contract is awarded will furnish Performance and Payment Bonds from an acceptable surety company on behalf of said bidder, any or all subcontractors or by each respective subcontractor, or by any combination thereof which results in performance security equal to the total amount of the contract, pursuant to N.J.S.A. 18A:64A-25.17.

The Consent of Surety shall include a valid Power of Attorney authorizing the Attorney-in-Fact to execute the documents. Failure to submit a Consent of Surety form shall result in rejection of the bid/proposal.

C. PERFORMANCE BOND

The successful bidder shall simultaneously with the delivery of the executed contract, submit an executed bond in the amount of one hundred percent (100%) of the acceptable bid as security for the faithful performance of this contract.

The performance bond provided shall not be released until final acceptance of the whole work and then only if any liens or claims have been satisfied. The surety on such bond or bonds shall be a duly authorized surety company authorized to do business in the State of New Jersey pursuant to N.J.S.A. 17:31-5. For multi-year contracts, the Performance Bond may be resubmitted each year on the Contract Anniversary Date for the amount remaining on the contract.

Failure to submit this with the executed contract shall be cause for declaring the contract null and void pursuant to N.J.S.A. 18A:64A-25.17.

D. LABOR AND MATERIAL (PAYMENT) BOND

The successful bidder shall with the delivery of the performance bond submit an executed payment bond to guarantee payment to laborers and suppliers for the labor and material used in the work performed under the contract.

Failure to submit a labor and material bond with the performance bond shall be cause for declaring the contract null and void.

E. MAINTENANCE BOND

Upon acceptance of the work by the owner, the contractor shall submit a maintenance bond (N.J.S.A. 18A:64A-25.17) in an amount not to exceed 100% of the project costs guaranteeing against the defective quality of work or materials for the period of one year.

REVISIONS AND ADDENDA

- A. The bidder understands and agrees that its bid/proposal is submitted based on the specifications prepared by the owner. The bidder accepts the obligation to become familiar with these specifications.
- B. Bidders are expected to examine the specifications and related bid/proposal documents with care and observe all their requirements. Ambiguities, errors, or omissions noted by bidders should be promptly reported in writing to the contracting agent. Any prospective bidder who wishes to challenge a bid/proposal specification shall file such challenges in writing with

the contracting agent no less than three business days before the opening of the bids/proposals. *Challenges filed after that time shall be considered void and have no impact on the county college or the award of a contract. In the event, that the bidder fails to notify the owner of such ambiguities, errors, or omissions, the bidder shall be bound by the requirements of the specifications and the bidder's submitted bid/proposal.*

- C. No oral interpretation and or clarification of the meaning of the specifications for any goods and services will be made to any bidder. Such request shall be in writing, addressed to the owner's representative stipulated in the specification. To be given consideration, *a written request must be received at least three (3) business days before the date fixed for the opening of the bid/proposal for goods and services, and construction bids.*
- D. *All revisions and addenda to the specifications and notice will be in writing and will be provided through an advertisement in The Star-Ledger, sent to potential bidders who provided a physical mail address when obtaining a copy of the bid/proposal package, or had submitted a bid/proposal submission. All addenda so issued shall become part of the specification and bid/proposal documents and shall be acknowledged by the bidder in the bid by completing the Acknowledgement of Receipt of Addenda form. The owner's interpretations or corrections thereof shall be final.*

When issuing addenda, the College shall provide required notice before the official receipt of bids/proposals to any person who has submitted a bid/proposal or who has received a bid/proposal package. They will be sent from certified mail or by certified facsimile transmission.

E. Discrepancies in Bids/Proposals

- 1. If the amount shown in words and its equivalent in figures do not agree, the written words shall be binding. Ditto marks are not considered writing or printing and shall not be used.
- 2. If there is a discrepancy between the unit prices and the extended totals, the unit prices shall prevail. In the event there is an error in the summation of the extended totals, the computation by the owner of the extended totals shall govern.

F. Optional Pre-Bid/Proposals Conference

Attendance is not mandatory but is strongly recommended. Failure to attend does not relieve the bidder of any obligations or requirements

BRAND NAMES, STANDARDS OF QUALITY, AND PERFORMANCE

- A. Brand names and/or descriptions used in these specifications are to acquaint bidders with the types of goods and services desired and will be used as a standard by which goods and services offered as equivalent will be evaluated.
- B. When a specification uses "brand name or equivalent," the listed brand name shall serve as a reference or point of comparison for the functional or operational characteristic desired for the good or service being requested. Where a bidder submits an equivalent, it shall be the responsibility of the bidder to document the equivalence claim. Failure to submit such documentation shall be grounds for rejection of the claim of equivalence.
- C. In submitting its bid, the bidder certifies that the goods and services to be furnished will not infringe upon any valid patent or trademark and that the successful bidder shall, at its own expense, defend any actions or suits charging such infringement, and will save the owner harmless from any damages resulting from such infringement.
- D. The contractor shall guarantee any or all goods and services supplied under these specifications. Defective or inferior goods shall be replaced at the expense of the contractor. The contractor will be responsible for return freight or restocking charges.

CERTIFICATES OF THE REQUIRED INSURANCE

Certificates of Insurance for those policies required above shall be submitted with the contract. Such coverage shall be with an insurance company authorized to do business in the State of New Jersey and shall name the owner as an additional insured.

Self-insured contractors shall submit an affidavit attesting to their self-insured coverage and shall name the owner as an additional insured.

INDEMNIFICATION

To the fullest extent permitted by law, the Contractor will defend, indemnify and save harmless Owner, Owner's Representative, Architect, their affiliates and agents, their respective members, officers, directors, and employees, (each an "Indemnitee", collectively the "Owner Indemnitees") from and against any and all liability (including, but not limited to, statutory liability), loss, damages, interest, judgments, claims and liens growing out of, and any and all costs and expenses (including, but not limited to, attorneys' fees and disbursements) arising out of or incurred in connection with, any and all claims, demands, suits, actions, and/or proceedings which shall be made or brought against any of the Owner Indemnitees and without any contribution from any Indemnitee or insurer thereof for or in relation to: (a) any (or any alleged) injury to, or death of, any person or persons (including, but not limited to, officers, directors, and employees of any of the Owner Indemnitees or of Contractor or its Subcontractors) or any (or any alleged) damage to or loss of the use of property (including, but not limited to, property of any of the Owner

Indemnitees) or otherwise, arising out of or in connection with the performance of the Work and which shall be (or shall be alleged to be) in whole or in part due to or the result of any act, omission, negligence, carelessness, or unlawful conduct on the part of Contractor, its agents, or subcontractors, or anyone directly or indirectly employed by any of them, or a default of Contractor in performance of any of its obligations hereunder; and (b) any infringement or alleged infringement of any patent, trademark, or copyright growing out of the performance of the Work and/or the use therein of any material, equipment, or process supplied by or through Contractor. The contractor's agreement to defend and indemnify extends to the Owner Indemnitee's concurrent or partial negligence, whether actual or alleged, to the fullest extent permitted by law. Notwithstanding anything to the contrary herein, the Contractor shall have no indemnity obligation under this paragraph to the extent such claim, loss, liability, damage, cost, or expense arises out of the sole proven negligence or unlawful conduct of an Owner Indemnitee.

The Contractor shall indemnify and hold harmless all of the Owner Indemnitees from and against any costs, and expenses (including reasonable attorney's fees) incurred by any of the Owner Indemnitees in enforcing any of the Contractor's defense, indemnity, and hold-harmless obligations under this Agreement.

LIABILITY FOR DEFECTIVE SERVICES:

Notwithstanding any payment or payments by Owner hereunder, Contractor shall be liable to Owner for all injuries sustained by Owner, its employees, officers, trustees, officials, directors, managers, and agents' employees, and any third party, by reason of any failure of Contractor to properly discharge its contractual obligations to Owner, its unsafe activities, its negligence, or its intention misconduct.

PRICING INFORMATION FOR PREPARATION OF BIDS/PROPOSALS

- A. The owner is exempt from any local, state, or federal sales, use, or excise tax. The owner will not pay for N.J. State Sales and Use Tax that is included in any invoices.
- B. Estimated Quantities: The owner has attempted to identify the item(s) and the estimated amounts of each item bid/proposal to cover its requirements; however, experience shows that the amount ordered may be different than that submitted for bidding. The right is reserved to decrease or increase the quantities specified in the specifications. **NO MINIMUM PURCHASE IS IMPLIED OR GUARANTEED.**
- C. The contractor shall be responsible for obtaining any applicable permits or licenses from any government entity that has jurisdiction to require the same. All bids/proposals submitted shall have included this cost.
- D. Bidders shall insert prices for furnishing goods and services required by these specifications. Prices shall be net, including any charges for packing, crating, containers, etc. All transportation charges shall be fully prepaid by the contractor, F.O.B. destination, and placement at locations specified by the owner. As specified, placement may require inside deliveries. No additional charges will be allowed for any transportation costs resulting from partial shipments made for the contractor's convenience.
- E. In the event of a public emergency declared at the local, state, or federal level before the expiration of the contract, if the owner opts to extend the terms and conditions of the contract, the contractor agrees to extend the terms and conditions of this specification, whether existing or expiring for no longer than six months, for construction for the duration of the emergency.

APPLICABLE LAW

This Contract and all litigation arising from or related to the Contract shall be governed by the County Colleges Contracts Law, N.J.S.A. 18A:64A-25.1 *et seq.*, and shall be governed by the applicable laws, and regulations, of the State of New Jersey without reference to conflict of laws principles. The Contractor shall comply with all applicable federal, state, and local laws, rules, and regulations. To the extent that applicable law requires that certain language be included in the Contract, such language shall be deemed included by reference.

VENUE

Any litigation resulting from this Contract shall be brought to the Superior Court of New Jersey, Essex County.

CONTRACT MODIFICATIONS

The owner reserves the right to issue Contract modifications, subject to mutual agreement between the Parties as to an equitable adjustment of the Contractor's compensation. All such amendments shall be in writing. Where the Parties cannot agree upon an equitable adjustment, the Owner may direct that the modification be implemented and adjust compensation in a reasonable matter as the Owner sees fit. In such circumstance, Contractor shall comply with the modification and, if so inclined, pursue a claim against Owner. In order for the Contractor to pursue such a claim, it must have notified the Owner in writing of its intent to do so within seven business days of its receipt of the written directive from the Owner to proceed over the Contractor's objection. All Contract modifications must be signed by the Owner's Representative designated below on behalf of the Owner.

WAIVER BY OWNER

Notwithstanding any language found elsewhere in the Contract, Owner shall not be deemed to have waived any right of Owner or requirement of Contractor unless such waiver is found in a writing signed by the Owner's Representative designated below and specifically and expressly stating the precise nature of the intended waiver. No such waiver by the Owner shall be implied.

INTERPRETATION

If any provision in this Contract is found to be ambiguous, it is agreed that such ambiguity need not be resolved against the drafter.

COUNTERPARTS

This Contract may be executed in any number of counterparts and all of such counterparts shall for all purposes constitute one agreement binding on the parties hereto, notwithstanding that all Parties are not signatories to the same counterpart. For purposes of this Contract, a counterpart signed by facsimile or other electronic means shall constitute an original. Any Party delivering an executed counterpart of this Contract by electronic means shall, if requested, also deliver an original executed counterpart, but the failure to deliver an originally executed counterpart shall not affect the validity of this Contract.

STATUTORY AND OTHER REQUIREMENTS

The following are mandatory requirements of this bid and contract.

A. MANDATORY AFFIRMATIVE ACTION CERTIFICATION

No firm may be issued a contract unless it complies with the affirmative action provisions of N.J.S.A. 10:5-31 and N.J.A.C. 17:27 as administered by the Division of Purchase & Property Contract Compliance and Audit Unit (Division) and provided below. The contract will include the language included in this specification.

1. Goods, General Services, Professional Service, and Construction Contracts

Each contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

- a. A Letter of Federal Approval indicating that the vendor is under an existing federally approved or sanctioned affirmative action program. A copy of the approval letter must be provided by the vendor to the Public Agency and the Division. This approval letter is valid for one year from the date of issuance.
- b. A Certificate of Employee Information Report (hereafter "Certificate"), issued in accordance with N.J.A.C. 17:27. The vendor must provide a copy of the Certificate to the Public Agency as evidence of its compliance with the regulations. The Certificate represents the review and approval of the vendor's Employee Information Report, Form AA-302 by the Division.
- c. The successful bidder shall complete an Initial Employee Report, Form AA-302, and submit it to the Division with a check or money order for \$150.00 made payable to "Treasurer, State of NJ" and forward a copy of the Form to the Public Agency. Upon submission and review by the Division, the Report shall constitute evidence of compliance with the regulations

B. NEW JERSEY ANTI-DISCRIMINATION

The contract for this bid shall require that the contractor agrees not to discriminate in employment and agrees to abide by all anti-discrimination laws including but not limited to N.J.S.A. 10:2-1 as included in Attachment B of this document.

C. AMERICANS WITH DISABILITIES ACT OF 1990

Discrimination on the basis of disability in contracting for the purchase of goods and services is prohibited. If awarded the contract, the contractor is required to comply with requirements related to the Americans with Disabilities Act as provided in this specification as Attachment C. The contractor is obligated to comply with the Act and to hold the owner harmless for any violations committed under the contract.

D. STATEMENT OF OWNERSHIP

N.J.S.A. 52:25-24.2 provides that no business organization regardless of the form of ownership shall be awarded any contract for the performance of any work or the furnishing of any goods and services, unless, **prior to the receipt of the bid or accompanying the bid** of said business organization, bidders shall submit a statement setting forth the names and addresses of all persons and entities that own ten percent or more of its stock or interest of any type at all levels of ownership. The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member exceeding the ten percent ownership, has been listed.

The included Statement of Ownership shall be completed and attached to the bid proposal. This requirement applies to all forms of business organizations, including, but not limited to, corporations and partnerships, publicly-owned corporations, limited partnerships, limited liability corporations, limited liability partnerships, sole proprietorship, and Subchapter S

corporations. Failure to submit a disclosure document shall result in rejection of the bid as it cannot be remedied after bids have been opened.

Not-for-profit entities should fill in their name, check the not-for-profit box, and certify the form. No other information is necessary.

E. PROOF OF BUSINESS REGISTRATION

Pursuant to N.J.S.A. 52:32-44, Essex County College is prohibited from entering into a contract with an entity unless the bidder/proposer/contractor and each subcontractor that is required by law to be named in a bid/proposal/contract have a valid Business Registration Certificate on file with the Division of Revenue and Enterprise Services within the Department of the Treasury.

Prior to contract award or authorization, the contractor shall provide the Contracting Agency with its proof of business registration and that of any named subcontractor(s). Subcontractors named in a bid or other proposal shall provide proof of business registration to the bidder, who in turn, shall provide it to the Contracting Agency prior to the time a contract, purchase order, or another contracting document is awarded or authorized.

During the course of contract performance:

1. the contractor shall not enter into a contract with a subcontractor unless the subcontractor first provides the contractor with valid proof of business registration.
2. the contractor shall maintain and submit to the Contracting Agency a list of subcontractors and their addresses that may be updated from time to time.
3. the contractor and any subcontractor providing goods or performing services under the contract, and each of their affiliates, shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1) on all sales of tangible personal property delivered into the State. Any questions in this regard can be directed to the Division of Taxation at (609) 292-6400. Form NJ-REG can be filed online at www.state.nj.us/treasury/revenue/busregcert.shtml.

Before final payment is made under the contract, the contractor shall submit to the Contracting Agency a complete and accurate list of all subcontractors used and their addresses.

Pursuant to N.J.S.A. 54:49-4.1, a business organization that fails to provide a copy of business registration as required, or that provides false business registration information, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000, for each proof of business registration not properly provided under a contract with a contracting agency.

Emergency Purchases or Contracts

For purchases of an emergent nature, the contractor shall provide its Business Registration Certificate within two weeks from the date of purchase or execution of the contract or before paying for goods or services, whichever is earlier.

F. DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

N.J.S.A. 52:32-55 prohibits State and local public contracts with persons or entities engaging in certain investment activities in the energy or finance sectors of Iran. Bidders must indicate if they comply with the law by certifying the form. Pursuant to N.J.S.A.18A:64A-25.43, the owner is required to notify the New Jersey Attorney General if it determines a false certification has been submitted.

G. DISCLOSURE OF RUSSIA OR BELARUS

Pursuant to New Jersey Executive Order #291, Essex County College will not enter into a contract for work with any person, company, or firm that invests directly in companies owned or controlled by the government of Russia, Belarus, or its instrumentalities. Bidders must indicate whether they comply with the law by certifying the form.

H. PURCHASE ORDER REQUIRED

No contractor or vendor shall commence any project, provide any service or deliver any goods until he/she receives an approved purchase order authorizing work to begin or goods to be delivered.

I. DEBARMENT, SUSPENSION, OR DISQUALIFICATION – Federal Executive Orders #12549, #12689, and N.J.S.A. 52:32-44.1 (P.L. 2019, c.406).

Essex County College will not enter into a contract for work with any person, company, or firm that is on the State Department of Labor and Workforce Development; Prevailing Wage Debarment List, the State of New Jersey Consolidated Debarment Report; and the Federal Debarred Vendor List – Exclude Parties List System. (www.state.nj.us/treasury/debarred).

All bidders are required to submit a sworn statement indicating whether or not the bidder is, at the time of the bid, included on the State Department of Labor and Workforce Development; Prevailing Wage Debarment List, or the State of New Jersey Consolidated Debarment Report, or the Federal Debarred Vendor List – Excluded Parties List System.

J. QUALIFICATION OF BIDDERS – CONTRACTOR QUESTIONNAIRE CERTIFICATION FORM

Essex County College may make such investigations as it seems necessary to determine the ability of the bidder to perform the terms of the contract. The bidder shall complete a Contractor Questionnaire Certification Form and return same with the proposal and shall furnish all information to the College that the College may require to determine the contractor's ability to perform the duties and obligations as outlined in these specifications.

All bidders are reminded that proposals may be rejected as not being responsive, therefore bidders are asked to complete the Questionnaire and to provide any supporting documents with the proposal package.

K. NOTICE OF EQUIPMENT AND MATERIALS CHANGES

The contractor shall notify Essex County College of impending changes in or discontinuation of models or specifications in materials or equipment known to him at the time of delivery and to deliver only the latest model and design of equipment specified at the time of delivery unless notified otherwise by the College.

L. WARRANTY

The contractor will replace without charge for materials, labor, or transportation any and all parts found defective within one year from the date of final acceptance.

If equipment fails to function properly for any reason whatsoever (other than negligence on the part of a College employee) within the first thirty days after delivery, it shall be replaced with new equipment under the conditions of warranty and manufacturer's guarantee as stated for new equipment or replacement.

SERVICE

During the warranty period, the Contractor will furnish field service within a twenty-four (24) hour period. The Contractor will provide loaner equipment, comparable to the equipment furnished, at no cost to Essex County College, if any equipment breakdown occurs which cannot be repaired within the twenty-four (24) hour service period.

The contractor shall provide at the time of delivery, service and operational manuals, schematics, parts lists, and any other technical data on each category of equipment purchased; listing the manufacturer's name, model number, and modifications. All the above data shall correspond to the equipment purchased.

Vehicles and equipment to receive pre-delivery inspection and service according to the manufacturer's specifications.

Operation instructions and manuals will be provided by the Contractor's representative to Essex County College personnel at the time of equipment delivery.

M. DOCUMENTS

A certificate of ownership will be furnished.

Vehicles shall conform to Motor Vehicle Laws of the State of New Jersey and State inspection to be acquired before acceptance by the College.

In addition to equipment specified in basic specifications, vehicles shall be equipped with all other standard equipment as specified by the manufacturer and must be so equipped and constructed to permit Gross Vehicle Weight specified. Equipment shall be equipped following federal regulations, including OSHA.

N. AUTHORITY OF ESSEX COUNTY COLLEGE

On all questions concerning the interpretations of specifications, the acceptability, quality of materials of items furnished and work performed the classification of materials, the execution of the work, and the determination of payment due or to become due, the decision of the Essex County College Board of Trustees, or its designate, shall be final and binding.

O. FORCE MAJEURE

As used in this Agreement, an event of "Force Majeure" shall mean any event that: (a) prevents the affected Party (the "Affected Party") from performing its obligations under this Agreement or complying with any conditions required by the other Party under this Agreement, and (b) is unforeseeable and is beyond the reasonable control of and not the result of the fault or negligence of the Affected Party or such Affected Party's Personnel (or their Affiliates), and (c) could not have been prevented by the Affected Party's or its Personnel's (or their Affiliates) exercise of reasonable diligence. For purposes of clause (b) above, the following events shall be considered to be beyond the reasonable control of an Affected Party or its Personnel: war, civil insurrection, flash floods, hurricanes, tornadoes, typhoons, lightning strikes, earthquakes, epidemics,

quarantines, embargoes, riots, and sabotage. Notwithstanding anything in this Section to the contrary, in no instance will the following be considered events beyond Contractor's reasonable control or constitute a Force Majeure event: (i) strikes or labor disturbances involving the employees of Contractor or any of its Subcontractors or caused by any violation by Contractor or its Subcontractors of any labor agreements; (ii) price fluctuations with respect to labor or materials, supplies or components of equipment related to items to be supplied by Contractor under this Agreement; (iii) mere economic hardship (including as suffered by the Affected Party or its Personnel or any of their Affiliates), or (iv) normal climatic conditions (based upon a one hundred year period) at the Project Site.

Burden of Proof. The burden of proof as to whether a Force Majeure event has occurred shall be upon the party claiming a Force Majeure event.

Excused Performance. If the Affected Party is rendered wholly or partly unable to perform its obligations under this Agreement because of a Force Majeure event, such Affected Party will be excused from whatever performance is affected by the Force Majeure Event to the extent so affected, provided that:

1. the Affected Party, within twenty-four (24) hours after knowing of the occurrence of the Force Majeure event, gives the other Party written notice describing the particulars of the occurrence;
2. the suspension of performance resulting from such Force Majeure event shall be of no greater scope and no longer duration than is reasonably required by the Force Majeure event;
3. no obligations of either Party which arose before the occurrence causing the suspension of performance are excused as a result of the occurrence;
4. the Affected Party must continue to perform its obligations under this Agreement to the extent possible, and the Affected Party must use all reasonable efforts to overcome, mitigate and remedy the damages, delays, and effects of the Force Majeure and its inability to perform its obligations under this Agreement as a result thereof; and
5. when the Affected Party is able to resume performance of its obligations hereunder, that Party shall give the other Party written notice to that effect and shall promptly resume such performance.

P. SUBCONTRACTS

Prior to awarding any subcontract, the Contractor shall notify the Owner and Architect or Engineer of the name of each proposed subcontractor and the amount of the subcontract. The owner shall have the right to reject any subcontractor who does not establish to the satisfaction of the Owner its experience, competence, and financial ability to perform the Work. Owner agrees to act diligently upon receipt from Contractor of the names of proposed subcontractors and shall not delay the award of any subcontract to a subcontractor deemed acceptable to Owner.

If Owner disapproves of a proposed subcontractor, it may direct the Contractor to award such work to an alternate subcontractor of the Owner's choosing provided that if an increase in the cost of performing the Work or furnishing the materials caused by the award of such subcontract to the alternate subcontractor shall result, Owner, shall have the option to permit the original subcontractor to work or approve a Change Order in accordance with "Changes in the Work" herein, and an appropriate adjustment of the Contract Sum.

By appropriate written agreement, the Contractor shall require each subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all obligations and responsibilities which the Contractor assumes toward the Owner. The contractor shall make available to each subcontractor copies of the Contract Documents to which the subcontractor will be bound.

All subcontracts and purchase orders shall include provisions that: (a) they are assignable to Owner, or another contractor designated by Owner, without consent of the subcontractor; (b) that upon such an assignment becoming effective such subcontractor will be bound to Owner or such contractor designated by Owner as fully and in the same manner as such subcontractor is bound to Contractor under such subcontract; and (c) that upon such assignment becoming effective all sureties of the obligations of such subcontractor shall be bound to Owner or such contractor designated by Owner as fully and in the same manner as such sureties are bound to the Contractor. The assignment of such subcontracts shall not become effective unless an event of default has occurred hereunder and Owner has terminated this Contract.

The contractor shall include in its subcontracts all requirements concerning affirmative action and equal employment opportunity set forth in "Equal Employment Opportunity and Affirmative Action Requirements" set forth, and require that subcontractors submit all applicable forms.

The contractor shall include in its subcontracts the dispute resolution provisions herein.

Q. ASSIGNMENT

Owner and Contractor each bind themselves, their successors, assigns and legal representatives to the other party hereto, and to the successors, assigns, and legal representatives of such other party in respect to all covenants, agreements, and obligations contained in the Contract Documents. However, the obligations of the Contractor arising hereunder may not be assigned without the Owner's prior written consent. Contractor further agrees to insert in all subcontracts the requirement

that the subcontract shall not be assigned other than to the Owner or to another Contractor designated by the Owner without the Owner's prior written consent.

R. PROHIBITED INTEREST

No official of the College who is authorized in such capacity and on the behalf of the College to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any material or supply contract or any subcontract in connection with the furnishings of supplies and/or equipment, shall become directly or indirectly interested personally in this contract or in any part thereof.

S. THE COLLEGE RESERVES

The right to cancel part of all of the awards in the event of a failure by the Contractor to deliver the materials as required and/or the failure to furnish materials as specified.

In case of rejection or non-delivery, the College may procure the articles or services from other sources and hold the Contractor responsible for any excess cost occasioned thereby as well as up to 15% for any and all fees, legal and otherwise.

DOCUMENT CHECKLIST

The bidder shall complete and sign the Bid Submission Document Checklist and include it in the bid submission. For construction bids, failure to submit the checklist is a fatal defect and the bid will be rejected. This document serves as a guide to bidders of the documents that are required to be submitted with the bid.

A. NON-COLLUSION AFFIDAVIT

The Affidavit shall be properly executed and submitted with the bid proposal.

B. NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW ACT

The manufacturer or supplier of chemical substances or mixtures shall label them in accordance with N.J. Worker and Community Right to Know Law (N.J.S.A. 34:5A-1 et seq., and N.J.A.C 8:59 et seq). All direct use containers shall bear a label indicating the chemical name(s) and Chemical Abstracts Service number(s) of all hazardous substances in the container, and all other substances which are among the five most predominant substances in the container, or their trade secret registry number(s) pursuant to N.J.A.C. 8:59-5. "Container" means a receptacle used to hold a liquid, solid or gaseous substance such as bottles, bags, barrels, cans, cylinders, drums, and cartons. (N.J.A.C. 8:59-1.3). Further, all applicable Material Safety Data Sheets (MSDS) - hazardous substance fact sheets - must be furnished. All containers which are stored at an owner's facilities by the contractor or subcontractors shall display RTK labeling. Vendors with questions concerning labeling should contact the New Jersey Department of Health and Senior Services Right to Know Program for assistance in developing proper labels. www.nj.gov/health/workplacehealthandsafety/right-to-know/.

C. PREVAILING WAGE ACT

Pursuant to N.J.S.A. 34:11-56.25 et seq., contractors on projects for public work shall adhere to all requirements of the New Jersey Prevailing Wage Act. The contractor shall be required to submit a certified payroll record to the owner within ten (10) days of the payment of the wages. In the event it is found that any worker, employed by the contractor or any subcontractor has been paid a rate of wages less than the prevailing wage required to be paid, the owner may terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and prosecute the work to completion.

The contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned period. The contractor shall submit said certified payrolls in the form outlined in N.J.A.C. 12:60-2.1(c). It is the contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the New Jersey Department of Labor and Workforce Development, Division of Workplace Standards. Additional information is available at http://lwd.dol.state.nj.us/labor/wagehour/wagerate/pwr_construction.html.

D. PUBLIC WORKS CONTRACTOR REGISTRATION ACT

N.J.S.A. 34:11-56.48 et seq. requires that a general or prime contractor and any listed subcontractors named in the contractor's bid proposal shall possess a certificate *at the time the bid proposal is submitted*. After the bid, and proposals are received and before the award of the contract, the successful contractor shall submit a copy of the contractor's certification along with those of all listed subcontractors. All non-listed subcontractors and lower-tier sub-subcontractors shall be registered before starting work on the project. It is the general contractor's responsibility that all non-listed sub-contractors at any tier have their certificate before starting work on the job.

Under the law, a "contractor" is "a person, partnership, association, joint-stock company, trust, corporation or other legal business entity or successor thereof who enters into a contract" which is subject to the provisions of the New Jersey Prevailing Wage Act [N.J.S.A. 34:11-56.25, et seq.] It applies to contractors based in New Jersey or another state.

To register, a contractor must provide the State Department of Labor and Workforce Development with a full and accurately completed application form.

The form is available online at www.state.nj.us/labor/lssc/lspubcon.html.

N.J.S.A. 34:11-56.55 specifically prohibits accepting applications for registration as a substitute for a certificate of registration.

E. EQUIPMENT CERTIFICATION

Bidder shall certify on the Equipment Certification form that they control or have access to the equipment necessary to do the required work if awarded the contract. If the bidder does not own or lease the equipment, a certification from the owner of the equipment that the bidder will have access to the equipment is required with the bid/proposal.

METHOD OF CONTRACT AWARD

- A. The length of the contract shall be stated in the technical specifications. Please see Section "Termination of Contract" for additional information.
- B. Depending on the nature of the bid and as the college determines in its best interest, the college may award the bid as per N.J.S.A. 18A:64A-25.1 et seq.
- C. The form of contract shall be submitted by the owner to the successful bidder. Terms of the specifications/bid package prevail. Bidder exceptions must be formally accepted by the owner; material exceptions shall not be approved.
- D. The successful bidder/respondent shall complete the W-9 Form and submit it to the college before the contract award. The form is available at the following link: www.irs.gov/pub/irs-pdf/fw9.pdf.

Continuation of the terms of the contract beyond the fiscal year is contingent on the availability of funds in the following year's budget. In the event of the unavailability of such funds, the owner reserves the right to cancel the contract.

CAUSES FOR REJECTING BIDS AND APPEAL OF DECISIONS

- A. No bid/proposal shall be accepted which does not conform to the specifications. Nothing contained in this specification shall be construed as depriving any county college of the right to reject all bids/proposals.
- B. Bidder acknowledges that this bid and the award of a contract are governed by the County College Contracts Law, N.J.S.A. 18A:64A-25.1 et seq. and that any legal challenges to the bidding process, the award of contract, or the rejection of any bids shall be pursued before the Board of Trustees of Essex County College following P.L. 1994, Ch. 48, Sec 6f and the Rules Governing Hearings Before the Board of Trustees of Essex County College.
- C. If a Bidder challenges or protests the award of a Bid, it shall reimburse the Owner for all costs, expenses, and losses incurred by the Owner, including all attorney's fees, because of such challenge or protest, except to the extent that the Bidder may be adjudicated to be a prevailing party against the Owner as to such challenge or protest. Under no circumstances shall the Owner reimburse to any party any fees, costs, or expenses related to a bid challenge or protest.

TERMINATION OF CONTRACT

- A. **Termination for Convenience.** The owner may terminate this Agreement for convenience without cause at any time upon ten days' written notice. Upon receipt of the notice, the Contractor shall discontinue its Work, remove its equipment, materials, and employees from the site and take such action as necessary to terminate its agreements with subcontractors and suppliers. The contractor shall then promptly deliver to the Owner a statement covering the balance owed under this Agreement for Work completed and materials ordered prior to receiving the notice of termination for convenience, for demobilization, and for any other costs for which it is liable to others by reason of such termination. Under no circumstances will Contractor be entitled to any lost profits by reason of termination for convenience. If the Owner terminates this Agreement pursuant to the provision entitled "Termination for Cause" and it is ultimately decided by a court of law or an arbitration panel that the Contractor has not failed to comply with any of the provisions of this Agreement or should not have had this Agreement terminated for cause, such termination shall be treated as a Termination for Convenience pursuant to this Clause and Contractor shall have no further or additional recourse in connection with such termination.
- B. **Termination for Cause.** The owner shall have the right to terminate this Contract after giving ten days' written notice of termination to the Contractor in the event of any default by the Contractor.
- C. **Default.** It shall be considered a default by the Contractor whenever the Contractor shall:
 - 1. declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors;
 - 2. disregard or violate provisions of the Contract Documents or fail to prosecute the work according to the agreed Schedule of Completion, including extensions thereof;

3. fail to provide a qualified superintendent, competent workers or subcontractors, or proper materials, or fail to make prompt payment therefor;
 4. shall repeatedly refuse or fail to supply enough properly skilled workers or proper materials;
 5. repeatedly disregards applicable laws, statutes, ordinances, codes, rules, and regulations, or lawful orders of a public authority.
- D. In the event of termination of the Contract by the Owner because of default by the Contractor, the Owner may take possession of the Work and all materials and equipment thereon and may finish the Work by whatever method and means it may select.
- E. Upon termination of the Contract by the Owner, no further payments shall be due to the Contractor until the Work is completed. If the unpaid balance of the contract price shall exceed the cost of completing the Work including all overhead costs, the excess shall be paid to the Contractor. If the cost of completing the Work shall exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The cost incurred by the Owner, as herein provided, and the damage incurred through the Contractor's default shall be certified by the Owner.

DISPUTE RESOLUTION PROCEDURES

- A. All claims, disputes, and other matters in question between the Owner and the Contractor arising out of or relating to this Contract or any breach thereof, except for claims which have been waived by the acceptance of Final Payment, shall be submitted to mediation within thirty days after a final determination is made by the Owner with regard to the claim, dispute or matter. The mediator shall be selected by mutual agreement between the parties or by the American Arbitration Association if an agreement cannot be reached among the parties. The mediation shall be conducted at the Essex County College, Newark, New Jersey. The cost of the mediation shall be borne equally among the parties. The mediation shall be attended by an executive officer of the Contractor who shall have full authority to act for and bind the Contractor and with duly authorized representatives of the Owner. Mediation shall be a condition precedent to arbitration.
- B. All claims, disputes, and other matters in question between the Owner and the Contractor arising out of or relating to this Contract or any breach thereof, not settled by mediation, shall be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association and applicable State statutes then in effect unless the parties mutually agree otherwise. The scope of the authority of the arbitrators in issuing any award shall be limited by any statute or regulation which governs the liability or damages from the Owner. The award rendered by the arbitrators in any such arbitration proceeding shall be final and binding, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.
- C. The parties acknowledge that by choosing arbitration as their sole means of dispute resolution, they are waiving their right to trial, whether by jury or by a judge and agree to submit all statutory, contractual, and equitable claims that may arise out of this Contract and the performance of the Work to binding arbitration. The parties further acknowledge that they are choosing arbitration, in part, in order to expedite the disposition of any disputes and, toward that end, they agree to work cooperatively with the arbitrator to limit discovery while preserving their rights to effectuate a thorough prosecution of their claims and/or defense against any claims that may be raised in the arbitration.
- D. Notice of the demand for arbitration shall be filed in writing with the other party to this agreement and the American Arbitration Association. The demand for arbitration shall be made within a reasonable time after the claim, dispute, or another matter in question has arisen, and in no event shall it be made before the mediation has been requested or after the date when the institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.
- E. The Owner, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided, however, that (1) the arbitration agreement governing the other arbitration permits consolidation, and (2) the arbitrations to be consolidated substantially invoke common questions of law or fact.
- F. The mediation and arbitration process shall not affect the Owner's right to terminate the Contractor's Work, in whole or part, whether for the Owner's convenience or due to the Contractor's default; and/or otherwise act in the public interest

DELIVERY

- A. Deliveries must be made within the time specified by the College on the order. Under no circumstances will a purchase order be valid for a period in excess of 90 days, unless otherwise specified. Such time shall be computed on the basis of the number of stated calendar days from the date on the order or as agreed prior to the date on order. If delivery is not made within such time, the College reserves the right to cancel the order and upon specific agreement, a new purchase order may be issued or placed the order as stated herein. Packages will NOT be received by Essex County College unless all delivery charges have been paid.

- B. Bidders shall acquaint themselves with conditions to be found at the site and shall assume all responsibility at no cost to the College for placing and installing the equipment furnishings in the locations required. All finished surfaces shall be cleaned and polished by the Contractor prior to final payment.
- C. DELIVERY TIME. Unless otherwise stipulated:
 - 1. Deliveries shall be made between 8:30 A.M. and 4:00 P.M. Monday through Friday at the College Receiving Department or as otherwise specified.
NOTE: The College will be closed on Fridays during July and August; therefore, deliveries shall be made between 8:30 A.M. and 4:00 P.M. Monday through Thursday.
 - 2. The College reserves the right to reject any delivery made before or after the aforesaid times unless the schedule(s) provides(s) for different delivery times.
 - 3. All areas affected by delivery shall remain unobstructed so “business” can operate as usual unless otherwise stated by the College.
- D. All containers are to be removed from the building(s) and campus.
- E. When the bid standard in the purchase order is “as per sample,” delivery shall conform to such sample when it was new and unused. Unless otherwise stated in the purchase order, deliveries must consist only of new and unused merchandise.
- G. The vendor accepts responsibility for damages to persons and property that may result from any act of his or his agent in making deliveries.
- H. Where possible all goods delivered are to be manufactured or produced in the United States or its territorial possessions.
- I. Open market orders are subject to audit by the Purchasing Department as to the reasonableness and justness of the prices charged.
- J. EXCESS ON ORDER Only the College reserves the right to require any specified additional delivery on any item in excess of the quantity originally ordered.
- K. NOTICE TO VENDORS. Vendors are authorized to ship only those items covered by the contract. If a review of material received indicates that material other than that covered by the contract has been ordered and delivered, the Director of Purchasing will take such steps as are necessary to have the material returned regardless of the time lapsed between the date of delivery and discovery of the violation. Full credit will be demanded. Compliance with this requirement is the full responsibility of the vendor. Violation of this clause may also result in the removal of the offending vendor’s name from the mailing list for a period of up to three years.

PAYMENT

- B. No payment will be made unless duly authorized by the owner’s authorized representative and accompanied by proper documentation.
- C. Payment will be made following the owner’s policy and procedures. Invoices shall specify, in detail, the period for which payment is claimed, the Purchase Order number, the services performed during the prescribed period, the amount claimed, and the correlation between the services claimed and this proposal.
- D. Purchase Order (P.O.) Number must appear on all invoices and must be submitted to the Accounts Payable Department at accountspayable@essex.edu.
- E. The owner may withhold all or partial payments on account of subsequently discovered evidence including but not limited to the following:
 - 1. Deliverables not complying with the project specification;
 - 2. Claims filed or responsible evidence indicating the probability of filing claims;
 - 3. A reasonable doubt that the contract can be completed for the balance then unpaid.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

- F. Public funds may be used to pay only for goods delivered or services rendered. The owner shall not pay penalties and/or interest on overdue bills unless otherwise required by law. No employee is authorized to sign a letter of credit or any other document that represents a legal commitment on the part of the owner to pay additional fees.
- G. **Owner’s right to withhold payment:** The owner shall have the right to withhold payment to the Contractor in the event that a 10-day cure notice has been issued to the Contractor and the required cure has yet to be fully implemented. Such

payment withholding shall be in such amount to cover 120% of the Owner's estimated cost of having to implement the needed cure at its cost. Where a termination notice has been issued to Contractor, no further payment shall issue to Contractor, except in accordance with the termination-for-cause provision elsewhere in this Contract. Where Contractor has caused the Owner to be exposed to third-party claims, Owner shall have the right to withhold payment in an amount equal to 120% of the estimated liability of the Owner on such claims.

CONTRACT RENEWAL OR EXTENSION

In the event, the Contract has an extension or renewal option by the Owner and the Owner determines that it is in its best interest to extend or renew the contract, the Contractor will be so notified in writing at least 30 days prior to the expiration date of the existing Contract. In the event that Owner determines to exercise the renewal or extension option, the Contractor agrees to provide the Services for the period of renewal or extension determined by the Owner. The contractor agrees to pay at least the minimum wage, as such rate may be increased over the term of the Contract, as may be extended at the sole discretion of the Owner in accordance with the provisions of the Request for Bids.

OTHER PROVISIONS

A. Both parties agree to comply with all requirements of the Federal Health Insurance Portability and Accountability Act of 1996 ("HIPAA") as may be amended from time to time, and the corresponding HIPAA regulations for the confidentiality and security of medical information. If awarded the bid, the contractor shall:

1. Not use or disclose protected health information other than as permitted or required by law
2. Use appropriate safeguards to protect the confidentiality of the information
3. Report any use or disclosure not permitted

The contractor, by execution of the contract, shall thereby indemnify and hold the owner harmless from all liabilities, claims, actions, costs, and penalties that may be incurred as the result of the failure of the contractor to comply with the requirements of the Health Insurance Portability and Accountability Act (HIPAA) or any other statute or case law protecting the privacy of persons using its services.

B. The owner shall retain all of its rights and interest in all documents and property both hard copy and digital furnished by the owner to the successful bidder (contractor) to assist the contractor in the performance of this contract. None of the documents and/or property shall, without the written consent of the owner, be disclosed to others or used by the contractor, or permitted by the contractor to be used by their parties at any time except in the performance of the resulting contract.

The contractor shall not have the right to use, sell, or disclose the total of the interim or final work products, or make them available to third parties, without the prior written consent of the owner. Any information supplied to the owner may be required to be supplied on CD/DVD or USB flash drive media compatible with Microsoft Windows, and Microsoft Office Suite 2010 or greater.

C. Under state and federal statutes, certain government records are protected from public disclosure (e.g., HIPPA, FERPA, and others). The owner, the contractor, and any subcontractors have a responsibility and an obligation to safeguard from public access student and employee personal information with which it has been entrusted when disclosure thereof would violate a student's right under the federal Family Educational Rights and Privacy Act (FERPA) and the employee's reasonable expectation of privacy. All payroll, personnel, and health insurance-related files are confidential. According to the New Jersey Open Public Records Act (OPRA), the owner retains the right to make any public disclosure under the law unless a claim of confidentiality under OPRA is made and sustained by the college. Also, among government records deemed confidential is administrative or technical information regarding computer hardware, software, and networks that, if disclosed, would jeopardize computer security. The contractor and any subcontractor(s) are prohibited from the sale or distribution of all supplied information to any third party.

D. Proof of licensure for any activity regulated by the State of New Jersey and required to do the work required under this specification, for either the firm or the person responsible for the work, shall be provided as required by the owner.

CONSTRUCTION REQUIREMENTS

THE CONTRACT DOCUMENTS

- A. The Contract Documents consist of this Contract, the Bid Specifications and Bidder's Price Proposal, the Technical Specifications and Contract Drawings, all written modifications issued after execution of this Contract, and the exhibits and forms attached hereto. These documents form the Contract, and all are fully a part of the Contract as if attached to this Agreement or repeated herein.

The Contract includes the following:

- A. Bidder's Price Proposal.
 - B. Technical Specifications.
 - C. Drawings
 - D. Establishment of Targeted Goals for Construction Contractors and Subcontractors
 - E. Initial Project Workforce Report, Form AA-201
 - F. Monthly Project Workforce Report, Form AA-202
- B. The Contractor represents and warrants to the Owner that the Contractor has (a) examined the Contract Documents, the job site, the surroundings, and local conditions, and (b) made all investigations it deems necessary or appropriate for a full understanding of the scope of the Work to be performed, and (c) examined all other documents and data which it deems necessary or appropriate to establish the Contract Sum. The contractor acknowledges that it considers the foregoing factors sufficient and is not relying upon any representations or warranties of the Owner except as expressly herein set forth.
- C. The Contractor shall carefully study and compare the Contract Documents with each other and with any other information furnished by the Owner and shall promptly report to the Owner and the Architect or Engineer errors, inconsistencies, or omissions discovered. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies, or omissions in the Contract Documents unless the Contractor recognized such error, inconsistency, or omission and knowingly failed to report it to the Architect or Engineer. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency, or omission that should reasonably have been recognized or have been discovered by a prudent and experienced Contractor in advance, without such notice to the Architect or Engineer, the Contractor shall assume complete responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.
- D. The Contractor shall take field measurements and verify field conditions and compare such field measurements and conditions with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported to the Owner and Architect or Engineer at once.

THE WORK

- A. The Contractor shall perform all the work required by the Contract Documents, including the Technical Specifications and the Drawings (the "Work") for the Project, and complete the Work within the time frame set forth in the approved Project Schedule, which shall be prepared by Contractor and approved by Owner and Architect or Engineer as set herein.
- B. The contractor agrees to furnish its best skill, judgment, and efficient business administration in performing its obligations under the Contract. The contractor agrees to maintain an adequate supply of workers and proper materials on the job site at all times, to perform the Work in the best and soundest way, and to cooperate with the Architect or Engineer, in order to complete the Work expeditiously in accordance with the Contract Documents.
- C. The contractor shall provide competent supervision of all phases of the Work and shall cause the Work to be performed in strict and complete compliance with the Drawings and Specifications and all things indicated and reasonably implied therefrom. The contractor shall act as the project manager to coordinate all work by subcontractors, attend all job meetings with the Owner and Architect or Engineer and periodically render reports to the Owner and Architect or Engineer on the progress of the Work.
- D. Contractor shall furnish to Owner and Architect or Engineer, prior to commencement of work and within twenty days from date hereof, a Construction Progress Schedule is broken down by stages and, after the issuance of any Change Order, shall furnish to Owner a revision of such Schedule. The Progress Schedule shall indicate the dates for the starting and completion of the various stages of construction (and shall be revised as required by the conditions of the Work, subject to the Owner's approval). The contractor shall maintain the progress of the Work in accordance with the Construction Progress Schedule, as the same may be revised. In order to comply with the Construction Progress Schedule, the Contractor will ensure that all subcontracts clearly state that the requirements of the Construction Progress Schedule must be met.
- E. The contractor shall perform its obligations hereunder in strict compliance with all applicable laws, ordinances, rules, regulations, orders, statutes, codes, and requirements of the Board of Fire Underwriters and all federal, state, municipal, and other governmental entities having jurisdiction over the Project. The contractor shall apply for and obtain all licenses and permits required in connection with the Work and, unless otherwise stated in the Contract Documents, shall be responsible

for the fees associated with such permits. Contractor warrants that, when completed, the Project shall be in compliance with all laws in effect at the time of completion. Changes in costs reasonably incurred by Contractor resulting from changes in any governmental requirements effective after the date of this Agreement (including interpretation by governmental officials which increase or decrease costs) shall be covered by a Change Order.

- F. With respect to any work performed by Contractor for which Owner has agreed to issue a change order, Contractor covenants to maintain complete and accurate books of account showing the costs of the Project, which books shall, at all reasonable times, be open to inspection by Owner and Architect or Engineer.

TIME OF COMMENCEMENT, SUBSTANTIAL COMPLETION, AND LIQUIDATED DAMAGES

- A. **Substantial Completion.** Within ten calendar days from the delivery of a notice from Owner to Contractor to proceed (the "Notice to Proceed") Contractor shall commence performance of the Work and, subject to authorized adjustments, Substantial Completion shall be achieved.
- B. **Punch List Completion Within Sixty Days Of Substantial Completion.** The Contractor shall complete all Contract Work within sixty days after the Substantial Completion as determined by the Architect or Engineer. If there is any item of equipment that cannot be obtained and installed within the aforesaid period of time, the Contractor shall so inform the Owner and Architect upon receipt of notice of Substantial Completion, and request additional time, which may be considered for that specific item.
- C. **Liquidated Damages.** The Contractor acknowledges and agrees that time is of the essence. If the Contractor shall neglect, fail or refuse to achieve Substantial Completion by the date set forth above, as may be extended by written Change Order, the Contractor does hereby agree, as a part of the consideration for the awarding of this Contract, to pay to the Owner, as liquidated damages and not as a penalty, the sum of Five Hundred Dollars (\$500.00) for each calendar day beyond the date of Substantial Completion. Said amount of liquidated damages is agreed upon because of the impracticability and difficulty of fixing and ascertaining the true value of damage which the Owner will sustain by failure of the Contractor to complete the Work in a timely fashion.
- D. **Delay:** If the Contractor is delayed in achieving Substantial Completion of the Work by Force Majeure, by the acts of or failure to act by the Owner, Owner's Consultant's or Owner's separate contractors, or by the failure of governmental entities to process or issue permits, approvals, licenses or ordinances within customary time periods, or other causes beyond the Contractor's control that delaying the Contractor in achieving Substantial Completion of the Work, in the extension of the Substantial Completion Date, Contractor shall give notice to Owner promptly and in no event later than three (3) calendar days of the delay causing event. Contractor's sole remedy for any (i) delay in the commencement, prosecution, or completion of the Work, (ii) hindrance, interference, suspension, or obstruction in the performance of the Work, (iii) loss of productivity, or (iv) other similar claims (items i through iv herein collectively referred to in this section as "Delays"), whether or not such Delays are foreseeable, shall be an extension of time to complete the Work. The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (i) is not caused, or could not have been anticipated, by the Contractor, (ii) could not be limited or avoided by the Contractor's timely notice to the Owner of the delay or reasonable likelihood that a delay will occur, and (iii) is of a duration not less than one (1) day. In no event shall the Contractor be entitled to any other compensation or recovery of any damages in connection with any Delays including without limitation, consequential damages, lost opportunity costs, impact damages, or other similar remuneration. Failure by Contractor to provide notice to Owner in accordance herein constitutes a waiver by Contractor of any right to a time extension.

CONTRACT SUM

- A. The Owner shall pay the Contractor for the performance of the Work, subject to additions and deductions by Change Order as provided in the Contract Documents, the total Contract Sum Such Contract Sum includes, without limitation, all labor, materials, tools, equipment, water, heat, power, transportation, facilities (temporary or otherwise), equipment rental costs and all other services necessary for the proper construction and completion of the Project in accordance with the Contract Documents.
- B. The Contract Sum is determined based upon a stipulated sum.
- C. The **Bid Price Proposal**, upon which the Contractor was determined to be the successful lowest responsible bidder to perform the Work as set forth in the **Technical Specifications**, and the **Drawings**. Any questions which arise as to the work to be performed under this Contract shall be determined by the Architect or Engineer with reference to the Bid Price Proposal Sheet, the Technical Specifications, and the Drawings.

PROGRESS PAYMENTS

- A. Based upon Applications for Payment submitted to the Architect or Engineer by the Contractor, issued in such form as acceptable to the Architect or Engineer, and Certificates for Payment issued by the Architect or Engineer, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents.

- B. **Schedule of Values.** The Contractor shall promptly prepare and present to the Owner a proposed Schedule of Values allocating the actual cost of the Work among the different elements of the Work. If requested by the Owner, the Contractor shall provide additional detail and supporting data as the Owner may require substantiating the accuracy of the Schedule of Values. The Contractor shall not front-end load its schedule of values by increasing any element thereof in excess of the actual cost, and such acts shall constitute a material breach of this Agreement. The Contractor's Schedule of Values shall be used in determining the amounts payable to the Contractor hereunder, but only after it has been acknowledged in writing by the Owner. The Schedule of Values may be amended when mutually acknowledged in writing by the Owner and Contractor.
- C. **Work Performed and Off-Site Materials.** Payments to the Contractor shall be based upon Work actually performed, installed, and approved by the Architect or Engineer and materials stored off-site, provided, however, that with respect to materials stored off-site, the following conditions shall have been satisfied: (a) Owner shall be furnished with an original invoice from the material supplier certifying that the price of such materials has been paid in full by Contractor; (b) Owner shall receive a warranty bill of sale for such materials; (c) Owner shall have received a certificate evidencing that such materials are insured against loss on an all risk basis with Owner listed as the named insured; (d) such materials shall be clearly and visibly marked and tagged so as to indicate that title thereto is vested in Owner; (e) Architect or Engineer shall have inspected and approved such materials for incorporation into the Project; (f) Owner shall have received an effective waiver of all liens and rights to assert liens from the owner and lessor of the property upon which such materials are stored; (g) Owner shall have received an Affidavit from Contractor certifying that such materials will be incorporated into the work; (h) a retainage of ten percent (10%) shall be withheld from each payment for stored materials, in addition to the normal retainage withheld.
- D. **Applications for Payment.** At least fourteen days before each payment is due, the Contractor shall furnish to the Architect or Engineer an itemized Application for Payment showing the value of Work performed through the end of the calendar month. The Contractor acknowledges that the Architect's or Engineer's approval and/or signature of the Contractor's Application shall not relieve or decrease the Contractor's obligations under the Contract. Upon the Architect's or Engineer's approval of the Contractor's Application, the Architect or Engineer shall forward such Application to the Owner.
- E. **Certification Relating to Applications for Payment.** Each Application for Payment shall be notarized and bear the signature of the Contractor's Project Manager or of a more senior representative of the Contractor, which signature shall constitute the Contractor's representation to the Owner that the Work indicated in the Application has progressed to the level represented, has been properly and timely performed as required herein, that no Work has been included in the Application for Payment contrary to the request of the Owner, or contrary to any provision of the Contract Documents, that expenses and costs claimed in the Application have been actually incurred, that all obligations of the Contractor covered by prior Applications have been paid in full, and that, to the best of the Contractor's knowledge, information and informed belief, the amount requested is currently due and owing, there being no reason known to the Contractor that payment of any portion thereof should be withheld. Submission of the Contractor's Application for Final Payment shall further constitute the Contractor's representation to the Owner that, upon receipt from the Owner of the amount requested, all obligations of the Contractor to others incurred in connection with the Project will be paid in full within ten work-days of such receipt. In the event that the Owner becomes informed that any of the foregoing representations by the Contractor are wholly or partially inaccurate, the Owner may withhold payment of sums then or in the future otherwise due to the Contractor until the inaccuracy, and the cause thereof is corrected to the Owner's reasonable satisfaction.
- F. **Lien Releases and Verified List of Subcontractors.** Each Application for Payment shall be accompanied by the Contractor's and subcontractors' lien releases and partial waivers of lien **that are conditioned upon the Contractor's receipt of payment from the Owner,** for the full amount of the payments made through the date of the Application for Payment and to be made under the current Application for Payment and the Work covered thereby. Provision of such lien releases and waivers of claim shall be a condition precedent to the Owner's duty to make payments to the Contractor. The Contractor's application for Final Payment shall be accompanied by final lien releases and waivers of claim from the Contractor and all subcontractors together with a verified list of all subcontractors, including suppliers of materials and systems incorporated into the Work. Provision of such final lien releases and waivers of claim and the verified list shall be a condition precedent to Final Payment to the Contractor.
- G. **Discharge of Lien Claims.** If any subcontractor refuses to furnish such evidence required by Owner, Contractor may be required to either withhold payment from such subcontractor or furnish a bond, as approved by Owner, in a form satisfactory to Owner, to indemnify them against any such lien. In the event a subcontractor or material supplier files a lien against the Project, the Contractor shall promptly cause such lien to be formally released, bonded against, or satisfied, and shall reimburse the Owner for all costs and expenses, including, but not limited to, reasonable attorneys' fees, and bonding and title indemnity expenses incurred by it in contesting, discharging, releasing or satisfying such lien or defending or otherwise participating in such suit. Owner shall have the right to retain out of any payment then or thereafter to become due to Contractor 150% of the amount claimed to indemnify Owner against any lien that may appear in favor of any person claiming by or under the Contractor, which amount shall include reasonable allowances for the estimated costs, including, but not limited to, attorneys' fees to defend any action in connection therewith or deposits which need to be made to have such lien released against the Project. Contractor shall similarly indemnify and protect and defend Owner in respect of any lien in favor of any person claiming by or under it, including, among others, its subcontractors or its and their material suppliers that may appear after final payment is made.

- H. **Payment of Applications for Payment.** Once the Contractor's Application for Payment has been certified by the Owner following approval by the Architect or Engineer, the Owner shall authorize payment to the Contractor at the next scheduled public meeting and issue payment during the Owner's next payment cycle following the meeting at which payment was authorized. If the Application is not in proper order or is not supported by all required documentation, then the Owner shall notify the Contractor of such deficiency, and the time for payment of such Application, or any applicable part thereof, shall be extended by the amount of time required to cure such deficiencies.
- I. **Withholding of Payment.** Any provision of the Contract Documents notwithstanding, the Owner shall not be obligated to make a payment or payments to the Contractor that is otherwise due if, and for so long as, any one or more of the conditions set forth in this paragraph exists:
- (i) Contractor's Application for Payment is not in the form or supported by the documentation required by this Agreement.
 - (ii) Any part of such payment is attributable to Work which is defective or not strictly conforming to the requirements of the Contract Documents.
 - (iii) Contractor has failed to make payments promptly to its subcontractors, consultants, employees, or others performing services in connection with the Project.
 - (iv) Reasonable evidence exists of damage or loss to Owner or to a third-party to whom Owner is or may be liable unless such liability has been accepted by Contractor's insurer.
 - (v) Reasonable evidence exists that the Work cannot be completed within the Contract Time and that the unpaid balance would be inadequate to cover actual damages or, if applicable, liquidated damages, for the anticipated delay.
 - (vi) Reasonable evidence exists that the Work cannot be completed for the unpaid balance of the Contract Sum.
 - (vii) Contractor is in default of any material obligations under the Contract Documents, after written notice by the Owner of such default to Contractor, and the Contractor has been given a reasonable opportunity to cure such default.

In the event that any of the foregoing conditions exist, the Owner shall be entitled to withhold from any sum then due or thereafter to become due, including from retained sums, an amount sufficient in the reasonable judgment of the Owner to satisfy, discharge and defend against such claims and to make good any losses, prospective losses, costs, attorney's fees, and other expenses which may result from the existence of such conditions. All other amounts due to the Contractor shall be paid as and when due.

- J. **Retainage.** The owner shall withhold ten percent of each progress payment due to the Contractor. Upon completion of fifty percent (50%) of the Work, retainage will be reduced to five percent until Substantial Completion of the Work. Owner may retain any such additional sums following Substantial Completion as Architect recommends is required to complete the Work. All amounts retained by Owner shall be retained until Final Completion of the Work and Contractor has signed its General Release and Final Waiver of Lien; provided, however, that Owner may, at its option, reduce or release retention for those subcontractors mutually agreed to by Owner and Contractor who have completed their portion of the Work provided that (i) such work has been approved by Architect or Engineer; (ii) each such subcontractor has signed a General Release and Final Lien Waiver; (iii) the Work is progressing satisfactorily in accordance with the Construction Progress Schedule; and (iv) such reduction or release does not, in Owner's opinion, increase Owner's financial risk on the Project. As a condition of the release of any retention to a subcontractor before the completion of the project, the subcontractor shall agree that the period of duration of any warranties made by it will not commence until the completion of all the Work.
- K. **"Final Completion"** shall be defined as such time as Contractor obtains a final Certificate of Completion from Architect or Engineer, and the Contractor submits to the Owner and Owner approves: (a) Release and Final Lien Waivers from Contractor and all subcontractors and material suppliers, in form and substance satisfactory to Owner; (b) Contractor's affidavit that all payrolls, bills for materials and equipment, and other indebtedness incurred by, through or under Contractor in connection with the Work (excluding Work pursuant to warranties and guaranties), have been paid or otherwise satisfied or, if not so paid or satisfied, that amounts satisfactory to Owner, in Owner's sole discretion, have been withheld to protect itself from any claims resulting therefrom, including, but not limited to, attorney's fees; (c) all Contractor's as built drawings, records and related data have been delivered to Owner; (d) all guarantees and warranties to which Owner is entitled hereunder have been submitted; (e) all other customary permits, approvals, certificates and authorizations required by any authority having jurisdiction over the Project have been issued; and (f) all other documentation reasonably required by Owner has been supplied.
- L. The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.
- M. Disputes regarding whether the Owner has failed to make payments in accordance with the Contract Documents may be submitted to the process of alternative dispute resolution set herein.

CHANGES IN THE WORK

- A. No one other than the Owner shall have the right to require or instruct the Contractor to make any changes, deletions, or addition to the Work that will result in a Change Order (as that term is defined in the General Conditions) or will result in a

change to the Contract Sum. Any such changes, deletions, or additions authorized by Owner must be in writing and signed by a duly authorized representative of Owner which change order shall first be approved by a resolution of the governing body of Owner.

- B. The owner reserves the right, from time to time to make changes, additions, revisions, or omissions in the Work as the Owner may deem advisable. The value of the Work to be changed, added, or omitted shall be stated in the Change Order and shall be added or deducted, as the case may be, from the Contract Sum.
- C. In the event the value of the Change Order cannot be determined by reference to the unit prices shown in Exhibit A, the value shall be equal to the actual cost of performing such Change Order, plus fifteen percent (15%) overhead and profit.
- D. The owner reserves the right to award separate contracts for the performance of any work not included in the Work described in the Contract Documents.

ADDITIONAL OBLIGATIONS OF CONTRACTOR

- A. The Contractor shall comply with the County College Contracts Law, N.J.S.A. 18A:64A-25.1 et seq., and all applicable New Jersey State Statutes, Administrative Regulations, and Proclamations, including the payment of any prevailing wage rates required by law.
- B. The contractor acknowledges that the Work will be performed in and around an active college campus and that it must cooperate fully with the Owner and Architect or Engineer with respect to any and all directives required to ensure the safety of students, staff, and the public.
- C. The contractor shall confine operations at the site to areas permitted by the Owner and Architect or Engineer and applicable ordinances and permits and shall not unreasonably encumber the site with its equipment and materials.
- D. The contractor shall require all personnel, including subcontractors, working on the site to carry a photo ID identifying which entity the employee works for, and said ID shall be visible at all times the employee is on the site or College grounds.
- E. The contractor shall keep the site and surrounding areas free from the accumulation of waste material and rubbish caused by its operations under this Contract. At the end of each working day, the Contractor is responsible for leaving the site in clean and good condition. At the completion of the Work, the Contractor shall remove from and about the Project any (including but not limited to solid waste, recycling, or any hazardous materials) waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials.
- F. Smoking, drinking of alcoholic beverages, and use of illegal drugs on or near the site are strictly prohibited.

CONTRACTOR' S WARRANTIES, GUARANTY, AND OBLIGATIONS TO REPAIR FAULTY WORK

- A. Unless a longer period of time is designated in the Contract Documents or required by existing law or judicial determination, the Contractor hereby guarantees all Work performed under the Contract Documents against defects due to faulty or defective materials or workmanship, or failure of the Work to conform to the Contract Documents, as shall appear within a period of one year from the date of Final Completion of the Project. The contractor shall require a similar warranty in all subcontracts, including the requirement that the Owner is reimbursed for any damage or loss to the Work resulting from such defects. Contractor agrees to repair or remove or replace as directed by Owner all Work which is defective or which fails to conform to the Contract Documents; to repair, remove and replace as directed by Owner all damaged portions of the Work resulting from or which is incidental to defects in the Work as stated above, or failure of the Work to conform to the Contract Documents. All repairs, removals, and replacements must be commenced after written notice from Owner as soon as reasonably practicable having due regard to the circumstances and the nature of the defect and workmen and materials sufficient in the opinion of Owner, in Owner's sole discretion, must be furnished to ensure prompt completion thereof. Should Contractor fail to proceed in accordance with the provisions of this section, Owner without further notice to Contractor may furnish all labor and material necessary for said repairs, or removals and replacements. The contractor agrees that the repair, replacement, or removal of such faulty or defective material or workmanship shall be at no cost to Owner and further that Owner shall be reimbursed for any damage or loss to the Work resulting from such defects sustained by Owner.
- B. The contractor shall deliver to the Owner all warranties and guarantees, together with appropriate assignments, as provided in the Contract Documents, at the time and in the manner that may be prescribed therein. Notwithstanding anything to the contrary in the General Conditions, the warranties and guarantees of the Contractor and all subcontractors and suppliers under this section shall extend to all materials purchased by the Contractor pursuant to the provisions thereof and shall be for the benefit of the Owner.
- C. The contractor shall make repairs promptly upon notification by the Owner. If the Contractor fails to make the necessary repairs within three days after due notice from the Architect or Engineer, the College may make the needed repairs and the cost of same will be deducted from the Contract Balance, provided, however, that in case of an emergency wherein the opinion of the Architect or Engineer serious loss or damage may occur, College may make repairs without previous notice and at the expense of the Contractor.

- D. The contractor shall promptly correct or remove from the premises all work, materials or equipment determined by the Architect or Engineer as failing to conform to the Contract Documents, whether such work or materials or equipment have been incorporated into the Project or not, and whether observed before or after Substantial Completion. The contractor shall commence replacement and re-execution of the Work in conformance with the Contract Documents within three days of written notice. The contractor shall bear the full expense of the replacement and re-execution of the Work, as well as making good all Work of whatever kind destroyed or damaged by such removal or replacement.
- E. Investigations, Tests, Reports: During construction or period of guarantees, if the Owner, Architect, or Engineer finds what appears to be defective work or improper functioning of any material, equipment, or systems installed, the Contractor will be liable for all reasonable inspection fees incurred by Architect or Engineer to inspect the work or material, equipment, or systems in question and install similar work and apparatus in conformity with requirements of the Contract, and to make tests and to file complete reports as directed to establish such conformity.

SAFETY

- A. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions at the job site, including the safety of all persons and property affected directly or indirectly by the Contractor's operations during the performance of the work. This requirement shall apply continuously 24 hours per day until acceptance of the work by the Owner. The owner's responsibility to observe the Contractor's performance is not intended to include a review of the adequacy of the Contractor's safety measures in, on, or near the job site.
- B. The contractor shall conform to and comply with all laws and regulations concerning occupational safety including the Occupational Safety & Health Act of 1970 and standards promulgated thereunder. The contractor shall conform to regulations concerning Material Safety Data Sheets, labeling of hazardous materials, and training of employees.
- C. Hazardous Substances. "Hazardous Substance" means any and all chemicals, constituents, contaminants, pollutants, materials (including but not limited to petroleum or petroleum products), and wastes and any other carcinogenic, corrosive, ignitable, radioactive, reactive, toxic or otherwise hazardous substances, mixtures (whether solids, liquids, gases), daughter or degradation products or any similar substances now or at any time subject to regulation, control, remediation or otherwise addressed under all applicable environmental laws, codes, and regulations that are in effect or considered to be hazardous or otherwise harmful to human health or the environment under such environmental laws, codes, and regulations.
 - 1. Preventative Measures; Notice Requirements. The contractor will take all measures necessary to prevent the release of any Hazardous Substances at the Project or adjacent areas in violation of applicable legal requirements. The contractor will immediately notify the Owner of (a) any releases of Hazardous Substances that occur in connection with the performance of the Work; (b) any and all material violations and any and all investigations, actions, claims, suits, notices of violation, fines, penalties, orders, and other proceedings related to material violations or alleged material violations of any environmental laws, codes, regulations, including but not limited to Permits issued thereunder, which are asserted against Contractor or any of Contractor's Personnel in connection with the Work or their activities on or in connection with the Project; (c) and Contractor's discovery of any Hazardous Substances at the Project or adjacent areas.
 - 2. Contractor Releases; Removal Obligations. The contractor will be responsible for removing from the Project and areas adjacent thereto, and for properly disposing of, in a manner acceptable to the Owner and in compliance with this Agreement, applicable legal requirements and all applicable Permits, all Hazardous Substances generated, released, or accumulated by Contractor or any Subcontractor in the course of performing the Work.
 - 3. Pre-Existing Hazardous Substances. In the event Contractor encounters on the Project material reasonably believed to be a Hazardous Substance that existed prior to the date of this Agreement, the Contractor will immediately cease performance of any Work in the area affected and report the condition to Owner in writing. The contractor will not thereafter resume the performance of the Work in the affected area except with the prior written permission of the Owner.

LIMITATIONS ON LIABILITY

- A. The contractor agrees that there is no Contractual limitation upon its contractual liability to the Owner. Owner shall have no liability to Contractor for consequential damages, punitive damages, special damages, speculative damages, unforeseeable damages, lost profits, unabsorbed overhead, and delay damages.

LIMITATION OF ARCHITECT'S OR ENGINEER'S RESPONSIBILITY

- A. Neither the Architect nor Engineer's authority to act under this Contract, nor any decision made by the Architect or Engineer in good faith either to exercise or not exercise authority shall give rise to any duty or responsibility of the Architect or Engineer to the Contractor, any subcontractor, manufacturer, fabricator, supplier or distributor, or any of their agents or employees or any other person performing any of the work under the Contract.

- B. The Architect or Engineer will not be responsible for the Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto. The Architect or Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the Contract.
- C. The Architect or Engineer will not be responsible for the acts or omissions of the Contractor or any of its subcontractors, or the agents or employees of the Contractor or its subcontractors, or any other persons at the site or otherwise performing any of the work under the Contract.

NOTICE TO CONTRACTORS

The Essex County College requires as a condition precedent to acceptance of proposals, a sworn statement executed by, or on behalf of, the person, firm association, or corporation to whom such contract is to be awarded, certifying that such person, firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contract. The form for this sworn statement is included in the proposal and shall be properly executed in order to have the proposal considered. Failure to execute the Equal Employment Opportunities, Non-Collusion Statement, Statement of Ownership Disclosure, Affirmative Action, Business Registration Certificate, and other specified prerequisites will automatically disqualify the proposal.

CLARIFICATION # 1

November 28, 2022

BID # 8160 CAFETERIA RENOVATIONS AT NEWARK CAMPUS

TO: All Bidders the project completion time is 6 months.

NOTICE: The following clarification is in response to questions submitted. The information contained herein supplements and/or supersedes the specific parts of the documents referred to in each item and shall be attached and becomes a part thereof. All other provisions shall remain in full force and effect as set forth on the original documents. Additional work called for herein shall comply with requirements originally specified.

2.0 Clarifications to Specifications:

Contract No.	Section No.	Page No.	Clarifications
8156	**	**	The Contractor shall include in their bid additional floor and dust protection spanning from the immediate work area, through the kitchen and through the corridor up to the entrance to parking lot "A". The length is approx. 140'-0" with a ceiling height of 9'-0". The contractor shall protect existing flooring with Masonite, or equal (taped at the seams) and plastic sheathing (taped) from floor to ceiling.

3.0 Clarifications:

Item No.	Clarifications Requirements
1.	<p>Q: Please issue interior wall elevations with tile. What elevation does the new tile go up to? Does new wall tile go up to ceiling level or if it is wainscot is there a Schluter trim above the top row? Also, please show layout/pattern of CWT-2 accent tile on wall elevations.</p> <p>A: All proposed wall tile start at the floor level and end at the ceiling level.</p>
2.	<p>Q: Is there a ceramic tile base at walls or does the wall tile go down over floor tile as it is shown on 8/A6.01 with a caulk joint at wall-to-floor transition?</p> <p>A: The wall tile shall go down to the floor as shown on 8/A6.01.</p>

3. Q: Once the existing wall tile is removed, surface of existing masonry substrate would not be smooth to receive large format and plank wall tile. Are we required to skim-coat existing masonry walls to receive new tile?
- A: The contractor is required to provide a smooth and uniform substrate to accommodate the installation of the proposed wall tile.
4. Q: Tiling specification section 2.3 lists mortar bed (mudset) and epoxy as setting materials, and 3.4 indicates epoxy adhesive for floor tile. Keynote-3 on A2.01 calls for 3" concrete infill (not mudset). We're figuring thinset or medium bed mortar as floor tile setting material over the 3" concrete infill and not epoxy. Please confirm.
- A: Please provide +/-3" concrete infill as required.
5. Q: Tiling specification section 2.3 lists mortar bed (mudset) and epoxy as setting materials, and 3.4 indicates thinset for wall tile. We're figuring thinset or medium bed mortar as wall tile setting material over the existing masonry substrate and not epoxy. Please confirm.
- A: Thinset or medium bed mortar are acceptable installation materials.
6. Q: Tiling specification section 2.4 is for sheet membrane waterproofing. There are no bathrooms or showers, and we were told most of the Cafeteria slab is slab-on-grade. Please confirm waterproofing membrane is not required, and if it is required please clarify where.
- A: Waterproofing membrane is not required.
7. Q: At the prebid meeting we were told floor tile is LFT (large format tile) to match existing bathrooms. A2.01 calls for 6"x35" plank tile, which is not quite the size of existing large tiles in bathrooms. Please confirm we're providing specified 6"x35" tiles. Also please specify the pattern - 1/3 offsets to avoid cambers in the middle of tile cause lippage?
- A: Please refer to the finish legend for floor tile information.
8. Q: Large tiles cannot be sloped and we have floor drains. We can have smaller localized slopes within concrete around drains and cut the tiles around drains to conform to this slope - please confirm. Current existing drains also look like they have small localized slopes around floor drains right now.
- A: This is acceptable.
9. Q: A7 series drawings show millwork - does floor tile continue under these millwork or does millwork get installed over concrete and not tile?
- A: Proposed floor tile is not to be installed under proposed millwork or low walls.

10. Q: "List of Subcontractors" form that is part of bid forms include a section for structural steel contractor in addition to M-E-P contractors. There is no structural steel at this project. Please amend this form by deleting the structural steel contractor section or advise if we should write "N/A" in this section.
- A: N/A is acceptable.
11. Q: Please confirm there are no known hazardous materials abatement or disturbance as part of this project. There is a "lead-safe work practices" spec section - is there any known existing lead paint that is being disturbed as part of this project? Is the paint over existing wall tile to be removed lead paint?
- A: To the best of the college's knowledge there is no lead paint or asbestos insulation in the work site. However, the contractor shall immediately stop work and notify the college if hazardous materials are encountered.
12. Q: Please confirm the work can occur during the daytime (1st shift) hours. You can work literally any shift.
- A: The college has security staff on duty 24 hours a day, so the GC can work at any time.
13. Q: Please advise if GC is required to provide a temporary construction office and/or temporary toilets.
- A: The college will not be able to provide a temporary office. The GC is free to use the restrooms on-site provided it is kept clean and neat.
14. Q: Please advise if a section of the parking lot back outside the building could be used for construction parking, or if not is there any designated area for construction parking.
- A: Parking accommodations will be made for the contractor's vehicles throughout the duration of the project.
15. Q: We were told at the prebid meeting that all existing wall tile is to removed off the face of existing CMU walls. This is not currently shown on A1.01 demolition plan. Please confirm we're to remove all existing wall tile.
- A: The contractor shall remove all existing wall tile, as required, throughout the cafeteria in order to accommodate the installation of the new wall finish
16. Q: Can we use 1/2" thick letters (signage detail on Drawing A2.02 shows 3/4" I can't find 3/4"
- A: This is acceptable.

TECHNICAL SPECIFICATIONS
FOR
CONTRACT #2 – CAFETERIA RENOVATIONS AT
MEGA-STRUCTURE FACILITY
AT
ESSEX COUNTY COLLEGE

Essex County Community College
303 University Avenue
Newark, NJ 07102

Attention: Mr. Mohamed Seddiki,
Executive Dean / Chief Information Officer

T #973-477-7806
Email: seddiki@essex.edu

LAN Job #2.20302.02

October 25, 2022

LAN

LAN ASSOCIATES

SINCE 1965

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TECHNICAL SPECIFICATIONS
FOR
CONTRACT #2 – CAFETERIA RENOVATIONS AT
MEGA-STRUCTURE FACILITY
AT
ESSEX COUNTY COLLEGE

Essex County Community College
303 University Avenue
Newark, NJ 07102

Attention: Mr. Mohamed Seddiki,
Executive Dean / Chief Information Officer

T #973-477-7806
Email: seddiki@essex.edu

Matthew T. Wolfe,
Registered Architect
NJ RA License #21A101963400

LAN Job #2.20302.02
October 25, 2022

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1.1 Miscellaneous: Definitions: The word "provide" means furnish and install complete. The word "Contractor" means the proper trade referred by its reference.

The contractor is referred to the "Instructions to Bidders", "Bid Form", "Form of Bid Bond", "Form of Contract", "Performance and Payment of Bonds", "General Conditions", "Supplementary General Conditions", "Contract Drawings", and any "Amendments" to any foregoing, all of which are hereby made part of this contract.

1.2 Submittals: A progress schedule shall be submitted to the Architect/Engineer by the Contractor prior to initiation of work and shall be adhered to at all times. Any deviation from the schedule shall be brought to the immediate attention of the Architect/Engineer.

Before work is started, the Contractor shall submit to the Architect/Engineer for approval a list of materials, with trade names, proposed to be furnished (4 copies) and shop drawings as requested by the Architect/Engineer. Submittals shall be representative of materials to be used by the Contractor in completing his work.

1.3 Progress Payments: Prior to the start of work, the Contractor shall submit a complete payment breakdown to the Architect/Engineer. Payments will be made by the Owner in accordance with Article 9 of the contract form. The Contractor shall submit applications for payment of vouchers on the forms prescribed and approved by the Owner. These applications shall be submitted to the Architect/Engineer for approval before final payment by the Owner.

1.4 Materials Handling:

1.4.1 Delivery: The Contractor shall be responsible for all materials being delivered in manufacturer's original unopened containers with manufacturer's labels intact and legible.

1.4.2 Storage: Storage space for materials and equipment is considered limited and the Contractor will schedule deliveries to minimize space required for storage.

The Contractor shall place and store materials and equipment in spaces agreed upon by the Owner, Architect/Engineer, and Contractor. The contractor shall provide continuous protection against damage or loss.

1.4.3 Use of Site: The Contractor's use of the premises is restricted to the areas involved in the work.

Telephone facilities of the Owner are not at the disposal of the construction personnel. The Owner is not responsible for any materials, tools, or equipment of the Contractor. All streets and all drive areas throughout and adjacent to the property must be kept free of obstructions.

1.4.4 Safety: All work shall be performed with the safety of the building occupants, students, and staff taken into consideration.

1.5 Special Conditions:

1.5.1 Visit to Site: The Contractor shall examine the drawings and specifications; must visit the site and note all field conditions which will influence the work required by his contract. The Contractor must verify the data noted in the drawings and specifications. He shall report any discrepancies between the bid documents and the field conditions to the Architect/Engineer no later than seven (7) days before the bids are due so that the Architect/Engineer may issue clarification addenda if required. Failure to report any discrepancies within the time frame noted, will nullify any extra cost claim by the Contractor, if claim is based on discrepancies between specifications, drawings, and field conditions.

1.5.2 Protection: Contractor shall be responsible for the existing building, new work, new facilities, and improvements within the area where his work is being accomplished. Any damage to these resulting directly or indirectly from the Contractor's operations shall be promptly corrected at the Contractor's expense.

Provide all necessary temporary enclosures, covers, guardrails, barricades, safety devices, etc., to adequately protect all workmen and the public, especially children, from possible injury due to the various processes required to accomplish the work required. Provide all necessary temporary partitions, enclosures, and coverings for the confinement of dust, dirt, and debris.

Temporarily protect partially completed construction items such as structural steel, roof deck, roofing, insulation, exposed wall cavities, interior walls, etc., as needed to protect against weather damage.

1.5.3 Security and Safety: The Contractor shall maintain adequate security at all times to protect the materials and work in place from damage, theft, malicious mischief and vandalism. The Contractor shall also observe and comply with all codes and regulations applicable to the safety of employees, tenants, and the general public. The Contractor, specifically, shall meet all requirements of OSHA as published in the Federal Register and procurable from the Government Printing Office, and the New Jersey Department of Labor Safety Regulations as related to the construction work.

1.5.4 Installation: The complete installation shall be in accordance with the latest rules and regulations of the Boards and Departments having jurisdiction.

Any item or requirement necessary for a complete installation but not specifically described in this specification shall conform to the governing rules and regulations.

The Contractor shall procure all the necessary and usual certificates for all work installed by him and deliver same to the Architect/Engineer before final acceptance.

The Contractor is responsible for all rigging, scaffolding, and hoisting that is required in order to install the equipment as specified.

1.5.5 Existing Work: Existing work shall be cut, drilled, altered, removed or temporarily removed and replaced as necessary for the performance of the contract. However, unless otherwise provided by the specifications, no structural members shall be cut or altered without the authorization of the Architect/Engineer. Work remaining in place which is damaged or defaced by reason of work as done under this contract, shall be restored equal to its condition at the time of the award of this contract.

1.6 Hours of Operation: All work shall be coordinated with the Owner. Working hours shall be scheduled during the hours of 7:00 a.m. and 10:00 p.m. Monday through Sunday.

The Contractor shall not interfere with the operation of existing essential services during all normal operating hours and periods. All work requiring temporary interruption of essential services shall be done only with the specific approval of the Architect/Engineer and Owner. The Contractor shall set up a schedule of work affecting existing services for approval by the Owner and the Architect/Engineer.

Contractor shall give 24 hours' notice to the Project Manager for those areas where access would be required the next working day.

Overtime of Owner employees resulting from and/or as requested by the Contractor(s) shall be chargeable to the Contractor.

Separate access to the construction activities will have to be provided by the Contractor as required, while construction is on-going. The General Contractor will provide, as required, temporary stairs, scaffolding, doors, etc. to provide separate access for all trades to the construction areas.

1.7 As-Builts: The Contractor (each prime contractor), upon completion of installation of work, shall provide the Owner with as-built drawings (4 copies) to be approved by the Architect/Engineer. These drawings shall show the exact location and invert of all items installed and/or altered by the Contractor.

1.8 Time of Completion: The Contractor, prior to being awarded the contract, shall prepare and submit for the Architect/Engineer's and Owner's approval, a progress schedule for the work. The progress schedule shall be related to the entire project to the extent required by the contract documents. This schedule shall indicate the dates from the start of work to completion and shall be revised as required by the conditions of the work subject to the Architect/Engineer's approval. Any departure from the schedule shall be brought to the attention of the Architect/Engineer.

The Contractor, in preparing his schedule, shall comply with the requirements of Table T-11 on Page 01000-30, which lists the total weeks for completion from the contract award date.

Any objections by a prospective bidder to this time schedule shall be indicated on the bid form with submittal of bid and notify Architect/Engineer in writing ten (10) calendar days before the bid.

1.9 Liquidated Damages: The Contractor agrees that, from the compensation otherwise to be paid, the Owner will assess liquidated damages in the amount indicated on Table 1-1 for each calendar day thereafter that the work included under his contract remains uncompleted after calendar occupancy day specified under Time of Completion which sum is agreed upon as the proper proportionate measure of liquidated damages which the Owner will sustain per diem, by failure of the Contractor to progress or complete his work under his contract at the time stipulated, and the sum is not to be construed as in any sense a penalty.

The above liquidated damages shall be interpreted as partial reimbursement to the Owner resulting from costs of legal fees and the cost of additional Architect/Engineer services, and other expenses of the Owner because of non-compliance by original dates, but shall not be considered as including costs of legal fees and the cost of additional services in connection with claims, arbitration, litigation, default, or insolvency of the Contractor.

1.10 Buy American:

1. In accordance with the provisions of Section 6(c) of the United States Housing Act of 1937, as amended, (42 USC 1406 (c)), the Buy American Act (41 USC 10a - 10d), Executive Order 10582, December 17, 1954 (3 CFR Supp.), New Jersey State Statute 52:33-1 to 52:33-4, the Contractor agrees that only domestic construction material will be used (by the contractor, sub-contractors, materialmen, and suppliers) in the performance of this contract.
2. "Construction Material" means any article, material, or supply brought to the construction site for incorporation in the building or work. An unmanufactured construction material is a domestic construction material, if it has been mined or produced in the United States. A manufactured construction material is a "domestic construction material" if it has been manufactured in the United States and if the cost of its components which have been mined, produced, or manufactured in the United States exceeds 50% of the cost of all its components. "Component" means any article, material, or supply directly incorporated in a construction material.
3. A component shall be considered to have been "mined, produced, or manufactured in the United States" (regardless of its source in fact) if the article, material or supply in which it

is incorporated was manufactured in the United States and the component is of a class or kind determined by HUD to be not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

1.11 Substitutes: When a product or material is specified by name, as noted in these specifications, such specifications establishes the standard type and quality considered most satisfactory for the particular purpose in the building and the proposal therefore should be based thereon, so that all bid under the same conditions. Another product or material of the same type and to meet the requirements may be submitted for consideration as a substitute only under the following conditions:

1. If a bidder intends to offer substitution of the product specified, such intentions must be stated in the bid. Bidder must prove equivalence of substitution and furnish detailed specifications and catalog cuts or drawings. Failure to identify exceptions or deviations from equipment specified must be interpreted to indicate that the product offered complies with the specification in every respect.
2. Requests for substitution must be submitted in writing at least ten (10) days before the date set for the receipt of bids. All bidders will, in turn, be notified if the proposed substitutes will be approved prior to the receipt of bids. Bids must be submitted with approved shop submittals.

1.12 Guarantees:

1. Guarantees shall be furnished by all prime contractors for all labor and materials for a period of one (1) year from the date of completion and final acceptance of his work by the Owner, which shall include an agreement to repair and make good at his own expense any and all defects which may appear in his work or materials.
2. Where special guarantees covering installation, operation, or performance of any systems or appliances furnished under this contract for this work are herein required, the full responsibility for the fulfillment of such guarantees, in triplicate, from any and all sub-contractors and material suppliers, two (2) copies of which shall be filed with the Architect/Engineer before final acceptance.

1.13 Communications: Should there be any problems with the contract in terms of working conditions, cooperation of the owner personnel, tenants, vandalism, job safety, stolen equipment and materials, unusual field conditions; the Contractor will immediately notify the Architect/Engineer and the owners representative in writing for resolution by the Architect/Engineer and the owner.

1.14 Protection:

1. Provide all required protective measures for removal work. Give particular attention to the protection requirements so as to prevent any damage to existing construction or to adjoining public and private property, including thoroughfares. The Contractor will be held responsible and shall restore at his own expense any such damage to the complete satisfaction of the Architect/Engineer.
2. Protect adjoining public and private property, including thoroughfares, from damage due to disposal operations.

3. Protect from damage all heating, plumbing, and electrical lines to remain.
4. Take extreme care to protect the occupants of adjoining areas and prevent any harm to them through the required operations.

1.15 Indemnity:

1. Each prime contractor agrees to indemnify and save the Owner and Architect/Engineer and their authorized representatives, harmless from and against any and all costs, loss, expenses, liability, damages, including cost of defending any action on account of any injury or damage to the buildings, improvements or property of any person, firm, corporation, or association and on account of any injury (including death) to any person or persons arising or resulting from the work provided for or performed under the specifications, or from any act, omission, or negligence of the contractor, sub-contractors, and his or their agents or employees. The foregoing provisions shall not be deemed to be released, waived or modified in any respect by reason of any surety provided by the contractor under this contract.

1.16 Ingress, Egress, and Circulation: Each prime contractor shall be responsible for performing his construction activities in such manner to maintain essential ingress and egress for visitors and occupants of Owner-occupied areas and to continuously maintain all required emergency exits from and circulation between existing facilities. Passageways for emergency exits shall be kept continuously free from debris, construction equipment, tools, stockpiles of materials, and other hazards to speedy evacuation. The contractor shall provide all necessary temporary work as prudence and good practice may dictate and in accordance with Public Law, to obtain and maintain all such ingress, egress, and circulation requirements. All temporary work shall be removed when no longer required.

1.17 Non-Interference with Owner's Operations: Each prime contractor shall acquaint himself with the general character of the Owner's operations prior to commencing work and shall so schedule his work to avoid interference therewith. The sequence of demolition and removal operations shall be in accordance with a schedule of contract operations approved by the Owner and Architect/Engineer.

1.18 Sequence of Work:

1. An approved Sequence of Work will be established for the work of this project that will not interfere with the Owner's operations. The Sequence of Work may be modified from time to time by the Owner if changes in his schedule of activities require it.
2. The Owner will occupy the existing building and the outdoor facilities during normal business hours and also for after-hours activities.
3. Emergency exit ways shall be kept clear at all times that people are in the building.

1.19 Final Cleaning Up:

1. Just prior to the Architect/Engineer's inspection tour to establish the date of Substantial Completion, Contractor shall do final cleaning of materials and equipment installed under the contract.

2. The Contractor shall restore the areas of the building or the site, damaged by his work, to its original condition.
3. Contractor shall be responsible for the proper cleaning of all equipment furnished under this contract and for the removal of rubbish, packing cases and debris.

1.20 Storage: Storage space for materials and equipment is considered limited and the Contractor will schedule deliveries to minimize space required for storage.

The Contractor shall place and store materials and equipment in spaces agreed upon by the Owner, Architect/Engineer, and Contractor. The Contractor shall provide continuous protection against damage or loss.

1.21 Visit to Site: Each prime contractor shall examine the drawings and specifications, must visit the site and note all field conditions which may influence the work required by his contract. Each prime contractor must verify the data noted in the drawings and specifications. He shall report any discrepancies between the bid documents and field conditions to the Architect/Engineer no later than ten (10) days before bids are due so that the Architect/Engineer may issue clarification addenda if required. Failure to report any discrepancies within the time frame noted, will nullify any extra cost claim by the Contractor, if claim is based on discrepancies between specifications, drawings, and field conditions.

1.22 Architect/Engineer's Inspections: Accommodate Architect/Engineer's inspections by providing manpower, equipment, etc. as required by the inspector. Assist the inspector as requested.

1.23 Contract Location:

1. Essex County College, 303 University Avenue, Newark, NJ 07102
T #973-877-3000
Executive Dean/Chief Information Officer: Mr. Mohamed Seddiki

1.24 Installation: The complete installation shall be in accordance with the latest rules and regulations of the Boards and Departments having jurisdiction.

Any item or requirement necessary for a complete installation but not specifically described in this specification shall conform to the governing rules and regulations.

Each prime contractor shall procure all the necessary and usual certificates for all work installed by him and deliver same to the Architect/Engineer before final acceptance.

Each prime contractor is responsible for all rigging, scaffolding, and hoisting that is required in order to install the equipment as specified.

1.25 Code Requirements: All work performed and materials furnished shall be done in strict accordance with current requirements of the Safety Code, the National Board of Fire Underwriters, the National Electrical Code, International Building Code New Jersey Edition, New Jersey Uniform Construction Code, National Standards Plumbing Code, International Building Code New Jersey Edition Mechanical Code, ASHRAE Mechanical Code, Elevator Code ASME/ANSI A17.1, State of New Jersey

Department of Education enhancements to the UCC, and state and local codes as may apply including all revisions and authorized standards to date.

1.26 Permits and Inspections: Each prime contractor shall obtain and pay for any necessary Municipal or State inspection and permit as required by the inspection authority, and make such tests as are called for by the regulations of such authorities. These tests shall be made in the presence of such authorities or their authorized representative. **All permit and inspections fees shall be reimbursed to the Contractor by the Owner. All receipts shall be submitted to the Owner in order to be eligible for reimbursement.**

1.27 Shop Drawings, Product Data, and Samples:

1. Work Included:

- a. Submit to Architect/Engineer, all shop drawings, product data, and samples as required by these specification sections.
- b. Designate construction schedule dates for submission, and dates shop drawings reviewed, product data and samples will be needed for each product.
- c. Contractor must stamp all submittals with "approval stamp" before submitting to the Architect/Engineer.

2. Shop Drawings:

- a. Original drawings prepared by Contractor, Sub-Contractor, supplier or distributor, which show some portion of the work, showing fabrication, layout, setting, or erection of details.
- b. Prepared by qualified details.
- c. Identify details by reference.
- d. Reproduction of submittals to be opaque diazo prints or blueprints.

3. Product Data:

- a. Manufacturer's Standard Schematic Drawings:
 1. Modify drawings to delete information which is not applicable to the project.
 2. Supplement standard information to provide additional information applicable to project.
- b. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
 1. Clearly mark each copy to identify pertinent materials, products or models.
 2. Mark each item with the appropriate specification reference.

3. Show dimensions and clearances required.
4. Show performance characteristics and capacities.
5. Show wiring diagrams and controls.
6. Indicate any deviations for characteristics specified clearly.

4. Samples:

- a. Where called for in specifications or required by Architect/Engineer provide physical examples to illustrate materials, equipment or workmanship and to establish standards by which completed work is judged.
- b. Provide office samples of sufficient size and quantity to clearly illustrate:
 1. Functional characteristics of products or material with integrally related parts and attachment devices.
 2. Full range of color samples.
 3. After review samples may be used in construction of the project.
- c. Clearly identify each sample with appropriate specification reference and clearly indicate any deviation from specification.

5. Contractor's Responsibilities:

- a. Review shop drawings, product data, and samples prior to submission, make certain that items conform to specifications and requirements of work, and so certify when submitting items for approval.
- b. Verify:
 1. Field measurements;
 2. Field construction criteria;
 3. Catalog numbers and similar data.
- c. Coordinate each submittal with requirements of work and of contract documents.
- d. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect/Engineer's review of the submittals.
- e. Contractor's responsibility for deviations in submittals from requirements of contract documents is not relieved by Architect/Engineer's review of submittals, unless Architect/Engineer deviations are identified by contract at time of submission.
- f. Notify Architect/Engineer, in writing, at the time of submissions or deviations in submittals from requirements of contract documents.

- g. Begin no work, which requires submittals until return of submittals with Architect/Engineer's stamp and initials or signature indicating review.
- h. After Architect/Engineer's review distribute copies, as needed.

6. Submission Requirements:

- a. Submittal schedule for shop drawings, product data, and samples shown:
 - 1. Date of Contractor's submittals;
 - 2. Date of Contractor's resubmittals;
 - 3. Date of approval;
 - 4. Date of release of work or purchase order.
- b. Schedule submissions at least fifteen (15) days before dates reviewed submittals will be needed.
- c. Submit number of copies of shop drawings and product data samples which Contractor requires for distribution and manuals, three (3) copies which will be retained by Architect/Engineer and two (2) copies for owner.
- d. Submit number of samples specified in each of these specification sections.
- e. Accompany submittals with transmittal letter in duplicate, containing:
 - 1. Date;
 - 2. Project title and number, and contract number;
 - 3. Contractor's name and address;
 - 4. Number of each shop drawing, product data, and sample; and quantity of drawings submitted;
 - 5. Notification of deviations from contract documents;
 - 6. Other pertinent data.
- f. Submittals shall include:
 - 1. Data and revision dates;
 - 2. Project title and number;
 - 3. The names of:
 - a. Architect/Engineer
 - b. Contractor
 - c. Subcontractor
 - d. Supplier
 - e. Manufacturer

- f. Separate details, when pertinent.
 4. Identification of product or material;
 5. Relation to adjacent structure or materials;
 6. Field dimensions, clearly identified as such;
 7. Specification section numbers;
 8. Applicable standards, such as ASTM number or Federal Specification;
 9. Identification of deviation from contract documents;
 10. Contractor's stamp, initialed or signed, certifying to review of submittal; verification of field measurements and compliance with contract documents.
7. Architect/Engineer's Review:
- a. Architect/Engineer will review and stamp submitted shop drawings and other submissions in one (1) of the following ways:
 1. "NO EXCEPTIONS TAKEN": Submission is in full compliance with all contract documents, or indicated deviations are acceptable.
 2. "MAKE CORRECTIONS NOTED": Submission has minor corrections not significant enough to require resubmission; noted corrections must be made in the final installation.
 3. "REJECTED": Submission does not meet contract requirements; resubmission of shop drawings, which meet contract requirements, is required.
 4. "AMEND AND RESUBMIT": Resubmission is required due to the nature and/or number of corrections.
 - b. Work shall be executed in accordance with "No Exception Taken" or "Make Corrections Noted" drawings only.
 - c. Architect/Engineer's approval is for conformity to design requirements and arrangement only. Contractor is responsible for quantity, dimension, accuracy of fit, and coordination with other trades. Approval is subject to all contract requirements and does not authorize any changes involving additional costs, unless stated in a separate letter or change order.
8. Resubmission Requirements:
- a. Shop Drawings:
 1. Revise initial drawings, as required, and resubmit, as specified to initial submittal;

2. Indicate on drawings any changes which have been made, other than those requested by Architect/Engineer;
 3. Submit new product data and samples, as required on initial submission.
9. Distribution of Submittals After Review:
- a. Distribute copies of shop drawings and product data which carry Architect/Engineer's stamp to:
 1. Contractor's File;
 2. Job Site File;
 3. Record Document File;
 4. Sub-Contractors;
 5. Supplier;
 6. Fabricator.
 - b. Distribute samples as directed; remove from site if so placed, or incorporated in finished work when permitted by Architect/Engineer.

1.28 Schedule of Values:

1. Work Included:
 - a. Submit to Architect/Engineer the Schedule of Values, within seven (7) days after award of contract.
 - b. Upon request of Architect/Engineer, support values given with data that will substantiate their correctness.
 - c. List quantities of materials specified under unit price allowances.
 - d. Payment for materials stored on site will be limited to those materials listed in Schedule of Unit Material Values.
 - e. Use Schedule of Values only as basis for Contractor's Application for Payment.
2. Submittals:
 - a. Form and Content:
 1. Submit typewritten Schedule of Values on AIA G702a.
 2. Use Table of Contents of these specifications as basis for format of listing costs of work for sections under divisions applicable to contract.
 3. Identify each line item with section number and title, as listed in Table of Contents of these specifications.

3. Preparation:

- a. Itemize separate line item cost for each of the following general cost items:
 1. Performance, and payment bonds;
 2. Field supervision and layout;
 3. Temporary facilities and controls;
 4. Mobilization;
 5. Performance testing (not less than 10% of value of equipment/system being tested);
 6. Allowances.
- b. Payment for field supervision, layout, temporary facilities, and controls will be made monthly as a percentage of project completion corresponding directly to the percent of total dollar value of the work owed (does not include retainage).
- c. Itemize separate line item cost for work required by each section of these specifications.
- d. Provide line item for each major component of work for which contractor will require partial payment or where so requested by the Architect/Engineer.

4. Review and Submittal:

- a. After review by Architect/Engineer and Owner, revise and resubmit schedule, as required.
- b. Schedule of Value(s) which are "front-loaded" will be rejected.

1.29 Cut-Overs, Interruptions to Existing Buildings: All cut-overs of mechanical and electrical services to existing buildings shall be scheduled and coordinated in advance with the A/E and done at a time convenient to the Owner so as not to unreasonably interfere with its operations.

1.30 Control Wiring: The Prime Contractor who furnishes and installs mechanical equipment, including but not limited to heating, ventilating, and air conditioning systems; ATC systems; boilers, remote monitoring systems; and so forth, which systems require electrical control wiring, shall include the cost of all such control wiring and its installation in his proposal.

Control wiring must connect to a point of electrical power supply as shown in the contract documents. (Power wiring and supply shall be provided by the Electrical Contractor.)

1.31 Openings, Channels, Cutting and Patching: Each contractor shall be responsible for furnishing an setting of sleeves, built-in items, anchors, inserts, etc. for his work and for all cutting, fitting closing in, patching, finishing, or adjusting of his work in new and/or existing construction, as required for the complete installation. Where applicable, the Contractor shall build these items into the construction.

The Contractor shall build recesses, channels, chases, openings, flues, and ducts, or any other feature of the heating and ventilating work. The Contractor shall provide openings for all louvers. Openings in masonry walls shall be lintels provided and installed by the Contractor. All contractors requiring recesses, channels, chases, openings, etc. shall furnish to the Contractor, through the A/E, complete detailed drawings for all chases, openings required in connection with some work in ample time to allow the construction work to proceed without interruption or delay. At least three copies shall be furnished to the A/E.

The Contractor shall close, build in, and furnish around or over all openings, chases, channels, pockets, etc. after installation has been completed. Should a contractor fail to furnish the above required information in time, he shall, at his own expense, arrange for all cutting, rebuilding, patching and furnishing, but shall employ the Contractor for the work.

Approval in writing must first be obtained by the contractor from the A/E before cutting or boring through an floor beam, floor construction or sorting members.

Repair of Cracks: The Contractor accepts sole responsibility for repair of uncontrolled dislodgment, cracking, delamination, and peeling of finished surfaces such as concrete, precast concrete, cast and natural stone, until masonry millwork, plaster, glass and applied finishes such as paint, and special coatings, within the contract scope and the limits of specified guarantee periods, regardless of the cause.

The Contractor shall be responsible for replacement of all broken glass installed by him or his subcontractors, after same has been installed, no matter by whom or what cause, and shall replace all broken, scratched, or otherwise damaged glass before the completion and acceptance of the work. He shall wash all glass on both sides at completion, or when directed, removing all paint spots, stains, plaster, etc.

Nothing herein is intended to limit the right of the Contractor to seek payment from the party who is responsible for damages.

1.32 Regulatory Requirements: All general construction, plumbing, heating, and electrical work is to be done in accordance with the New Jersey Uniform Construction Code. No work requiring inspections and approvals of construction code officials is to be covered or enclosed prior to inspection and approval by appropriate code enforcement officials.

1.33 Temporary Water:

1. Temporary water will be provided by the Owner at no charge to the Contractor provided and to the extent it may be existing and available at the site immediately prior to commencement of and during construction. It is the obligation of any Prime Contractor requiring temporary facilities to investigate and make specific arrangements with the Owner for such facilities and to include in his proposal the cost of any additional facilities he may require for proper conduct of his Work.

1.34 RESERVED:

1.35 Temporary Enclosures: Whenever necessary, in order to maintain proper temperatures for the execution of the work, or for the protection thereof, the Contractor shall furnish and maintain temporary enclosures for all openings in exterior walls that are not enclosed with finishing materials. Temporary wood doors shall be provided at door openings.

1.36 Protection of Work and Property:

1. Safety Precautions and Programs: Each prime contractor shall be responsible, in cooperation with and under the leadership of the Contractor, for initiating, maintaining, and supervising all safety precautions and programs in connection with the work. He shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent, unless otherwise designated by the contractor in writing to the Contracting Officer.
2. Safety of Persons and Property: Each prime contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:
 - a. Every employee on the work and all other persons who may be affected thereby;
 - b. All the work and all the materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the contractor or any of his subcontractors, or lower tier subcontractors; and
 - c. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

The contractor shall give all notices in writing, and comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the safety of persons or property of their protection for damage, injury or loss.

The contractor shall erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards for safety and protection, including rails, night-lights, the posting of danger signs, and other warnings against hazards, promulgating safety regulations, notifying owners and users of adjacent utilities and other means of protection against accidental injury or damage to persons or property.

When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution for the work, the contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

No contractor shall load or permit any part of the work to be loaded so as to create a safety hazard.

The contractor shall promptly remedy all damage or loss to any property caused in whole or in part by the contractor, any of his subcontractors, subcontractors, or anyone directly or indirectly employed by any of them, or by anyone whose acts any of them may be liable and for which the contractor is responsible. The foregoing obligations of the contractor are in addition to his obligations as stated elsewhere herein.

1.37 Emergencies: In any emergency affecting the safety of persons or property, the contractor shall act with diligence, at his discretion, to prevent threatening injury, damage, or loss. In such case, he shall immediately notify the Owner and Architect/Engineer of the action taken and shall forthwith prepare and submit a detailed and documented report to the Owner and Architect/Engineer.

Wherever the contractor has taken no action, but has notified the Owner and the Architect/Engineer or wherever the Owner and Architect/Engineer has otherwise been made aware of any emergency

threatening injury to persons, or loss or damage to the work, or to adjacent property, the contractor shall act only as instructed or authorized by the Owner or Architect/Engineer.

1.38 Temporary Drives, Walks, and Parking Areas: The Contractor shall be responsible for keeping all roadways, drives, and parking areas within or proximate to the site free and clear of debris, gravel, mud, or any other site materials by insuring that all measures reasonably necessary are taken to prevent such materials from being deposited on such surfaces including, as may be appropriate, the cleaning of vehicle wheels, etc. prior to their leaving the construction site. Should such surface require cleaning, the Contractor will clean these surfaces without additional cost to the Owner. The Contractor will be held accountable for any citations, fines, or penalties imposed for failure to comply with local rules and regulations.

1.39 Temporary Controls:

1. Dust Control - The Contractor, at his expense, shall provide and maintain necessary temporary dustproof partitions around areas of work in any existing building or in new building areas as directed by the Architect/Engineer.
2. Pollution Control - All sewage disposal work shall conform with the regulations of the State of New Jersey Department of Environmental Protection.
3. Haul Routes:
 - a. The Contractor shall be responsible for providing and maintaining unobstructed traffic lanes on the designated Construction Access Routes either shown on the contract drawings or reasonably required so as to perform the work and shall provide and maintain all reasonable required safety devices.
 - b. The Contractor shall obtain permission, in writing, from the A/E before using any existing driveway or parking areas not specifically designated for such use in the Contract Documents for construction purposes. He shall maintain such driveways and areas in good condition during the construction period, and completing of the project, shall leave them in the same condition as the start of the work. Conditions before use should be carefully photographed or documented by the Contractor.

1.40 Testing of Mechanical and Electrical Systems: When mechanical, electrical, or other equipment is installed, it shall be the responsibility of the installing Contractor to operate it for such period of time as may be required for the proper inspecting and testing of the equipment and for instructing the Owner's operating personnel. All tests shall be conducted in the presence of, and upon timely notice (three (3) working days) to the A/E prior to acceptance of the installation.

If the Architect/Engineer determines that any work requires special inspection, testing or approval, not otherwise required herein, he will, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give a three (3) work day notice. If such special testing or inspection reveals a failure of the work to comply with the requirements of the Contract, the Contractor shall bear all costs thereof.

1.41 Final Clean Up: In addition to those responsibilities addressed in the General Conditions, the Contractor shall:

1. Remove all debris and rubbish resulting from or relating to his work. Rubbish shall not be thrown from building openings above the ground floor unless contained within chutes;
2. Remove putty stains from glass and mirrors; wash and polish inside and outside;
3. Remove marks, undesirable stains, fingerprints, other soil, dust or dirt from painted, decorated or stained woodwork, plaster or plasterboard, metal acoustic tile and equipment surfaces;
4. Remove spots, paint and soil from resilient, glazed and unglazed masonry and ceramic flooring and wall work;
5. Remove temporary floor protections, clean, wash or otherwise treat and/or polish, as directed, all finished floors;
6. Clean exterior and interior metal surfaces, including doors and window frames and hardware of oil stains, dust, dirt, paint and the like, polish where applicable and leave without fingerprints or blemishes; and

1.42 Changes in Work:

1. Changes to Contract: The Owner may at any time, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including, but not limited to the following changes:
 - a. In the specifications (including drawings and designs);
 - b. In the method or manner of performance of the work;
 - c. Directing acceleration in the performance of work.
2. Requests for Equitable Adjustment: All requests for contract time extensions must be accompanied by copies of the current (approved) progress schedule and copies of the revised (proposed) progress schedule detailing the incorporation of the changed work and the effects of such incorporation on progress. Failure to provide the schedule data shall be grounds for rejection of the request.

Notwithstanding any other portion of this contract, any time extensions for changes in the work depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The contract modification making such time extension will provide for an extension of contract completion date only for those specific elements so delayed, and will not alter the contract completion dates for other portions of the work. This contract modification may further provide for an equitable readjustment of liquidated damages pursuant to the new completion schedule.

The Contractor, in connection with any request it makes for an equitable adjustment, shall furnish a price breakdown, itemized as required by the Owner. Unless otherwise directed, the breakdown shall cover all work involved in the change whether such work was deleted, added, or changed. Further, the breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, subcontract, and overhead costs, as well as profit. Any amount proposed for subcontracts shall be supported by a similar price breakdown. In addition, if the request includes a time extension, a justification shall also be furnished. The request, together with the price breakdown and time extension justification, shall be furnished by the date specified.

If any change under this article causes an increase or decrease in the contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, an equitable adjustment may be made in the contract price or delivery schedule or both, and the contract modified in writing accordingly.

The following rates shall apply in computing indirect costs and profit for the negotiation of equitable adjustments, under all provisions of this contract which provide for such adjustments that do not exceed \$25,000. When the contract time is increased as a result of a change, the resulting change in contract amount will include the indirect impact cost of extended performance, computed in accordance with the terms of this article, and no further consideration of such costs arising from the specific modification will be given. The percentages for overhead and profit shall be negotiated and may vary according to the nature, extent and complexity of the work involved. The percentages shall be applicable for deleted work as well as additional work. When a change consists of both added and deleted work, the applicable percentages shall be applied to the net cost or credit. In any event, the percentages shall not exceed the following:

- a. Overhead will be the sum of the following:
 1. 10% of the direct labor costs. NOTE: For the purpose of this article, the term "direct labor" shall include all foremen, equipment operators, and skilled, semi-skilled and common laborers directly assigned to the specified operation. The term "direct labor costs" shall consist of the contract or actual payroll rate of wage per hour and fringe benefits paid for each and every hour that such employees are actually engaged in the performance of the work.
 2. 10% of the direct material costs. NOTE: For the purpose of this article, the term "direct material costs" shall consist of the actual costs of the materials include applicable tax and transportation charges.
- b. For rented equipment, an hourly rental rate will be used which will be determined by using the monthly rental rates taken from the current edition of the Rental Rate Blue Book for Construction Equipment and dividing it by 176. An allowance will be made for operating costs for each and every hour the equipment is actually operating in accordance with the rates listed in the aforesaid Rental Book. The contractor will be allowed only 65% of the rental rate on contractor owned equipment.
- c. Bond premiums, payroll taxes, and travel subsistence, if applicable, will be allowed at actual cost for the equitable adjustment allowed.
- d. The prime contractor's profit on the sub-contractor's work will be 6% of the sub-contractor's costs. Sub-contractor indirect costs will be computed in the same manner as for the prime contractor. The prime contractor agrees to incorporate this article in each of its sub-contracts. NOTE: When more than one tier of sub-contractors exists, for the purpose of mark-ups, they shall be treated as one sub-contractor.

The Owner, in order to avoid delays in the progress of the work or when in the best interests of the Owner, has the discretion to direct the contractor, in writing, to proceed with a change without prior agreement on costs. Such direction shall be in the form of an

unpriced change order or letter of direction. If the contractor intends to assert a request for an equitable adjustment under this article, the contractor must submit to the Owner or, if instructed, to the Owner's designated project representative a Change Order form completed in sufficient detail and in accordance with this article within twenty (20) calendar days after receipt of an unpriced change order or letter of direction.

Where the cost of property made obsolete or excess as a result of a change is included in the Contractor's request for adjustment, the Owner shall have the right to prescribe the manner of disposition of such property.

In order to avoid delays in the progress of work, the Owner has the discretion to order a contractor to proceed, even in the absence of a formal change order. The Contractor shall submit a follow up change order request within twenty (20) calendar days following the date of authorization to proceed with the changed work. The cost of such work shall then be evaluated by the Owner on the basis of the reasonable expenditures and savings for those performing the work.

Failure to agree to any adjustment shall be a dispute concerning a question of fact. However, nothing in this article shall excuse the Contractor from proceeding with the contract as changed.

1.43 Application for Payment:

1. Work Included: Submit applications for payment to Architect/Engineer, in accordance with schedule established by the General Conditions of the Contract for Construction and the Contract Between Owner and Contractor.
2. Related Work: Related work includes General Conditions for Construction, Supplementary General Conditions, Schedule of Values, and Contract Closeout.
3. Format and Data Required: Submit applications typed on AIA documents. Where "Architect" or "Engineer" is referred to, it shall also mean "Architect/Engineer".
4. Preparation of Application:
 - a. Application Form:
 1. Fill in required information, including Change Orders executed prior to the date of submittal of application;
 2. Fill in summary dollar values to agree with respective totals indicated on continuation sheets;
 3. Execute certification with signature of a responsible officer of contract firm. Signature shall be notarized.
 - b. Continuation Sheets:
 1. Fill in total list of all scheduled component items of work, with item number, and scheduled dollar value for each item;
 2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar or as specified in the Schedule of Values.

3. List each Change Order executed prior to date of submission at the end of the continuation sheets. Round off values to nearest dollar or as specified for Change Order executed prior to date of submission, at end of continuation sheets.
 4. List by an original component item of work.
 5. Submit revised progress schedule with each Application for Payment.
5. Substantiating Data: When Architect/Engineer requires substantiating data, Contractor shall submit suitable information with a cover letter identifying the following:
- a. Project;
 - b. Application number and date;
 - c. Detailed list of enclosures;
 - d. For stored products:
 1. Item number and identification, as shown on application;
 2. Description of specific material.

Submit one (1) copy of data and cover letter for each application.

6. Preparation of Final Application: Fill in application form as specified for progress payments. All documentation, as called for in the "General Conditions of the Contract for Construction" and Section 1.53 shall have been submitted and found acceptable by the Owner before Application for Final Payment is made.
7. Submittal Procedure: Submit five (5) copies of each Application for Payment to Architect/Engineer at times stipulated in the agreement. When Architect/Engineer finds the application properly completed and correct, he will transmit three (3) Certificates for Payment to Owner, and return one (1) copy to Contractor.

1.44 Contract Closeout:

1. Work Included: Provide an orderly and efficient transfer of the completed work to the Owner.
2. Related Work:
 - a. Documents affecting work of this section include, but are not necessarily limited to:
 1. General Conditions of the Contract for Construction; and
 2. Appropriate sections of Section 1.0 of these specifications.
 - b. Activities relative to Contract Closeout are described in, but not necessarily limited to, Article 8 of the General Conditions of the Contract for Construction;
 - c. "Substantial Completion" is defined in Article 8 of the General Conditions of the Contract for Construction.

3. Quality Assurance: Prior to requesting inspection by Architect/Engineer, use adequate means to assure that work is completed, in accordance with specified requirements, and is ready for the requested inspection.
4. Procedures:
 - a. Substantial Completion:
 1. Prepare and submit items required by Paragraph 9.7 of the General Conditions;
 2. Provide a Consent of Surety to reduction in retainage;
 3. Within reasonable time after receipt of list, Architect/Engineer will inspect to determine status of completion;
 4. Should Architect/Engineer determine work is not substantially complete:
 - a. Architect/Engineer promptly will so notify contractor, in writing, giving the reasons;
 - b. Contractor shall remedy deficiencies and notify Architect/Engineer when ready for re-inspection;
 - c. Architect/Engineer will re-inspect work.
 5. When Architect/Engineer concur that work is substantially complete:
 - a. Architect/Engineer will prepare "Certificate of Substantial Completion" accompanied by Contractor's list of items to be completed or corrected, as verified by the Architect/Engineer;
 - b. Architect/Engineer will submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate.
 - b. Final Completion:
 1. Prepare and submit the notice required by the General Conditions;
 2. Verify work is complete including, but not necessarily limited to, items mentioned in the General Conditions;
 3. Certify the following:
 - a. Contract documents have been reviewed;
 - b. Work has been inspected for compliance with contract documents;
 - c. Work has been completed, in accordance with contract documents;
 - d. Equipment and system have been tested as required, and are operational;
 - e. Work is completed and ready for final inspection;
 - f. Work meets requirements of and has been inspected by all cognizant governmental agencies;

- g. Work has been installed, in accordance with the requirements of all manufacturers used on project, and that no warranties or bonds have been voided.
4. Architect/Engineer will make an inspection to verify status of completion;
 5. Should Architect/Engineer determine that work is incomplete or defective:
 - a. Architect/Engineer shall promptly notify contractor, in writing, listing incomplete or defective work;
 - b. Contractor shall remedy deficiencies promptly and notify the Architect/Engineer when ready for re-inspection.
 6. Architect/Engineer determines that work is acceptable under the contract documents, he will request contractor to make closeout submittals.
- c. Closeout submittals include, but are not necessarily limited to the following:
1. Project Record Documents, including record drawings, operation, and maintenance manuals.
 2. Operation and maintenance data for items so listed in pertinent other sections of these specifications and for other items when so directed by the Architect/Engineer.
 3. Warrantees and bonds (including Maintenance Bond).
 4. Keys and keying schedule.
 5. Spare parts and extra stock of materials.
 6. Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to the following:
 - a. Certificate of Inspection and acceptance from Fire Marshall;
 - b. Certificate of Inspection and acceptance from Electrical Department or UL;
 - c. Certificate of Occupancy.
 7. Evidence of payment and release of liens from all sub-contractors and material men.
 8. List of Sub-Contractors, service organizations, and principal vendors, including names, addresses and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.
 9. Consent of Surety to Final Payment.
 10. General Release.
- d. Final Adjustment of Accounts:

1. Submit a final statement of accounting to Architect/Engineer, showing all adjustments to the contract sum;
 2. If so required, Architect/Engineer will prepare a final Change Order showing adjustments to contract sum which were not made previously by Change Orders.
5. Instruction:
- a. Complete instruction of Owner's personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the work;
 - b. Minimum of twenty-four (24) hours instruction shall be provided to Owner's personnel at such time, as requested by Owner.

1.45 Cleaning:

1. Work Included:
 - a. Provide necessary cleaning during construction to maintain premises and public properties free from accumulation of waste, debris, and rubbish caused by operations;
 - b. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials; clean all sight-exposed surfaces, whether worked on or not and leave project clean and ready for occupancy;
 - c. If contractor fails to clean up at completion of work, owner may do so and charge the cost to the contractor.
2. Related Work: Related work includes Contract Closeout.
3. Requirements of Regulatory Agencies:
 - a. Fire Protection:
 1. Store volatile, flammable materials, and waste in covered protective metal containers and remove from premises daily; storage and handling of such materials shall meet requirements of the Fire Code and Fire Marshall;
 2. Provide fire extinguishers, fire protective devices, firefighting clothing, equipment and materials in quantities and location, as required by the Fire Marshall;
 3. Designate key person to be responsible for fire protection and firefighting.
 - b. Pollution Control:

1. Conduct cleanup and disposal operations to comply with local ordinances and pollution laws:
 - a. Burning or burying of rubbish and waste materials on project site is prohibited;
 - b. Dispose of volatile fluid wastes; such as mineral spirits, oil or paint thinner; into storm and/or sanitary sewer systems, streams, and/or waterways is prohibited.

4. Quality Assurance:
 - a. Use adequate number of skilled mechanics who are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and methods needed for proper performance of the work in this section;
 - b. Use experience laborers or professional cleaners for the final cleaning.

5. Cleaning Materials:
 - a. Use only cleaning materials recommended by manufacturer of surface to be cleaned;
 - b. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

6. During Construction:
 - a. Contractor shall oversee cleaning of its work operations and shall ensure that building and grounds are maintained free from accumulations of waste materials and rubbish;
 - b. Contractor shall sprinkle his dusty debris with water before removal;
 - c. At one (1) week intervals maximum during progress of work, Contractor shall cleanup site and dispose of waste materials, rubbish, and debris;
 - d. Contractor to provide dump containers and locate on site for collection of waste materials, rubbish, and debris and provide removal service;
 - e. Contractor shall not allow its waste materials, rubbish, and debris to accumulate and become unsightly or hazardous condition;
 - f. Contractor shall vacuum or otherwise clean interior of building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until building is ready for acceptance or occupancy;
 - g. Contractor shall lower his waste materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights;
 - h. Contractor shall schedule cleaning operations so dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces, or on equipment.

7. Final Cleaning: Prior to substantial completion and turnover of the project to the Owner, Contractor shall clean all areas of the building, whether worked on or not if affected by his operations.

1.46 Project Record Documents:

1. Work Included:

- a. Contractor shall provide maintenance of documents, as follows:

1. Maintain at job site one (1) copy of the following:

- a. Contract drawings;
- b. Specifications;
- c. Addenda;
- d. Approved shop drawings;
- e. Approved catalog cuts;
- f. Change orders;
- g. Other modifications to the contract;
- h. Field test reports;
- i. Work set of record drawings.

2. Store documents in temporary field office, apart from other documents used for construction;

3. Provide necessary files and racks for storage of documents;

4. Do not use record documents for construction purposes;

5. Make documents available at all times for inspection by Architect/Engineer and Owner.

2. Related Work: Related work includes Operations and Maintenance Data.

3. Recording: Information shall be recorded by the Contractor to permit accurate record drawings to be made by Architect/Engineer:

- a. Label each document file, "PROJECT RECORD", in two inch (2") high printed letters;

- b. Keep record documents current;

- c. Do not allow any work to be permanently sealed until required information has been recorded;

- d. Contract drawings:

1. Legibly mark to record actual construction;
2. Elevations of various elements in relation to datum;
3. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements;

4. Location of internal utilities concealed in construction and referenced to visible and accessible features of structure, if significantly different than that shown on drawings;
 5. Field changes of dimensions and details;
 6. Changes made by Change Order or Field Order;
 7. Details not on original contract drawings;
 8. At completion of work, turn over all information to Architect/Engineer.
- e. Specifications and Addenda: Legibly mark up each section to record the following information:
1. Manufacturer;
 2. Trade name;
 3. Catalog number of each product and item of equipment actually installed;
 4. Changes made by Change Order or Field Order;
 5. Other matters not originally specified.
4. Sub-Contractors and Suppliers List: Provide a complete list of names, addresses, and telephone numbers of all contractors, sub-contractors, and suppliers employed on the project.
5. Submittals:
- a. At completion of project, deliver record documents to Architect/Engineer;
 - b. Accompany each submittal letter in duplicate, containing the following:
 1. Date;
 2. Project title and number;
 3. Contractor's name and address;
 4. Title and number of each record document;
 5. Certification in writing that each document, as submitted, is complete and accurate and reflects the actual condition at the building site;
 6. Signature of Contractor or authorized representative.

1.47 Operation & Maintenance Data:

1. Work Included:
 - a. Contractor, as well as those subcontracted to him, shall provide maintenance information and operation instructions for equipment and systems provided.
 - b. Contractor shall coordinate efforts of his sub-contractors and shall integrate their efforts with his.

1.48 Insurance Requirements: **The Owner shall procure and maintain at his own expense, insurance for liability for damages imposed by law and assumed under this Contract, of the kinds and in the amounts hereinafter required, in insurance companies authorized to do business in the State of New Jersey.** At or before the time of executing the Contract, the Owner shall furnish a certificate or certificates of insurance together with declaration pages in form showing the Owner has complied with the subsection. The certificate or certificates and declaration pages shall provide that the policies shall not be changed or cancelled. All certificates and notices of cancellation or change shall be

mailed to the Contractor at the address set forth in the Contract. The Owner shall furnish the Contractor with a certified copy of each policy itself, including the provisions establishing premiums.

All proof of insurance shall clearly set forth all exclusions and deductible clauses. The Owner, at its sole discretion, may allow certain deductible clauses which it does not consider excessive, overly broad or harmful to the interests of the Owner. Standard exclusions will be allowed provided that they are not inconsistent with the requirements of this subsection. Allowance of any additional exclusions will be in the discretion of the Owner. Regardless of the allowance of exclusions or deductions by the Contractor, the Contractor shall be responsible for the deductible limit of the policy and all exclusions consisting with the risks he assumes under this contract and imposed by law. Contracts for sewer, water lines, or facilities requiring excavation shall include coverage for underground facilities.

Insurance coverage in the amounts set forth herein shall not be construed to relieve the Contractor for liability in excess of such coverage, nor shall it preclude the Owner from taking such other actions as are available to it under any other provision of this contract or otherwise in law.

The general liability insurance required shall name the Contractor, its employees, Owner, its officers, and employees as named insured.

The coverage to be provided under the general liability insurance policy shall be at least as broad as the standard un-amended and unendorsed comprehensive general liability policy. Moreover such policy shall be endorsed so as to delete any exclusions applying to property damage liability arising from underground utilities (including, but not limited to wires, pipes, ducts, conduits, structures, and the like) and collapse of foundations.

The insurance policy shall be endorsed to include broad form general liability, contractual liability, and completed operations coverage.

The following coverages shall be provided and maintained by the Owner. Specific coverage amounts are indicated in the Supplemental Instructions to Bidders in these specifications.

1. Worker's Compensation and/or Employer's Liability Insurance as required or specified by State Law adequate to cover all employees employed in connection with the work and, in case any work is sublet, all sub-contractor's employees employed in connection with the work unless sub-contractor provides proof of such insurance for its own employees.
2. Public personal injury liability and property damage liability including contingent liability and contractual liability.

All required policies shall remain in force until all work has been completed.

All of the foregoing shall apply equally to each and every sub-contractor who shall be employed by the Contractor on this project, and the Contractor shall be responsible to see that each and every such sub-contractor shall be in compliance at all times with these regulations, and the Owner shall have the same remedies against the Contractor and the sub-contractor for non-compliance of the sub-contractor as if the Contractor himself were out of compliance.

1.49 Contractor Assumption of Absolute Liability: The liability of the Contractor hereunder, for all injuries to persons or damages to persons or damages to property, is absolute and is not dependent upon any question or negligence on his or its part or on the part of his or its agents, servants, or employees, and neither the approval of the Architect/Engineer or the methods of doing the work, nor the failure of the Architect/Engineer to call attention to improper or inadequate methods or to require a change in methods nor the neglect of the Architect/Engineer to direct the Contractor to take any particular precautions or to

refrain from doing any particular thing, shall excuse the Contractor in case of any such injury to persons or damages to property.

1.50 Lien Interest: No materials or supplies, for the work shall be purchased by the Contractor or by any sub-contractor subject to any lien interest or under a conditional sale or other agreement by which an interest is retained by the seller. The contractor warrants that he has good title to all materials and supplies used by him in the work.

1.51 Possible Asbestos Containing Materials: There may be some areas where asbestos containing building materials may exist (i.e. floor tile, plaster walls, ceiling tile, etc.) and could possibly be disturbed during construction of this project. The contractor shall review the Asbestos Management Plan for each building before any construction starts. The Asbestos Management Plan is located at the main office of each school and identifies areas where asbestos containing building materials are located. Should there be an area where asbestos containing building materials must be disturbed, the contractor shall notify the Owner immediately. Do not start work. Asbestos material disturbance will be addressed by the Owner, unless the removal is specifically included in the scope of work of this contract.

1.52 Use and/or Storage of "Hazardous Substances": The contractor is to notify the owner of any "Hazardous Substances" to be used/stored on site during construction at the Pre-Construction Meeting. This notification shall include a "Hazardous Substances Fact Sheet" as prepared by the Department of Health and Senior Services.

Should the need for the use of a hazardous substance arise during construction, the contractor is to utilize the following procedure:

1. If the school is occupied, notice is to be given to the owner of the need for a hazardous substance a minimum of two (2) weeks prior to its arrival on site. A "Hazardous Material Fact Sheet" is to be submitted at that time for each substance to be used. Also, a notice indicating the type(s) of hazardous substance(s) to be used is to be posted within the school a minimum of two (2) days prior to its arrival on site.
2. If the school is not to be occupied within 24 hours of use, notice is to be given to the owner and a notice posted within the school (as per the description above) a minimum of two (2) days prior to the arrival of hazardous substances on site.

The above procedures are as per Act No. 246 of the State of New Jersey, PL 1997, c.364.

1.53 Lead Base Paint: All contractors shall be made aware that some of the walls and ceilings that are painted and are required to be disturbed may contain lead base paint. The contractor shall follow safe work practices with regard to removing any lead based paint from these areas. Please refer to Section 028310 for General Procedures required for any activities that would affect the lead based paint.

Pursuant to 40 CFR Part 745, all firms performing renovation, repair and painting projects in target housing must be certified with the EPA to conduct lead-based paint activities and/or renovations prior to disturbing any areas where lead-based paint has been identified, or where the painted surface(s) has not already been determined to be lead free by an EPA-certified lead inspector/risk assessor.

END OF SECTION 010000

TABLE 1-1

LIQUIDATED DAMAGES

ESSEX COUNTY COLLEGE

Contract No.	Description	Start Date	Completion Date	Liquidated Damages \$/Calendar Day
2	Cafeteria Renovations at Essex County College	Notice to Proceed	6 months from Notice to Proceed	300

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS/REQUIREMENTS INCLUDES:

A. Work of items listed below is comprised of **Cafeteria Renovations at Essex County College.**

B. SUMMARY OF WORK

The scope of work for the Cafeteria Renovations at Essex County College includes, but is not limited to, modifications to the existing HVAC system, demolition and replacement of electrical outlets, receptacles and light fixtures, as well as the demolition of plumbing fixtures, domestic piping and sanitary lines.

The new scope of work includes, but is not limited to, the installation of new floor, ceiling and wall finishes, new light fixtures outlets and receptacles, new plumbing fixtures and gas piping, new doors and door hardware.

The Contractor shall be responsible to create a containment area around the immediate work site using plastic sheathing (with taped seams), masonite (or similar) to protect existing adjacent flooring and negative air machines (if possible) for the duration of the project. The Contractor shall keep the immediate work area clean and free of debris at all times.

C. Contractor's Duties:

1. Except as specifically noted, provide and pay for:
 - a. Labor, materials, and equipment;
 - b. Tools, construction equipment, and machinery;
 - c. Other facilities and services necessary for proper execution and completion of work.
2. Comply with codes, ordinances, regulations, rules, orders and other legal requirements of public authorities which bear on performance of work.
3. Promptly submit written notice to Architect/Engineer of observed variance of Contract Documents from legal requirements:
 - a. Appropriate modification to Contract Documents will adjust necessary changes;
 - b. Assume responsibility for work known to be contrary to such requirements when above notice has not been given.
4. Owner is exempt from sales tax:
 - a. Obtain sales tax exemption certificate from Owner;

- b. Put exemption certificate number on invoices for material incorporated in work;
- c. Upon completion of work, file with Owner a notarized statement that all purchases made under exemption certificate were entitled to be exempt;
- d. Pay legally assessed penalties for improper use of exemption certificate number.

1.2 CONTRACT:

- A. Perform all work under a single lump sum/fixed price contract with Owner for work listed below and on drawings listed herein;
- B. Work is fully described on drawings and in this specification; work generally includes, but is not limited **Cafeteria Renovations at Essex County College**. A detailed description of work included for these contracts can be found in various sections of this specification.

END OF SECTION 011100

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
 - 1. Unforeseen Conditions allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices.

1.2 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.3 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work.

1.6 UNIT-COST AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials under allowance shall be included as part of the Unit Price.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.
- D. Quantity Allowances shall be as listed on Bid Form and Drawings.

1.7 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Base Bid: Allowance: Contractor shall include in his Base Bid amount specified on Bid Form for Unforeseen Conditions.
 - 1. This allowance includes material cost, receiving, handling, installation, as well as Contractor overhead and profit.
 - 2. Coordinate quantity allowance adjustment with corresponding unit-price requirements in Section 012200 "Unit Prices."

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 010000 "General Requirements" for procedures for submitting and handling Change Orders.

1.2 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, bonding, applicable taxes, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

PART 2 - PRODUCTS

- A. Unit Price B – Provide and Install Additional Point of Sale Counter
 - 1. Description: Provide and install additional point of sale counter w/ optional tray rest and optional (3) sided laminate base, as noted on equipment schedule.
 - 2. Unit of Measurement: Each.
 - 3. Quantity Allowance: This is listed on the bid form.

END OF SECTION 012200

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 SCHEDULE OF VALUES (COST REPORTING)

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.

- e. Date of submittal.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. The breakdown shall also include lines for the following:
 - a. Bonds
 - b. Insurance
 - c. Mobilization
 - d. Cost of supervision
 - e. Punch List
 - f. Closeout documentation
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit Three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
 - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
 16. Initial settlement survey and damage report if required.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Project meetings.
- B. See Division 1 General Requirements for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.

2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.3 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five (5) days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for requests for interpretations (RFIs).
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Preparation of Record Documents.

- k. Use of the premises and existing building.
 - l. Work restrictions.
 - m. Owner's occupancy requirements.
 - n. Responsibility for temporary facilities and controls.
 - o. Construction waste management and recycling.
 - p. Parking availability.
 - q. Office, work, and storage areas.
 - r. Equipment deliveries and priorities.
 - s. First aid.
 - t. Security.
 - u. Progress cleaning.
 - v. Working hours.
3. Minutes: Architect will record and distribute meeting minutes.
- C. Progress Meetings: Conduct progress meetings at bi-weekly intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. 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 conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. 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) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) Requests for interpretations (RFIs).

- 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
3. Minutes: Architect will record and distribute to Contractor the meeting minutes.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

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

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Field condition reports.

B. Related Sections include the following:

1. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
2. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
3. Division 1 Section "Photographic Documentation" for submitting construction photographs.

1.03 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Preliminary Construction Schedule: Submit two opaque copies.

Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

C. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

D. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

1.04 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Timeframe: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - a. Items that may be identified at the Pre-Construction Meeting.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 4. Startup and Testing Time: Include not less than 2 days for startup and testing.
 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 4. Work Restrictions: Show the effect of the following items on the schedule:
 - b. Coordination with existing construction.
 - c. Limitations of continued occupancies.
 - d. Uninterruptible services.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Submittals.
 - b. Installation.
 - c. Tests and inspections.
 - d. Startup and placement into final use and operation.
 6. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Completion of mechanical installation.
 - b. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

2.03 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT-CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 5 days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require 12 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.04 REPORTS

- A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
- B. See Division 1 Section Contract Closeout for submitting photographic negatives and/or digital media as Project Record Documents at Project closeout.

1.2 SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.
- B. Construction Photographs: Submit two (2) prints of each photographic view within seven (7) days of taking photographs.
 - 1. Format: 8-by-10-inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
 - 2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken if not date stamped by camera.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier.

1.3 COORDINATION

- A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

1.4 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1600 by 1200 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified commercial photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Film Images:
 - 1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
 - 2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Architect.
- D. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.
- E. Preconstruction Photographs: Before commencement of demolition, take digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take twenty (20) photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take twenty (20) photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
- F. Periodic Construction Photographs: Take twelve (12) digital photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- G. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
1. Three days' notice will be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
 - 1. Division 1 Section "Project Management and Coordination" for Administrative Procedures for Coordinating Construction Operations.

1.03 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's and Construction Manager's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.04 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals. The contractor will be required to sign the Architect/Engineer's standard CADD Release Form prior to the release of any electronic copies.
- 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. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent

- submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Allow 15 days for processing each resubmittal.
 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Drawing number and detail references, as appropriate.
 - j. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).

- e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Submittal and transmittal distribution record.
 - i. Remarks.
 - j. Signature of transmitter.
- H. 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.
- I. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.01 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Standard product operating and maintenance manuals.
 - j. Compliance with recognized trade association standards.
 - k. Compliance with recognized testing agency standards.
 - l. Application of testing agency labels and seals.
 - m. Notation of coordination requirements.
- 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: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. 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 30 by 40 inches.
 4. Number of Copies: Submit five blue- or black-line prints of each submittal, unless prints are required for operation and maintenance manuals. Submit seven prints where prints are required for operation and maintenance manuals. Architect will retain three prints; remainder will be returned. Mark up and retain one returned print as a Project Record Drawing.
 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.
 6. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 7. Number of Samples for Initial Selection: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 8. 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.
- D. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Number and name of room or space.

3. Location within room or space.
- E. Contractor's Construction Schedule: Comply with requirements in Division 1.
- F. Submittals Schedule: Comply with requirements in Division 1.
- G. Application for Payment: Comply with requirements in Division 1.
- H. Schedule of Values: Comply with requirements in Division 1.
- I. 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.

2.02 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 1. Number of Copies: Submit five copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized 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.
 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "General Requirements."
- B. Contractor's Construction Schedule: Comply with requirements in Division 1.
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

- G. **Manufacturer Certificates:** Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. **Material Certificates:** Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. **Field Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- J. **Maintenance Data:** Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Operation and Maintenance Data."
- K. **Design Data:** Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- L. **Manufacturer's Instructions:** Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- M. **Manufacturer's Field Reports:** Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- N. **Insurance Certificates and Bonds:** Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

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

3.02 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. "NO EXCEPTIONS TAKEN": Submission is in full compliance with all contract documents, or indicated deviations are acceptable.
 - 2. "MAKE CORRECTIONS NOTED": Submission has minor corrections not significant enough to require resubmission; noted corrections must be made in the final installation.
 - 3. "REJECTED": Submission does not meet contract requirements; resubmission of shop drawings, which meet contract requirements, is required.
 - 4. "AMEND AND RESUBMIT": Resubmission is required due to the nature and/or number of corrections.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 017320 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of a building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Repair procedures for selective demolition operations.
- B. Related Sections include the following:
 - 1. Section 013233 "Photographic Documentation" for preconstruction photographs taken before selective demolition.

1.03 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 Owner 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.

1.04 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
 - 1. Coordinate with Owner who will establish special procedures for removal and salvage.

1.05 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Locations of temporary partitions and means of egress.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Pre-demolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

1.06 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.07 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site will not be permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equal or surpass that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 PREPARATION

- A. **Dangerous Materials:** Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. **Site Access and Temporary Controls:** Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 - 3. Protect existing site improvements, appurtenances, and landscaping to remain.
- C. **Temporary Facilities:** Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- D. **Temporary Enclosures:** Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
- E. **Temporary Partitions:** Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

3.03 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
 - 2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.04 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain [fire watch and] portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 9. Dispose of demolished items and materials promptly.
 - 10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items: Comply with the following:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.
- E. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- F. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts. Provide shoring, as necessary, to provide a safe work environment.
- G. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- H. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

3.05 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 - 1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- D. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall

coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- E. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 017320

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

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

B. Related Sections include the following:

1. Divisions 3 through 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.03 DEFINITIONS

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

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

1.04 QUALITY ASSURANCE

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

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

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

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.

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

aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

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

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

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

PART 3 - EXECUTION

3.01 EXAMINATION

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

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

3.02 PREPARATION

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

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

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

3.03 PERFORMANCE

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

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

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

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Concrete/Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
3. Proceed with patching after construction operations requiring cutting are complete.

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

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

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

END OF SECTION 017329

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

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

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

- B. Related Sections include the following:

- 1. Division 1 Section "Photographic Documentation" for submitting Final Completion construction photographs and negatives.
- 2. Divisions 3 through 26 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 SUBSTANTIAL COMPLETION

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

- 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
- 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
- 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- 4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
- 5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- 6. Complete final cleaning requirements, including touchup painting.
- 7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after

inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

1.04 FINAL COMPLETION

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

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

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

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

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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

1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
2. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.06 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated.
- 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 the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. 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.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Remove labels that are not permanent.
 - h. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
- 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of systems and equipment.
- B. Related Sections include the following:
 - 1. Section 017839 "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 2. Divisions 3 through 26 Sections as indicated in Table of Contents for specific operation and maintenance manual requirements for products in those Sections.

1.03 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.

1.04 SUBMITTALS

- A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Engineer will return 1 copy of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Engineer will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Engineer's comments. Submit 4 copies of each corrected manual within 15 days of receipt of Engineer's comments.

1.05 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with the 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."

2.02 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.

6. Name and address of Engineer.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch, 20-lb/sq. ft. 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.

2.03 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. Power failure.
 3. System, subsystem, or equipment failure.
- 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. Required sequences for electric or electronic systems.
 2. Special operating instructions and procedures.

2.04 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Precautions against improper use.
 9. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.

5. Required sequences for electric or electronic systems.
 6. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

2.05 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of

contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

- C. **Manufacturers' Maintenance Documentation:** Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.

- D. **Maintenance Procedures:** Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.

- E. **Maintenance and Service Schedules:** Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. **Scheduled Maintenance and Service:** Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. **Maintenance and Service Record:** Include manufacturers' forms for recording maintenance.

- F. **Spare Parts List and Source Information:** Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

- G. **Maintenance Service Contracts:** Include copies of maintenance agreements with name and telephone number of service agent.

- H. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

- A. Emergency Manual: Contractor shall 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.
- B. Product Maintenance Manual: Contractor shall assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Contractor shall 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. Contractor shall 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. Contractor shall prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Contractor shall 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. Contractor shall 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.
- E. Drawings: Contractor shall 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."

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
 - 2. Divisions 3 through 26 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.03 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one (1) set(s) of marked-up Record Prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Final Submittal: Submit one (1) set(s) of marked-up Record Prints, one (1) set(s) of Record Transparencies, and four (4) copies printed from Record Transparencies. Print each Drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit one copy (1) of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit five (5) copies of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Architect for resolution.

3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.
 4. Print the Contract Drawings and Shop Drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.
- C. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
 2. Format: DWG Version, operating in Microsoft Windows operating system.
 3. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
 4. Refer instances of uncertainty to Architect for resolution.
 5. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
 - a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
- D. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- E. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
 3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.02 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 and Record Drawings where applicable.

2.03 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 and Record Drawings where applicable.

2.04 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and DPMC Representative reference during normal working hours.

END OF SECTION 017839

SECTION 028300 - LEAD-SAFE WORK PRACTICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quality assurance requirements including personnel training'
2. Regulatory requirements.
3. Work practices.
4. Requirements for transport and disposal of lead waste materials by legal and appropriate means.

1.2 REFERENCES

A. United States Environmental Protection Agency (USEPA):

1. 40 CFR Part 260 - Hazardous waste Management system: General
2. 40 CFR Part 261 - Identification and Listing of Hazardous Waste.
3. 40 CFR Part 262 - Standards Applicable to Generators of Hazardous Waste.
4. 40 CFR Part 263 - Standards Applicable to Transporters of Hazardous Waste.
5. 40 CFR Part 264 - Standards for Owners and Operators of Hazardous Waste Treatment Storage, and Disposal Facilities.
6. 40 CFR Part 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.
7. 40 CFR Part 266 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities.
8. 40 CFR Part 268 - Land Disposal Restrictions.
9. 40 CFR Part 270 – EPA Administered Permit Programs: The Hazardous Waste Permit Program.
10. 40 CFR Part 745, Subpart L - Lead-Based Paint Activities.
11. 40 CFR Part 745, Subpart E - Residential Property Renovation.

- B. United States Department of Transportation (DOT):
 - 1. 49 CFR 171 -General Information, Regulations, and Definitions.
 - 2. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
 - 3. 49 CFR 173 - Shippers -General Requirements for Shipments and Packaging.
- C. Occupational Safety and Health Administration (OSHA):
 - 1. 29 CFR 1926.62 - Construction Standard for Lead

1.3 DEFINITIONS

- A. Child-Occupied Facility: A building, or portion of a building, constructed prior to 1978, visited regularly by the same child, under 6 years of age, on at least two different days within any week (Sunday through Saturday period), provided that each day's visit lasts at least 3 hours and the combined weekly visits last at least 6 hours, and the combined annual visits last at least 60 hours. Child-occupied facilities may include, but are not limited to, day care centers, preschools and kindergarten classrooms. Child-occupied facilities may be located in target housing or in public or commercial buildings. With respect to common areas in public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only those common areas that are routinely used by children under age 6, such as restrooms and cafeterias. Common areas that children under age 6 only pass through, such as hallways, stairways, and garages are not included. In addition, with respect to exteriors of public or commercial buildings that contain child-occupied facilities, the child-occupied facility encompasses only the exterior sides of the building that are immediately adjacent to the child-occupied facility or the common areas routinely used by children under age 6.
- B. Cleaning Verification Card: Card developed and distributed, or otherwise approved, by EPA for the purpose of determining, through comparison of wet and dry disposable cleaning cloths with the card whether post-renovation cleaning has been properly completed.
- C. Lead: Metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded in this definition are all other organic lead compounds.
- D. Lead-Based Paint (LBP): Paint or other surface coatings that contain lead equal to or in excess of 1.0 mg/cm² or 0.5% by weight or air.
- E. Minor repair and maintenance activities are activities, including minor heating, ventilation conditioning work, electrical work, and plumbing, that disrupt 6 square feet or less of painted surface per room for interior activities or 20 square feet or less of painted surface for exterior where none of the work practices prohibited or restricted by §745.S5(a)(3) are used and when the work does not involve window replacement or demolition of painted surface areas. When removing painted components, or portions of painted components, the entire surface area removed is the amount of painted surface disturbed. Jobs, other than emergency renovations, performed in the same room within the same 30 days must be considered the same job for the purpose of determining whether the job is a minor repair and maintenance activity.
- F. Pamphlet: The EPA pamphlet entitled Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools developed under section 406(a) of TSCA for use in

complying with Section 406(b) of TSCA, or any State or Tribal pamphlet approved by EPA pursuant to 40 CFR 745.326 that is developed for the same purpose.

- G. Renovation: The modification of any existing structure, or portion thereof, that results in the disturbance of painted surfaces, unless that activity is performed as part of an abatement as defined by this part (40 CFR 745.223). The term renovation includes, but is not limited to, the removal, modification or repair of painted surfaces or painted components (e.g., modification of painted doors, surface restoration, window repair, surface preparation activity such as sanding, scraping, or other such activities that may generate paint dust); the removal of building components (e.g., walls, ceilings, plumbing, windows); weatherization projects (e.g., cutting holes in painted surfaces to install blown-in insulation or to gain access to attics, planing thresholds to install weather-stripping), and interim controls that disturb painted surfaces. A renovation performed for the purpose of converting a building, or part of a building, into target housing or a child-occupied facility, is a renovation under this subpart. The term renovation does not include minor repair and maintenance activities.
- H. Renovator: An individual who either performs or directs workers who perform renovations. A certified renovator is a renovator who has successfully completed a renovator course accredited by EPA or an EPA-authorized State or Tribal program.
- I. Work Area: The area that the certified renovator establishes to contain the dust and debris generated by a renovation.

1.4 SYSTEM DESCRIPTION

- A. Lead-Safe Work Practices: Lead-Safe Work Practices provide for disturbance of lead, including removal and disposal of lead-based paint; lead containing dust; and lead contaminated soil in accordance with all applicable codes, regulations, standards, laws and ordinances and provides anticipated general overview of requirements and conditions necessary to meet regulatory requirements and specific conditions of this Project. Failure to expressly refer to applicable code, regulation, standard, law and ordinance within Contract Documents does not imply that applicable regulatory requirements are not applicable to this Project.
 - 1. Presumed Lead Containing Surfaces: Surfaces for which there is no analytical data, and are suspected to contain lead based on age, use or other factors, should be presumed to contain lead at a level above 0.5% until a negative determination can be made through recognized industry standards.

1.5 SUBMITTALS

- A. Quality Control Submittals:
 - 1. Submit the following items prior to beginning lead related activities at the site:
 - a. Written communication from designated treatment, storage or disposal facility that it:
 - 1) Is authorized to receive and dispose of waste products generated by this Project;
 - 2) Has the capacity to receive and dispose of waste products generated by this Project and;

- 3) Will provide or assure that ultimate disposal method indicated on manifest for particular hazardous waste(s) will be followed.
 - b. Instructions regarding requirements for distribution of waste manifest as completed at time of shipment.
 - c. Emergency Contact List.
 - d. A written acknowledgment that the owner has received the EPA pamphlet entitled Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools.
 - e. Provide a certificate of mailing at least seven (7) days prior to the renovation.
 - f. A statement describing the steps performed to notify all occupants, parents and guardians of the intended renovation activities and to provide the pamphlet
2. Submit the following items during course of lead related activities at site:
 - a. Employee Training and Certification Documentation: Provide Owner with Valid Training and Certification documentation for all renovators in accordance with 40 CFR Part 745.90(a) prior to beginning work.
 3. Submit the following items after completion of lead related activities at Site:
 - a. Daily Logs.
 - b. Sign in Sheets.
 - c. Documentation of Hazardous Waste Determination, consisting of Toxicity Characteristic Leachate Procedure sample analysis and documentation that identifies the material(s) sampled.
 4. Certificates: Submit certification that indicates compliance with requirements specified in Quality Control below.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Contractor:
 - a. Supervision: Provide full-time, on-site supervisor for each site.
 - b. Personnel Certification Requirements:
 - 1) Lead Personnel: Received "Lead-Safe Work Practices" training approved by United States Department of Housing and Urban Development (HUD) within the last 12 months.
 - 2) Lead Supervisory Personnel: Maintain current USEPA certification as a lead-based paint abatement supervisor as per 40 CFR 763.

- c. Personnel Training Requirements: In addition to the training requirements for USEPA certification, all supervisory or Lead-Safe Work Practice personnel, including any personnel entering lead activity areas shall have training as required by 29 CFR 1926.62
 - 2. Owner's Sampling / Monitoring Firm: Independent of Contractor and possessing current USEFTA certification to perform lead-based paint activities. May not be applicable to the project.
 - a. Personnel Certification:
 - 1) Monitoring: Possess current USEPA certification, as per 40 CFR 745, subpart L, as either "Risk Assessor" or "Inspector".
 - 2) Final Inspection or Clearance Testing Possess current USEPA certifications, as per 40 CFR 745, subpart L, as either "Risk Assessor" or "Inspector".
 - 3. Lead Analysis Laboratories:
 - a. Maintain current National Lead Laboratory Accreditation Program (NLLAP) accreditation.
 - b. Use most recent version of specified test method.
 - c. Analyze samples for waste characterization using:
 - 1) Toxicity Characteristic Leachate Procedure - EPA Method 1311 and an acceptable, EPA recognized analysis method.
 - d. Analyze air samples for lead for total lead (if required) using an acceptable, EPA recognized analysis method.
 - e. Analyze wipe samples, paint chip samples and soil samples using an acceptable, EPA recognized analysis method.
- B. Regulatory Requirements:
 - 1. Hazardous Waste Generator Status: Owner is "Conditionally Exempt Small Quantity Generator as defined by 6 NYCRR 371 and 40CFR 260. Schedule removal, on-site storage, and transport as required to maintain Owner's status as "Conditionally Exempt Small Quantity Generator.
- C. Recordkeeping and Reporting Requirements: Firms performing renovations must retain and, if requested, make available to EPR at records necessary to demonstrate compliance with this subpart for a period of 3 years following completion of the renovation. This 3-year retention requirement does not supersede longer obligations required by other provisions for retaining the same documentation, including any applicable State or Tribal laws or regulations.
 - 1. Records that must be retained pursuant to paragraph (a) of this section shall include (where applicable):
 - a. Reports certifying that a determination had been made by an inspector (certified pursuant to either Federal regulations at §745.226 or an EPA-authorized State or

Tribal certification program) that lead-based paint is not present on the components affected by the renovation, as described in §745.82(b)(1).

- b. Signed and dated acknowledgments of receipt as described in §745.84(a)(1)(i), (a)(2)(i), (b)(1)(i), (c)(1)(i)(A), and (c)(1)(ii)(A).
- c. Certifications of attempted delivery as described in §745.84(a)(2)(i) and (c)(1)(ii)(A).
- d. Certificates of mailing as described in §745.84(a)(1)(ii), (a)(2)(ii), (b)(1)(ii), (c)(1)(i)(B) and (c)(1)(ii)(B).
- e. Records of notification activities performed regarding common area renovations, as described in §745.84(b)(3) and (b)(4), and renovations in child-occupied facilities, as described in §745.84(c)(2).
- f. Any signed' and dated statements received from owner-occupants documenting that the requirements of §745.85 do not apply. These statements must include a declaration that the renovation will occur in the Owner's residence, a declaration that no children under age 6 reside there, a declaration that no pregnant woman resides there, a declaration that the housing is not a child-occupied facility, the address of the unit undergoing renovation, the owner's name, an acknowledgment by the owner that the work practices to be used during the renovation will not necessarily include all of the lead-safe work practices contained in EPA's renovation, repair, and painting rule, the signature of the owner, and the date of signature. These statements must be written in the same language as the text of the renovation contract, if any.
- g. Documentation of compliance with the requirements of §745.85, including documentation that a certified renovator was assigned to the project, that the certified renovator provided on-the job training for workers used on the project, that the certified renovator performed or directed workers who performed all of the tasks described in §745.85(a), and that the certified renovator performed the post-renovation cleaning verification described in §745.85(b). If the renovation firm was unable to comply with all of the requirements of this rule due to an emergency as defined in §745.82, the firm must document the nature of the emergency and the provisions of the rule that were not followed. This documentation must include a copy of the certified renovator's training certificate, and a certification by the certified renovator assigned to the Project that:
 - h. Training was provided to workers (topics must be identified for each worker).
 - i. Warning signs were posted at the entrances to the work area.
 - j. If test kits were used, that the specified brand of kits was used at the specified locations and that the results were as specified.
 - k. The work area was contained by:
 - 1) Removing or covering all objects in the work area (interiors).
 - 2) Closing and covering all HVAC ducts in the work area (interiors).

- 3) Closing all windows in the work area (interiors) or closing all windows in and within 20 feet of the work area (exteriors).
 - 4) Closing and sealing all doors in the work area (interiors) or closing and sealing all doors in and within 20 feet of the work area (exteriors).
 - 5) Covering doors in the work area that were being used to allow passage but prevent spread of dust.
 - 6) Covering the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater (interiors) or covering the ground with plastic sheeting or other disposable impermeable material anchored to the building extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering, weighted down by heavy objects (exteriors).
 - 7) Installing (if necessary) vertical containment to prevent migration of dust and debris to adjacent property (exteriors).
- l. Waste was contained on-site and while being transported off-site.
 - m. The work area was properly cleaned after the renovation by:
 - 1) Picking up all chips and debris, misting protective sheeting, folding it dirty side inward, and taping it for removal.
 - 2) Cleaning the work area surfaces and objects using a HEPA vacuum and/or wet cloths or mops (interiors).
 - n. The certified renovator performed the post-renovation cleaning verification (the results of which must be briefly described, including the number of wet and dry cloths used).
 - o. When test kits are used, the renovation firm must, within 30 days of the completion of the renovation, provide identifying information as to the manufacturer and model of the test kits used, a description of the components that were tested including their locations, and the test kit results to the person who contracted for the renovation.
 - p. If dust clearance sampling is performed in lieu of cleaning verification as permitted by §745.85(c), the renovation firm must provide, within 30 days of the completion of the renovation, a copy of the dust sampling report to the person who contracted for the renovation.

1.7 PROJECT/SITECONDITIONS

- A. Emergency Contact List: Prepare emergency contact list providing means to contact applicable individuals and agencies in event of emergency at any time of day or night and including at least the following individuals and agencies:

1. Contractor Personnel:
 - a. Project manager
 - b. Project supervisor
2. Sampling Organization:
 - a. On Site Sampling Technician
3. Owner
4. Local police department
5. Local fire department
6. Local hospital and ambulance service

B. Restrict access to all work areas. Immediately report any access by unauthorized individuals to Owner and/or Owner's representative.

1.8 SEQUENCING AND SCHEDULING

A. Completion: Complete Lead related work in accordance with Construction Schedule requirements with each phase considered distinct and separate for purpose of schedule and substantial completion.

1. Substantial Completion of phase occurs when:

- a. All components of phase have passed visual inspection by Supervisor; and
- b. Satisfactory clearance criteria are achieved for each portion of phase; and
- c. All containment barriers have been removed; and
- d. Areas are returned to Owner.

2. If Contractor fails to achieve substantial completion within specified schedule requirements, all costs associated with extension of schedule, including (but not limited to) cost of Architect's time and expenses, sampling costs, monitoring costs, direct costs incurred by Owner, and costs to accelerate sample analysis deducted from Final Payment.

B. Restrictions on Working Hours: Schedule work only during regular working hours approved by Owner prior to beginning lead related work. Do not use overtime or multiple shifts with "overtime" defined as any time in excess of 8 hours in single day, work on weekends, or work on holidays.

C. Changes in Working Hours: Advise Owner of any changes in hours or days when lead activities will be conducted at Site at least 24 hours prior to change. Contractor retains all liability resulting from Contractor failure to make required notification.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Respirators: Provide respirators approved as acceptable for protection by National Institute for Occupational Safety and Health (NIOSH) under provisions of 30 CFR Part 11.
 - 1. Supply and use respirators as required in accordance with 29 CFR 1910.134 and 29 CFR 1926.62.
 - 2. Provide respirators, filters and ancillary supplies as required for employees and authorized visitors.
 - 3. Account for hazards other than lead in respirator selection.
- B. Protective Clothing: Provide disposable protective clothing complying with requirements of 29 CFR 1926.62 that is disposed of after one use. Provide disposable clothing as required for employees and authorized visitors.
- C. Lead Related Construction Facilities and Controls:
 - 1. Polyethylene sheeting (plastic sheeting) - 6-mil thickness, sized to minimize seams.
 - 2. Tape and/or adhesive spray capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water;
 - 3. Polyethylene waste disposal bags -6-milthickness with preprinted labels;
 - 4. HEPA filtered negative pressure equipment.
 - 5. HEPA filtered vacuums.
 - 6. Water filtration, 3 stage with final filtration to at least 5 microns.
 - 7. Barrier tape.
 - 8. Warning signs.
 - 9. Hygiene facilities as required by 29 CFR 1926.62 including showers, cleansing agents and disposable towers.
 - 10. Lead specific detergent similar to:
 - a. "Ledizsolv Detergent" by LSV, Inc., New York, New York.
 - b. "Sentines 805 EnviroWash" by Sentinel, Minneapolis, Minnesota.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions (by Contractor): Examine conditions under which lead related work is to be performed and notify Owner in writing of any conditions detrimental to proper and timely

performance. Do not proceed with lead related work until unsatisfactory have been corrected in manner acceptable to Contractor.

3.2 PREPARATION

A. Notification:

1. While the renovation is ongoing, post informational signs describing the general nature and locations of the renovation and the anticipated completion date. These signs must be posted in areas where they can be seen by the parents or guardians of the children frequenting the child-occupied facility. The signs must be accompanied by a posted copy of the pamphlet or information on how interested parents or guardians can review a copy of the pamphlet or obtain a copy from the renovation firm at no cost to the parents or guardians.
2. Post signs clearly defining the work areas and warning occupants and other persons not involved in renovation activities to remain outside of the work areas. These signs must be posted before beginning the renovation and must remain in place and readable until the renovation and the post-renovation cleaning verification have been completed.

B. Protection:

1. Provide personal protective equipment as required by 29 CFR 1926.62 at no cost to employees or authorized visitors.
2. Institute respirator program in accordance with 29 CFR 1926.62 and 29 CFR 1910.134 (b), (d), (e) and (f).
3. Use protective clothing and respirators whenever lead is being disturbed, abated, cleaned up, and containerized or stored in vehicle or container used to transport waste to landfill in accordance with applicable regulations.
4. Institute medical surveillance program in accordance with 29 CFR 1926.62 for all employees performing or supervising lead handling work, entering work area containment, or using respirator.

C. Prior to all other preparation activities, construct wash station or decontamination facilities as required by applicable regulations adjacent to lead work area.

D. Before beginning the renovation, the firm must isolate the work area so that no dust or debris leaves the work area while the renovation is being performed. In addition, the firm must maintain the integrity of the containment by ensuring that any plastic or other impermeable materials are not torn or displaced, and taking any other steps necessary to ensure that no dust or debris leaves the work area while the renovation is being performed. The firm must also ensure that containment is installed in such a manner that it does not interfere with occupant and worker egress in an emergency.

E. Exterior Renovations: For all exterior renovations, the firm conducting the work shall:

1. Close all doors and windows within 20 feet of the renovation. On multi-story buildings, close all doors and windows within 20 feet of the renovation on the same floor as the renovation, and close all doors and windows on all floors below that are the same horizontal distance from the renovation.

2. Ensure that doors within the work area that will be used while the job is being performed are covered with plastic sheeting or other impermeable material in a manner that allows workers to pass through while confining dust and debris to the work area.
 3. Cover the ground with plastic sheeting or other disposable impermeable material extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering.
 4. In certain situations, the renovation firm must take extra precautions in containing the work area to ensure that dust and debris from the renovation does not contaminate other buildings or other areas of the property or migrate to adjacent properties.
- F. Interior renovations. For all interior renovations, the firm conducting the work shall:
1. Remove all objects from the work area, including furniture, rugs, and window coverings, or cover them with plastic sheeting or other impermeable material with all seams and edges taped or otherwise sealed.
 2. Close and cover all ducts opening in the work area with taped-down plastic sheeting or other impermeable material.
 3. Close windows and doors in the work area. Doors must be covered with plastic sheeting or other impermeable material. Doors used as an entrance to the work area must be covered with plastic sheeting or other impermeable material in a manner that allows workers to pass through while confining dust and debris to the work area.
 4. Cover the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater.
 5. Use precautions to ensure that all personnel, tools, and other items, including the exteriors of containers of waste, are free of dust and debris before leaving the work area.
 6. The firm must clean all objects and surfaces in the work area and within 2 feet of the work area in the following manner, cleaning from higher to lower:
 7. Clean walls starting at the ceiling and working down to the floor by either vacuuming with a HEPA vacuum or wiping with a damp cloth.
 8. Thoroughly vacuum all remaining surfaces and objects in the work area, including furniture and fixtures, with a HEPA vacuum. The HEPA vacuum must be equipped with a beater bar when vacuuming carpets and rugs.
 9. Wipe all remaining surfaces and objects in the work area, except for carpeted or upholstered surfaces, with a damp cloth. Mop uncarpeted floors thoroughly, using a mopping method that keeps the wash water separate from the rinse water, such as the 2-bucket mopping method, or using a wet mopping system.
- G. Do not begin lead disturbance or removal activities until all preparation work, including installation of wash stations or decontamination enclosure systems and any required engineering controls (ex. negative air pressure equipment, etc.) has been completed as required by applicable regulations.

3.3 LEAD WORK PROCEDURES

- A. Exterior Lead Work Constraints: Do not proceed with lead activities if wind speeds are greater than 20 miles per hour. Stop lead activities and proceed with cleanup activities before rain begins.
- B. Unacceptable Removal Methods:
 - 1. Open flame burning or torching (includes propane-fueled heat grids).
 - 2. Machine sanding, grinding, power planing, needle gun without HEPA local vacuum exhaust tool.
 - 3. Hydroblasting or high-pressure wash.
 - 4. Abrasive blasting or sandblasting without HEPA vacuum exhaust tool.
 - 5. Heat guns operating above 1,100 deg. F.
 - 6. Methylene chloride paint removal products.
 - 7. Dry scraping.
- C. Acceptable Removal Methods:
 - 1. Component Removal:
 - a. Mist all disturbed paint and dust and maintain in moist condition.
 - b. Entirely remove indicated components.
 - c. Wet scrape residual paint from adjacent unpainted surfaces. Do not damage adjacent surfaces;
 - d. Collect all paint chips, dust and debris and seal in 6 mil plastic bags.
 - e. Seal removed building components in 6 mil plastic sheeting or 6 mil plastic bags.
 - 2. Heat Gun Removal (operating at less than 1,100 deg. F):
 - a. Provide fire extinguishers in lead work area, and ensure adequate electrical power is available.
 - b. Use in limited areas only.
 - c. Do not gouge or abrade substrate.
 - 3. Wet Scraping:
 - a. Apply adequate water to moisten surface completely; avoid large amounts of water on floor or ground.
 - b. Do not moisten areas near electrical circuits.

- c. Use spray bottles or wet sponge attached to scraper.
4. Offsite Stripping:
- a. Apply paint removers in accordance with manufacturer's recommendations.
 - b. Test paint remover in inconspicuous location approved by Architect to avoid damage to substrate.
 - c. Identify building component to ensure reinstallation in same location.
 - d. Mist all paint and dust disturbed and maintain in moist condition.
 - e. Wet scrape residual paint from adjacent unpainted surfaces. Do not damage adjacent surfaces.
 - f. Collect all paint chips, dust and debris and seal in 6 mil plastic bags. Seal removed building components in plastic sheeting. Inform offsite paint remover regarding presence of lead-based paint before shipping;
 - g. Do not reinstall components until removal of residual paint and cleaning is complete and satisfactory clearance verification achieved.
5. Onsite Stripping:
- a. Apply paint removers in accordance with manufacture's recommendations.
 - b. Test paint remover in inconspicuous location approved by Architect to avoid damage to substrate.
 - c. Do not damage adjacent surfaces.
 - d. Collect all paint chips, dust and debris and seal in 6 mil plastic bags.
6. Work Stoppage Criteria During Lead Activities:
- a. During lead related activities, stop work immediately if damaged containment barriers are discovered or if dust or paint chips are discovered outside of lead work area.
 - b. Prior to resumption of lead activities, perform cleanup of areas adjacent to lead work area using HEPA vacuums or wet cleaning methods.

D. Clean Up Procedures:

1. Exterior:
- a. At end of each day, whether or not lead related activities are complete, clean up and store all removed components, debris, and plastic sheeting drop cloths in lockable containers with solid floors, walls and ceilings until transported off site.
 - b. HEPA vacuum and wash all plastic sheeting with lead specific detergent.

- c. Place all plastic sheeting used to cover ground and seal openings to interior of building in containers.
 - d. A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present on surfaces in and below the work area, including windowsills and the ground. If dust, debris or residue is present, these conditions must be eliminated and another visual inspection must be performed. When the area passes the visual inspection, remove the warning signs.
2. Interior:
- a. Conduct ongoing cleaning during lead related activities, including regular removal of large and small debris.
 - b. Clean up visible debris and components prior to leaving lead work site at end of work shift.
 - c. Decontaminate all tools, equipment, and worker protection gear before removing from contaminated areas.
 - d. Wait at least t hour after active lead removal or disturbance has ceased before final cleaning.
- E. After a successful visual inspection, a certified renovator must:
1. Verify that each windowsill in the work area has been adequately cleaned, using the following procedure.
 2. Wipe the windowsill with a wet disposable cleaning cloth that is damp to the touch. If the cloth matches or is lighter than the cleaning verification card, the windowsill has been adequately cleaned.
 3. If the cloth does not match and is darker than the cleaning verification card, re-clean the windowsill, then either use a new cloth or fold the used cloth in such a way that an unused surface is exposed, and wipe the surface again. If the cloth matches or is lighter than the cleaning verification card, that windowsill has been adequately cleaned.
 4. If the cloth does not match and is darker than the cleaning verification card, wait for t hour or entire surface has dried completely, whichever is longer.
 5. After waiting for the windowsill to dry, wipe the windowsill with a dry disposable cleaning cloth. After this wipe, the windowsill has been adequately cleaned.
 6. Wipe uncarpeted floors and countertops within the work area with a wet disposable cleaning cloth. Floors must be wiped using an application device with a long handle and a head to which the cloth is attached. The cloth must remain damp at all times while it is being used to wipe the surface for post-renovation cleaning verification. If the surface within the work area is greater than 40 square feet, the surface within the work area must be divided into roughly equal sections that are each less than 40 square feet. Wipe each such section separately with a new wet disposable cleaning cloth. If the cloth used to wipe each section of the surface within the work area matches the cleaning verification card, the surface has been adequately cleaned.

7. If the cloth used to wipe a particular surface section does not match the cleaning verification card, re-clean that section of the surface as directed in paragraphs (a)(5)(ii)(B) and (a)(5)(ii)(C) of this section, then use a new wet disposable cleaning cloth to wipe that section again. If the cloth matches the cleaning verification card, that section of the surface has been adequately cleaned.
8. If the cloth used to wipe a particular surface section does not match the cleaning verification card after the surface has been re-cleaned, wait for 1 hour or until the entire surface within the work area has dried completely, whichever is longer.
9. After waiting for the entire surface within the work area to dry, wipe each section of the surface that has not yet achieved post-renovation cleaning verification with a dry disposable cleaning cloth. After this wipe, that section of the surface has been adequately cleaned. When the work area passes the post-renovation cleaning verification, remove the warning signs.

F. Removal of Work Area Containment:

1. Do not remove remaining plastic sheeting, barriers, wash station, decontamination facilities, engineering controls and ancillary items until satisfactory clearance verification results are achieved.
2. Notify Owner immediately if any residual lead debris is identified during removal of plastic sheeting, barriers, decontamination facilities, negative pressure equipment and ancillary items, and clean up debris.
3. Clean all tape, glue, staples, etc., used in lead work process.
4. Repair damage to walls, floors, ceilings, fixtures, or other items not scheduled for demolition or lead work to pre-lead work condition. Where finishes are damaged, refinish or repaint entire object or to nearest break in surface of walls, ceilings, soffits, etc.
5. Remove entire containment when partial occupancy by Owner is required before Owner occupies area or other contractors occupy space for additional construction as required.
6. Paint or otherwise seal treated surfaces not scheduled for painting.

3.4 WASTE SEGREGATION AND CHARACTERIZATION

A. Segregate waste in following categories:

1. Removed components (considered construction and demolition debris for bidding purposes).
2. Paint chips, dust and filters from HEPA vacuums (considered hazardous waste for bidding purposes).
3. Respirator filter cartridges, rags, sponges, mops, scrapers and other materials used for testing lead work, and clean-up (considered construction and demolition debris for bidding purposes).
4. Contaminated soil (considered hazardous waste for bidding purposes).

5. Cleaned plastic sheeting and disposable work clothes (considered construction and demolition debris for bidding purposes).
- B. Sample each container of waste to determine if it is characterized as hazardous waste, treating each sample as follows:
 1. Prepare using Toxicity Characteristic Leachate Procedure, EPA method 1311.
 2. Analyze for lead using EPA method 6010, 6020, 7420 or 7421.
 3. Analyze for any other hazardous characteristic introduced into waste by lead procedures.
 - C. Consider cleaned plastic sheeting and disposable work clothes not sufficiently cleaned as hazardous waste and dispose as hazardous waste at no additional cost to Owner.
 - D. Maintain each waste category above in separate hard walled lockable containers until waste characterization is complete. If waste mixed from different categories, dispose all mixed waste as hazardous waste at no additional cost to Owner.
- 3.5 FIELD QUALITY CONTROL
- A. Inspection of Barriers: Provide inspection of all barriers at least twice daily by Contractor's Supervisor and record inspections and observations in daily project log.
 - B. Repairs to Barriers and/or Enclosure Systems: Repair damage and defects in barriers and enclosure systems immediately upon discovery and prior to resumption of lead activities.
 - C. Testing By Owner: Owner reserves right to obtain independent monitoring and sampling services to provide independent documentation regarding compliance with regulatory requirements. Place all plastic sheeting used to cover ground and seal openings to interior of building in containers. A certified renovator must perform a visual inspection to determine whether dust, debris or residue is still present on surfaces in and below the work area, including windowsills and the ground. If dust, debris or residue is present, these conditions must be eliminated and another visual inspection must be performed. When the area passes the visual inspection, remove the warning signs.
 - D. Interior:
 1. Conduct ongoing cleaning during lead related activities, including regular removal of large and small debris.
 2. Clean up visible debris and components prior to leaving lead work site at end of work shift.
 3. Decontaminate all tools, equipment, and worker protection gear before removing from contaminated areas.
 4. Wait at least 1 hour after active lead removal or disturbance has ceased before final cleaning.
 - E. After a successful visual inspection, a certified renovator must:

1. Verify that each windowsill in the work area has been adequately cleaned, using the following procedure.
2. Wipe the windowsill with a wet disposable cleaning cloth that is damp to the touch. If the cloth matches or is lighter than the cleaning verification card, the window sill has been adequately cleaned.
3. If the cloth does not match and is darker than the cleaning verification card, re-clean the windowsill, then either use a new cloth or fold the used cloth in such a way that an unused surface is exposed, and wipe the surface again. If the cloth matches or is lighter than the cleaning verification card, that windowsill has been adequately cleaned.
4. If the cloth does not match and is darker than the cleaning verification card, wait for 1 hour or entire surface has dried completely, whichever is longer.
5. After waiting for the windowsill to dry, wipe the windowsill with a dry disposable cleaning cloth. After this wipe, the windowsill has been adequately cleaned.
6. Wipe uncarpeted floors and countertops within the work area with a wet disposable cleaning cloth. Floors must be wiped using an application device with a long handle and a head to which the cloth is attached. The cloth must remain damp at all times while it is being used to wipe the surface for post-renovation cleaning verification. If the surface within the work area is greater than 40 square feet, the surface within the work area must be divided into roughly equal sections that are each less than 40 square feet. Wipe each such section separately with a new wet disposable cleaning cloth. If the cloth used to wipe each section of the surface within the work area matches the cleaning verification card, the surface has been adequately cleaned.
7. If the cloth used to wipe a particular surface section does not match the cleaning verification card, re-clean that section of the surface as directed in paragraphs (a)(5)(ii)(B) and (a)(5)(ii)(C) of this section, then use a new wet disposable cleaning cloth to wipe that section again. If the cloth matches the cleaning verification card, that section of the surface has been adequately cleaned.
8. If the cloth used to wipe a particular surface section does not match the cleaning verification card after the surface has been re-cleaned, wait for 1 hour or until the entire surface within the work area has dried completely, whichever is longer.
9. After waiting for the entire surface within the work area to dry, wipe each section of the surface that has not yet achieved post-renovation cleaning verification with a dry disposable cleaning cloth. After this wipe, that section of the surface has been adequately cleaned. When the work area passes the post-renovation cleaning verification, remove the warning signs.
10. Where Owner provides monitoring, sampling (or both), use most stringent results from inspections, daily air sampling and clearance sampling.

F. Contractor Requirements:

1. Provide air sampling as required by 29 CFR 1926.62.
2. Provide sampling and analysis for waste characterization.

3. Provide access to lead work areas for Owner's Monitor / Sampling Technician as needed to observe all lead related work and collect samples.
 4. Provide adequate lighting, ladders, scaffolding, and similar items to enable Monitor / Sampling Technician to perform visual inspections of all surfaces within lead work areas as needed.
 5. Provide sufficient temporary electrical power to locations within lead work areas, as required, to supply high volume air sampling pumps for daily.
 6. Do not perform any monitoring functions with Contractor's personnel or with firms wholly or partly owned by Contractor. Notify Owner and Architect immediately of any conflict of interest between Contractor and any firm providing monitoring, sampling or laboratory analysis.
 7. Contractor retains complete and total responsibility for complying with Contract Documents and all regulatory requirements. Area Air Sampling Procedures (if used): Comply with provisions of NIOSH 7082.
- G. Clearance Sampling Procedures (if used):
1. Owner reserves right to obtain independent monitoring and sampling services to provide independent documentation regarding compliance with regulatory requirements. Where Owner provides monitoring, sampling (or both), use most stringent results from inspections, daily air sampling and clearance sampling.

3.6 PACKAGING, TRANSPORTATION AND WASTE DISPOSAL PROCEDURES

- A. Use hazardous waste characterization performed in accordance with "Waste Segregation and Characterization" above to document and confirm classification of waste. Prior to removing waste from site, confirm in writing to Owner:
1. Results of waste characterization testing.
 2. Identification of waste documented to have waste classification identified in "Waste Segregation and Characterization" above.
 3. Identification of waste characterization varying from "Waste Segregation and Characterization" above.
- B. Packaging: Package, label, and mark all hazardous waste materials in accordance with applicable requirements of 49 CFR 173, 178 and 179.
- C. Hazardous Waste Determination: Provide analysis required by Treatment, Storage or Disposal facility to document hazardous waste determination.
- D. Hazardous Waste Manifests:
1. Maintain manifest from date of transport until date of disposal, destruction or recycling.
 2. Return fully executed manifests to Owner within 60 days of date waste accepted by initial transporter.

3. Complete manifest and deliver to Owner for review and signature.
 4. Retain copies of manifest required to remain with hazardous waste shipment and deliver remaining copies to Owner.
 5. Advise Owner regarding required distribution of manifest, both verbally and in writing.
- E. Disposal: Transport hazardous waste to treatment or disposal facility complying with following requirements:
1. Permitted, licensed or registered by state to dispose of hazardous waste.
 2. Possesses interim status to dispose of hazardous waste.
 3. Authorized to manage hazardous waste under Resource Conservation and Recovery Act (RCRA).
 4. Beneficially uses/re-uses or legitimately recycles/reclaims waste; or treats waste prior to beneficial use/reuse or legitimate recycling/reclamation.
- F. Construction and Demolition Debris: Dispose of material determined to be Construction and Demolition Debris as such in accordance with 6 NYCRR 360 and 364. Provide trip tickets or other documentation clearly identifying amount of material removed from site, transported to disposal site and disposed of, including at least:
1. Name, address and telephone of waste generator.
 2. Approximate quantity.
 3. Name and telephone of disposal site operator.
 4. Name and physical site location of disposal site.
 5. Name, address, and telephone number of transporter.

END OF SECTION 028300

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, general provisions of the Contract, and other related construction documents such as Division 01 specifications apply to this Section.

1.02 SUMMARY

- A. This Section includes a lightweight, fast-setting, Portland cement-based system for filling indoor concrete prior to the installation of a leveling course.

1. ARDEX K-15® Premium Self-Leveling Underlayment
2. ARDEX P 51™ Primer
3. ARDEX P 82™ Primer
4. ARDEX EP2000

- B. Related Sections include the following:

1. Division 09 Finishes Sections.

1.03 REFERENCES

- A. ASTM C 109M, Compressive Strength Air-Cure Only
- B. ASTM C348, Flexural Strength of Hydraulic-Cement Mortars
- C. ASTM E84, Surface Burning Characteristics of Building Materials
- D. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes
- E. ASTM F1869, Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- F. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used. Include manufacturer's Material Safety Data Sheets.
- B. Qualification Data: For Installer.

1.05 QUALITY ASSURANCE

- A. Installation of the ARDEX product must be completed by a factory-trained applicator, such as an ARDEX LevelMaster® Elite or Choice Contractor, using mixing equipment and tools approved by the manufacturer. Contact ARDEX Engineered Cements (724) 203-5000 for a list of recommended installers.
- B. Product must have a hydraulic cement-based inorganic binder content as the primary binder which includes Portland cement per ASTM C150: Standard Specification for Portland Cement and other specialty hydraulic cements. Gypsum-based products are not acceptable.
- C. Manufacturer Experience: Provide products of this section by companies which have successfully specialized in production of this type of work for not less than 10 years. Contact Manufacturer's Representative prior to installation.

1.06 WARRANTY

- A. ARDEX K-15® installed as part of a floor system, shall be installed in conjunction with the recommended ARDEX Tile & Stone Installation Materials or WW HENRY Flooring Adhesive, as appropriate, to provide the ARDEX SystemOne 10-year comprehensive warranty.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original packaging, labeled with product identification, manufacturer, batch number and shelf life.
- B. Store products in a dry area with temperature maintained between 50° and 85° F (10° and 29° C) and Protect from direct sunlight.
- C. Handle products in accordance with manufacturer's printed recommendations.

1.08 PROJECT CONDITIONS

- A. Do not install material below 50° F (10° C) surface and air temperatures. These temperatures must also be maintained during and for 48 hours after the installation of products included in this section. Install quickly if substrate is warm and follow warm weather instructions available from the ARDEX Technical Service Department (888) 512-7339

PART 2 - PRODUCTS

2.01 HYDRAULIC CEMENT UNDERLAYMENT

A. Hydraulic Cement-based Self-Leveling Underlayment

- 1. Acceptable Products:
 - a. ARDEX K 15®; Manufactured by ARDEX Engineered Cements: 400 Ardex Park Drive, Aliquippa, PA 15001 USA, (724) 2013-5000, www.ardex.com.
 - i. Primer Standard Porous Concrete: ARDEX P 51™ Primer.
 - ii. Performance and Physical Properties: Meet or exceed the following values for material cured at 73° F±3°F (23° C±3°C) and 50% ±5% relative humidity
 - b. Application: Barrel Mix or Pump
 - c. Flow Time: 10 minutes

- d. Initial Set: Approx. 30 minutes
- e. Final Set: Approx. 90 minutes
- f. Compressive Strength: 4100 psi at 28 days, ASTM C109M
- g. Flexural Strength: 1000 psi at 28 days, ASTM C78
- h. VOC: 0 g/l, calculated SCAQMD 1168

2.02 WATER

- A. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

PART 3 - EXECUTION

3.01 PREPARATION

- A. Concrete Subfloors: Prepare substrate in accordance with manufacturer's instructions.
 - 1. Prior to proceeding please refer to ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring. All concrete subfloors must be sound, solid, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bond breaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.
 - 2. All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.
 - 3. Substrates shall be inspected in accordance with ASTM F1869 or ASTM F2170 and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering. For areas where moisture vapor emissions exceed the limited required by the floor covering manufacturer refer to Section 07 26 19. Topical Moisture Vapor Mitigation Systems and install the appropriate ARDEX Moisture Control System.
- B. Joint Preparation:
 - 1. Moving Joints – honor all expansion and isolation joints up through the underlayment. A flexible sealing compound such as ARDEX ARDISEAL™ Rapid Plus may be installed.
 - 2. Saw Cuts and Control Joints – fill all non-moving joints with ARDEX ARDIFIX™ Joint Filler or ARDEX SD-F™ FEATHER FINISH® as recommended by the manufacturer.
- C. Wooden subfloors must be clean and free of all foreign matter. Sand to bare wood then vacuum to remove all dust. Re-nail any loose boards exhibiting movement.
- D. Metal subfloors must be clean and free of all rust and foreign matter, substrates must be rigid, well supported, free of undue flex and vibration and mechanically cleaned of bond-inhibiting contaminants. All metal substrates (other than lead) must be sanded with #80 or #100 grit sand paper or lightly shot blasted, vacuumed thoroughly and wiped clean with 91% isopropyl alcohol. Care must be taken when mechanically preparing thin metal foils so that metal foil is not compromised. Metal substrates are to be primed with ARDEX EP2000 100% solids, two component, fully ridged, sand-broadcasted epoxy primer.

- E. Cutback and other non-water soluble adhesive residues must be wet scraped to a thin, well-bonded layer.
- F. Non-porous subfloors such as ceramic and quarry tile as well as terrazzo should be clean and free of all waxes and sealers. If necessary, clean by mechanical methods such as shot blasting or other.

3.02 APPLICATION OF ARDEX K15®

- A. Examine substrates and conditions under which materials will be installed. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.
- C. Priming:
 - 1. Primer for standard absorbent concrete subfloors: Mix ARDEX P-51 1:1 with water and apply evenly with a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, thin film (min. 3 hours, max. 24 hours). Underlayment 400 to 600 sq. ft. per gallon.
 - 2. Primer for extremely absorbent concrete subfloors: Make an initial application of ARDEX P-51 mixed with 3 parts water using a soft push broom. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry thoroughly before proceeding with the standard application of primer as described above for standard absorbent concrete.
 - 3. Primer for non-porous subfloors, wooden subfloors, or cutback and other non-water soluble adhesive residues over concrete: Primer with ARDEX P-82 Ultra Prime. Mix Part A (red) with Part B (white) and apply with a short-nap or sponge paint roller, leaving a thin coat of primer no heavier than a thin coat of paint. Do not leave any bare spots. Remove all puddles and excess primer. Allow to dry to a clear, slightly tack film (minimum 3 hours, maximum 24 hours). Underlayment shall not be installed until primer is dry. Primer coverage is approximately 300 to 400 square feet per gallon (wood substrates) or 400 – 500 square feet (non-porous substrates).
 - 4. Metal substrates are to be primed with ARDEX EP 2000 100% solids, sand broadcasted epoxy primer. Each individual unit of ARDEX EP 2000 comes in a 10 lb. (4.5 kg) unit containing separate, premeasured quantities of hardened (Part B) and resin (Part A) mix and install per ARDEX recommendation with a sand broadcast. After 16 hours, broom sweep and vacuum the surface to remove all loose sand.
- D. Mixing: Comply with manufacturer's printed instructions and the following.
 - 1. Add 7 quarts (6.5 L) of clean potable water per two 55-pound bag.
 - 2. Mix using a ½" (650 rpm) low speed heavy-duty mixing drill with an ARDEX T-1 mixing paddle. Do not overwater.
 - 3. Aggregate mix: For areas to be installed over 1 ½" thick, aggregate may be added to reduce material costs. Mix ARDEX K 15® with water first, then add from 1/3 up to 1 part by volume of washed, well graded pea gravel aggregate (1/8" to ¼" or larger). Do not use sand. Note: The addition of aggregate will diminish the workability to the make it

necessary to install a finish coat to obtain a smooth surface. ARDEX recommends a ¼” application of ARDEX K 15® neat to be installed as the finish coat.

4. For pump installation, ARDEX K 15® shall be mixed using the ARDEX ARDIFLO™ Automatic Mixing Pumps. Contact ARDEX Technical Services Department (888) 512-7339 for complete pump operation instructions.

E. Application: Comply with manufacturer’s printed instructions and the following.

1. ARDEX K 15® must be installed at a minimum thickness of 1/8” over the highest point in the floor, which typically results in an average thickness of ¼” over the entire floor. ARDEX K 15® can be installed up to 1 ½” over large areas neat, and up to 5” with the addition of proper aggregate. ARDEX K 15® can also be featheredged to match existing elevations.
2. Pour or pump the liquid ARDEX K 15® and spread in place with the ARDEX T-4 Spreader. Use the ARDEX T-5 Smoother and featheredge and touch-up. Wear non-metallic cleats to avoid leaving marks in the liquid ARDEX K 15®.
3. Wood subfloors require the use of the mesh-reinforced ARDEX K15® + E25™ Resilient Emulsion Underlayment System. After priming, install 3.4 galvanized diamond metal lath by stapling to the wooded subfloor approximately every 6 inches to center.
4. Metal subfloors require the use ARDEX K15® + E25™ Resilient Emulsion Underlayment System.
5. Steel subfloors require that the substrate first be primed with an anti-corrosive paint. After thorough drying of the paint, prime the surface with ARDEX P82™ Ultra Prime.

F. Curing

1. ARDEX K15® can be walked on in 2-3 hours. Moisture-insensitive tiles such as ceramic quarry and porcelain can be installed after 6 hours. Underlayment can accept all other finish floor covering materials after 16 hours at 70°F and 50% relative humidity. For resinous systems such as epoxy and polyurethane floors please contact the ARDEX Technical Services Department.

3.03 FIELD QUALITY CONTROL

- A. Where specified, field sampling of the ARDEX underlayment is to be done by taking an entire unopened bag of the product being installed to an independent testing facility to perform compressive strength testing in accordance with ASTM C 109/modified: air-cure only. There are no in situ test procedures for the evaluation of compressive strength.

3.04 PROTECTION

- A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.

END OF SECTION 035416

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Reinforcement, anchorage, and accessories.

B. Related Sections:

1. Joint sealers: Division 7.

1.2 SUBMITTALS

- A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements.
- B. Mix Proportions: Submit mix proportions for all mortar and grout to be used throughout the project including material specifications and laboratory test results. With each mortar and grout mix, indicate locations to be used and whether mix is to be proportioned in the field or by off-site supplier.

1.3 QUALITY ASSURANCE

- A. Source Control: Obtain masonry units from one manufacturer, with texture and color uniform or of a uniform blend acceptable to the architect.
- B. Prior to start of reinforced masonry construction, schedule a meeting at the site to review requirements and procedures. All parties involved with the work, in addition to the Architect and Engineer, shall be present at the meeting.
- C. Testing Agency Services
 1. Testing agency used for concrete sampling and testing shall be employed at the contractor's expense to take periodic field samples of mortar and grout for testing. Grout shall be sampled and tested in accordance with ASTM C1019. Mortar shall be sampled and tested in accordance with ASTM C270 and C780.
- D. Mock-up: Prior to commencement of exposed masonry work, erect sample panel to serve as standard of appearance and workmanship throughout construction period.
 1. Build at location and to design indicated on drawings, or as otherwise directed by the architect.
 2. Adjust until mock-up appearance and workmanship are acceptable to the architect.
 3. Upon completion of construction and at the direction of the architect, demolish mock-up construction completely and remove debris.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means which will prevent mechanical damage and deterioration due to moisture, temperature changes, and contamination by other materials.
 - 1. Provide protection which will limit moisture absorption of concrete masonry units to the maximum percentage specified for Type I units at a relative humidity which is normal for the project site.
- B. Protect cementitious materials from precipitation and absorption of ground moisture.
- C. Store masonry accessories to prevent corrosion, dirt accumulation, and other deterioration.

1.5 PROJECT CONDITIONS

- A. Construction Protection: Cover tops of incomplete masonry elements with waterproof sheet material at end of each work day and when masonry work is not under way.
 - 1. Secure weather protection in place with weights or by use of temporary fasteners.
 - 2. Immediately remove mortar, soil, and other such materials from exposed masonry faces to prevent staining.
 - 3. Prevent splashing and soiling of masonry near ground level by spreading sheet material to cover soil or masonry faces.
- B. Loading Protection: Do not apply uniform floor or roof loads for at least 12 hours, or concentrated loads for at least 3 days, after completion of masonry elements.
- C. Cold-Weather Protection: Do not lay masonry units which have wet surfaces or units which are below freezing. Remove ice or snow from masonry bed by careful application of heat. Remove masonry damaged by freezing.
 - 1. General: As cold weather arrives, builders must take precautions when doing masonry construction. By changing procedures, equipment, or supplies, mason contractors can avoid seasonal delays associated with cold weather. This permits better utilization of a mason contractor's resources, particularly manpower. Successful masonry construction can proceed despite cold temperatures by following an effective cold weather construction program.

The Specification for Masonry Structures (ACI 530.1-08/ASCE 6-08/TMS 602-08) contains minimum requirements for cold weather masonry construction. When ambient temperature falls below 40°F (4.4°C), cold weather construction applies. As the temperature of mortar materials falls below normal:

- Water requirement to reach a given consistency is reduced
- A given amount of air-entraining agent yields more entrained air
- Initial and final set of the mortar are significantly delayed
- Heat-liberating reaction rates between Portland cement and water are substantially reduced, becoming minimal as mortar temperature drops below 40°F (4.4°C)
- Strength gain rates are reduced

Cold masonry units lower the temperature of mortar placed in contact with those units. Not only does this slow reaction rates between cement and water and reduce strength gain rates, it delays tooling and setting times. If the units are cold enough, the temperature of the mortar

may drop below freezing and result in disruptive expansion of the mortar as water in the mortar freezes. Wet or ice covered unit surfaces prevent development of good bond between mortar and unit.

In addition to affecting the performance of masonry materials, cold weather may also affect the productivity and workmanship of masons. During cold weather, masons must first ensure their personal comfort and safety, then attend to normal construction tasks and any additional materials preparation, handling, and protection of masonry. These extra activities consume more time as temperatures continue to drop. The goal of a cold weather construction plan is to eliminate or minimize the undesirable effects of cold temperatures on materials and people in a cost-effective manner. The mason contractor must evaluate the effectiveness and practicality of techniques in the context of specific project and weather conditions encountered. Depending on the severity of weather, one or more of the following strategies can be considered:

- Optimize the selection of masonry materials for cold weather performance
- Protect materials
- Heat materials
- Protect or enclose work areas
- Heat work areas and in-place work

2. **Masonry Materials:** Masonry units are typically selected on the basis of aesthetic or structural properties rather than consideration of performance in cold weather construction. Mortar type is also generally determined by structural or other performance criteria. However, knowledge of how mortar and unit properties interact in cold weather enables the mason contractor to modify construction procedures to accommodate the specified materials.

The initial water content of mortar required for workability is in the range of 11% to 16%. Mortar used to lay units stiffens as mixing water contained in the mortar is absorbed by units, evaporates, or reacts with the portland cement in the mortar. To avoid disruptive expansion upon freezing, water content of mortar needs to be below 6%. Units having high initial rates of absorption (suction) will accelerate stiffening by drawing water from the mortar. Low absorption or wet units remove very little water from the mortar.

Likewise, the water-retentive properties of mortar affect its rate of moisture loss and stiffening. Mortars having high lime content or fine sands tend to have higher water demands and higher water retentivity than higher strength mortars or mortars made using well-graded sands. Although air entrainment increases water retentivity, it also reduces initial water demand required to achieve a workable consistency and has been shown to reduce susceptibility of mortar to damage by early freezing.

The rate at which portland cement reacts with water is primarily influenced by the temperature of the mortar or grout. The use of higher fineness cements (such as ASTM C 150 Type III) or accelerators increases reaction rates. These materials can be used in mortar to augment, but not substitute for, other cold weather construction practices.

Accelerators are sometimes mistakenly called “antifreeze” admixtures. Their function is not to reduce the freezing point of mortar, but to increase the rates of early-age strength development. Thus, they don’t eliminate the need to protect mortar from freezing, but may limit the amount of time that protection is required.

Calcium chloride (at a limit of 2% by mass of cement) is commonly used in concrete as an accelerator, but its use in mortar is prohibited by the Specification for Masonry Structures because it contributes to corrosion of embedded metal such as wall ties, anchors, and joint

reinforcement. Only non-chloride based accelerators, as verified by the admixture manufacturer, should be allowed.

ASTM C 270 indicates that admixtures are not to be used unless specified. Therefore, unless project specifications call for the use of an accelerator, the mason must request permission from the specifier in order to use one.

Protection, Storage, and Heating: All masonry materials should be protected from rain, snow, and ice. Masonry units and packaged mortar materials should be securely wrapped with canvas or polyethylene tarpaulins and stored above the reach of moisture migrating from the ground. Sand piles should also be covered and care taken to avoid contamination of the same with mud and clay.

Masonry materials may need to be heated prior to use to assure cement hydration in mortar. At temperatures of less than 40°F (4.4°C), cement hydration necessary for strength development is minimal. At temperatures of 120°F (48.9°C) or higher, flash set is imminent. When mixed, the mortar should be in the range of 40°F to 120°F (4.4°C to 48.9°C) and kept above freezing until used in masonry. If ambient temperatures are falling below freezing, a minimum grout temperature of 70°F (21.1°C) is recommended at the time of grout placement.

Water can be heated in barrels or tubs. It is the easiest material to heat and it can store much more heat (per unit mass) than the other materials used in mortar. Although recommendations vary as to the highest temperature to which water should be heated, the Specification for Masonry Structures places a maximum of 140°F (60°C) because higher temperatures pose a safety hazard and could result in flash set. To avoid flash set, heated water should be combined with cold sand in the mixer before adding cement.

Sand is typically delivered to the project and used in a damp loose condition. Even though sand piles are covered, it may be necessary to heat sand to thaw frozen lumps when temperatures fall below freezing. Generally, sand is heated to about 50°F (10°C), although higher temperatures are permissible as long as the sand is not scorched and as long as resultant mortar or grout temperatures do not exceed 120°F (48.9°C). Sand piles can be heated with electric heating pads, by placing sand over a heated pipe, or by using steam heating systems.

Masonry units should not have any visible ice on bedding surfaces when used, nor should the temperature of masonry units be less than 20°F (- 6.7°C) to avoid rapid lowering of mortar or grout temperatures. Better productivity is often attained by using units that have a minimum temperature of 40°F (4.4°C). Masonry units are usually heated on pallets in an enclosure or stored in a heated area. The units should be kept dry, although very high-absorption fired-clay brick may need to be wetted, but not saturated, prior to use.

Table 1 - Cold Weather Construction Requirements

<u>Ambient Temperature</u>	<u>Cold Weather Procedures For Work In Progress</u>
Above 40°F (4.4°C)	No special requirements.
Below 40°F (4.4°C)	Do not lay glass unit masonry.
32°F to 40°F (0°C to 4.4°C)	Heat sand or mixing water to produce mortar temperature between 40°F and 120°F (4.4°C and 48.9°C) at the time of mixing.

	Heat materials for grout only if they are below 32°F (0°C).
25°F to 32°F (-3.9°C to 0°C)	Heat sand or mixing water to produce mortar temperature between 40°F and 120°F (4.4°C and 48.9°C) at the time of mixing. Keep mortar above freezing until used in masonry.
	Heat materials to produce grout temperature between 70°F and 120°F (21.1°C and 48.9°C) at the time of mixing. Keep grout temperature above 70°F (21.1°C) at the time of placement.
20°F to 25°F (-6.7°C to -3.9°C)	In addition to requirements for 25°F to 32°F (-3.9°C to 0°C), heat masonry surfaces under construction to 40°F (4.4°C) and use wind breaks or enclosures when the wind velocity exceeds 15 mph (24 km/h).
	Heat masonry to a minimum of 40°F (4.4°C) prior to grouting.
20°F (-6.7°C) and below	In addition to all of the above requirements, provide an enclosure and auxiliary heat to keep air temperature above 32°F (0°C) within the enclosure.
Ambient Temperature (minimum for grouted; <u>mean daily for un-grouted</u>)	<u>Cold Weather Procedures For Newly Completed Masonry</u>
Above 40°F (4.4°C)	No special requirements, except for the following: Maintain glass unit masonry above 40°F (4.4°C) for the first 48 hours after construction. Maintain autoclaved aerated concrete (AAC) above 32°F (0°C) for the first 24 hours after thin-bed mortar application.
25°F to 40°F (-3.9°C to 4.4°C)	Cover newly constructed masonry with a weather-resistive membrane for 24 hours after being completed.
20°F to 25°F (-6.7°C to -3.9°C)	Cover newly constructed masonry with weather-resistive insulating blankets (or equal protection) for 24 hours after being completed.
20°F (-6.7°C) and below	Extend the time period to 48 hours for grouted masonry, unless the only cement used in the grout is ASTM C 150 Type III. Keep newly constructed masonry above 32°F (0°C) for at least 24 hours after being completed. Use heated enclosures, electric heating blankets, infrared lamps, or other acceptable methods. Extend the time period to 48 hours for grouted masonry, unless the only cement used in the grout is ASTM C 150 Type III.

3. **Protecting Work Areas and Construction:** Wind breaks, heated wall coverings, and plain or heated enclosures are used to maintain adequate mortar temperatures and to improve the comfort and efficiency of masons and laborers. The level of protection required will depend on the severity of weather encountered. The Specification for Masonry Structures defines certain cold weather construction requirements as summarized in Table 1. It includes provisions needed during the work day while masonry is being laid, as well as protection requirements for newly constructed masonry. Several means of implementing these provisions are available to the mason contractor. Regional climatic differences and project-specific factors must be taken into account when selecting the most effective methods of protection for a given project. Basic principles required for satisfactory cold weather masonry construction described here and in the reference documents are well established. The use of innovative construction and protection techniques based on these established principles can improve the effectiveness and efficiency of a cold weather construction program.
4. **References:**
 - a. All-Weather Concrete Masonry Construction, NCMA TEK 3-1C, National Concrete Masonry Association, Herndon, Virginia, 2002.
 - b. Cold and Hot Weather Construction, BIA Technical Notes 1, Brick Industry Association, Reston, Virginia, June 2006.
 - c. Concrete Masonry Handbook for Architects, Engineers, Builders, Farny, J. A., Melander, J. M., and Panarese, W. C., EB008, Portland Cement Association, 2008, pages 128–137.
 - d. Recommended Practices & Guide Specifications for Cold Weather Masonry Construction, International Masonry Industry All Weather Council, Washington, D.C., twelfth printing, 1993. (Available from PCA as LT107.)
 - e. Specification for Masonry Structures and Commentary (ACI 530.1-08/ASCE 6-08/ TMS 602-08), Masonry Standards Joint Committee, comprising the American Concrete Institute, Farmington Hills, Michigan, the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia, and The Masonry Society, Boulder, Colorado, 2008.
 - f. Hot & Cold Weather Masonry Construction, Masonry Industry Council, Lombard, Illinois, 1999. (Available from PCA as LT232.)
5. **Related Publications:** Readers of this publication may also be interested in the following publications available for purchase from the Portland Cement Association. To order, write or call Customer Service, Portland Cement Association, 5420 Old Orchard Road, Skokie, Illinois 60077-1083, phone 847.966.6200 or 800.868.6733, fax 847.966.9666, or at www.cement.org.

Concrete Masonry Handbook, EB008
 Mortars for Masonry Walls, IS040
 Masonry Cement Mortars, IS181
 Trowel Tips: Efflorescence, IS239
 Trowel Tips: Tuckpointing, IS240
 Trowel Tips: Mortar Sand, IS241
 Trowel Tips: Field Testing Mortar, IS242
 Trowel Tips: Hot Weather Masonry Construction, IS243
 Trowel Tips: Cleaning Masonry, IS244
 Trowel Tips: Workmanship Part I, Preparing for Quality, IS245

Trowel Tips: Workmanship Part II, Imparting Quality to Masonry, IS246
Trowel Tips: Mortar Color, IS247
Recommended Practices for Laying Concrete Block, PA043
Recommended Practices & Guide Specifications for Cold Weather
Masonry Construction, LT107
Hot & Cold Weather Masonry Construction, LT232

- D. Hot-Weather Protection: Cover or shade masonry units and mortar materials and use cool water for mortar whenever ambient air temperature is 90 degrees F or above, if relative humidity is less than 30 percent or wind is in excess of 15 miles per hour, provide protection by immediately covering newly constructed walls, by providing windbreaks, or by using fog spray to reduce rate of evaporation.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards for type required, and as follows:
1. Size: Standard units with nominal face dimensions of 16 inches long and 8 inches high (15-5/8 by 7-5/8 actual), with nominal thicknesses as indicated on drawings for various locations. Special units with nominal face dimensions of 16 inches long and 4 inches high (15-5/8 by 3-5/8 actual), with nominal thickness as indicated on the drawings for various locations.
 2. Special shapes: Provide special block types where required for corners, control joints, headers, lintels, and other special conditions, whether or not specifically indicated on the drawings as special.
 - a. Outside corners: Square-edged units except where otherwise indicated.
 3. Hollow load-bearing units: ASTM C 90, and as follows:
 - a. Type I: Moisture-controlled units.
 - b. Lightweight.
 - c. Exposed faces: Manufacturer's standard color and texture, except where special finish is indicated, as follows:
 1. Match existing units for color, pattern, and texture.
 - a. Finish:
 1. Smooth Face
 2. Scored.
 - b. Pattern:
 1. Patterns as shown on drawings.

2.2 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Type III may be substituted during cold-weather construction.
 - 2. Provide Portland cement of color required to product approved mortar sample.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: ASTM C 144.
 - 1. White mortar aggregates: Sand or ground stone.
 - 2. Colored mortar aggregates: Ground stone, in colors required to match architect's sample.
- D. Grout Aggregate: ASTM C 404.
- E. Pigments for Colored Mortar: Iron oxides and chromium oxides with demonstrated record of satisfactory performance in mortar mixes.
- F. Water: Potable.
- G. Accelerating Admixture: Non-chloride type for cold weather mortar mixes, in proportion recommended by manufacturer.
- H. NO AIR-ENTRAINING ADMIXTURE SHALL BE ALLOWED.

2.3 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed, except as specifically indicated otherwise.
 - 1. Bending: Shop-fabricate reinforcing bars which are shown to bent or hooked.
- B. Joint Reinforcement and Anchorage Materials: Comply with the following general requirements for materials required in joint reinforcement and anchorage devices:
 - 1. Steel wire: ASTM A 82.
 - a. Hot-dip galvanizing (after fabrication): ASTM A 153, Class B-2.
 - 1. Use: Exterior locations or in contact with earth.
 - 2. Hot-dip galvanized steel sheet: ASTM A 635 or ASTM A 366; galvanizing in compliance with ASTM A 153, Class B.
 - a. Use: Anchors and miscellaneous sheet metal in masonry accessories at exterior exposures.
- C. Joint Reinforcement: Welded-wire units prefabricated into straight lengths of not less than 10 feet, with deformed continuous side rods and plain cross rods.
 - 1. Width: Approximately two inches less than nominal wall width, providing not less than 5/8 inch mortar coverage on exterior exposures and 1/2 inch elsewhere.

2. Wire sizes:
 - a. Side rod diameter: 0.1875 inch.
 - b. Cross rod diameter: 0.1483 inch.
 3. Configuration:
 - a. Applications of single unit width: Truss design, diagonal cross rods at not more than 16 inches on center.
 - b. Corners: Prefabricated L- and T-shaped units.
- D. Rigid Anchors: Provide straps fabricated from sheet metal, sized, shaped, and located as indicated on the drawings.

2.4 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
 1. Asphalt – Coated Copper Flashing: 5-oz./sq. ft. (1.5 – kg/sq.m) copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
 - a. Products:
 1. Hohmann & Barnard, Inc.; H & B C – Coat Flashing C-FAB
 2. Sandell Manufacturing Co., Inc.; Coated Copper Flashing
 3. York Manufacturing, Inc.; Copperseal
- B. Single – Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from high density polyethylene incorporating chemical stabilizers that prevent UV degradation. Cell flashing panes have integral weep spouts that are designed to be built into mortar bed joints and weep collected moisture to the exterior of CMU walls and that extend into the cell to prevent clogging mortar.
 1. Product: Subject to compliance with requirements, provide “Blok-Flash” by Advanced Building Products, Inc.
- C. Solder and Sealants for Sheet Metal Flashings:
 1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent lead.
 3. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashings and trim remain watertight.

- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Pre-molded Control Joints: Strips sized for standard sash block and designed to allow movement while maintaining lateral stability, and as follows:
 - 1. Either styrene-butadiene rubber compound complying with ASTM D 2000, 2AA-805; or polyvinyl chloride complying with ASTM D 2287, Type PVC 654-4.
- B. Bond Breaker Strips: ASTM D 226, Type I; No. 15 asphalt felt.
- C. Weep Holes: Cotton sash cord of length required to allow 2-inch exposure while leaving 18 inches within cavity.
- D. Sealant and Backer Rod: As specified in Division 7.

2.6 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures unless indicated as acceptable in the contract documents.
 - 1. Do not use calcium chloride in mortar or grout mixture.
- B. Mixing: Use mechanical batch mixer and comply with referenced ASTM standards.
- C. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.
 - 1. Limit cementitious materials to lime and Portland cement.
 - 2. Masonry below grade and in contact with earth: Type M.
 - 3. Reinforced masonry and exterior above grade walls: Type S.
 - 4. Applications as follows: Type N.
 - a. Interior walls.
 - b. Locations for which another mortar type has not been specifically indicated.
- D. Grout: ASTM C 476; provide consistency required at time of placement to fill completely all spaces indicated to be grouted. Grout shall be either fine or coarse depending on space to be grouted. Minimum grout strength shall be 2500 psi at 28 days as measured by ASTM C1019 "Standard Method of Sampling and Testing Grout." Slump shall be a minimum of 8-inches as measured by slump cone test. Higher slump shall be provided for masonry units with high IRA (initial rate of absorption) and smaller grout spaces. Provide specific information to mix designer.

PART 3 - EXECUTION

3.1 INSTALLATION PROCEDURES

- A. Concrete Masonry Units: Do not wet concrete masonry units prior to laying.
- B. Reinforcement and Anchorage: Before placing metal masonry accessories, remove loose rust, dirt, and other coatings.
- C. Masonry Thickness: Build masonry elements to full thickness shown.
 - 1. Build single-wythe walls to actual thickness of masonry units.
- D. Chases and Recesses: Build masonry to accommodate the work of other trades, including chases and recesses as shown or required. Provide not less than 8 inches of masonry between jambs of openings and chases and recesses.
- E. Openings for Equipment and Services: Leave openings in masonry as required for subsequent installation of equipment and services. Make openings in designated locations and in exact size required, if known; otherwise, leave rough openings in approximate size required and complete masonry work after installation of equipment, matching adjoining masonry.
- F. Cutting: Where cutting is required, use power saws to provide clean, sharp, unchipped edges.
 - 1. Do not use wet cutting techniques with concrete unit masonry.

3.02 MASONRY CONSTRUCTION - GENERAL

- A. Layout: Lay out masonry for accurate pattern bond, for uniform joint widths, and for accurate location of specific features before beginning actual construction. Avoid use of masonry units of less than 1/2 size. Do not use units with less than nominal 4 inch horizontal face dimensions at corner and jambs.
- B. Pattern Bond: Lay exposed masonry in pattern bonds indicated on drawings.
 - 1. Lay concealed masonry in running bond, or lap units at least 2 inches.
 - 2. Interlock wythes at corners and offsets in each course with masonry bond.
- C. Stopping Work: Lay masonry in proper sequence to avoid toothing. Rack walls back in each course at end of each work day. Before resuming, clean exposed surfaces and remove loose masonry units and mortar.
- D. Built-in Work: As work progresses, build in items indicated for installation in masonry, filling around built-in items solidly with masonry.
 - 1. Fill joints between masonry and metal frames solidly with mortar, unless specific conditions are otherwise detailed.
 - 2. At locations where built-in items are to be connected to hollow unit masonry, solidly grout cores to provide adequate anchorage.
 - 3. Unless other conditions are specifically detailed, solidly grout cores for at least 24 inches below bearing plates, lintels, and similar features and conditions.
- E. Expansion and Control Joints: Build in movement joints every 20'-0" o.c. maximum, installing accessory items as masonry is constructed.

1. Install paintable non-elastic joint fillers in all rated partitions and provide UL rated fire stopping sealant. Rating for sealant shall be the same as wall construction. Contractor shall provide a Sika product or equivalent.

F. Nonbearing Partitions: Extend full height to solid structure above, unless otherwise detailed.

1. Fill joint at top of nonbearing partitions with mortar when structure above has reached final deflection.

G. Lintels: Install steel lintels at all openings.

1. Bearing: Provide not less than 8 inches of bearing at each jamb. Grout cells solid under bearing for full height of opening (16 inches wide).
2. Reinforcement: At masonry openings greater than one foot in width, install horizontal joint reinforcement immediately below sill. Except at control joints, install opening reinforcement to extend not less than 24 inches beyond jamb on each side.

3.3 LAYING MASONRY UNITS

A. Hollow Masonry Units: Install so that face shells are solidly mortared, horizontally and vertically. Bed webs solidly in mortar at starting course.

1. Bed webs solidly in mortar at cores to be grouted.

B. Joints: Make mortar joints visually and dimensionally consistent.

1. Except as otherwise indicated, maintain mortar joint widths of 3/8 inch.

C. Concealed Joints: Cut flush, unless otherwise detailed.

D. Exposed Joints: Treat as indicated on the drawings.

E. Resetting: Do not pound, tap, or otherwise attempt to adjust masonry units after initial set has occurred. Remove units which require adjusting, clean thoroughly, and reset in fresh mortar.

3.4 JOINT REINFORCEMENT, SINGLE-WYTHE WALLS

A. General: Provide continuous horizontal joint reinforcement for all single-wythe masonry walls, unless otherwise indicated. Lap reinforcing a minimum of 12 inches.

B. Vertical Spacing:: Not more than 16 inches on center.

C. Continuity: Use prefabricated L-shaped and T-shaped sections at corners and intersections. Do not span movement joints with reinforcement.

3.5 ANCHORING MASONRY

A. Structural Framing Anchorages: Anchor masonry to structural framework at points of adjacency, and as follows:

1. Maintain open space of 1 inch or more between face of framing member and masonry elements or as shown on the drawings.

2. Fasten anchors to structure and embed in mortar joints as masonry is laid.
3. Space anchors at maximum of 24 inches on center horizontally and 24 inches on center vertically.

3.6 INSTALLING REINFORCED UNIT MASONRY

- A. Preparation: Clean reinforcement bars of loose rust; do not use bars which have rusted excessively or which have bends or kinks not shown on drawings.
- B. Placing Reinforcement: Secure reinforcement accurately at intervals not to exceed 72 inches o.c. to avoid displacement: provide rebar positioner installed in mortar joints as masonry is laid; minimum spacing between bars or to masonry surfaces shall be bar diameter or 1/4 inch for fine grout and 1/2 inch for coarse grout, whichever is greater.
- C. Splicing: Provide lapped splices of 30 bar diameter minimum. Provide lap-joint tie for each splice; other methods or locations must be approved by the architect.
- D. Formwork: Construct formwork where required for temporary support of reinforced masonry, bracing as required to maintain proper shape during placement and curing of grout and adequately tight to avoid grout leakage.

3.7 GROUTING

- A. Grouting Technique: Perform all grouting by means of low-lift technique. High lift grouting may be used only with prior approval of Architect and Engineer.
 1. Do not exceed 48 inches in height for grout pours.

3.8 INSTALLING CONCEALED MASONRY FLASHING

- A. General: Whether or not specifically indicated, install flashing at all conditions such as lintels and shelf angles, where the downward flow of any water within the masonry will be interrupted, so that such water will be diverted to the exterior. Extend flashings full width at such obstructions and at least 4 inches into adjoining masonry, and turn up to form watertight pan or provide pre-fabricated end dam. Remove or cover protrusions or sharp edges on substrates which could puncture flashings. Place flashings on sloped mortar bed; seal lapped ends and penetrations of flashing before covering with mortar.
 1. Extend metal flashings through exterior face of masonry and turn down to form drip.
 2. Extend fabric or laminated flashings to within 1/4 inch of exterior face of masonry.
- B. Head and Sills: Turn up ends of flashing at least 2 inches at heads and sills to form a pan, and seal joints.
- C. Sealing: Seal all joints in flashing to assure watertight integrity.
 1. Lap end joints on non-deformed metal flashings at least 4 inches; seal laps with elastic sealant or mastic.
 2. Lap end joints of flexible flashings at least 4 inches; seal in accordance with manufacturer's instructions.

- D. Weep Holes: Provide weep holes in head joints of the first course of masonry immediately above concealed flashings. Space at intervals of 24 inches on center.
- E. Reglets and Other Accessories: Install to receive flashing where indicated.

3.9 PARGING

- A. Mortar: Parge in two coats, using Type S or Type N mortar, to total thickness of not less than 1/2 inch.
- B. Finishing: Trowel to dense, hard surface.
- C. Curing: Damp-cure for at least 24 hours.

3.10 REPAIRING MASONRY

- A. Replacement: Carefully remove areas of damaged masonry and replace with matching, undamaged units using mortar which matches original work.
- B. Pointing: As joints are being tooled, remove mortar with visible holes or mortar which cannot be compacted properly because of hidden voids, and replace with fresh mortar, filling each joint completely and tooling to match adjacent work.

3.11 CLEANING AND PROTECTION

- A. Clean masonry after mortar is thoroughly set and cured.
 - 1. Scrape off adhered mortar particles by hand, using non-metallic tools.
 - 2. Test cleaning methods on half of sample panel, leaving other half in original state.
 - 3. Comply with directions of concrete unit masonry manufacturer and NCMA Tek Bulletin No. 45 for cleaning CMU. ALL EXPOSED CONCRETE MASONRY UNITS SHALL BE POWER WASHED FOR FINAL CLEANING. Concrete masonry units shall be dry before applying Sprayed-on Water-repellent.
 - 4. NO ACID BASED CLEANING SOLUTIONS SHALL BE ALLOWED.
- B. Protection: Institute protective measures as required to ensure that unit masonry work will be clean and undamaged at substantial completion.

END OF SECTION 042200

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Wood furring.

1.02 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

1.03 QUALITY ASSURANCE

A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":

1. Dimension lumber framing.
2. Miscellaneous lumber.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry, unless otherwise indicated.
1. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood framing members that are less than 18 inches for built in gutter.

2.03 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent for 2-inch nominal thickness or less, no limit for more than 2-inch nominal thickness.
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.
- C. Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 grade and any of the following species:
1. Hem-fir (north); NLGA.
 2. Spruce-pine-fir; NLGA.
 3. Douglas fir-larch (north); NLGA.

- D. Framing Other Than Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least 1,500,000 psi and an extreme fiber stress in bending of at least [1000 psi] for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.04 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.
 2. Eastern softwoods, No. 2 Common grade; NeLMA.
 3. Northern species, No. 2 Common grade; NLGA.
 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.05 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.06 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

3.02 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.2 PRE-INSTALLATION MEETINGS

- ##### A. Pre-installation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate, fire-retardant-treated materials, and cabinet hardware and accessories.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

- ##### B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.
2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern and surface finish.
3. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

- ##### A. Qualification Data: For fabricator.

- ##### B. Woodwork Quality Standard Compliance Certificates:

- ##### B. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. Woodwork, including installation, to meet AWI certification standards.
 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. MW-C Custom Millwork (As identified in the interior finish schedule and drawings) – Frameless construction. Fabricated utilizing high pressure laminate premium laminate as a basis of design and cost. Interior is to be white melamine.
- C. Grade: Custom.
- D. Type of Construction: Frameless.
- E. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
1. Acceptable Manufacturers:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Panolam Industries International, Inc.
 - e. Wilsonart International; Div. of Premark International, Inc.
 - f. Or Approved Equal.
- G. Laminate Cladding for Exposed Surfaces:
1. Horizontal Surfaces: Grade HGS.
 2. Vertical Surfaces: Grade HGS.
 3. Edges: Grade HGS.
 4. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts, unless otherwise indicated.
- H. Materials for Semi-exposed Surfaces:
1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - a. Edges of Plastic-Laminate Exposed Shelves: Matching laminate in color, pattern, and finish.
 - b. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
 2. Drawer Sides and Backs: Solid-hardwood lumber.
 3. Drawer Bottoms: Hardwood plywood.
- I. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

- J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
- L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 2. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
 - 3. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 - 1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not

extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
 2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
 4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
 2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
 3. Acceptable Products:
 - a. Flakeboard Company Limited; Duraflake FR.
 - b. SierraPine; Encore FR.
 - c. Or Approved Equal.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
1. Acceptable Products:
 - a. Panel Source International, Inc.; Pyroblock Platinum.
 - b. SierraPine; Medite FR.
 - c. Or Approved Equal.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets. Cabinet pulls will be located during the submittal process.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.

1. Amerock – Extensity, 3” Pull, Satin Nickel, BP29379G10
 2. Amerock – Appliance, 12” Bar Pull, Stainless Steel, BP54008SS
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Drawer Slides: BHMA A156.9.
1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 2. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 3. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
 5. For computer keyboard shelves, provide Grade 1HD-100.
 6. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Nickel Plated BHMA 670 (US15).
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- L. Magnetic Touch Latch Hardware Basis of Design: Rockler Woodworking and Hardware single door magnetic touch latch or approved equal.
1. Touch latch with 3/8” throw and slotted holes for adjusting. To include strike plate and all hardware for installation.
 2. Color: To be selected from manufacturer’s standard range.

2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement, Contact cement, or Resorcinol.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate cabinets to dimensions, profiles, and details indicated.

C. Complete fabrication including assembly and hardware application to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Design Consultant seven days in advance of the dates and times woodwork fabrication will be complete.

2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged

finish at cuts.

- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with one of the following:
 - a. No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips
 - b. No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION 064116

SECTION 072700 - FIRESTOPPING AND SMOKESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Firestopping of all penetrations through fire barriers, including:
 - a. Voids around:
 1. Pipes.
 2. Ducts.
 3. Conduit.
 4. Cable trays.
 5. Cables and wires not in conduit.
 - b. Other openings, as required by authorities having jurisdiction.
 - c. Other openings indicated.
2. Smokestopping of all penetrations through smoke barriers.

B. Extent of fire and smoke barriers is indicated on drawings.

C. Work Not Included: Repairing penetrations made in error and repairing penetrations which are too large to be sealed by the methods indicated; these are to be repaired using the original material of the construction.

D. Products Furnished but Not Installed:

1. Sleeves, which are an integral part of the firestopping assembly, must be set by installer of other construction.

E. Related Sections:

1. Cutting and patching: Division 1.

1.02 REFERENCES

- A. ASTM E 119-88 -- Standard Test Methods for Fire Tests of Building Construction and Materials; 1988.
- B. ASTM E 814-94 -- Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 1994.
- C. Certification Listings; Warnock Hersey International Inc.; 1994.
- D. Fire Resistance Directory; Underwriters Laboratories Inc.; 1994.
- E. FM P7825c -- Approval Guide, Building Materials 1996; Factory Mutual System; 1996.

1.03 DEFINITIONS

- A. Fire Barrier: Any wall, floor, ceiling, or roof, which is indicated as having a fire-resistance rating.
- B. Smoke Barrier: Any wall, floor, ceiling, or roof which is indicated as being designed to prevent passage of smoke and gases; may be indicated as "smoke barrier," "smoke partition," "smoke wall," etc.

1.04 SUBMITTALS

- A. Preinstallation Inspection Report: Identify penetrations, which need to be repaired using the original material of the assembly.
- B. Schedule of Firestopping: Complete list, for approval, of penetrations to be sealed, indicating location, fire rating of penetrated assembly, identification of penetration seal to be used, fire rating of penetration seal, and evidence of acceptable testing.
- C. Schedule of Smokestopping: Complete list, for approval, of penetrations to be sealed, indicating location, construction of penetrated assembly, and identification of penetration seal to be used.
- D. Product Data: Complete product and system description, including tested assembly details, installation instructions, and limitations on use.
- E. Maintenance Data: Include detailed instructions for repair and for modification due to changes in penetrating items.
- F. Final inspection report(s).
- G. Project Record Documents: Drawings showing locations of all fire and smoke barriers, the actual penetrations through them, and the manner in which they have been sealed; cross-referenced to maintenance data.

1.05 QUALITY ASSURANCE

- A. Testing Requirements: Testing shall have been conducted or witnessed by an independent testing agency acceptable to governing authorities.
 - 1. Test methods: ASTM E 814 and ASTM E 119; as indicated for each penetration seal.
 - 2. Conduct tests with a measurably higher pressure inside the chamber than outside.
 - 3. The listing of the assembly to be used in the current edition of one of the following classification guides will be considered evidence of acceptable testing:
 - a. Underwriters Laboratories Inc. "Fire Resistance Directory."
 - b. Factory Mutual System "Approval Guide."
 - c. Warnock Hersey "Certification Listings."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of products to minimize storage time at site.

- B. Deliver products to project site in original unopened containers bearing the name of the manufacturer, product name, type, and testing agency's identification mark.
- C. Store products in accordance with manufacturer's instructions.

1.07 PROJECT CONDITIONS

- A. Coordination Meeting: Prior to the start of work which involves cutting penetrations, conduct a meeting with installers of such work to identify fire and smoke barriers and required configurations of penetrations and to discuss the proper procedures and time schedule for cutting, patching, and sealing penetrations in such assemblies, with emphasis on avoiding unnecessary cutting and patching.

1.08 SEQUENCING AND SCHEDULING

- A. Perform firestopping and smokestopping work after completion of work which penetrates fire and smoke barriers, but prior to covering up or eliminating access to the penetration. Coordinate with installers of such other work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Materials:
 - 1. Manufacturers: Products made by the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
 - a. American Vamag Company, Inc.
 - b. Bio Fireshield, Inc.
 - c. Chase Technology Corporation.
 - d. Dow Corning Corporation.
 - e. Flamemaster Corporation.
 - f. GE Silicones.
 - g. Insta-Foam Products, Inc.
 - h. International Protective Coatings Corporation.
 - i. Hevi-Duty/Nelson.
 - j. Semco Division/Products Research and Chemical Corporation.
 - k. 3M Ceramic Materials Department.
 - l. Tremco

2.02 MATERIALS

- A. Firestopping Materials: Provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
 - 1. Use the materials required for the tested assemblies indicated on the schedule.

- a. Where no tested assembly is indicated for a particular penetration, use any tested assembly, which complies with the requirements of the specification.
 2. T rating: Not less than F rating.
 3. Provide products which:
 - a. Allow normal expansion and contraction movement of the penetrating item without failure of the penetration seal.
 - b. Emit no hazardous, combustible, or irritating by-products during installation or curing period.
 - c. Do not require special tools for installation.
 4. Prohibited products: Do not use any of the following products:
 - a. Safing insulation unless used in an ASTM E 814 tested assembly.
- B. Smokestopping: Use any gunnable or pourable joint sealant suitable for the application; use only fully curing types where accessible in the finished work. Provide products which:
1. Allow normal expansion and contraction movement of the penetrating item without failure of the penetration seal.
 2. Emit no hazardous, combustible, or irritating by-products during installation or curing period.
 3. Do not require special tools for installation.
- C. Labels: Red, permanent marking using the "Fire-Rated Assembly - Do not disturb - See maintenance instructions" and the testing agency designation, or equivalent as approved by the authority having jurisdiction.
1. For marking firestopping and smokestopping assemblies, use self-adhesive tape or wired-on labels.
 2. For marking fire and smoke barriers themselves, use letters at least 2 inches high.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Preinstallation Inspection: Inspect all fire and smoke barriers for penetrations of any type; mark or otherwise identify all penetrations indicating action required: 1) repair; 2) firestopping; or 3) smokestopping.
1. Conduct inspection prior to covering up or enclosing walls or ceilings.
 2. Conduct inspection jointly with the architect.
 3. Submit a report detailing findings of inspection to the architect.

- B. If the configuration of a particular penetration does not conform to the configuration necessary for the required firestopping assembly, notify the installer of the penetration for modification of the configuration to suit the assembly; do not use the firestopping assembly in other configurations except as specifically stated in the test report or as approved by the authority having jurisdiction.

3.02 PREPARATION

- A. Installation Meeting: Prior to start of work, conduct a meeting to verify that the installation instructions and procedures required are understood by installers.
 - 1. The following shall attend this meeting:
 - a. General contractor.
 - b. Installers of firestopping.
 - c. Installers of smokestopping.
 - d. Firestopping manufacturers' representatives.
 - e. The architect.
- B. Prepare penetrations in accordance with the material manufacturer's instructions.

3.03 INSTALLATION

- A. Install firestopping materials in exact accordance with manufacturer's instructions and the conditions of the testing; provide all accessory materials required.
- B. Remove combustible forming materials, unless they are a required component of the tested assembly.

3.04 PERMANENT IDENTIFICATION OF PENETRATIONS

- A. Near fire and smoke barriers, mark each exposed penetration with label identifying it as a fire-stopped or smoke-stopped assembly.
- B. Mark each fire and smoke barrier above lay-in ceilings with words identifying it as a fire or smoke barrier at intervals required by authorities having jurisdiction, but not less than 20 feet.

3.05 FIELD QUALITY CONTROL

- A. Obtain the services of firestopping material manufacturer's representative to instruct installers and to inspect the completed installations for correctness.
- B. Inspect completed installations for completeness and correct installation.
 - 1. If installed work is to be covered in completed work, inspect and obtain approval prior to covering.
 - 2. Obtain the architect's approval; notify the architect that the work is complete and ready for inspection.
 - 3. Obtain the approval of the material manufacturer.
 - 4. Obtain the approval of the authority having jurisdiction.

5. Submit report of inspection to the architect.

3.06 CLEANING

- A. Clean up excess material adjacent to penetrations promptly; use methods and materials approved by the manufacturers of the penetration seals and of surfaces to be cleaned.

3.07 PROTECTION

- A. Protect installed work during curing period.
- B. Protect installed work from damage from construction operations using substantial barriers if necessary.
- C. Repair damaged materials in accordance with manufacturer's instructions.

END OF SECTION 072700

SECTION 079000 - JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. The sealing of joints indicated on schedule at the end of this section.
 2. The sealing of exterior joints, including:
 - a. Exterior face of building expansion joints.
 - b. Wall joints.
 - c. Joints around perimeter of frames.
 - d. Joints between exterior roof slate and exterior walls.
 3. The sealing of interior joints, including:
 - a. Wall joints.
 - b. Joints around perimeter of frames.
 4. The sealing of concealed joints in sound-retardant assemblies, including:
 - a. Around all electric outlet boxes, between top and bottom stud runners and structure, and where indicated.
 5. The sealing of joints in floors and pedestrian paving.
 6. The sealing of penetrations through exterior walls and roofs by pipes, ducts and conduit.
 7. The sealing of other joints indicated on drawings.
- B. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on drawings to be sealed or not.

1.02 REFERENCES

- A. AAMA 800-92 -- Voluntary Specifications and Test Methods for Sealants; American Architectural Manufacturers Association; 1992.
- B. ASTM C 719-93 -- Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle); 1993.
- C. ASTM C 834-95 -- Standard Specification for Latex Sealants; 1995.
- D. ASTM C 919-84(88) -- Standard Practice for Use of Sealants in Acoustical Applications; 1984 (Reapproved 1988).
- E. ASTM C 920-95 -- Standard Specification for Elastomeric Joint Sealants; 1995.
- F. ASTM C 1193-91 -- Standard Guide for Use of Joint Sealants; 1991.

- G. ASTM D 2628-91 -- Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements; 1991.
- H. FS A-A-272 -- Caulking Compounds; 1980.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data on each joint sealer, with instructions for substrate preparation and installation.
- B. Samples for Color Selection: Cured samples of actual products showing manufacturer's full range of colors (Products exposed to view only.)
- C. Samples for Color Verification: Cured samples of each color of each product used, prepared to simulate actual joints minimum 6 inches long; use substrates similar appearance to actual substrates. (Products exposed to view only.)
- D. Substrate Test Report for Each Sealer.
- E. Certified Product Test Reports: Independent testing agency reports showing compliance with all specified requirements.
 - 1. Reports may be on tests conducted up to 24 months before submission, provided the products tested were aged specimens of the same formulation as that to be used.
- F. Field Installation Test Reports.
- G. Certificates: For each sealer, provide manufacturer's certificate stating that the product complies with the specifications and is appropriate for the use it is being put to.
- H. Installer's Preconstruction Inspection Report: List all conditions detrimental to performance of joint sealer work.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Execution of at least 50 sealer installations of similar size and scope.
 - 2. Similar installations completed within 5 years before start of this project.
 - 3. Lead mechanic assigned from among those experienced on previous similar projects.
- B. Substrate Tests: Have samples of actual substrate materials tested by manufacturer(s) of sealer products.
 - 1. Test to determine what preparation procedures (if any are necessary to make sealers adhere properly under environmental conditions that may occur during installation.
 - 2. Test to determine compatibility with substrates backers, and secondary seals, if any.
 - 3. Use manufacturer's standard test methods.

4. Report the sealer manufacturer's recommendations for substrate preparation and sealer installation and identify specific primer(s) required.
 5. The requirement for testing for this project will be waived if test reports based on previous testing of the products and substrates to be used are acceptable to the architect.
- C. Field Installation Tests: Before installation, test the adhesion of all sealers to actual substrates.
1. Seal at least 5-foot lengths of joints and cure properly. Try to pull sealer out of joint by hand, by method recommended by sealer manufacturer.
 2. Select test joints representative of joints to be sealed by the product to be tested.
 3. Perform tests for each type of sealer.
 4. Do tests in the presence of the architect.
 5. Report acceptable results only.
- D. Mock-ups: Before beginning installation, install sealers in joints in actual construction as directed by the architect, to show color, materials, and installation. Keep mock-ups intact as the standard for evaluating the completed work.
- E. Pre-installation Meeting: Have the installer, sealer manufacturers' representatives, and other affected installers meet to review sealer installation and protection procedures and sequencing with other work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
1. Air or substrate temperature exceeds the range recommended by sealer manufacturer or is below 40 degrees F (4.4 degrees C).
 2. Substrate is wet, damp, or covered with snow, ice, or frost.
- B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the architect and get sealer manufacturer's recommendations for alternative procedures.
- C. Coordination Data: Compression gasket manufacturer's requirements for joint dimensional tolerances; provide to installers of joints to be sealed with compression gaskets.

1.07 WARRANTY

- A. Submit written warranty signed by contractor and installer guaranteeing to correct failures in sealer work that occur within 5 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure is defined as failure to remain weathertight due to faulty materials or workmanship. Correction is limited to replacement of sealers.

PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

- A. General: Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
 1. For each generic product, use only materials from one manufacturer.
 2. Provide only materials which are compatible with each other and with joint substrates.
 3. Colors of exposed sealers: As selected by the architect from manufacturer's standard colors.
- B. Manufacturers: Products of the manufacturers listed, provided they comply with requirements of the contract documents will be among those considered acceptable.
 1. Polysulfide sealants:
 - a. A. C. Horn, Inc.
 - b. W. R. Meadows, Inc.
 - c. Pecora Corporation.
 - d. Products Research & Chemical Corporation.
 2. Silicone sealants:
 - a. Bostik Inc.
 - b. Dow Corning Corporation.
 - c. Pecora Corporation.
 - d. Tremco, Inc.
 - e. GE Silicones.
 - f. Rhone-Poulenc, Inc.
 3. Urethane sealants:
 - a. Bostik Inc.
 - b. Mameco International, Inc.
 - c. Pecora Corporation.
 - d. Products Research & Chemical Corporation.
 - e. Sika Corporation.
 - f. Sonneborn Building Products Division/ChemRex, Inc.
 - g. Tremco, Inc.
 - h. W. R. Meadows, Inc.

4. Acrylic solvent-release sealants:
 - a. Pecora Corporation.
 - b. Koch Protective Treatments, Inc.
 - c. Tremco, Inc.

5. Butyl sealants:
 - a. Pecora Corporation.
 - b. Koch Protective Treatments, Inc.
 - c. Tremco, Inc.

6. Acrylic-latex emulsion sealant:
 - a. Bostik Inc.
 - b. Pecora Corporation.
 - c. Sonneborn Building Products Division/ChemRex, Inc.

2.02 ELASTOMERIC SEALANTS

- A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.
 1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with the other requirements specified, when tested in accord with ASTM C 719, with base joint width measured at the time of application.
 2. For M-type substrates: Comply with requirements for Use M.
 3. For G-type substrates: Comply with requirements for Use G.
 4. For A-type substrates: Comply with requirements for Use A.
 5. For O-type substrates: Comply with requirements Use M (minimum) and Use O for the particular substrate.

- B. Two-Part Pourable Polysulfide Sealant: Type M, Grade P, Class 12-1/2, Use T.

- C. Polysulfide Sealant for Water Immersion: Type M, Grade NS, Class 12-1/2, Use T, specifically recommended by the manufacturer for sealing joints immersed continuously in water.

- D. One-Part Non-sag Polysulfide Sealant: Type S, Grade NS, Class 12-1/2, Use NT.

- E. High Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of at least 50 percent in both extension and compression.

- F. Medium Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less than 50 percent in both extension and compression.

- G. High Strength Silicone Sealant: One-part, acid- or non-acid-curing, Type S, Grade NS, Class 25, Use NT; with not over plus or minus 30 percent movement capability.
- H. Mildew-Resistant Silicone Sealant: One-part, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates.
- I. Silicone Sealant for Use T: One-part, non-acid curing, Type S, Grade NS, Class 25, Use T, Use M, plus movement capability of 50 percent in both extension and compression.
- J. All-Purpose Urethane Sealant: Multipart, non-sag, Type M, Grade NS, Class 25, Uses NT, M, G and A.
- K. Multipart Pourable Urethane Sealant: Type M, Grade P, Class 25, Use T.
- L. Non-sag Urethane Sealant for Use T: Type S or M, Grade NS, Class 25, Use T.
- M. One-Part Pourable Urethane Sealant: Type S, Grade P, Class 25, Use T.
- N. Urethane Sealant for Water Immersion: One- or two-part urethane, Grade NS, Class 25, Use NT, specifically recommended by the manufacturer for sealing joints immersed continuously in water.

2.03 SOLVENT-RELEASE-CURING SEALANTS

- A. Acrylic Sealant: Non-sag, one-part, solvent-release-curing; complying with ASTM C 920, Type S Grade NS, Use NT, with the following exceptions:
 - 1. Weight loss: 15 percent, maximum.
 - 2. Movement capability: 12-1/2 percent in both extension and compression, minimum.
- B. Butyl Sealant: Non-sag, one part, solvent-release-curing; complying with FS A-A-272, Type III; non-staining; paintable.

2.04 LATEX SEALANTS

- A. Acrylic-Latex Emulsion Sealant: One-part, non-sag, mildew-resistant, paintable; complying with ASTM C 834.

2.05 NONCURING SEALERS

- A. Non-curing Butyl Sealant: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic rubber sealant.
- B. Butyl Polyisobutylene Sealant: Non-curing, nondrying, solvent-release; complying with 809.2, as described in AAMA 800.

2.06 COMPRESSION SEALS

- A. Compression Gaskets: Neoprene (polychloroprene) hollow gasket; complying with ASTM D 2628; sizes and shapes as indicated.
 - 1. Accordion Type

2. Manufacturers:
 - a. The D. S. Brown Company.
 - b. Watson Bowman Acme Corp.

2.07 SEALANT BACKERS

- A. Backers - General: Non-staining; recommended or approved by sealant manufacturer for specific use.
- B. Backer Rods: Flexible, nonabsorbent, compressible polyurethane foam, either open-cell or non-gassing closed-cell, unless otherwise restricted by sealant manufacturer; preformed to appropriate size and shape.

2.08 MISCELLANEOUS MATERIALS

- A. Primers: Use primers determined to be required by substrate tests.
- B. Cleaners: As recommended by sealer manufacturer and not damaging to substrates.
- C. Masking Tape: Nonabsorbent, non-staining.
- D. Tooling Agents: Approved by sealant manufacturer; non-staining to sealant and substrate.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints for characteristics that may affect sealer performance, including configuration and dimensions.
- B. For compression gaskets, joints should have straight, parallel sides within proper tolerances, free of spalls.
- C. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Cleaning: Just before starting sealer installation, clean out joints in accord with recommendations of sealer manufacturers and as follows:
 1. Remove all material that could impair adhesion, including dust, dirt, coatings, paint, oil, and grease. Exception: Materials tested to show acceptable adhesion and compatibility.
 2. Dry out damp and wet substrates thoroughly.
 3. Clean M-type and O-type substrates by suitable mechanical or chemical methods.
 4. Remove loose particles by vacuuming or by blowing with oil-free compressed air.
 5. Concrete: Remove laitance and form-release coatings.

6. Clean A-type and G-type substrates by chemical or other methods which will not damage the substrate.
 7. Use methods which will not leave residues that will impair adhesion.
- B. Priming: Prime substrates as recommended by sealer manufacturer.
- C. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape as soon as practical.
- D. Install fillers where needed to provide proper joint depth or support for sealant backers.

3.03 INSTALLATION

- A. Comply with sealer manufacturers' instructions and recommendations, except where more restrictive requirements are specified.
- B. Gunnable and Pourable Sealants: Comply with recommendations of ASTM C 1193.
- C. Sealants in Acoustical Assemblies: Comply with recommendations of ASTM C 919.
- D. Backers:
1. Install backers at depth required to result in shape and depth of installed sealant which allows the most joint movement without failure.
 - a. Make backers continuous, without gaps, tears, or punctures.
 - b. Do not stretch or twist backers.
 2. If backers become wet or damp before installation of sealant, dry out thoroughly before proceeding.
- E. Sealants: Use methods recommended by manufacturer; completely fill the joint; make full contact with bond surfaces; tool non-sag sealants to smooth surface eliminating air pockets.
1. Use concave joint shape shown in Figure 5A in ASTM C 1193, where not otherwise indicated.
- F. Compression Gaskets: Use methods recommended by manufacturer; use as few end joints as possible; apply adhesive just before installing gaskets; make adhesively sealed joints at ends, corners, and intersections; install with top face approximately 1/8 to 1/4 inch below adjoining surfaces.

3.04 PROTECTION AND CLEANING

- A. Clean surfaces adjacent to joints as work progresses and before sealants set using methods and materials approved by manufacturers of sealers and of surfaces to be cleaned.
- B. Protect joint sealers from contamination and damage.
- C. Remove and replace damaged sealers.

3.05 SCHEDULE OF JOINT SEALERS

- A. General: Unless otherwise indicated, joints around perimeter of frames, where indicated to be sealed, are to be sealed using sealer specified for the substrate adjacent to the frame.
- B. Exterior Joints for Which No Other Sealer Is Indicated:
 - 1. Use one of the following sealants:
 - a. High movement silicone sealant.
 - b. Medium movement silicone sealant.
 - 2. Backer: Backer rod.
 - 3. Joint shape: Concave joint configuration.
- C. Interior Joints for Which No Other Sealer Is Indicated:
 - 1. Use one of the following sealants:
 - a. Acrylic-emulsion latex sealant.
 - 2. Backer: Backer rod.
 - 3. Joint shape: Concave joint configuration.
- D. Underwater Joints:
 - 1. Use one of the following sealants:
 - a. Polysulfide sealant for water immersion.
 - b. Urethane sealant for water immersion.
 - 2. Backer: Backer rod.
 - 3. Joint shape: Concave joint configuration.
- E. Exterior Joints Well Protected from Weather and Not Subject to Movement:
 - 1. Use one of the following sealants:
 - a. Acrylic sealant.
 - b. Butyl sealant.
 - 2. Backer: Backer rod.
- F. Joints around Pipes, Ducts, and Conduit Penetrating Exterior Walls and Roofs:
 - 1. Use one of the following sealants:
 - a. Same as used for adjacent substrates.

END OF SECTION 079000

SECTION 081110 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.
5. Factory finishing hollow metal doors and factory machining for hardware.

B. Related Sections:

1. Division 04 Section "Concrete Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Door Hardware".
3. Division 09 Section "Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.

14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
 1. Elevations of each door design.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of anchorages, joints, field splices, and connections.
 6. Details of accessories.
 7. Details of moldings, removable stops, and glazing.
 8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
 1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.
- E. Informational Submittals:

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: 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 (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

- E. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.
 1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:
 - a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.29, R-Value 3.4, including insulated door, thermal-break frame and threshold.
 2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:
 - a. Rate of leakage of the door assembly shall not exceed 0.25 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).

- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Management and Coordination" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
 - B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
 - C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages 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.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CECO Door Products.
 - 2. Curries Company.
 - 3. Steelcraft.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Manufacturers Basis of Design:

1. Curries Company Polystyrene Core: 707 Series.
2. Curries Company Polyurethane Core: 707 Series.

2.4 SPECIAL FUNCTION HOLLOW METAL DOORS

A. Embossed Wood Grain Doors: Subject to the same compliance standards and requirements as standard hollow metal doors, provide wood pattern engraved and stainable full flush or 6-panel embossed face sheets fabricated from minimum A40 galvanized steel with vertical edges having a similar engraved wood grain stainable surface. Door faces and edges to be factory stained and protected with a ultra-violet (UV) resistant clear coating.

1. Provide doors with a minimum .005" wood grain embossing. The wood grain pattern is to match the grain pattern design of a typical wood stile and rail door.
2. Vision lites to match engraved wood grain design and stain of the door.
3. Manufacturers Basis of Design:
 - a. CECO Door Products Madera Series.
 - b. Curries Company CurriStain Series.

2.5 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with positive 3/8" vinyl thermal break and integral vinyl weather-stripping.
- C. Weather-stripped Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide where indicated weather-stripped profiles with 1/8" integral kerf formed into the frame soffit able to receive manufacturer's listed gasket material. Available for use in both masonry and drywall construction, with fire rating up to 3 hours complying with NFPA 105, UL 1784, and ASTM E-283 Test criteria.
- D. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 - 2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 - 3. Manufacturers Basis of Design:
 - a. Curries Company - Thermal Break TB Series.
 - b. Curries Company – Kerfed Weather-stripped WM Series.
- E. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 - 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 - 3. Manufacturers Basis of Design:
- F. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- G. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.7 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal components.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 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 thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
 - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
 - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
 - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
 - 1. Shipping Limitations: 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.
 - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

- a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
 3. Sidelight and Transom Bar 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.
 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
 5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
 6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
 7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
 8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 9. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry 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) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. 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) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 10. Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.
- B. Factory Pre-Finished: Factory apply electrostatic paint finish to doors in accordance with ANSI A250.3 test procedure acceptance criteria for factory applied finished coatings. Color as selected by the architect from manufacturer's full range of standard colors.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. 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. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door 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 of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. 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 post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

- B. Remove grout and other bonding material from hollow metal work immediately after installation.

- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081110

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 06 Section "Rough Carpentry"
2. Division 07 Section "Joint Sealers" for sealant requirements applicable to threshold installation specified in this section.
3. Division 08 Sections:
 - a. "Hollow Metal Doors and Frames"

1.02 REFERENCES

A. UL - Underwriters Laboratories

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
2. NFPA 101 – Life Safety Code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
 - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
 - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
3. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
 - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
 - c. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each hardware set cross-referenced to indications on Drawings.
 - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for hardware.

- 8) Door and frame sizes and materials.
- 9) Degree of door swing and handing.

4. Key Schedule:

- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
- b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
- c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
- d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
- e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
- f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Final approved hardware schedule edited to reflect conditions as installed.
 - d. Final keying schedule
 - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. fire door assemblies, in compliance with NFPA 80.
 - b. required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: 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 meets these requirements:
 - a. For door hardware: DHI certified AHC or DHC.
 - b. Can provide installation and technical data to Architect and other related subcontractors.
 - c. Can inspect and verify components are in working order upon completion of installation.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
 - a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
 - b. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
 - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
 - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Accessibility Requirements:
 - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

- a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2) Preliminary key system schematic diagram.
 - 3) Requirements for key control system.
 - 4) Address for delivery of keys.

2. Pre-installation Conference

- a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- b. Inspect and discuss preparatory work performed by other trades.
- c. Review required testing, inspecting, and certifying procedures.
- d. Review questions or concerns related to proper installation and adjustment of door hardware.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.07 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
 - a. Mechanical Warranty
 - 1) Locks
 - a) Schlage ND Series: 10 years
 - 2) Closers
 - a) LCN 4050 Series: 25 years

1.08 MAINTENANCE

- A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
- B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- B. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Ives 5BB series
2. Acceptable Manufacturers and Products:
 - a. Hager BB1191/1279 series
 - b. McKinney TB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
 - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
5. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins

2.04 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage ND series
2. Acceptable Manufacturers and Products:
 - a. Sargent 11-Line

b. Corbin-Russwin CL3100 series

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

a. Lever Design: RHO

2.05 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
 - a. SFIC (Tie into Owner's Existing Key System as required)
2. Acceptable Manufacturers and Products:

B. Requirements:

1. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.06 KEYING

A. Scheduled System:

1. Existing factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
 - a. Replaceable Construction Cores.
 - 1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
 - a) 3 construction control keys

- b) 12 construction change (day) keys.
- 2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:

- a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - 1) Master Keying system as directed by the Owner.
- b. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
- c. Provide keys with the following features:
 - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
- d. Identification:
 - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
 - 2) Identification stamping provisions must be approved by the Architect and Owner.
 - 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
 - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
 - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
 - 1) Change (Day) Keys: 3 per cylinder/core.
 - 2) Permanent Control Keys: 3.
 - 3) Master Keys: 6.

2.07 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

- a. LCN 4050A series

2. Acceptable Manufacturers and Products:

- a. Falcon SC70A series
- b. Norton 7500 series

B. Requirements:

- 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.

2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.08 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.09 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
 - a. Glynn-Johnson
2. Acceptable Manufacturers:
 - a. Rixson
 - b. Sargent

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.10 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.11 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

- B. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Lock Cylinders:
 - 1. Install construction cores to secure building and areas during construction period.
 - 2. Replace construction cores with permanent cores as indicated in keying section.
- J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- K. Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- L. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- M. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- N. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- O. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- P. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
 - 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE







- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

Abbreviation	Name
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	Lcn Commercial Division
MIS	Misc - Out-Sourced Items
SCH	Schlage Lock Company

66368 OPT0245561 Version 1

Hardware Group No. 01

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	TIED INTO OWNER'S EXISTING KEY SYSTEM		626	MIS
1	EA	OH STOP & HOLDER	100H		630	GLY
1	EA	SURFACE CLOSER	4050A	RW/PA 	689	LCN
			TOP JAMB MOUNTED			
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

END OF SECTION 087100

SECTION 092600 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum wallboard.
 - 2. Tile backing panels.

1.2 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Samples: For the following products:
 - 1. Trim Accessories: Full-size sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."
- B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
 - 1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

- C. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Install mockups for the following applications:
 - a. Surfaces with texture finishes.
 - b. Surfaces indicated to receive non-textured paint finishes.
 - c. Surfaces indicated to receive textured paint finishes.
 - 2. Simulate finished lighting conditions for review of mockups.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Steel Framing and Furring:
 - a. Clark Steel Framing Systems.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc. - Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. MarinoWare; Division of Ware Ind.
 - f. National Gypsum Company.
 - g. Scafco Corporation.
 - h. Unimast, Inc.
 - i. Western Metal Lath & Steel Framing Systems.
 - j. Or approved equal.
 - 2. Gypsum Board and Related Products:
 - a. G-P Gypsum Corp.
 - b. Certainteed Corp.
 - c. Or approved equal.

2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.
- B. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40, hot-dip galvanized ASTM A 653, G60, hot-dip galvanized manufacturer's standard corrosion-resistant zinc coating.
 - 1. Cold Rolled Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, 3/4 inch (19.1 mm) deep.
 - 2. Steel Studs: ASTM C 645.
 - a. Minimum Base Metal Thickness: As indicated 0.0312 inch.
 - b. Depth: As indicated on the drawings.
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: As indicated 0.0312 inch.
 - 4. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
 - a. Configuration: Hat shaped, with face attached to two flanges by slotted or expanded metal legs.
- C. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Acceptable Products:
 - a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
 - b. Chicago Metallic Corporation; Drywall Furring 640 System.
 - c. USG Interiors, Inc.; Drywall Suspension System.
 - d. Or approved equal.

2.3 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Glass-Mat Faced Gypsum Wallboard: ASTM C 1177.
 - 1. Acceptable Products:
 - a. DensArmor Plus Interior Panels by G-P Gypsum Corp.
 - b. GlasRoc Brand Sheathing by Certainteed Corp.
 - c. U.S.G. Fiberrock Brand "Aqua-Tough".
 - d. Or approved equal.
 - 2. Core: 5/8 inch (15.9 mm), Type X.
 - 3. Long Edges: Tapered.
 - 4. Location: As indicated.

2.4 INTERIOR GYPSUM WALLBOARD (WET AREAS)

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Glass-Mat Faced Gypsum Wallboard: ASTM C 1178

1. Acceptable Products:
 - a. DensShield by G&P Gypsum Corp.
 - b. GlasRoc Brand Sheathing by Certaineed Corp.
 - c. Or approved equal.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Location: As indicated.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead: Use at outside corners, unless otherwise indicated.
 - b. Bullnose Bead: Use at outside corners.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
 - d. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound; use [at exposed panel edges.
 - f. Expansion (Control) Joint: Use where indicated.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.

2.6 JOINT TREATMENT MATERIALS

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

B. Joint Tape:

1. Basis-of-Design: "G-P Gypsum; ToughRock Tape" or 10-by-10 glass mesh or approved equal.
2. Glass-Mat Gypsum Wallboard: [Paper] [10-by-10 glass mesh].
3. Tile Backing Panels: As recommended by panel manufacturer.

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

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - a. Basis-of-Design: G-P Gypsum; ToughRock Sandable Setting Compound" or approved equal.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Basis-of-Design: G-P Gypsum; ToughRock Sandable Setting Compound" or approved equal.
 - b. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.

- a. Basis-of-Design: G-P Gypsum; ToughRock Sandable Setting Compound” or approved equal.
- 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - a. Basis-of-Design: G-P Gypsum; ToughRock Sandable Setting Compound or approved equal.
- 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
 - a. Basis-of-Design: G-P Gypsum; ToughRock Sandable Setting Compound or approved equal.

D. Joint Compound for Tile Backing Panels:

- 1. Basis-of-Design: G-P Gypsum; "ToughRock Setting Compound" or approved equal.
- 2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
- 3. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
- 4. Glass-Mat Gypsum Wallboard: As recommended by wallboard manufacturer.
- 5. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 ACOUSTICAL SEALANT

A. Acceptable Products:

- 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
 - c. Or approved equal.
- 2. Acoustical Sealant for Concealed Joints:
 - a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
 - b. Pecora Corp.; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
 - d. Or approved equal.

- B. Acoustical Sealant for Exposed and Concealed Joints: Non-sag, paintable, non-staining, latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- 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.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

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

3.2 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories,

furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 - 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
 - a. Use deep-leg deflection track where indicated.
 - b. Use firestop track where indicated.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or approved equal devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 - 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 - 4. Secure rod flat angle hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.
- C. Sway-brace suspended steel framing with hangers used for support.
- D. For exterior soffits, install cross bracing and framing to resist wind uplift.

- E. Screw furring to framing.
- F. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.
- G. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
 - 1. Hangers: 48 inches 1200 mm.
 - 2. Carrying Channels (Main Runners): 48 inches.
 - 3. Furring Channels (Furring Members): 16 inches 24 inches.
- H. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

- A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.
- B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch short of full height to provide perimeter relief.
 - 2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
 - a. Terminate partition framing at suspended ceilings where indicated.
- D. Install steel studs and furring at the following spacings:
 - 1. Single-Layer Construction: 16 inches o.c., unless otherwise indicated.
 - 2. Multilayer Construction: 16 inches o.c., unless otherwise indicated.
 - 3. Cementitious Backer Units: 16 inches o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
- F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. 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.

1. Install two studs at each jamb, unless otherwise indicated.
2. 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.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. 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.

H. Z-Furring Members:

1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.
4. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch- diameter, tie wire and inserted through slot in web of member.

3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum 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.

E. 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.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- K. Floating Construction: Where feasible, including where recommended in writing by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.
- L. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- N. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.7 PANEL APPLICATION METHODS

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular 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 board.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- B. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base

layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

- C. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 1. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- D. Single-Layer Fastening Methods: Apply gypsum panels to supports with corrosion resistant drill screws.
- E. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- F. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- G. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered and located over supports.
 - 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings Install control joints according to ASTM C 840 and in specific locations approved by Design Consultant for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- 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, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated panels are substrate for acoustical tile indicated.
 - 3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges where indicated.
 - 4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
 - 5. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface where indicated.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

3.10 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

3.11 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Design Consultant will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify Design Consultant seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.

2. Before notifying Design Consultant, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.

END OF SECTION 092600

SECTION 093000 - CERAMIC TILE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceramic wall tile.
 - 2. Ceramic floor tile.

1.2 REFERENCES

- A. ANSI A108.1A-1993 -- American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar; 1992.
- B. ANSI A108.4-1992 -- Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesive; 1992.
- C. ANSI A108.6-1992 -- Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1992.
- D. ANSI A108.10-1992 -- Installation of Grout in Tilework; 1992.
- E. ANSI A118.3-1992 -- American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive; 1992.
- F. ANSI A118.6-1992 -- American National Standard Specifications for Ceramic Tile Grouts; 1992.
- G. ANSI A118.8-1992 -- American National Standard Specifications for Modified Epoxy Emulsion Mortar/Grout; 1992.
- H. ANSI A136.1-1992 -- American National Standard for Organic Adhesives for Installation of Ceramic Tile; 1992.
- I. ANSI A137.1-1988 -- American National Standard Specifications for Ceramic Tile; 1988.
- J. ASTM A 82-94 -- Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1994.
- K. ASTM A 185-94 -- Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1994.
- L. ASTM C 503-89 -- Standard Specification for Marble Dimension Stone (Exterior); 1989.
- M. ASTM C 920-95 -- Standard Specification for Elastomeric Joint Sealant; 1995.
- N. ASTM E 90-90 -- Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions; 1990.
- O. Handbook for Ceramic Tile Installation; Tile Council of America, Inc. (TCA) 1994.

1.3 DESIGN REQUIREMENTS

- A. Sound-Rated Construction: At locations indicated, provide construction built in accordance with manufacturer's assemblies, laboratory-tested per ASTM E 90 for designated STC ratings.

1.4 SUBMITTALS

- A. Product Data: Written product information, which demonstrates materials to be used on the project comply with contract documents.
- B. Shop Drawings: Showing tile layout and details of expansion joints in tile work and underlying construction.
- C. Samples - Initial Selection: Manufacturer's color selection boards of actual tile materials including a complete selection of available tile colors and finishes for each tile type indicated. Include samples of accessory materials requiring color selection.
- D. Samples for Verification Purposes: Submit the following:
 - 1. Submit each tile type selected mounted on a minimum 12-inch square board with joints filled using selected grout.
 - 2. Trim and accessories: Samples of actual units in selected color.
 - 3. Stone thresholds: 6-inch-long samples.
 - 4. Edge strips: 6-inch long samples.
- E. Certification: Submit Master Grade Certificates for each delivery of each tile type, signed by tile manufacturer and installer.
- F. Test Reports: Submit independent testing agency's certified test reports which demonstrate tile materials and installation products comply with project requirements.
- G. Qualifications Documentation: Written confirmation that companies executing work in this section comply with experience requirements.

1.5 QUALITY ASSURANCE

- A. Material Source: Furnish each type, finish, and color of tile product and accessory materials from a single supplier.
- B. Installer: A company with not less than 20 installations of tile work similar in size and complexity to the work of this project.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store tile products and setting materials in manufacturer's sealed packages. Protect material from damage and store in dry location.

1.7 PROJECT CONDITIONS

- A. Provide temperatures in tiled areas during installation and after completion as required by referenced installation standard or manufacturer's instructions, but not less than 50 degrees F.
- B. If necessary to use temporary heaters, vent units to exterior to protect tile work from carbon dioxide accumulation.

1.8 MAINTENANCE

- A. Extra Materials: Deliver supply of maintenance materials to the Project School District. Furnish maintenance materials from same lot as materials installed, and enclosed in protective packaging with appropriate identifying labels.
 - 1. Furnish not less than 2 percent of total product installed maintenance stock for each type, color, pattern, and size of tile product installed.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- A. Ceramic Tile Standard: ANSI A137.1.
 - 1. Tile grade: "Standard Grade," unless noted otherwise.
- B. Tile Installation Materials Standard: ANSI standard referenced for setting and grouting materials.
- C. Colors, Textures, and Patterns, Tile, Grout, and Other Products: As indicated on Finish Legend on sheet A2.01.
 - 1. Tile trim and accessories: Match color and finish of adjoining flat tile.
- D. Color Blending: Factory-blend tile products which have a natural color range so products taken from one box will have the same range as products from a separate box.

2.2 TILE PRODUCTS

- A. As scheduled on Drawing A2.01 Finish Legend.

2.3 SETTING MATERIALS

- A. Portland Cement Mortar Installation Materials: ANSI A108.1A.
 - 1. Setting bed reinforcing: Galvanized welded wire fabric, 2 inches by 2 inches, ASTM A 185; with W0.3 by W0.3, 0.0625 inch diameter, wire, ASTM A 82 except for minimum wire size.
- B. Chemical-Resistant, Water-Cleanable Ceramic Tile Setting and Grouting Epoxy: ANSI A118.3.
 - 1. Service temperature: Product recommended and certified by manufacturer to resist anticipated ambient temperature range, but not less than 140 F degrees on a continuous basis.
 - 2. Acceptable Manufacturers:

- a. American Olean Tile Company.
- b. Boiardi Products Corporation.
- c. C-Cure Corporation.
- d. Mapei Corporation.
- e. Laticrete International, Inc.
- f. Southern Grouts & Mortars, Inc.
- g. Summitville Tiles, Inc.
- h. Tamms Industries.
- i. Approved equal.

2.4 WATERPROOFING MATERIALS

- A. Sheet Membrane: 0.030 inch thick chlorinated polyethylene (CPE) sheet with nonwoven polyester laminated to both sides, 60 inches wide.
 - 1. Acceptable Products:
 - a. "Laticrete International, Inc.
 - b. "NobleSeal TS"; The Noble Company.
 - c. "Dal-Seal TS"; Dal-Tile Corporation.
 - d. Approved equal.

2.5 GROUTING MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10.
- B. Chemical-Resistant Epoxy Grout: ANSI A118.3.
 - 1. Service temperature: Product recommended and certified by manufacturer to resist anticipated ambient temperature range, but not less than 140 F degrees on a continuous basis.
 - 2. Acceptable Manufacturers:
 - a. American Olean Tile Company.
 - b. Atlas Mineral & Chemicals, Inc.
 - c. Boiardi Products Corporation.
 - d. Bostik Inc.
 - e. C-Cure Corporation.
 - f. Mapei Corporation.
 - g. Laticrete International, Inc.
 - h. Southern Grouts & Mortars, Inc.
 - i. Summitville Tiles, Inc.
 - j. Tamms Industries.
 - k. Approved equal.

2.6 ELASTOMERIC SEALANTS

- A. Compatibility: Provide sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates for project performance conditions.
- B. Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and O (for nonporous substrates) with added fungicide.
 - 1. Acceptable Manufacturers:
 - a. Dow Corning Corporation.
 - b. GE Silicones.

- c. Pecora Corporation.
 - d. Tremco, Inc.
 - e. Approved equal.
- C. Urethane Sealant: ASTM C 920, Grade P; Class 25; Uses T, M, and A.
- 1. Acceptable Manufacturers:
 - a. Bostik Inc.
 - b. Mameco International, Inc.
 - c. Pecora Corporation.
 - d. Tremco, Inc.
 - e. Approved equal.
- D. Chemical-Resistant Sealants: Sealants recommended by tile setting materials manufacturer to be compatible with and have similar chemical resistant performance as the chemical-resistant mortar and grout.
- 1. Basis of Design: Atlas Mineral & Chemicals, Inc. or approved equal.

2.7 MISCELLANEOUS MATERIALS

- A. Edge strips; fabricated from the following material with 1/8 inch wide exposed edge, and means for securing strip to substrate:
- 1. Zinc alloy.
 - 2. Stainless steel.
- B. Tile Cleaner: Product specifically acceptable to tile manufacturer and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation or Ceramic Tile Institute.
- 1. Acceptable Manufacturers:
 - a. Hillyard, Inc.
 - b. Mapei Corporation.
 - c. Approved equal.

2.8 MIXING MORTAR AND GROUT

- A. Mix mortar and grout to comply with referenced standards and manufacturer's mixing procedures.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify with the installer that substrate areas where tile is to be installed have been prepared correctly, and that all backing materials have been installed. Correct unacceptable conditions before start of tile work.

3.2 PREPARATION

- A. Factory-Blending: Before start of installation verify that tile with an anticipated range of colors has been correctly blended to achieve a uniform color range from tile package to tile package.

3.3 INSTALLATION - GENERAL

- A. Tile Installation Standard: ANSI A108 series, for setting and grouting materials listed.
- B. Installation Methods: Comply with TCA "Handbook for Ceramic Tile Installation" for type of applications indicated.
- C. Install waterproofing to comply with waterproofing manufacturer's instructions as necessary to result in a watertight installation.
- D. Install tile under or behind equipment and fixtures.
- E. Carefully cut, drill, and grind tile to fit around items projecting through tile surface, so that escutcheons or cover plates conceal cut edges.
- F. Joint Patterns: Lay out tile according to patterns indicated on drawings, or if not shown, in a grid pattern with floor joints aligning with wall and trim joints. Install joints straight and of uniform width.
 - 1. Sheet-mounted tile: Install with joint dimension between sheets the same width as the joint within the sheet for a continuous, uniform installation.

3.4 TILE APPLICATIONS

- A. Interior Wall, Thin-Bed: (See Sheet A2.08 Finish Legend on Drawings)
 - 1. Tile: Refer to Finish Legend.
 - 2. Installation method:
 - a. Dry Set Mortar or Latex Portland Cement Mortar: TCA W202.
 - b. Adhesive: PermaFlex 400, ANSI A108.5.
 - 3. Grout: Sand-Portland cement.
- B. Interior Wall, Thin-Bed: (See Sheet A2.08 Finish Legend on Drawings)
 - 1. Tile: Refer to Finish Legend.
 - 2. Installation method:
 - a. Gypsum board on metal studs: TCA W242.
 - b. Adhesive: Organic adhesive, ANSI A108.4.
 - 3. Grout: Sand-Portland Cement
- C. Interior Floor, Thin-Bed: (See Sheet A2.08 Finish Legend on Drawings)
 - 1. Tile: Refer to Finish Legend.
 - 2. Installation method:
 - a. Concrete subfloor: TCA F205.
 - b. Bond coat: Chemical-resistant, water cleanable epoxy adhesive, ANSI A108.6.
 - 3. Grout: Chemical-resistant epoxy resin.

3.5 CLEANING AND PROTECTION

- A. Clean tile surfaces after installation is complete.
- B. Replace any broken, chipped, marred, or otherwise damaged tile before final acceptance.

- C Protection: Apply neutral protective cleaner to tile after installation if recommended by tile manufacturer. Overlay completed tile installation with kraft paper for protection from subsequent construction activities.
1. Do not allow any traffic on completed tile floors for minimum 7 days after completion.
 2. Remove protection, rinse, and dry tile installations before final review and acceptance.

END OF SECTION 093000

SECTION 095120 - ACOUSTICAL PANEL CEILINGS (DUNE)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Division - 1 specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:

1. Acoustical ceiling panels.
2. Exposed grid suspension system.
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

B. Related Sections:

1. Division 23 Sections – Heating Ventilating and Air Conditioning
2. Division 26 Sections – Electrical

C. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products which have not been approved by Addenda, the specified products shall be provided without additional compensation.
2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.

9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
 10. ASTM E 1264 Classification for Acoustical Ceiling Products.
 11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
 12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.
- B. ASHRAE Standard 62.1-2004, "Ventilation for Acceptable Indoor Air Quality"

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
- B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.
- C. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.
- D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
- E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
- B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
 1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
 - a. Flame Spread: 25 or less
 - b. Smoke Developed: 50 or less
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.6 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, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.7 PROJECT CONDITIONS

A. Space Enclosure:

All ceiling products and suspension systems must be installed and maintained in accordance with Armstrong written installation instructions for that product in effect at the time of installation and best industry practice. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F (0°C) and 120°F (49°C) and not subject to Abnormal Conditions.

Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.

ClimaPlus Ceilings: Installation of the products shall be carried out where the temperature is between 32°F (0° C) and 120°F (49° C). It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc.) must be complete and dry.

The ceilings must be maintained to avoid excessive dirt or dust buildup that would provide a medium for microbial growth on ceiling panels. Microbial protection does not extend beyond the treated surface as received from the factory, and does not protect other materials that contact the treated surface such as supported insulation materials.

1.8 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
 2. Grid System: Rusting and manufacturer's defects
 3. Acoustical Panels with ClimaPlus or designated as inherently resistive to the growth of micro-organisms installed with Armstrong suspension systems: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
- B. Warranty Period ClimaPlus:
1. Acoustical panels: Ten (10) years from date of substantial completion.
 2. Grid: Ten (10) years from date of substantial completion.
 3. Acoustical panels and grid systems with ClimaPlus performance supplied by one source manufacturer is thirty (30) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. USG Interiors, Inc.

2.2 ACOUSTICAL CEILING UNITS

A. Acoustical Panels Type: ClimaPlus Healthcare, Item #86169 or Approved Equal.

1. Surface Texture: Fine
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 24in X 3/4in
5. Edge Profile: Square Lay-In for interface with DXLA 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.75.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35

B. Acoustical Panels Type: ClimaPlus Healthcare, Item #88189 or Approved Equal.

1. Surface Texture: Fine
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24in X 48in X 3/4in
5. Edge Profile: Square Lay-In for interface with DXLA 15/16" Exposed Tee.
6. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.75.
7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35

2.3 SUSPENSION SYSTEMS

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
 1. Structural Classification: ASTM C 635 ID.
 2. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
 3. Acceptable Product: DXLA 9/16" Dimensional Tee as manufactured by USG, Inc.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
- D. Accessories

2.4 SUSPENSION SYSTEMS

- A. Components: All main beams and cross tees shall be commercial quality hot-dipped galvanized (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed flange design. Exposed surfaces chemically cleansed, capping pre-finished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
 - 1. Structural Classification: ASTM C 635 HD.
 - 2. Color: Unpainted and match the actual color of the selected ceiling tile, unless noted otherwise.
 - 3. Acceptable Product: Drywall Grid System as manufactured by USG, Inc.
- B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.
- D. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
- E. Accessories: 10ft Channel Molding

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: ClimaPlus Ceilings)

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

- A. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- B. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.
- C. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

- D. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- E. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

- A. Replace damaged and broken panels.
- B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
- C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095120

SECTION 099000 - PAINTING

PART 1 - GENERAL

1.01 SECTION INCLUDES: (See Paint Schedule and finish designations)

- A. Painting interior
- B. Natural finish of wood

1.02 RELATED SECTIONS: (including but not limited to)

- A. Section 042200, Concrete Masonry Unit

1.03 DEFINITIONS

- A. "Paint or Painting" as used in this specification, are in a general sense and include: Sealers, primers, stains; oil, alkyd, latex, epoxy, and enamel type paints; lacquers; fillers; and the application of these materials.

1.04 PRODUCT SUBMITTALS

- A. Product Data: Listing of proposed products matched to specified products. Cut sheet for each product indicating generic formulation, sheen, ingredients, percentage by volume, and breakdown of pigment versus vehicle.
- B. Samples: Full range of custom mixed color chips for selection.

1.05 CONTRACT CLOSEOUT SUBMITTALS

- A. Maintenance Materials: Turn over to Owner upon completion; one gallon of each type and color of finish. Include color pigmentation formulation.

1.06 PACKING AND DELIVERY

- A. Delivery: Unopened containers with manufacturer's labels indicating type of paint, stock number, color number and instructions.

1.07 STORAGE AND PROTECTION

- A. Storage: Do not store volatiles, thinners, and solvents (including rags and tool cleaning pails) within the building.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Temperature:
 - 1. Interior: Constant 65 degrees F. or above. Prevent wide variations in temperature which might result in condensation.
 - 2. Exterior: Do not paint materials when temperature is below 50 degrees F.
- B. Avoid painting any surfaces while they are exposed to hot sun.
- C. Provide proper conditions of ventilation and light; use artificial light in quantity equivalent to normal occupancy lighting.

PART 2 - PRODUCTS

2.01 PAINT AND FINISHES

- A. Manufacturer:
- | | |
|-----------------------------------------|------------------------------|
| Pratt & Lambert, Inc. | PPG Industries |
| ICI Glidden | Benjamin Moore Paint Co. |
| M.A. Bruder & Sons, Inc. | Duron Paints & Wallcoverings |
| Sherwin Williams (Product #s specified) | |
- B. Specific products are indicated in painting schedule included at the end of this Section. These products establish a standard of quality. Others may be required to substantiate properties and qualities.
- C. Ready-mixed; well ground, not settle badly, cake or thicken in the container, readily broken up with a paddle to a smooth consistency; and having easy brushing properties; Lead free.
- D. Colors: Standard colors.
1. Colors to be selected by Architect and approved by Owner.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Inspection and Surfaces:
1. Carefully examine executed work of other trades which might affect this Work.
- B. Protect materials and equipment from damage by painting and finishing.
1. Tape, mask, cover and/or coat adjacent materials, areas, surfaces, and equipment not to receive finishes noted in this Section. Specifically protect wood floors and natural unfinished wood.
 2. Before painting, remove hardware, accessories, plates and similar items or provide ample protection of such items.
 3. Remove doors, if necessary, to paint bottom edge.
 4. Use only skilled mechanics for removing and replacing such items. Upon completion of each space, replace above items.
- C. General Preparation of Surfaces:
1. Prepare all surfaces in accordance with manufacturer's recommendations for product being used.
 2. Surfaces: Clean; dry; free of moisture and dampness; smooth, even, true to plane; and free of material which will adversely affect adhesion or appearance of applied coating.

3.02 PREPARATION- WOOD SURFACES TO BE PAINTED OR FINISHED

- A. Dry, clean, and free from oil, grease, wax, loose dirt or other foreign matter.

- B. Sand surfaces smooth and even, and then dust off before applying the first coat.
- C. Coat knots, sap streaks, and pitch spots with recommended sealer.
- D. Fill nail holes, cracks, and imperfections.
 - 1. Paint Finish: Use wood putty
 - 2. Natural or Stain Finish: Use plastic wood filler (match for specie and finish color).
- E. Apply paste wood filler on open grain wood. Wipe across the grain; then with a circular motion to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface until smooth.

3.03 PREPARATION- METAL SURFACES TO BE PAINTED

- A. Thoroughly clean metal surfaces where rust or scale is present, by the use of wire brushing and/or abrasive paper.
- B. Wash surfaces with mineral spirits to remove any grease, oil or dirt.
- C. Touch-up all shop primed or coated surfaces chipped or abraded, using shop coat material specified. Feather edges of damaged shop coat to achieve smooth finish. Comply with metal preparation as indicated by the manufacturer of the coating.

3.04 PREPARATION - MASONRY SURFACES

- A. Masonry Surfaces: Allow to cure at least thirty (30) days before painting. Before apply the first coat of paint, fill all joints and point up all holes, Correct any imperfections. Remove all mortar or plaster droppings and any other foreign matter. Brush surfaces with a stiff bristle or wire brush.
- B. Neutralize free lime with a solution acceptable to the manufacturers of the paint which is to be applied.

3.05 PREPARATION- CONCRETE SURFACES

- A. Patch openings, voids, holes, cracks, and irregularities with Portland Cement mortar and finish flush with adjacent surfaces.
- B. Remove contaminants, oil, scum, grease, and the like.
- C. Remove all loose, powdery or dusting surface laitance mechanically (scarification).
- D. Remove form oil from concrete as recommended by paint manufacturer for proper adhesion.
- E. Allow surfaces to dry completely, usually 60 to 90 days of moderate, weather, before painting.

3.06 PREPARATION- GYPSUM BOARD SURFACES

- A. Fill all minor irregularities with spackling compound and sand to smooth, level surfaces. Exercise care to avoid raising nap of paper.

- B. Allow to cure at least 15 days before painting.
- C. Do not use sandpaper on paper surfaces to be painted.
- D. Do not apply paint or sealer when moisture content exceeds that required by paint manufacturer.

3.07 APPLICATION OF PAINTS

- A. General Requirements: Comply with manufacturer's instructions including environmental conditions, temperatures, pot life, drying and recoating times. Utilize tools and equipment recommended for products.
 - 1. Do not apply coating until moisture content of surface is within limitations recommended by the paint manufacturer. Test with moisture meter.
 - 2. Apply paint, enamel, stains and varnishes with suitable brushes, rollers or spray equipment which have been kept clean, free from contamination and suitable for finish required.
 - 3. Rate of application of coating shall not exceed that as recommended by the paint manufacturer for the purpose of surface involved.
 - 4. Sand and dust between each coat to remove visible defects and blemishes.
- B. Coverage:
 - 1. Apply not less than 2 separate and distinct coats of finish on all exposed Work throughout.
 - 2. Apply to shop or factory primed surfaces not less than 1 finish coat; in addition to the prime coat.
 - 3. Apply additional coats should there be a deficiency in coverage.
 - 4. Apply additional coats over entire surface until paint film is of uniform finish, color appearance and coverage, specifically when previous color, stain, dirt, spackle, patching or undercoats show through final coats.
 - 5. If problems arise in connection with application of paint, stop painting area immediately and contact paint manufacturer for recommendation.
- C. Methods of Application:
 - 1. Brush Application: Brush each coat out uniformly to eliminate laps, skips and excess brush marks. Brush apply field coats on metals, and trim.
 - 2. Roller Application: Use proper skill to avoid signs of lapping and excess paint lines from edge of roller. When cutting in with a brush is required, these areas must be of same texture, color and hiding as adjacent areas, to ensure good appearance.
 - 3. Spray Application: Absolute masking and protective measures shall be taken to avoid damage to other finish materials. Manufacturer's recommendations for dry mil thickness are minimums and square feet per gallon shall not be exceeded. Paints shall not be diluted for purpose of spraying.
- D. Drying:
 - 1. Do not apply any type finish until the preceding coats are thoroughly dry and hard.
 - 2. Interior Paint: Allow to dry at least 24 hours between coats.

3. Exterior Paint: Allow to dry at least 48 hours between coats.
- E. Appearance: (As visible from 3 feet)
1. Smooth and even; free from runs, sags, skips, streaks and holidays.
 2. No variation in sheen or color within continuous surfaces.
 3. No clogging of lines and angles of shapes and details.
 4. Edges (adjoining other materials or other colors): Paint sharp and clean without overlapping.
 5. Coats: Proper consistency and well spread so as to show no laps and brush marks.

3.08 REPAIR AND CORRECTION

- A. Repair damage (resulting from painting) done to the Work of others and existing Work.
- B. Correct Work damage caused by drafty, dusty conditions or cold, to complete satisfaction, without additional cost.
- C. Refinish entire surface where portion of finish has been damaged or is not acceptable.
- D. No claims will be allowed for correction of defective Work caused by failure to adequately prepare substrates and abide by manufacturers recommendations.

3.09 CLEANING

- A. Touch-up and restore where finish is damaged.
- B. Remove spilled, splashed, or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.
- D. Leave storage spaces clean and in condition required for equivalent spaces in project. Leave premises clean and free from all rubbish and accumulated material left from this Work.

3.10 SCHEDULE - INTERIOR SURFACES (NORMAL EXPOSURE)

- A. MASONRY - (Walls & Ceilings, Concrete, Cement Board)
 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1st Coat: S-W ProMar 200 Latex Wall Primer, B28W200
(4 mils wet, 1.2 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Semi-Gloss Enamel, B31 W200
 - 3rd Coat: S-W ProMar 200 Latex Semi-Gloss Enamel, B31W200
(4 mils wet, 1.5 mils dry per coat)
- B. MASONRY - (CMU - Concrete or Cinder Block)
 1. Latex Systems:

- a. Semi-Gloss Finish:
 - 1st Coat: S-W ProMar Interior/Exterior Block Filler B25W25 (75-125 sq.ft./gal.)
 - 2nd Coat: S-W ProMar 200 Latex Semi-Gloss B3IW200 Series
 - 3rd Coat: S-W ProMar 200 Latex Semi-Gloss B31 W200 Series (4 mils wet, 1.5 mils dry per coat)
 - b. Flat Finish:
 - 1st Coat: S-W ProMar Interior/Exterior Block Filler B25W25 (75-125 sq.ft./gal.)
 - 2nd Coat: S-W ProMar 200 Latex Flat Wall Paint B3OW200
 - 3rd Coat: S-W ProMar 200 Latex Flat Wall Paint B3OW200 (4 mils wet, 1.4 mils dry per coat)
- C. CONCRETE - (Floors)
 - 1. Alkyd Systems:
 - a. Gloss Finish:
 - 1st Coat: S-W Industrial Enamel, B54Z Series
 - 2nd Coat: S-W Industrial Enamel, B54Z Series (4 mils wet, 2 mils dry per coat)
- D. METAL - (Aluminum)
 - 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1st Coat: S-W ProMar 200 Latex Semi-Gloss 631 W200 Series
 - 2nd Coat: S-W ProMar 200 Latex Semi-Gloss B31 W200 Series (4 mils wet, 1.5 mils dry per coat)
- E. METAL - (Galvanized)
 - 1. Latex Systems:
 - a. Semi-Gloss Finish:
 - 1st Coat: S-W ProMar 200 Latex Semi-Gloss B31 W200 Series
 - 2nd Coat: S-W ProMar 200 Latex Semi-Gloss B3IW200 Series (4 mils wet, 1.3 mils dry per coat)
 - b. Flat Finish:
 - 1st Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
 - 2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200 (4 mils wet, 1.4 mils dry per coat)
- F. METAL - Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous & Ornamental Iron, Sashes, Doors, Partitions, Cabinets, Lockers, Fixtures, Equipment, Copper, Non-Galvanized Metal
 - 1. Latex Systems:
 - a. Gloss Finish:

1st Coat: DTM Acrylic Primer/Finish, B66W1
(6 mils wet, 3 mils dry)
2nd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series
3rd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series
(4 mils wet, 2 mils dry per coat)

- b. Semi-Gloss Finish:
 - 1st Coat: DTM Acrylic Primer/Finish, B66W
(6 mils wet, 3 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Semi-Gloss B3IW200 Series
 - 3rd Coat: S-W ProMar 200 Latex Semi-Gloss B3IW200 Series
(4 mils wet, 1.3 mils dry per coat)
- c. Egg-Shell Finish:
 - 1st Coat: S-W ProMar 200 Latex Wall Primer, B28W200
(4 mils wet, 1.2 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Egg-Shell,
B2OW200 Series
 - 3rd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series
(4 mils wet, 1.6 mils dry per coat)
- d. Flat Finish:
 - 1st Coat: DTM Acrylic Primer/Finish, B66W1
(6 mils wet, 3 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
 - 3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, 83OW200
(4 mils wet, 1.4 mils dry)

G. WOOD - Walls, Ceilings, Doors, Trim, Cabinet Work, Counters, Partitions, Frames
Including Sitka Spruce, Southern Pine, Douglas Fir, Cedar, Redwood, Lauan)

- 1. Latex Systems:
 - a. Gloss Finish:
 - 1st Coat: S-W Wall & Wood Primer, B49WZ2
(4 mils wet, 2 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series
 - 3rd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series
(4 mils wet, 2 mils dry per coat)
 - b. Semi-Gloss Finish:
 - 1st Coat: S-W Wall & Wood Primer, B49WZ2
(4 mils wet, 2 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Semi-Gloss, B31 W200 Series
 - 3rd Coat: S-W ProMar 200 Latex Semi-Gloss, B3IW200 Series
(4 mils wet, 1.5 mils dry per coat)
 - c. Egg-Shell Finish:
 - 1st Coat: S-W Wall & Wood Primer, B49WZ2
(4 mils wet, 2 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series
 - 3rd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series
(4 mils wet, 1.5 mils dry per coat)
 - d. Flat Finish:

1st Coat: S-W Wall & Wood Primer, B49WZ2
(4 mils wet, 2 mils dry)
2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
(4 mils wet, 1.4 mils dry per coat)

2. Stained & Varnished (Clear Finish)

a. Open Grained Wood:

1st Coat: S-W Interior Oil Stain, A48 Series
2nd Coat: S-W SHERWOOD Natural Filler, D7OTI
3rd Coat: S-W Oil Base Varnish, Gloss A66V91
4th Coat: S-W Oil Base Varnish, Gloss or Satin A66 Series

b. Closed Grain Wood:

1st Coat: S-W Interior Oil Stain, A48 Series
2nd Coat: S-W Oil Base Varnish, Gloss A66V91
3rd Coat: S-W Oil Base Varnish, Gloss or Satin A66 Series
(4 mils wet, 1.5 mils dry per coat)

H. WOOD - (Floors-Stained, Varnished)

1. Urethane System:

a. Gloss Finish:

1st Coat: S-W Oil Stain
2nd Coat: S-W Polyurethane Varnish, A67VI/A67FI
3rd Coat: S-W Polyurethane Varnish, A67VI/A67FI
(4 mils wet, 1.5 mils dry per coat)

I. DRYWALL - (Walls, Ceilings, Gypsum Board, Etc.)

1. Latex Systems:

a. Gloss Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, 628W200
(4 mils wet, 1.2 mils dry)
2nd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series
3rd Coat: S-W ProMar 200 Latex Gloss, B2IW201 Series
(4 mils wet, 2 mils dry per coat)

b. Semi-Gloss Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W200
(4 mils wet, 1.2 mils dry)
2nd Coat: S-W ProMar 200 Latex Semi-Gloss, B3IW200 Series
3rd Coat: S-W ProMar 200 Latex Semi-Gloss, B3IW200 Series
(4 mils wet, 1.3 mils dry per coat)

c. Egg-Shell Finish:

1st Coat: S-W ProMar 200 Latex Wall Primer, B28W200
(4 mils wet, 1.2 mils dry)
2nd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series
3rd Coat: S-W ProMar 200 Latex Egg-Shell, B2OW200 Series

(4 mils wet, 1.6 mils dry per coat)

- d. Flat Finish:
 - 1st Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
(4 mils wet, 1.4 mils dry)
 - 2nd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
 - 3rd Coat: S-W ProMar 200 Latex Flat Wall Paint, B3OW200
(4 mils wet, 1.4 mils dry per coat)

END OF SECTION 099000

SECTION 101400 - SIGNAGE (GENERAL)

PART 1 - GENERAL

1.01 REGULATORY REQUIREMENTS

- A. The sign material and installation work of this contract shall adhere to the standards and Requirements of the following and others as mentioned on the contract documents and other specification sections.

1.02 SCHEDULE OF WORK

- A. The contractor shall prepare a Project Schedule for the manufacture and installation of Signage. The schedule shall be coordinated with the project manager, general Contractor and CPM schedule. The schedule shall be a CPM (Critical Path Method).
- B. The proposed schedule shall show the separate timelines for shop drawings, manufacturing, installation and removals if required which shall take place. Schedule shall be completed within 10 working days of award of contract.
- C. The project schedule shall be updated on monthly basis showing the current status including all work completed and the proposed schedule for remaining work. Updated schedule is to be provided with Invoices for work in progress billing.

1.03 QUALITY CONTROL

- A. Architect reserves the right and shall be at liberty to inspect all materials and workmanship at any time during the manufacturing process and shall have the right to reject any and all materials and workmanship which do not conform to the specifications. If no inspection is made, the contractor shall not be relieved of any obligations to furnish materials and workmanship in accordance with these specifications.
- B. Architect will have authority to reject work which does not conform to the Contract Documents.
- C. The Contractor will be solely responsible for construction means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the contract.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All signs shall be fabricated in accordance with the following:
 - 1. American Society for Testing and Materials-ASTM B 209-92a - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; (ASTM); 1992.
 - 2. Metal Finishes Manual for Architectural and Metal Products; National Association of Architectural Metal Manufacturers; (NAAMM); 1988.

- B. All signs shall be standardized, categorized, manufactured and installed as per the Contract Documents, specifications, Sign Drawings, sign message schedule, and Location Plans. Each sign type must have an associated number and reference as per the Sign Message Schedule and Sign Location Plans.

2.02 MATERIALS

- A. Cast Acrylic Sheet: Cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet; sizes and thickness indicated; minimum flexural strength of 16,000 psi when tested according to ASTM D 790; minimum allowable continuous service temperature of 176 degrees F (80 degrees C).
- B. Aluminum Sheet: Alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- C. Aluminum Castings: Alloy and temper recommended by the sign manufacturer for the casting process used and for the use and finish indicated.
- D. Vinyl Film: Opaque non-reflective vinyl film & reflective vinyl when specified 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior as well as interior applications.
- E. Metal Fasteners: Use metals that are not corrosive to the sign material or mounting surface.
- F. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
 - 1. Mechanical mounting: Sheet metal or wood screws to suit substrate; pan head, theft proof head, Phillips oval head, or Phillips round head screws as shown on the contract documents or in the contract specifications.
- G. Paint: As manufactured by MAP (Matthews Acrylic Polyurethane) by Matthews Paint Co., Wheeling, IL., or approved equal.
- H. Bracket-Mounted Units: Manufacturer's standards brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings.
- I. Colored Coatings for Acrylic Plastic Sheet: Use coatings, inks, and paints for copy and background colors that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are non-fading for the application intended.
- J. Silk-screening Inks: Ink will be NAZDAR 70 Series or equal printed through 280 mesh. All colors are to be opaque and free of pinholes.
- K. Double-Faced Tape: Double-Faced Tape (or D.F. Tape) will be 3M #4950 series Urethane Foam.
- L. Laminating Tape: Laminating tape will be 3M #9483 Series, 100 per inch or equal. Or suitable 3M tape for the use intended.

- M. Mechanical Fasteners: All screws, bolts, and fasteners, where used with aluminum, will be aluminum, unless otherwise specified and will be of adequate thickness. Length and construction to properly secure the sign unit. Any visible portion of any mounting device will match the adjacent sign material, unless otherwise noted. All bolts will be supplied with washers.
- N. Polycarbonate: All Polycarbonate used for insert will be clear with a thickness of .1875.

2.03 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, must provide color matches as indicated.
- B. Metal Finishes: Comply with NAAMM Metal Finishes Manual for finish designations and applications recommendations (NAAMM).
- C. Aluminum Finishes: Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
 - 1. Clear anodized, medium matte: AA-M31C22A31. Mechanical finish, fine satin directional textured; chemical finish, medium matte etched finish; anodic coating, Class II Architectural, clear film thicker than 0.4 mil.
- D. Finishes/edges: All finishes for painted surfaces will be smooth, flat, and free of defects in workmanship or natural material defects including all welded seams. All Painted edges shall be soft edges to assure proper paint adhesion
- E. Fabrication: Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance plus or minus 1/16" measured diagonally.
- F. Acrylic: All acrylic edges are to be routed smooth and be free of chips.

2.04 ILLUMINATION

- A. Illuminate in the manner indicated using standard lighting components including LED, fluorescent lamps, using transformers, insulators, and other components as required. All illumination shall provide even illumination across the entire illuminated area with no hot spots.
- B. General Contractor to connect all illuminated signs to existing power supply system, and shall coordinate electrical characteristics with those of the power supply provided.
- C. All fluorescent fixtures must be HIGH OUTPUT.

2.05 PAINTING

- A. All painted signs shall be painted in accordance with these specifications, sign drawings and contract documents and color specifications.
- B. Surface preparation and painting of all new aluminum sign panels, frames, posts, brackets, and trim shall be done in contractor's shop and shall be in compliance of the paint manufacturer's specifications for cleaning, conversion coating and painting.

1. Prime Coat: Apply one prime coat to all bare surfaces, minimum of 1.0-mil dry thickness over base surfaces.
 2. Finish Coats: Apply two-coat finish over prime surfaces; high gloss sheen; total of 4.0 mils dry film thickness over primer.
- C. Clean all surfaces thoroughly, removing all rust, mil scale, fabrication films, dust, dirt, and other foreign matter from surface. Wipe surfaces clean, smooth and ready to receive paint finish as specified.
- D. Sheen: Where gloss or sheen is specified or is listed as a standard for approval for the project, the terms refer to tested luster, shine, or sheen of the dry film and for purposes of this specification is defined as follows when tested with a 60-degree gloss meter:
1. Flat - 10-degree gloss or less;
 2. Eggshell - 11 to 19-degree gloss;
 3. Satin - 20 to 30-degree gloss;
 4. Semi-gloss - 31 to 74-degree gloss;
 5. Gloss - 75-degree gloss or more.
- E. Each coat of paint shall be applied as a continuous film of uniform thickness free of pores. Any thin spots or missed areas shall be repainted and permitted to dry before the following coat of paint is applied. During the application of the paint, care shall be taken to prevent all runs or sags. Should either occur, they shall be sanded out and repainted.
- F. After drying, any areas of paint damaged for any cause, shall be removed, the surface again prepared and then repainted with the same paint and the same thickness as the damaged area.
- G. Upon request, allow representatives of the owner to make product samples from coating batches used in the work; allow access to checking applied finished coatings using a Tooke Dry Film Thickness Gage, as directed. Should test of materials or application indicate a quality less than that specified apply additional approved coating material at no additional cost.
- H. Mixing and thinning: Mix and thin paint products in strict accordance with manufacturer's directions; mix and thin other materials in accordance with "best" trade practices, as approved.
- I. Verify all requirements and provide painting/coating work in coordination with work of other trades as required to meet approved Schedule for completely finished installations.

2.06 FABRICATION, ASSEMBLY AND MOUNTING OF SIGNS

- A. All locations will be site checked by the Contractor prior to fabrication to ensure sign fabrication to assure proper installation.
- B. Installation method shall be confirmed by the Contractor for each location. Any required modifications to the contract documents intended method of installation shall be noted in writing to the Architect.
- C. Signs shall be located as shown on the approved site plan and/or building floor plan drawings. All signs shall be securely fastened to building structural members capable of carrying the incremental loading of the sign and its wind loads without damaging or weakening the structural member.

- D. All signs for this procurement shall be fabricated in the shop with the various parts or assemblies ready for erection at the site. Work that cannot be shop assembled shall be given a trial fit at the shop to assure a proper expeditious field assembly.
- E. All sign joints, corners, miters, etc., shall be accurately machined, filed and fitted and rigidly framed together at joints and contact points. All work shall be carefully matched to produce a perfect continuity of lines and design. Metal in contact shall have hair line joints, unless otherwise shown on the drawings. Work shall be erected plumb, level and true, with proper alignment and proper relationship to the work of other trades. Mill joints to a tight, hairline fit. Form joints exposed to the weather to exclude water penetration.
- F. Welded Connections: Comply with American Welding Society (AWS) for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of the exposed side. Clean exposed welded surfaces of welding flux and dress on all exposed and contact surfaces.
- G. Conceal fasteners where possible; otherwise locate fasteners where they will be inconspicuous.
- H. All exposed metal work shall be free from buckle, warping, and oil canning effects. The flatness of metal panels shall not deviate more than 1/16" measured between any two points on the panel.
- I. All removable members shall be carefully machined and fitted and shall be secured by screws of proper size and approved spacing. Structural supports, hangers, and built-in reinforcement wholly contained within the finished assemblies shall not be visible. Bolts, pop rivets, screws, etc., shall be concealed whenever possible and shall be sized to firmly hold the sign in place. All signs shall be mounted, painted, fastened, etc., absolutely plumb and level.
- J. Metal Fasteners: Selection of appropriate anchors for existing wall types is required. Use metals that are not corrosive to the sign material or mounting surface and shall be concealed where possible. All exposed fasteners must be vandal-proof.
- K. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Furnish inserts, as required, to be set into concrete or masonry work.
- L. Posts: Fabricate posts to lengths required for mounting method indicated.
 - 1. Direct Burial: For permanent sign installation, provide posts 36 inches longer than height of sign indicated to permit direct embedment in concrete foundations using 3000 lb. concrete mix.
 - 2. Base Plate For removable post installations: provide posts with base plates, flanges, or other fittings of sizes recommended by the manufacturer, welded to bottom of posts. Pre-drill slotted holes in base plate for anchor bolt connection.
 - a. Sign manufacturer to furnish templates as necessary for accurate setting of anchor bolts in concrete foundations.
 - b. Sign manufacturer to provide anchors bolts of size required for connection of posts to concrete foundations.

2.07 CONSTRUCTION

- A. Contractor shall construct items to comply with specifications and requirements indicated for materials, thickness, finishes, colors, designs, shapes, sizes, and detail of construction.
- B. All work, including electrical work, will be constructed as complete systems, including all stiffeners, fasteners, welding, sealants, jointing miscellaneous pieces and material thickness, wiring, fittings, lamps, switches, circuits and connections required to enable the work to function properly.
- C. Work shall be performed by competent workers that are fully trained and licensed and whose work shall be of the best quality, free from defects impairing strength, durability, and appearance. All items will be made of new materials. Connections, angles, shapes, and details are suggestive and are to be sized, reinforced and detailed as required for their particular application. Details not shown are to be at least equal in quality to those detailed. All details of construction are to be engineered with appropriate strength materials and finished to withstand the potential rigors of their installed locations.
- D. Sign locations shall be as shown on the drawings, with messages and other information as indicated in the tables. Before the signs are installed, the Contractor shall coordinate precise location of signs by conducting an on site inspection with the Project Manager on the site. The final location of signs will be approved by Project Manager.
- E. The Contractor shall be responsible for final engineering and integrity of the signs, and their methods of mounting. The Contractor shall base the dimensions, sizes and layout of all anchoring devices on actual field conditions. The installation of signs constitutes Contractor's acceptance of the conditions of the substrate at the area where the sign is placed.
- F. In the case when the existing conditions in the opinion of the Contractor prevent the Contractor from safely securing the specified sign in the specified location, the Contractor shall present an alternative placement of the sign to the Project Manager for review and approval. Final fabrication, placement, and mounting method are subject to the approval by Project Manager.

2.08 SUBMITTALS

A. SHOP DRAWINGS

- 1. Take field measurements prior to preparation of shop drawings and fabrication where necessary to ensure proper fitting. Show recorded measurements on final shop drawings.
- 2. Submit shop drawings with a floor plan keyed to a message schedule for each sign which is to be approved by the client for each type of sign prior to the fabrication of any sign of this type. Shop drawings shall indicate materials, anchors, grounds, layout, and reinforcement and assemblies proposed to be used, sizes and dimensions, details of installation hardware, as well as show sign panel itself with the layout of the graphic elements and the copy.
- 3. Drawings indicating the need for extensive structural design will require the signature and seal of a professional engineer licensed in the State of New Jersey.
- 4. Drawings within the Contract Documents are for design intent only. The Fabricator will be responsible for making a product which meets the requirements of both the specifications and the drawings, and which works effectively, efficiently and safely.

B. PRODUCT DATA

1. Submit product data for each type sign specified, including details of construction relative to materials, dimensions of individual components profiles and finishes.

C. SAMPLES

1. Submit a full size prototype sign for representative sign type as directed of final installation for approval with required background and accent color, appropriate finishes (stepping, trim, supports, motif) and message. Prototypes, if they are of acceptable standards, will be used and installed as actual signs.
2. Message must maintain a 70% visibility in relation to the background color in order to meet ADA requirements.

D. PROJECT SCHEDULE

1. Submit a Project Schedule. All submittals shall be made to the Construction Manager and must be approved prior to any fabrication or installation work is started.

- E. All electronic art and graphic files supplied to the Contractor or used by the Contractor in the preparation of the shop drawings or as-built plans shall be the property of Designer.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Install interior signage at locations shown on drawings. Attach signage to substrates, in accordance with specified installation details and all applicable codes.
- B. Install level, plumb, and at proper height, clean and securely mounted. Repair or replace damaged units, as directed by Construction Manager.
- C. Furnish templates, anchor bolts, internal reinforcing, and other items required to be set in concrete post foundations at proper time for setting.
- D. Locate sign units and accessories where indicated on approved location plans and in accordance with the installation details indicated on the approved shop drawings.
- F. The contractor shall be responsible for coordinating all underground utility checks with Construction Manager.
- G. Excavation: In firm undisturbed or compacted soil, drill or (using a post-hole digger) hand-excavate holes for each post to the minimum diameter recommended by the sign manufacturer, but not less than 4 times the largest post cross-section.
1. Excavate hole depths approximately 3 inches lower than the required post bottom, with bottom of posts set not less than 36 inches below finished grade surface.
- H. Setting Posts: Center and align posts in holes. Provide any necessary temporary bracing to maintain plumb and true positioning while concrete sets.

1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position until concrete has achieved its initial set.
 2. Set anchor bolts and other embedded items required for installation post and panel signs. Use templates, setting drawings diagrams, instructions, and directions provided by suppliers of items to be attached.
- I. Contractor shall be responsible for the installation of any additional blocking, support, or substrate members as maybe required for the support of the signs.

3.02 CLEANING AND PROTECTION

- A. At completion of the installation, clean soiled surfaces of sign units in accordance with the product manufacturer's instructions. Protect installed sign units from damage until acceptance by owner.

END OF SECTION 101400

SECTION 220000 – PLUMBING SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 22, and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - a. Work covered under plumbing contract.
 - b. Work under other contracts.
 - c. Use of premises.
 - d. Owner's occupancy requirements.
 - e. Specification formats and conventions.

- B. Related Sections include the following:

- a. Division 22 Sections.

1.3 WORK COVERED UNDER PLUMBING CONTRACT

- A. Provide all labor, materials, tools, machinery, equipment, and services necessary to complete the plumbing work under this contract. All systems and equipment shall be complete in every aspect and all items of material, equipment, and labor shall be provided for a fully operational system. Coordinate the work with work of other trades so as to resolve conflicts without impeding job progress. The plumbing work includes the following:

- B. PLUMBING:

- 1. Remove existing plumbing fixtures as indicated on plans, complete with all associated flushometers, faucets, piping, valves, cleanouts, traps, fittings, supports, etc.
 - 2. Remove existing domestic cold and hot water piping as indicated on plans, complete with hose bibs, valves, fittings, supports, insulation, etc.
 - 3. Furnish and install new plumbing fixtures, piping, valves, strainers, cleanouts, accessories, etc. as specified on plans and in the specifications.
 - 4. Furnish and install new waste and vent piping, complete with cleanouts, fittings, hangers and supports. Saw cut existing floor slabs, ceiling, walls and roof as required and patch. Coordinate all slopes and inverts and tie-in connections in field.
 - 5. Furnish and install new domestic water piping (DCW/DHW/DHWR) as indicated on the plans, complete with valves, balancing assemblies, fittings, hangers, supports, insulation, etc.

6. Provide insulation to all domestic cold piping (DCW/DHW/DHWR). Refer to specification section 220719 – Plumbing Piping Insulation for insulation requirements.
7. Provide identification tags and flow arrows for all piping.
8. Provide proper piping supports, hangers, anchors, spring isolation hangers, etc.
9. Provide proper slope to all piping as per latest National Standard Plumbing Code and other applicable codes.
10. Pressure-test all piping for any leakage. Provide pressure test reports to Owner/Architect for review.
11. Furnish and install new floor drains, and related piping, traps, and trap primers.
12. Provide identification tags/markers/tapes for all plumbing equipment, piping, etc.
13. Furnish and install all ancillary equipment needed for a complete and proper installation including, but not limited to anchors, hangers, fittings, strainers, valves, union, etc.
14. All cutting, patching and alteration work shall be performed.
15. The contractor shall furnish and install all items required for a complete and functioning system.

1.4 WORK UNDER OTHER CONTRACTS

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

1.5 USE OF PREMISES

- A. General: Each Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - a. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
 - b. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

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

1.6 OWNER'S OCCUPANCY REQUIREMENTS

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

1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.
 - a. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - b. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - a. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

- b. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.8 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 220000

SECTION 220501 - BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Mechanical sleeve seals.
 - 5. Sleeves.
 - 6. Escutcheons.
 - 7. Grout.
 - 8. Equipment installation requirements common to equipment sections.
 - 9. Painting and finishing.
 - 10. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.

3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 - 1. Manufacturers:
 - a. Eclipse, Inc.
 - b. Epco Sales, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Epco Sales, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Central Plastics Company.
 - c. Pipeline Seal and Insulator, Inc.
 - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.

- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
 - 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM or NBR 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 or Stainless steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece/Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.
- D. One-Piece/Split-Plate, Stamped-Steel Type: With concealed or exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.

- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: Cast-brass type with polished chrome-plated finish.
 - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - h. Bare Piping in Equipment Rooms: One-piece, cast-brass type or One-piece, stamped steel type.
 - i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).
 - b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 - 1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealers" for materials and installation.
- O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
 - P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
 - Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Firestopping and Smokestopping" for materials.
 - R. Verify final equipment locations for roughing-in.
 - S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- 3.2 PIPING JOINT CONSTRUCTION
- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
 - B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - D. 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.
 - E. 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.

- F. 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.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

- A. Painting of plumbing systems, equipment, and components is specified.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- C. **All new gas piping shall be painted yellow. (1 coat primer, 2 finish coats)**

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.8 GROUTING

- A. Mix and install grout for plumbing equipment base bearing surfaces, and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout around anchors.
- G. Cure placed grout.

END OF SECTION 220501

SECTION 220523 – PLUMBING VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following general-duty valves (Lead Free Type):
 - 1. Copper-alloy ball valves.
 - 2. Bronze check valves.
 - 3. Spring-loaded, lift-disc check valves.
 - 4. Bronze gate valves.
 - 5. Bronze globe valves.
- B. Related Sections include the following:
 - 1. Division 22 Section for valve tags and charts.
 - 2. Division 22 piping Sections for specialty valves applicable to those Sections only.
- C. All valves and fittings for portable water system shall be lead-free type in compliant with requirements of NSF/ANSI Standard 61.

1.3 DEFINITIONS

- A. The following are standard abbreviations for valves:
 - 1. CWP: Cold working pressure.
 - 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 3. NBR: Acrylonitrile-butadiene rubber.
 - 4. PTFE: Polytetrafluoroethylene plastic.
 - 5. SWP: Steam working pressure.
 - 6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.
 - 1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use hand-wheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.

- B. Bronze/Brass Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.
- C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- F. Valve Actuators:
 - 1. Chain wheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
 - 2. Gear Drive: For quarter-turn valves NPS 8 (DN 200) and larger.
 - 3. Hand wheel: For valves other than quarter-turn types.
 - 4. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.
 - 5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
- G. Extended Valve Stems: On insulated valves.
- H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- I. Valve Grooved Ends: AWWA C606.
 - 1. Solder Joint: With sockets according to ASME B16.18.
 - a. Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.
 - 2. Threaded: With threads according to ASME B1.20.1.
- J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

- A. Available Manufacturers:
- B. Manufacturers:
 - 1. One-Piece, Copper-Alloy Ball Valves:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Grinnell Corporation.
 - d. Kitz Corporation of America.
 - e. Legend Valve & Fitting, Inc.
 - f. NIBCO INC.
 - g. Watts Industries, Inc.; Water Products Div.

- C. Copper-Alloy Ball Valves, General: MSS SP-110, full port type.
- D. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, full port type.

2.4 BRONZE CHECK VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:

- a. Cincinnati Valve Co.
- b. Red-White Valve Corp.
- c. Walworth Co.
- d. NIBCO Inc.
- e. Or approved equal.

2. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:

- a. Cincinnati Valve Co.
- b. Red-White Valve Corp.
- c. Walworth Co.
- d. NIBCO INC.
- e. Or approved equal.

3. Type 3, Bronze, Swing Check Valves with Metal Disc:

- a. American Valve, Inc.
- b. Cincinnati Valve Co.
- c. Grinnell Corporation.
- d. Kitz Corporation of America.
- e. Legend Valve & Fitting, Inc.
- f. Milwaukee Valve Company.
- g. NIBCO INC.
- h. Powell, Wm. Co.
- i. Red-White Valve Corp.
- j. Walworth Co.
- k. Watts Industries, Inc.; Water Products Div.
- l. Or approved equal.

C. Bronze Check Valves, General: MSS SP-80.

D. Type 1, Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.

E. Type 1, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.

F. Type 3, Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.

2.5 SPRING-LOADED, LIFT-DISC CHECK VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type I, Wafer Lift-Disc Check Valves:

a. Mueller Steam Specialty.

2. Type II, Compact-Wafer, Lift-Disc Check Valves:

a. Durabla Fluid Technology, Inc.

b. Flomatic Valves.

c. Grinnell Corporation.

d. Metraflex Co.

e. Milwaukee Valve Company.

f. Mueller Steam Specialty.

g. NIBCO INC.

h. Or approved equal.

3. Type III, Globe Lift-Disc Check Valves:

a. Durabla Fluid Technology, Inc.

b. GA Industries, Inc.

c. Grinnell Corporation.

d. Metraflex Co.

e. Milwaukee Valve Company.

f. NIBCO INC.

g. Or approved equal.

4. Type IV, Threaded Lift-Disc Check Valves:

a. Check-All Valve Mfg. Co.

b. Durabla Fluid Technology, Inc.

c. Grinnell Corporation.

d. Legend Valve & Fitting, Inc.

e. Metraflex Co.

f. Milwaukee Valve Company.

g. Mueller Steam Specialty.

h. NIBCO INC.

i. Watts Industries, Inc.; Water Products Div.

j. Or approved equal.

C. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.

D. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.

E. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.

- F. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.
- G. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

2.6 BRONZE GATE VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type 1, Bronze, Non-rising-Stem Gate Valves:

- a. American Valve, Inc.
- b. Cincinnati Valve Co.
- c. Grinnell Corporation.
- d. Kitz Corporation of America.
- e. Legend Valve & Fitting, Inc.
- f. Milwaukee Valve Company.
- g. NIBCO INC.
- h. Powell, Wm. Co.
- i. Red-White Valve Corp.
- j. Walworth Co.
- k. Watts Industries, Inc.; Water Products Div.
- l. Or approved equal.

2. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:

- a. American Valve, Inc.
- b. Cincinnati Valve Co.
- c. Grinnell Corporation.
- d. Kitz Corporation of America.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Powell, Wm. Co.
- h. Red-White Valve Corp.
- i. Walworth Co.
- j. Or approved equal.

C. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy hand wheel.

D. Type 1, Class 150, Bronze Gate Valves: Bronze body with non-rising stem and bronze solid wedge and union-ring bonnet.

E. Type 2, Class 150, Bronze Gate Valves: Bronze body with rising stem and bronze solid wedge and union-ring bonnet.

2.7 BRONZE GLOBE VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Type 1, Bronze Globe Valves with Metal Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Kitz Corporation of America.
- d. Legend Valve & Fitting, Inc.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Powell, Wm. Co.
- h. Red-White Valve Corp.
- i. Walworth Co.
- j. Or approved equal.

2. Type 2, Bronze Globe Valves with Nonmetallic Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Kitz Corporation of America.
- d. McWane, Inc.; Kennedy Valve Div.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Powell, Wm. Co.
- h. Red-White Valve Corp.
- i. Walworth Co.
- j. Or approved equal.

3. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:

- a. Cincinnati Valve Co.
- b. Grinnell Corporation.
- c. Milwaukee Valve Company.
- d. NIBCO INC.
- e. Walworth Co.
- f. Or approved equal.

C. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy hand wheel.

D. Type 1, Class 150, Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.

E. Type 3, Class 150, Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include union-ring bonnet.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
 1. Shutoff Service: Ball or gate valves.
 2. Throttling Service: Ball or globe valves.
 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Heating Water Piping: Use the following types of valves:
 1. Ball Valves, NPS 2 (DN 50) and Smaller: One or Two-piece, CWP rating, copper alloy.
 2. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150, ferrous alloy.
 3. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, horizontal / vertical, bronze.
 4. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 150, bronze.
 5. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, gray iron.
 6. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Single / Dual-plate, wafer-lug/ double-flanged, Class 150, ferrous alloy.
 7. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 150.
 8. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 (DN 65) and Larger: Class 125, cast iron.
 9. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2 / 3, Class 150, bronze.
 10. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 150, bronze.

3.3 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.

3.4 JOINT CONSTRUCTION

- A. Refer to Division 22 Section "Basic Plumbing Materials and Methods" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Fiberglass pipe hangers.
 - 4. Metal framing systems.
 - 5. Fiberglass strut systems.
 - 6. Thermal-hanger shield inserts.
 - 7. Fastener systems.
 - 8. Pipe stands.
 - 9. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

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 plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

- A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.
5. Pipe positioning systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Fiberglass strut systems. Include Product Data for components.
4. Pipe stands. Include Product Data for components.
5. Equipment supports.
6. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

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: Pre-galvanized 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.

B. Copper Pipe Hangers:

1. Manufacturers' catalogs indicate that copper pipe hangers are small, typically NPS 4 (DN 100) or smaller, and types available are limited.
2. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or [ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 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] [stainless-] steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: Stainless steel.
 - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless steel, roller-type pipe support.
 - 5. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
- C. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
- D. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- E. Metal framing system in first paragraph below requires calculating and detailing at each use.
- F. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- G. Fiberglass strut system in first paragraph below requires calculating and detailing at each use.
- H. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping
- I. Fastener System Installation:
 - 1. Verify suitability of fasteners in two subparagraphs below for use in lightweight concrete or concrete slabs less than 4 inches thick.
 - 2. 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.
 - 3. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

- J. Pipe stand in first paragraph below requires calculating and detailing at each use.
- K. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
 3. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- L. Equipment support in first paragraph below requires calculating and detailing at each use.
- M. Equipment Support Installation:
1. Fabricate from welded-structural-steel shapes.
 2. 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.
 3. Install lateral bracing with pipe hangers and supports to prevent swaying.
 4. Install building attachments within concrete slabs or attach to structural steel.
 5. Install additional attachments at concentrated loads, including valves, flanges, and strainers, [NPS 2-1/2 (DN 65)] and larger and at changes in direction of piping.
 6. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts
- N. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- O. 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.
- P. Insulated Piping:
1. Attach clamps and spacers to piping.
 2. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 3. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 4. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 5. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated.
 6. 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 (DN 100) and larger if pipe is installed on rollers.
 7. High-compressive-strength inserts may permit use of shorter shields or shields with less arc span. Revise first subparagraph below to suit Project.
 8. 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 (DN 100) and larger if pipe is installed on rollers.
- Q. Shield Dimensions for Pipe: Not less than the following:
1. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.

2. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
3. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
4. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
5. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

R. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

S. 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 (40 mm).

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.

B. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

C. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099123 "Interior Painting".

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

3.5 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, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. 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 (DN 15 to DN 750).
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches of insulation.
 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. 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.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 220529

SECTION 220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates
2. Equipment markers
3. Equipment signs
4. Access panel and door markers
5. Valve tags
6. Pipe Markers

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:
 - a. Manufacturer, product name, model number, and serial number.
 - b. Capacity, operating and power characteristics, and essential data.
 - c. Labels of tested compliances.

2. Location: Accessible and visible.
3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.

1. Terminology: Match schedules as closely as possible.

2. Data:
 - a. Name and plan number
 - b. Equipment service
 - c. Design capacity
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed
3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
 1. Data: Instructions for operation of equipment and for safety procedures.
 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
 3. Thickness: 1/8 inch, unless otherwise indicated.
 4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
- D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
 1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 3. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 4. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pre-tensioned Pipe Markers: Pre-coiled semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
 - 1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
 - 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
 - 1. Material: 0.032 inch-thick brass/aluminum
 - 2. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 22 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
 - 1. Fuel-burning units, including boilers, furnaces, heaters
 - 2. Pumps and similar motor-driven units.
 - 3. Fans.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
 - 1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 - 3. Locate markers where accessible and visible.
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.

- b. Meters, gages, thermometers, and similar units.
 - c. Fuel-burning units, including boilers, furnaces, heaters.
 - d. Pumps and similar motor-driven units.
 - e. Fans.
- C. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
- 1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
- D. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
- 1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
 - 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
 - 3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
 - 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:
- 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:
 - 1. Valve-Tag Size and Shape:
 - a. Hot Water: 1-1/2 inches, round/square
 - b. Gas: 1-1/2 inches, round/square
 - c. Steam: 1-1/2 inches, round/square

3.5 ADJUSTING AND CLEANING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.
- B. Clean faces of mechanical identification devices.

END OF SECTION 220553

SECTION 220601 - HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following hangers and supports for mechanical system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Pipe stands.
 - 7. Pipe positioning systems.
 - 8. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.

2. Fiberglass pipe hangers.
 3. Thermal-hanger shield inserts.
 4. Powder-actuated fastener systems.
 5. Pipe positioning systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
1. Trapeze pipe hangers. Include Product Data for components.
 2. Metal framing systems. Include Product Data for components.
 3. Fiberglass strut systems. Include Product Data for components.
 4. Pipe stands. Include Product Data for components.
 5. Equipment supports.
- C. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
 2. AWS D1.2, "Structural Welding Code--Aluminum."
 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
 5. ASME Boiler and Pressure Vessel Code: Section IX.

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 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

- B. Manufacturers:
 - 1. Carpenter & Paterson, Inc.
 - 2. ERICO/Michigan Hanger Co.
 - 3. PHS Industries, Inc.
 - 4. Pipe Shields, Inc.
 - 5. Rilco Manufacturing Company, Inc.
 - 6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 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.
 - 1. Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. Masterset Fastening Systems, Inc.
 - d. MKT Fastening, LLC.
 - e. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Empire Industries, Inc.
 - c. Hilti, Inc.
 - d. ITW Ramset/Red Head.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.

2.7 PIPE STAND FABRICATION

- A. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
 - 1. Manufacturers:
 - a. MIRO Industries.
 - b. Cooper Industries.
 - c. PHP Systems/Design
 - d. Or Approved Equal

2.8 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.
- B. Manufacturers:
 - 1. C & S Mfg. Corp.
 - 2. HOLDRITE Corp.; Hubbard Enterprises.
 - 3. Samco Stamping, Inc.
 - 4. Or Approved Equal

2.9 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches of insulation.
 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
 10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
 11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
 12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
 17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) 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.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

- a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- 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. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

- O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel 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 building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. 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.
- F. Pipe Stand Installation:
 - 1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- J. 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.

- K. Install lateral bracing with pipe hangers and supports to prevent swaying.
- L. 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 (DN 65) 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.
- M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- O. Insulated Piping: Comply with the following:
 - 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 according to ASME B31.1 for power piping and 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 (DN 100) 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 (DN 100) 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 (DN 8 to DN 90): 12 inches long and 0.048 inch thick.
 - b. NPS 4 (DN 100): 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
 - 6. Insert Material: Length at least as long as protective shield.
 - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 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 smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 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.

3.6 PAINTING

- A. Touch Up: 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. Touch Up: Clean and touchup paint 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 220601

SECTION 220719 – PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes mechanical insulation for equipment, and pipe, including the following:

1. Insulation Materials:
 - a. Mineral fiber.
2. Fire-rated insulation systems.
3. Adhesives.
4. Mastics.
5. Lagging adhesives.
6. Sealants.
7. Field-applied jackets.
8. Tapes.
9. Securements.
10. Corner angles.

1.3 DEFINITIONS

- A. ASJ: All-service jacket.
- B. FSK: Foil, scrim, kraft paper.
- C. FSP: Foil, scrim, polyethylene.
- D. PVDC: Polyvinylidene chloride.
- E. SSL: Self-sealing lap.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 2. Attachment and covering of heat tracing inside insulation.
 3. Insulation application at pipe expansion joints for each type of insulation.
 4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 5. Removable insulation at piping specialties, equipment connections, and access panels.
 6. Application of field-applied jackets.
 7. Application at linkages of control devices.
 8. Field application for each equipment type.
- C. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:
1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2 (DN 50).
 2. Sheet Form Insulation Materials: 12 inches square.
 3. Jacket Materials for Pipe: 12 inches long by NPS 2 (DN 50).
 4. Sheet Jacket Materials: 12 inches square.
 5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.
- D. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.
- E. 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.
- F. Field quality-control inspection 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. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. 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.
 - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 INSULATION MATERIALS

- A. Refer to Part 3 schedule articles for requirements about 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, Preformed Pipe Insulation:

1. Products:

- a. Fibrex Insulations Inc.; Coreplus 1200.
- b. Johns Manville; Micro-Lok.
- c. Knauf Insulation; 1000° Pipe Insulation.
- d. Manson Insulation Inc.; Alley-K.
- e. Owens Corning; Fiberglas Pipe Insulation.
- f. Or approved equal.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

G. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.

1. Products:

- a. Knauf Insulation; Permawick Pipe Insulation.
- b. Owens Corning; VaporWick Pipe Insulation.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied [ASJ] [FSK jacket] complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Products:

- a. CertainTeed Corp.; CrimpWrap.
- b. Johns Manville; MicroFlex.
- c. Knauf Insulation; Pipe and Tank Insulation.
- d. Manson Insulation Inc.; AK Flex.
- e. Owens Corning; Fiberglas Pipe and Tank Insulation.
- f. Or approved equal.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

- B. Calcium Silicate Adhesive: Fibrous, sodium-silicate-based adhesive with a service temperature range of 50 to 800 deg F.
1. Products:
 - a. Childers Products, Division of ITW; CP-97.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-27/81-93.
 - c. Marathon Industries, Inc.; 290.
 - d. Mon-Eco Industries, Inc.; 22-30.
 - e. Vimasco Corporation; 760.
 - f. Or approved equal.
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Products:
 - a. Aeroflex USA Inc.; Aero seal.
 - b. Armacell LCC; 520 Adhesive.
 - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
 - d. RBX Corporation; Rubatex Contact Adhesive.
 - e. Or approved equal.
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
 - f. Or approved equal.
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
 - f. Or approved equal.
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products:
 - a. Dow Chemical Company (The); 739, Dow Silicone.
 - b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Red Devil, Inc.; Celulon Ultra Clear.

- e. Speedline Corporation; Speedline Vinyl Adhesive.
- f. Or approved equal.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-35.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-90.
 - c. ITW TACC, Division of Illinois Tool Works; CB-50.
 - d. Marathon Industries, Inc.; 590.
 - e. Mon-Eco Industries, Inc.; 55-40.
 - f. Vimasco Corporation; 749.
 - g. Or approved equal.
 - 2. Water-Vapor Permeance: ASTM E 96, 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, 59 percent by volume and 71 percent by weight.
 - 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.
 - 1. Products:
 - a. Childers Products, Division of ITW; CP-30.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-35.
 - c. ITW TACC, Division of Illinois Tool Works; CB-25.
 - d. Marathon Industries, Inc.; 501.
 - e. Mon-Eco Industries, Inc.; 55-10.
 - f. Or approved equal.
 - 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:
 - a. Childers Products, Division of ITW; Encacel.
 - b. Foster Products Corporation, H. B. Fuller Company; 60-95/60-96.
 - c. Marathon Industries, Inc.; 570.
 - d. Mon-Eco Industries, Inc.; 55-70.
 - e. Or approved equal.

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:

- a. Childers Products, Division of ITW; CP-10.
- b. Foster Products Corporation, H. B. Fuller Company; 35-00.
- c. ITW TACC, Division of Illinois Tool Works; CB-05/15.
- d. Marathon Industries, Inc.; 550.
- e. Mon-Eco Industries, Inc.; 55-50.
- f. Vimasco Corporation; WC-1/WC-5.
- g. Or approved equal.

2. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 200 deg F.
4. Solids Content: 63 percent by volume and 73 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products:

- a. Childers Products, Division of ITW; CP-52.
- b. Foster Products Corporation, H. B. Fuller Company; 81-42.
- c. Marathon Industries, Inc.; 130.
- d. Mon-Eco Industries, Inc.; 11-30.
- e. Vimasco Corporation; 136.
- f. Or approved equal.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
3. Service Temperature Range: Minus 50 to plus 180 deg F.
4. Color: White.

2.6 SEALERS

A. Joint Sealers:

1. Joint Sealants for Cellular-Glass, Phenolic-Foam, and Polyisocyanurate Products:

- a. Childers Products, Division of ITW; CP-76.
- b. Foster Products Corporation, H. B. Fuller Company; 30-45.
- c. Marathon Industries, Inc.; 405.
- d. Mon-Eco Industries, Inc.; 44-05.

- e. Pittsburgh Corning Corporation; Pittseal 444.
 - f. Vimasco Corporation; 750.
 - g. Or approved equal.
2. Joint Sealants for Polystyrene Products:
- a. Childers Products, Division of ITW; CP-70.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-45/30-46.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Vimasco Corporation; 750.
 - f. Or approved equal.
- 3. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 4. Permanently flexible, elastomeric sealant.
 - 5. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 6. Color: White or gray.
- B. FSK and Metal Jacket Flashing Sealants:
- 1. Products:
 - a. Childers Products, Division of ITW; CP-76-8.
 - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Vimasco Corporation; 750.
 - f. Or approved equal.
 - 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.
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
- 1. Products:
 - a. Childers Products, Division of ITW; CP-76.
 - b. Or approved equal.
 - 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.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. 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. Products:

- a. Johns Manville; Zeston.
- b. P.I.C. Plastics, Inc.; FG Series.
- c. Proto PVC Corporation; LoSmoke.
- d. Speedline Corporation; SmokeSafe.
- e. Or approved equal.

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.

5. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Products:

- a. Childers Products, Division of ITW; Metal Jacketing Systems.
- b. PABCO Metals Corporation; Surefit.
- c. RPR Products, Inc.; Insul-Mate.
- d. Or approved equal.

E. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Products:

- a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
- b. Compac Corp.; 104 and 105.
- c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
- d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
- e. Or approved equal.

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 and UL listed.
1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corp.; 110 and 111.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
 - e. Or approved equal.
 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.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
 - b. Compac Corp.; 130.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
 - d. Venture Tape; 1506 CW NS.
 - e. Or approved equal.
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.
1. Products:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - b. Compac Corp.; 120.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 - d. Venture Tape; 3520 CW.
 - e. Or approved equal.
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Products:

- a. Childers Products; Bands.
- b. PABCO Metals Corporation; Bands.
- c. RPR Products, Inc.; Bands.
- d. Or approved equal.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 3/4 inch wide with wing or closed seal.
3. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch diameter shank, length to suit depth of insulation indicated.

a. Products:

- 1) AGM Industries, Inc.; CWP-1.
- 2) GEMCO; CD.
- 3) Midwest Fasteners, Inc.; CD.
- 4) Nelson Stud Welding; TPA, TPC, and TPS.
- 5) Or approved equal.

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:

- 1) AGM Industries, Inc.; CWP-1.
- 2) GEMCO; Cupped Head Weld Pin.
- 3) Midwest Fasteners, Inc.; Cupped Head.
- 4) Nelson Stud Welding; CHP.
- 5) Or approved equal.

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:

- 1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.
- 2) GEMCO; Perforated Base.

- 3) Midwest Fasteners, Inc.; Spindle.
 - 4) Or Approved Equal
- b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: Aluminum, 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. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick, aluminum 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:
 - 1) AGM Industries, Inc.; RC-150.
 - 2) GEMCO; R-150.
 - 3) Midwest Fasteners, Inc.; WA-150.
 - 4) Nelson Stud Welding; Speed Clips.
 - 5) Or approved equal.
 - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.
- D. Wire: 0.062-inch soft-annealed, galvanized steel.
1. Manufacturers:
- a. ACS Industries, Inc.
 - b. C & F Wire.
 - c. Childers Products.
 - d. PABCO Metals Corporation.
 - e. RPR Products, Inc.
 - f. Or approved equal.

2.10 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005; Temper H-14.
- C. 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 316.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 - 1. Verify that systems and equipment 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. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. 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.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 COMMON INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and 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 2 inches or 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

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 Below-Grade Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall 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 wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. 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. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestopping and Smokestopping."

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 7 Section " Firestopping and Smokestopping."

3.5 EQUIPMENT INSULATION INSTALLATION

A. Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
 - a. Do not weld anchor pins to ASME-labeled pressure vessels.
 - b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
 - c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
 - d. Do not overcompress insulation during installation.
 - e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
 - f. Impale insulation over anchor pins and attach speed washers.
 - g. 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.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

3.6 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, vessels, and equipment. 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.

3.7 CELLULAR-GLASS INSULATION INSTALLATION

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 but 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.

3.8 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.

2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 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 UL-listed fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 7 Section "Firestopping and Smokestopping."

3.11 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.12 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.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 1. Fire-suppression piping.
 2. Drainage piping located in crawl spaces.

3. Below-grade piping.
4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 3 (DN 75) and Smaller: Insulation shall be any of the following:
 - a. Cellular Glass: 1 inch thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
2. NPS 4 (DN 32) and Larger: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inches thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 3 (DN 75) and Smaller: Insulation shall be any of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
2. NPS 4 (DN 100) and Larger: Insulation shall be any of the following:
 - a. Cellular Glass: 2 inches thick.
 - b. Mineral-Fiber Pipe Insulation, Type I: 1-1/2 inch thick.

3.14 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. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Exposed:
 1. Aluminum, Smooth: 0.016 inch thick.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes domestic water piping inside the building and 5 feet to outside of the building.
- B. Related Sections include the following:
 - 1. Division 22 Section "Domestic Water Piping Specialties" for water distribution piping specialties.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with 80 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

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 PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.3 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
 - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
 - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.4 VALVES

- A. General-duty ball valves are specified in Division 22 Section "Plumbing Valves."

- B. Backflow preventers, strainers, and drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

PART 3 - EXECUTION

3.1 PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Fitting Option: brazed joints may be used on aboveground copper tubing.
- D. Under-Building-Slab, Domestic Water Piping on House Side of Water Meter, NPS 4 (DN 100) and Smaller: Soft copper tube, Type K with no fittings.
- E. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
 - 1. NPS 1 (DN 25) and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 - 2. NPS 2 (DN 50): Hard copper tube, Type L; copper pressure fittings; and soldered joints.

3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping NPS 3 (DN 75) and smaller.
 - 2. Drain Duty: Hose-end drain valves.
- B. Install drain valves at low points in horizontal piping, and where required to drain water piping.
 - 1. Install hose-end drain valves at low points in water mains, risers, and branches.

3.3 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Plumbing Materials and Methods."

- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- E. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

3.4 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support devices are specified in Division 22 Section "Hangers and Supports." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet: MSS Type 49, spring cushion rolls, if indicated.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 (DN 20) and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2 (DN 65): 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet with 1/2-inch rod.
 - 6. NPS 6 (DN 150): 10 feet with 5/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

3.7 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
 - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.

3.8 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
 - 4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.9 CLEANING

- A. Clean and disinfect potable and non-potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following domestic water piping specialties:
 - 1. Strainers.
 - 2. Drain valves.
 - 3. Water hammer arresters.
 - 4. Trap-seal primer valves.
- B. All backflow preventers, valves, strainers and fittings for portable water system shall be lead-free type in compliant with requirements of NSF/ANSI Standard 61.
- C. PERFORMANCE REQUIREMENTS
- D. Minimum Working Pressure for Domestic Water Piping Specialties: 80 psig, unless otherwise indicated.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 STRAINERS FOR DOMESTIC WATER PIPING (Lead Free Type)

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron[with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and] for NPS 2-1/2 (DN 65) and larger.
3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 (DN 50) and Smaller: 0.020 inch.
 - b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 inch.
6. Drain: Pipe plug or Factory-installed, hose-end drain valve.

2.2 DRAIN VALVES (Lead Free Type)

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 (DN 6) side outlet with cap.

2.3 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. PPP Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - g. Tyler Pipe; Wade Div.
 - h. Watts Drainage Products Inc.
 - i. Zurn Plumbing Products Group; Specification Drainage Operation.
 - j. Or approved equal.
3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: [Metal bellows] [Copper tube with piston].
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.4 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. MIFAB, Inc.
 - b. PPP Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Or approved equal.
3. Standard: ASSE 1018.
4. Pressure Rating: 125 psig minimum.
5. Body: Bronze.

6. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
7. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Basic Plumbing Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install water control valves with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install water hammer arresters in water piping according to PDI-WH 201.
- E. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- F. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.
- G. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Wire and Cable."

3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
 1. Outlet boxes.
 2. Supply-type, trap-seal primer valves.

- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification For Plumbing Piping And Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test each system according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

SECTION 221123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes fuel gas piping within the building. Products include the following:
 - 1. Pipe, tube, fittings, and joining materials.
 - 2. Protective pipe and fitting coating.
 - 3. Piping specialties.
 - 4. Specialty valves.
 - 5. Pressure regulators.

1.3 PROJECT CONDITIONS

- A. Gas System Pressures: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2.0 psig and is reduced to secondary pressure of 0.5 psig or less.
- B. Design values of fuel gas supplied for these systems are as follows:
 - 1. Nominal Heating Value: 1000 Btu/cu. ft.
 - 2. Nominal Specific Gravity: 0.6.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Piping.
 - 2. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 - 3. Pressure regulators. Include pressure rating, capacity, and settings of selected models.
- B. Shop Drawings: For fuel gas piping. Include plans and attachments to other work.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
- C. Welding certificates.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For natural gas specialties and accessories to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Electrical Components and Devices: 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. NFPA Standard: Comply with NFPA 54, "International Fuel Gas Code."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

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 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

- A. Steel Pipe: ASTM A 53/A 53M; Type E or S; Grade B; black. Wall thickness of wrought-steel pipe shall comply with ASME B36.10M.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
 - 2. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.

3. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
5. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
6. Joint Compound and Tape: Suitable for natural gas.
7. Steel Flanges and Flanged Fittings: ASME B16.5.
8. Gasket Material: Thickness, material, and type suitable for natural gas.

2.4 PROTECTIVE COATING

- A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in contact with materials that may corrode the pipe.

2.5 PIPING SPECIALTIES

- A. Flexible Connectors: ANSI Z21.24, copper alloy.
- B. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.6 SPECIALTY VALVES

- A. Valves, NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
- B. Valves, NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
- C. Appliance Connector Valves: ANSI Z21.15 and CSA International listed.
 1. Manufacturers:
 - a. American Valve Inc.
 - b. B&K Industries, Inc.
 - c. Brass Craft Manufacturing Co.
 - d. Conbraco Industries, Inc.; Apollo Div.
 - e. JMF Company.
 - f. Jomar International Ltd.
 - g. Key Gas Components, Inc.
 - h. Legend Valve and Fitting, Inc.
 - i. McDonald, A. Y. Mfg. Co.
 - j. Mueller Co.; Mueller Gas Products Div.
 - k. Newman Hattersley Ltd.; Specialty Valves Div.
 - l. Robert Manufacturing Co.
 - m. State Metals, Inc.
 - n. Watts Industries, Inc.; Water Products Div.
 - o. Or Approved Equal.
- D. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig minimum pressure rating.
- E. Gas Valves, NPS 2 (DN 50) and Smaller: ASME B16.33 and CSA International-listed bronze body and 125-psig pressure rating.

1. Manufacturers:
 - a. Dungs, Karl, Inc.
 - b. Flow Control Equipment, Inc.
 - c. Grinnell Corp.
 - d. Honeywell International Inc.
 - e. Jomar International Ltd.
 - f. KITZ Corporation.
 - g. Legend Valve and Fitting, Inc.
 - h. McDonald, A. Y. Mfg. Co.
 - i. Milwaukee Valve Company.
 - j. Mueller Co.; Mueller Gas Products Div.
 - k. NIBCO INC.
 - l. Red-White Valve Corp.
 - m. Watts Industries, Inc.; Water Products Div.
 - n. Or Approved Equal.
 2. Tamperproof Feature: Include design for locking.
- F. Plug Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig pressure rating.
1. Manufacturers:
 - a. Flow Control Equipment, Inc.
 - b. Milliken Valve Co., Inc.
 - c. Nordstrom Valves, Inc.
 - d. Olson Technologies, Inc.; Homestead Valve Div.
 - e. Walworth Co.
 - f. Or Approved Equal.
 2. Tamperproof Feature: Include design for locking.
- G. General-Duty Valves, NPS 2-1/2 (DN 65) and Larger: ASME B16.38, cast-iron body, suitable for fuel gas service, with "WOG" indicated on valve body, and 125-psig pressure rating.
1. Gate Valves: MSS SP-70, OS&Y type with solid wedge.
 2. Butterfly Valves: MSS SP-67, lug type with lever handle.
- H. Automatic Gas Valves: ANSI Z21.21, with electrical/mechanical operator for actuation by appliance automatic shutoff device.
1. Manufacturers:
 - a. ASCO General Controls.
 - b. ASCO Power Technologies, LP; Division of Emerson.
 - c. ASCO Valve Canada, Division of Emerson Electric Canada Limited.
 - d. Dungs, Karl, Inc.
 - e. Eaton Corporation; Controls Div.
 - f. Eclipse Combustion, Inc.
 - g. GPS Gas Protection Systems Inc.
 - h. Honeywell International Inc.
 - i. Johnson Controls.
 - j. Or Approved Equal.
- I. Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valve; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position shall normally be closed.
1. Manufacturers:

- a. ASCO General Controls.
- b. ASCO Power Technologies, LP; Division of Emerson.
- c. Dungs, Karl, Inc.
- d. Eclipse Combustion, Inc.
- e. Goyen Valve Corp.; Tyco Environmental Systems.
- f. Magnatrol Valve Corp.
- g. Watts Industries, Inc.
- h. Or Approved Equal.

2.7 PRESSURE REGULATORS

- A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.
 - 1. Manufacturers:
 - a. Line Pressure Regulators:
 - 1) Invensys.
 - 2) Maxitrol Company.
 - 3) National Meter Industries, Inc.
 - 4) Schlumberger Limited; Gas Div.
 - 5) Or Approved Equal.
 - b. Appliance Pressure Regulators:
 - 1) Eaton Corporation; Controls Div.
 - 2) Harper Wyman Co.
 - 3) Maxitrol Company.
 - 4) SCP, Inc.
 - 5) Or Approved Equal.
 - 2. NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
 - 3. NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
 - 4. Service Pressure Regulators: ANSI Z21.80. Include 100-psig minimum inlet pressure rating.
 - 5. Line Pressure Regulators: ANSI Z21.80 with 2-psig minimum inlet pressure rating.
 - 6. Line Pressure Regulators: ANSI Z21.80 with 10-psig inlet pressure rating, unless otherwise indicated.
 - 7. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
- B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for fuel piping system to verify actual locations of piping connections before equipment installation.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

3.3 PIPING APPLICATIONS

- A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.
- B. Fuel Gas Piping, 2 psig or Less - aboveground or in pipe tunnel:
 - 1. NPS 3/4 and NPS 1 (DN 20 and DN 25) Steel pipe, malleable-iron threaded fittings, and threaded joints.
 - 2. NPS 1-1/4 to NPS 2 (DN 32 to DN 50) Steel pipe, steel welding fittings, and welded joints.
 - 3. NPS 2-1/2 (DN 65) and Larger: Steel pipe, steel welding fittings, and welded joints.
- C. Fuel Gas Piping, 2 psig or Less below slab:
 - 1. NPS 3/4 and NPS 2 (DN 20 and DN 50) TracPipe Counterstrike CSST stainless steel gas pipe with fittings or approved equal manufacturers.

3.4 VALVE APPLICATIONS

- A. Appliance Shutoff Valves for Pressure 0.5 psig or Less: Appliance connector valve or gas stop.
- B. Appliance Shutoff Valves for Pressure 0.5 to 2 psig: Gas stop or gas valve.
- C. Piping Line Valves, NPS 2 (DN 50) and Smaller: Gas valve.
- D. Piping Line Valves, NPS 2-1/2 (DN 65) and Larger: Plug valve or general-duty valve.

3.5 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 23 Section.
- B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.
 - 1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
 - 2. In Floors: Gas piping with welded joints and protective wrapping specified in Part 2 "Protective Coating" Article may be installed in floors, subject to approval of authorities having jurisdiction. Surround piping cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

3. In Floor Channels: Gas piping may be installed in floor channels, subject to approval of authorities having jurisdiction. Channels must have cover and be open to space above cover for ventilation.
 4. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls.
 - a. Exception: Tubing passing through partitions or walls.
 5. In Walls: Gas piping with welded joints and protective wrapping specified in Part 2 "Protective Coating" Article may be installed in masonry walls, subject to approval of authorities having jurisdiction.
 6. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - a. Exception: Accessible above-ceiling space specified above.
- C. Drips and Sediment Traps: Install drips at points where condensate may collect. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.
1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.
- E. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.
- F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- G. Connect branch piping from top or side of horizontal piping.
- H. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- I. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valve.
- J. Install flanges on valves, specialties, and equipment having NPS 2-1/2 (DN 65) and larger connections.
- K. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.
- L. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside building and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.6 JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 23 Section.
- B. Use materials suitable for fuel gas.
 - 1. Brazed Joints: Make with brazing alloy with melting point greater than 1000 deg F. Brazing alloys containing phosphorus are prohibited.
- C. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support and equipment support materials and installation requirements are specified in Division 23 Section "Hangers and Supports for HVACR Piping and Equipment."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4 (DN 32): Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet; minimum rod size, 1/2 inch.
 - 5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

- A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.
- B. Install piping adjacent to appliances to allow service and maintenance.
- C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.
- E. Ground equipment according to Division 26 Section "Grounding and Bonding."
 - 1. Do not use gas pipe as grounding electrode.
- F. Connect wiring according to Division 26 Section "Building Wire and Cable."

3.9 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each pressure regulator, and specialty valve.

1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
2. Nameplates, pipe identification, and signs are specified in Division 23 Section "Mechanical Identification."

3.10 PAINTING

- A. Use materials and procedures in Division 09 Sections.
- B. Paint gas piping.
 1. Color: Yellow (1 primer, 2 finish coats).

3.11 FIELD QUALITY CONTROL

- A. Test, inspect, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.
- B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
- C. Verify capacities and pressure ratings of pressure regulators, valves, and specialties.
- D. Verify correct pressure settings for pressure regulators.
- E. Verify that specified piping tests are complete.

END OF SECTION 221123

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.
 - 3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures" and International Building Code – New Jersey Edition – Latest Edition

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings:
 - 1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
 - 2. Sovent Drainage System: Include plans, elevations, sections, and details.
- C. Field quality-control inspection and test reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

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 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Solvent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.
- C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - 1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
 - a. Manufacturers:
 - 1) ANACO.

- 2) Fernco, Inc.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.
 - 6) Charlotte Pipe & Foundry Co.
 - 7) Or approved equal.
2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.
- a. Manufacturers:
 - 1) ANACO.
 - 2) Clamp-All Corp.
 - 3) Ideal Div.; Stant Corp.
 - 4) Mission Rubber Co.
 - 5) Tyler Pipe; Soil Pipe Div.
 - 6) Charlotte Pipe & Foundry Co.
 - 7) Or approved equal.
3. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.
- a. Manufacturers:
 - 1) MG Piping Products Co.
 - 2) Or approved equal.

2.5 SPECIAL PIPE FITTINGS

- A. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Mission Rubber Co.
 - c. Or Approved Equal
- B. Pressure Pipe Couplings: AWWA C219 metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser, Inc.; DMD Div.
 - c. EBAA Iron Sales, Inc.
 - d. Ford Meter Box Company, Inc. (The); Pipe Products Div.
 - e. JCM Industries, Inc.
 - f. Romac Industries, Inc.
 - g. Smith-Blair, Inc.
 - h. Viking Johnson.

- i. Or approved equal.
 - 2. Center-Sleeve Material: Manufacturer's standard.
 - 3. Gasket Material: Natural or synthetic rubber.
 - 4. Metal Component Finish: Corrosion-resistant coating or material.
- C. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
- 1. Manufacturers:
 - a. EBAA Iron Sales, Inc.
 - b. Romac Industries, Inc.
 - c. Star Pipe Products; Star Fittings Div.
 - d. Or Approved Equal

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless cast-iron soil pipe and fittings and couplings; and hubless-coupling joints.
- C. Aboveground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless cast-iron soil pipe and fittings shielded, stainless-steel couplings; and hubless-coupling joints.
- D. Aboveground, vent piping NPS 4 (DN 100) and smaller shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless cast-iron soil pipe and fittings; couplings; and hubless-coupling joints.
- E. Aboveground, vent piping NPS 5 (DN 125) and larger shall be any of the following:
 - 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - 2. Hubless cast-iron soil pipe and fittings; shielded, stainless-steel couplings; and hubless-coupling joints.
- F. Underground, soil, waste, and vent piping NPS 4 (DN 100) and smaller shall be any of the following:
 - 1. Service class, cast-iron bell and spigot type soil pipe with gasketed joints.

- G. Underground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:
 - 1. Service class, cast-iron bell and spigot type soil pipe with gasketed joints.

3.2 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install underground, ductile-iron, special pipe fittings according to AWWA C600.
 - 1. Install encasement on piping according to ASTM A 674 or AWWA C105.
- D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- E. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.
- F. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

- J. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Solvent Drainage System: Comply with ASSE 1043 and solvent fitting manufacturer's written installation instructions.
 - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- K. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- L. Install ABS soil and waste drainage and vent piping according to ASTM D 2661.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Plumbing Materials and Methods."
- B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
- D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.4 VALVE INSTALLATION

- A. General valve installation requirements are specified in Division 22 Section "Plumbing Valves."

3.5 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Install individual, straight, horizontal piping runs according to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 22 Section "Hangers and Supports."

- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches with 3/8-inch rod.
 2. NPS 3 (DN 80): 60 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches with 5/8-inch rod.
 4. NPS 6 (DN 150): 60 inches with 3/4-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221317 - DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. FRP: Fiberglass-reinforced plastic.
- D. HDPE: High-density polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PUR: Polyurethane plastic.
- H. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for frost-resistant vent terminals.
 - 1. Wiring Diagrams: Power, signal, and control wiring.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- 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 NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate size and location of roof penetrations.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Metal Floor Cleanouts:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
 - a. MIFAB, Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Or approved equal.

B. Stainless Steel Wall Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
 - a. MIFAB, Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Or approved equal.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated or a comparable product by one of the following:
 - a. MIFAB, Inc.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Tyler Pipe; Wade Div.
 - d. Watts Drainage Products Inc.
 - e. Or approved equal.
2. Standard: ASME A112.6.3 with backwater valve.
3. Pattern: Floor drain.
4. Outlet: Side.
5. Sediment Bucket: Refer to plumbing schedule.
6. Top or Strainer Material: Bronze.
7. Top of Body and Strainer Finish: Nickel bronze.
8. Top Shape: Round.

2.3 MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
 - a. NPS 2 (DN 50): 4-inch minimum water seal.
 - b. NPS 2-1/2 (DN 65) and Larger: 5-inch minimum water seal.

B. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend [1 inch (25 mm)] [2 inches (51 mm)] <Insert dimension> above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

E. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

F. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.
2. Design: To provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

G. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.4 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.
2. Vent Pipe Flashing: 8 oz./sq. ft.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

- D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.
- E. Fasteners: Metal compatible with material and substrate being fastened.
- F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- G. Solder: ASTM B 32, lead-free alloy.
- H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Basic Plumbing Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221317

SECTION 230000 – MECHANICAL SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 23, and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - a. Work covered under Mechanical Contract.
 - b. Work under other contracts.
 - c. Use of premises.
 - d. Owner's occupancy requirements.
 - e. Specification formats and conventions.

- B. Related Sections include the following:

- a. Division 23 Sections.

1.3 WORK COVERED UNDER MECHANICAL CONTRACT

- A. Provide all labor, materials, tools, machinery, equipment, and services necessary to complete the mechanical work under this contract. All systems and equipment shall be complete in every aspect and all items of material, equipment, and labor shall be provided for a fully operational system. Coordinate the work with work of other trades so as to resolve conflicts without impeding job progress. The mechanical work includes the following:

- B. MECHANICAL

- 1. The mechanical contractor shall furnish all labor, materials, equipment, rigging, appliances, tools and accessories required for providing, installing, connecting and testing the new mechanical system, associated work, controls etc., in accordance with these specifications and the applicable drawings. The work includes:
 - a. Remove all existing mechanical equipment including, but not limited to VAV boxes, etc., complete with all existing ductwork (to points of disconnect shown), insulation, valves, supports, thermostats, controls, etc. Patch wall openings to match existing.
 - b. Remove all demolished equipment and debris from the site in accordance with all State and Local regulations.
 - c. Coordinate all removals as further scheduled on the drawings so as not to interfere with Owner's use of the building.

- d. Furnish and install new VAV boxes, both powered and non-powered as indicated in the schedule, new ductwork (to point of new connection shown), hangers, supports, pneumatic controls, etc. for a complete operating system. Tie the new VAV boxes and thermostats into the existing building pneumatic control system.
- e. All cutting, patching and alteration work shall be coordinated with the owner's use of the space.
- f. Furnish and install new supply, return, and exhaust air ductwork as indicated on the drawings. All ductwork shall be galvanized steel construction, except the fresh air intake ductwork to new air handlers, which shall be aluminum construction. All aluminum construction ductwork shall be SMACNA Class "A" sealed.
- g. All supply, return and outdoor air ductwork shall be internally or externally insulated as indicated on drawings. All internally lined ductwork shall be provided with IAQ liner.**
- h. Furnish and install motorized dampers, volume dampers.
- i. Furnish and install flexible duct connectors at all duct connections to all HV/HVAC units.
- j. Provide fire stopping for all duct penetrations through rated walls/slabs with pipe escutcheons.
- k. Minor cutting and patching work.
- l. Furnish and install all ancillary equipment needed for a complete and proper installation including, but not limited to anchors, hangers, expansion loops, fittings, strainers, valves, union, etc.
- m. All ductwork shall be properly fabricated, installed and supported as per SMACNA and ASHRAE guidelines. Contractor to perform duct leakage testing of entire ductwork. **Submit six (6) sets of duct leakage testing report to engineer/owner for review.**
- n. Contractor to perform testing, adjusting and balancing (TAB) of the entire mechanical and HVAC system, including all RTU's, hot-water distribution system, pumps, terminal units, air side distribution, air outlets/inlets etc. **Submit six (6) sets of air, and unit TAB reports for review.**
- o. Provide testing, commissioning and start-up reports for all new mechanical/heating/HVAC systems installed in this project.
- p. Submit six (6) sets of shop drawings of all equipment, sheet metal standards, piping standards, air outlets/inlets, supports, louvers, roof vents, controls, electricals, wiring diagram, etc.**
- q. Contractor to prepare as-built drawings of the entire mechanical/HVAC system. Submit six (6) sets of Operation and Maintenance Manuals.**
- r. Testing, Adjusting and Balancing (TAB) shall be done during the respective season for the units, during the summer season for cooling mode, during winter for heating mode, and during fall/spring for free cooling mode.

- s. Contractor to provide operator training for all new equipment to owner designated personnel consisting of **minimum of two (2) four (4)-hour sessions** for proper equipment operation, maintenance, safety, alarms, etc. **THE TRAINING SHALL BE VIDEO TAPED. PROVIDE TWO (2) COPIES OF VIDEO TAPES FOR FUTURE REFERENCE BY THE OWNER.**
- t. Provide color coded identification tags, identification markers and equipment tags for all equipment including HVAC units, ductwork, control valves, motorized dampers, relief vents, etc.
- u. Provide two-year service for the new HVAC system, from the date of handover of the project to the owner. Submit service reports after each service visit.
- v. **All supply, return and outdoor air ductwork shall be internally or externally insulated as indicated on drawings. All internally lined ductwork shall be provided with IAQ liner.**
- w. Furnish and install motorized dampers, volume dampers.
- x. **Warranty: The entire system shall be warranted for a period of two complete years from the date of acceptance by the owner, including all materials and labor components.**
- y. **Commissioning:** The following is the commissioning scope of work for this project:
 1. There will not be a separate commissioning agent on this project. The architect/engineer/Project Management firm will oversee the commissioning process.
 2. Submittals/Shop Drawings shall include detailed start up procedures.
 3. All equipment shall be factory tested before being shipped to project site.
 4. Perform functional performance test (FPT) of all HVAC systems and equipment. Submit FPT Reports.
 5. Perform pre-functional checklist. Document the procedures in writing. Submit report.
 6. Perform seasonal performance tests for all three modes, peak cooling, peak heating, and economizer/free cooling modes.
 7. Provide detailed Start-Up Reports.
 8. Trending: The building control system/energy management system, shall be monitored for the first year by the Controls Contractor, as well as by the Owner/Owner designated team for proper operation to optimize energy performance without compromising the comfort conditions.
 9. The contractor shall certify in writing that the entire work was completed and systems are operational according to the contract documents, including calibration of instrumentation and controls.
 10. Schedule, witness and document tests, inspections and systems startup. Inform architect/engineer sufficiently in advance to enable them to witness startup.
 11. Perform testing, adjusting and balancing of all airside, waterside, and units/systems.
 12. Contractor to perform testing, adjusting and balancing (TAB) of the entire mechanical and HVAC system, indoor/roof top HVAC/AC/split AHU's, hot-water distribution system, air side distribution, air outlets/inlets etc. Submit six (6) sets of air, water and unit TAB reports for review. Testing, Adjusting

and Balancing (TAB) shall be done during the respective season for the units, during the summer season for cooling mode, during winter for heating mode, and during fall/spring for free cooling mode.

13. Compile test data, inspection reports and certificates and include them in the Systems Manual and Commissioning Report.
14. Certify date of acceptance and startup for each item of equipment for start of warranty periods.
15. Prepare as-built drawings. Submit six (6) sets of each, along with two (2) sets of Mylar (for drawings) and two (2) CD's (for drawings).
16. Conduct Operation and Maintenance Training Programs, to be provided by qualified instructors for all HVAC systems and equipment. Videotape and edit training sessions. Submit two (2) videotapes for Owners future use and reference.
17. Submit ten (10) sets of all documents.

1.4 WORK UNDER OTHER CONTRACTS

- A. General: All work shall be performed under a single prime contractor.

1.5 USE OF PREMISES

- A. General: The Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits. The building will be fully occupied during construction and all construction activities will have to be coordinated with the owner's use of the space. Any work inside of the building must be completed at night during second shift or on weekends and all areas must be put back in working order for the next day. Work on the roof, with the exception of rigging/crane, can be done during normal hours. Any crane lifts must be don't on the weekend and coordinated with the owner.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - a. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
 - b. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations for the next business day. Protect building and its occupants during construction period.

1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy the premises during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner

usage including working second shift and weekends. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.

- a. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - b. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
- a. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
 - b. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 - c. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.
- a. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - b. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
- a. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - b. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.8 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 230000

SECTION 230130 - HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes cleaning of the following existing duct systems:
 1. Supply systems.
 2. Return systems.
 3. Outdoor Air Intake systems.
 4. Exhaust system.

Refer to drawings for areas/locations where existing duct system is to be cleaned.

1.3 DEFINITIONS

- A. ASCS: Air system cleaning specialist.
- B. NADCA: National Air Duct Cleaners Association.
- C. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

- A. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.
- B. Qualification Data: For ASCS.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. ASCS Qualifications: A member of a nationally recognized nonprofit industry organization dedicated to the cleaning of HVAC systems.
 1. Certification: Employ an ASCS certified by NADCA or a nationally recognized certification program.
 2. Supervisor Qualifications: Certified by a nationally recognized program and organization.
 3. Experience: Submit records of experience in the field of HVAC systems cleaning.

4. Equipment, Materials, and Labor: Have equipment, materials, and labor required to perform specified services.
- B. Comply with current published standards of NADCA.

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 SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.
- B. Galvanized-Steel Sheet: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 DUCT-MOUNTING ACCESS DOORS

- A. General Description: Fabricate doors airtight and suitable for duct pressure class.
- B. Rectangular Duct Door: Double wall; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
1. Manufacturers:
 - a. American Warming and Ventilating.
 - b. Cesco Products.
 - c. Ductmate Industries, Inc.
 - d. Flexmaster U.S.A., Inc.
 - e. Greenheck.

- f. McGill AirFlow Corporation.
 - g. Nailor Industries Inc.
 - h. Ventfabrics, Inc.
 - i. Ward Industries, Inc.
 - j. Or approved equal
- 2. Frame: Galvanized-steel sheet; with bendover tabs and foam gaskets.
 - 3. Provide number of hinges and locks as follows:
 - a. Less Than 12 Inches (300 mm) Square: Secure with two sash locks.
 - b. Up to 18 Inches (450 mm) Square: Two hinges and two sash locks.
 - c. Up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches with outside and inside handles.
- C. Round Duct Door: Double wall; fabricated of galvanized sheet metal with insulation fill and 1-inch (25-mm) thickness. Include cam latches.
- 1. Manufacturers:
 - a. American Warming and Ventilating.
 - b. Cesco Products.
 - c. Ductmate Industries, Inc.
 - d. Flexmaster U.S.A., Inc.
 - e. Greenheck.
 - f. McGill AirFlow Corporation.
 - g. Nailor Industries Inc.
 - h. Ventfabrics, Inc.
 - i. Ward Industries, Inc.
 - j. Or approved equal
 - 2. Frame: Galvanized-steel sheet; with spin-in notched frame.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch- (25-mm-) thick fibrous-glass or polystyrene-foam board.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine systems to determine appropriate methods, tools, and equipment required for performance of work.
- B. Prepare written report listing conditions detrimental to performance of work.
- C. Proceed with work only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare a written plan that includes strategies and step-by-step procedures. At a minimum, include the following:
 - 1. Supervisor contact information.
 - 2. Work schedule including location, times, and impact on occupied areas.
 - 3. Methods and materials planned for each HVAC component type.
 - 4. Required support from other trades.
 - 5. Equipment and material storage requirements.
 - 6. Exhaust equipment setup locations.
- B. Use the existing service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.
- C. Comply with NADCA ACR 2006, "Guidelines for Constructing Service Openings in HVAC Systems" Section.

3.3 CLEANING

- A. Comply with NADCA ACR 2006.
- B. Remove visible surface contaminants and deposits from within the HVAC system.
- C. Systems and Components to Be Cleaned:
 - 1. Air devices for supply and return air.
 - 2. Air-terminal units.
 - 3. Ductwork:
 - a. Supply-air ducts, including turning vanes, to the air-handling unit.
 - b. Return-air ducts to the air-handling unit.
 - c. Exhaust-air ducts.
 - 4. Air-Handling Units:
 - a. Interior surfaces of the unit casing.
 - b. Coil surfaces compartment.
 - c. Condensate drain pans.
 - d. Fans, fan blades, and fan housings.
 - 5. Filters and filter housings.
- D. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process.
- E. Particulate Collection:
 - 1. For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.

2. HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger shall be used where the particulate collection equipment is exhausting inside the building,
- F. Control odors and mist vapors during the cleaning and restoration process.
- G. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.
- H. System components shall be cleaned so that all HVAC system components are visibly clean. On completion, all components must be returned to those settings recorded just prior to cleaning operations.
- I. Clean all air-distribution devices, registers, grilles, and diffusers.
- J. Clean visible surface contamination deposits according to NADCA ACR 2006 and the following:
1. Clean air-handling units, airstream surfaces, components, condensate collectors, and drains.
 2. Ensure that a suitable operative drainage system is in place prior to beginning wash-down procedures.
 3. Clean evaporator coils, reheat coils, and other airstream components.
- K. Duct Systems:
1. Create service openings in the HVAC system as necessary to accommodate cleaning.
 2. Mechanically clean duct systems specified to remove all visible contaminants so that the systems are capable of passing the HVAC System Cleanliness Tests (see NADCA ACR 2006).
- L. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.
- M. Mechanical Cleaning Methodology:
1. Source-Removal Cleaning Methods: The HVAC system shall be cleaned using source-removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and to safely remove these contaminants from the facility. No cleaning method, or combination of methods, shall be used that could potentially damage components of the HVAC system or negatively alter the integrity of the system.
 - a. Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.
 - b. Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials such as duct and plenum liners.
 2. Cleaning Mineral-Fiber Insulation Components:
 - a. Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the

HVAC system is under constant negative pressure and shall not be permitted to get wet according to NADCA ACR 2006.

- b. Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests (see NADCA ACR 2006).
- c. Fibrous materials that become wet shall be discarded and replaced.

N. Coil Cleaning:

1. Measure static-pressure differential across each coil.
2. See NADCA ACR 2006, "Coil Surface Cleaning" Section. Type 1, or Type 1 and Type 2, cleaning methods shall be used to render the coil visibly clean and capable of passing Coil Cleaning Verification (see applicable NADCA ACR 2006).
3. Coil drain pans shall be subject to NADCA ACR 2006, "Non-Porous Surfaces Cleaning Verification." Ensure that condensate drain pans are operational.
4. Electric-resistance coils shall be de-energized, locked out, and tagged before cleaning.
5. Cleaning methods shall not cause any appreciable damage to, cause displacement of, inhibit heat transfer, or cause erosion of the coil surface or fins, and shall comply with coil manufacturer's written recommendations when available.
6. Rinse thoroughly with clean water to remove any latent residues.

O. Antimicrobial Agents and Coatings:

1. Apply antimicrobial agents and coatings if active fungal growth is reasonably suspected or where unacceptable levels of fungal contamination have been verified. Apply antimicrobial agents and coatings according to manufacturer's written recommendations and EPA registration listing after the removal of surface deposits and debris.
2. When used, antimicrobial treatments and coatings shall be applied after the system is rendered clean.
3. Apply antimicrobial agents and coatings directly onto surfaces of interior ductwork.
4. Sanitizing agent products shall be registered by the EPA as specifically intended for use in HVAC systems and ductwork.

3.4 CLEANLINESS VERIFICATION

- A. Verify cleanliness according to NADCA ACR 2006, "Verification of HVAC System Cleanliness" Section.
- B. Verify HVAC system cleanliness after mechanical cleaning and before applying any treatment or introducing any treatment-related substance to the HVAC system, including biocidal agents and coatings.
- C. Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.
- D. Additional Verification:
 1. Perform surface comparison testing or NADCA vacuum test.
 2. Conduct NADCA vacuum gravimetric test analysis for nonporous surfaces.

- E. Prepare a written cleanliness verification report. At a minimum, include the following:
 - 1. Written documentation of the success of the cleaning.
 - 2. Site inspection reports, initialed by supervisor, including notation on areas of inspection, as verified through visual inspection.
 - 3. Surface comparison test results if required.
 - 4. Gravimetric analysis (nonporous surfaces only).
 - 5. System areas found to be damaged.
- F. Photographic Documentation: Comply with requirements in Section 013233 "Photographic Documentation."
- G. **Report results of tests in writing. Include photo documentation showing ductwork before and after cleaning.**

3.5 DUCT ACCESSORIES 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. Provide 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 duct-mounting access doors where access doors do not currently exist to allow for the cleaning of ducts, accessories, and terminal units as follows:
 - 1. On both sides of duct coils.
 - 2. Downstream from volume dampers, turning vanes, and equipment.
 - 3. Adjacent to fire or smoke dampers; reset or install new fusible links.
 - 4. Before and after each change in direction, at maximum 50-foot (15-m) spacing.
 - 5. On sides of ducts where adequate clearance is available.
- D. Install the following sizes for duct-mounting, rectangular access doors:
 - 1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 - 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 - 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
 - 4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 - 5. Body Access: 25 by 14 inches (635 by 355 mm).
 - 6. Body Plus Ladder Access: 25 by 17 inches (635 by 430 mm).

3.6 CONNECTIONS

- A. Reconnect ducts to fans and air-handling units with existing flexible connectors after cleaning ducts and flexible connectors. Replace existing damaged and deteriorated flexible connectors.
- B. For fans developing static pressures of 5-inch wg (1250 Pa) and higher, cover replacement flexible connectors with loaded vinyl sheet held in place with metal straps.

- C. Reconnect terminal units to supply ducts with existing flexible ducts or replace damaged and deteriorated existing flexible ducts with maximum 12-inch (300-mm) lengths of new flexible duct.
- D. Reconnect diffusers or light troffer boots to low-pressure ducts with existing flexible ducts or replace damaged and deteriorated existing flexible ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.
- E. Reconnect existing and new flexible ducts to metal ducts with adhesive plus sheet metal screws.

3.7 RESTORATION

- A. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR 2006, "Restoration and Repair of Mechanical Systems" Section.
- B. Restore service openings capable of future reopening. Comply with requirements in Section 233113 "Metal Ducts." Include location of service openings in Project closeout report.
- C. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 233113 "Metal Ducts."
- D. Ensure that closures do not hinder or alter airflow.
- E. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.

END OF SECTION 230130

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Mechanical sleeve seals.
 - 5. Sleeves.
 - 6. Escutcheons.
 - 7. Grout.
 - 8. Mechanical demolition.
 - 9. Equipment installation requirements common to equipment sections.
 - 10. Painting and finishing.
 - 11. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Transition fittings.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Escutcheons.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
 - 1. Acceptable Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Eclipse, Inc.

- c. Epco Sales, Inc.
 - d. Hart Industries, International, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Industries, Inc.; Wilkins Div.
 - g. Or Approved Equal.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
- 1. Acceptable Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Epco Sales, Inc.
 - c. Watts Industries, Inc.; Water Products Div.
 - d. Or Approved Equal.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
- 1. Acceptable Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Pipeline Seal and Insulator, Inc.
 - d. Or Approved Equal.
 - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
- 1. Acceptable Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
 - c. Epco Sales, Inc.
 - d. Or Approved Equal.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
- 1. Acceptable Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.
 - e. Or Approved Equal.

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Acceptable Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - e. Or Approved Equal.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Stainless steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
1. Finish: Polished chrome-plated and rough brass.
- E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.3 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Division 09 Sections "Painting"
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.5 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.6 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 230500

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Metal framing systems.
2. Fiberglass strut systems.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

- B. Related Sections:

1. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

- A. 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.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 ACTION SUBMITTALS

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

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Metal framing systems.
 - 2. Fiberglass strut systems.
 - 3. 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 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] [stainless-] steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.2 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.3 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) 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.
- B. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- C. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- D. 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.
- E. Install lateral bracing with pipe hangers and supports to prevent swaying.
- F. 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 (DN 65)] <Insert size> 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.
- G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

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 (40 mm).

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 a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099000 "Painting".
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- G. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- H. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

- I. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- J. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230553 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment nameplates.
 - 2. Equipment markers.
 - 3. Equipment signs.
 - 4. Access panel and door markers.
 - 5. Pipe markers.
 - 6. Duct markers.
 - 7. Stencils.
 - 8. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Valve numbering scheme.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Data:
 - a. Manufacturer, product name, model number, and serial number.
 - b. Capacity, operating and power characteristics, and essential data.
 - c. Labels of tested compliances.
 - 2. Location: Accessible and visible.
 - 3. Fasteners: As required to mount on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.
 - 2. Data:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
 - 3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
 - 1. Data: Instructions for operation of equipment and for safety procedures.
 - 2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
 - 3. Thickness: 1/8 inch, unless otherwise indicated.
 - 4. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
 - 5. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.
- D. Access Panel and Door Markers: 1/16-inch thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.
 - 1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

2.2 DUCT IDENTIFICATION DEVICES

- A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.3 STENCILS

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door markers, equipment markers, equipment signs, and similar operational instructions.
 - 1. Stencil Material: Metal or fiberboard, Aluminum, or Brass.
 - 2. Stencil Paint: Exterior, gloss, acrylic enamel black, unless otherwise indicated. Paint may be in pressurized spray-can form.
 - 3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1, unless otherwise indicated.

2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.
 - 1. Material: 0.032-inch thick brass or aluminum.
 - 2. Material: 0.0375-inch thick stainless steel.
 - 3. Material: 3/32-inch thick laminated plastic with 2 black surfaces and white inner layer.
 - 4. Valve-Tag Fasteners: Brass wire-link or beaded chain; or S-hook.

2.5 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
 - 2. Frame: Extruded aluminum.
 - 3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 by 5-1/4 inches minimum.
 - 2. Fasteners: Brass grommet and wire.

3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:
 1. Fuel-burning units, including boilers, furnaces, heaters, and stills.
 2. Pumps, and similar motor-driven units.
 3. Heat exchangers, coils, evaporators, and similar equipment.
 4. Fans, blowers, primary balancing dampers, and mixing boxes.
 5. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
 1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Meters, gages, thermometers, and similar units.
 - c. Fuel-burning units, including boilers, furnaces, and heaters.
 - d. Pumps and similar motor-driven units.
 - e. Heat exchangers, coils, and similar equipment.
 - f. Fans, blowers, primary balancing dampers, and mixing boxes.
 - g. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.
 - h. Strainers, filters, water-treatment systems, and similar equipment.

- C. Stenciled Equipment Marker Option: Stenciled markers may be provided instead of laminated-plastic equipment markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
- D. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.
 - 1. Identify mechanical equipment with equipment markers in the following color codes:
 - a. Green: For cooling equipment and components.
 - b. Yellow: For heating equipment and components.
 - c. Green and Yellow or Orange: For combination cooling and heating equipment and components.
 - 2. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
 - 4. Include signs for the following general categories of equipment:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
 - b. Fuel-burning units, including boilers, furnaces, and heaters.
 - c. Pumps and similar motor-driven units.
 - d. Heat exchangers, coils, evaporators, and similar equipment.
 - e. Fans, blowers, primary balancing dampers, and mixing boxes.
 - f. Packaged HV/HVAC (central-station and zone-type units), split HV/HVAC, indoor AHU's, etc.
 - g. Strainers, filters, water-treatment systems, and similar equipment.
- E. Stenciled Equipment Sign Option: Stenciled signs may be provided instead of laminated-plastic equipment signs, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
- F. Install access panel markers with screws on equipment access panels.

3.3 DUCT IDENTIFICATION

- A. Install duct markers with permanent adhesive on air ducts in the following color codes:
 - 1. Green: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Blue: For exhaust, outside, relief, return, and mixed-air ducts.
 - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
 - 5. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

- B. Stenciled Duct Marker Option: Stenciled markers, showing service and direction of flow, may be provided instead of laminated-plastic duct markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.
- C. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.4 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

3.5 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.6 CLEANING

- A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Additional Tests
 - a. Sound testing.
 - b. Duct leakage testing.
 - c. Controls verification.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. T&B: Testing, adjusting, and balancing
- C. T&B Agency: An independent entity certified by AABC to perform testing and balancing work.
- D. TBE: AABC certified test and balance engineer.
- E. TBT: AABC certified test and balance technician.
- F. HVAC: Heating, ventilating, and air conditioning.
- G. BAS: Building automation systems.
- H. Contract documents: the mechanical drawings and test and balance specification
- I. NC: noise criteria
- J. RC: room criteria

1.4 T&B INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation T&B of AABC certification of T&B agency and personnel, including a sample copy of the AABC "National Performance Guaranty." If not submitted within the timeframe specified, the engineer has the right to choose an AABC agency at the Contractor's expense.
- B. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit T&B strategies and step-by-step procedures as specified in "Preparation" Article.
- C. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article to be used and filled out by systems Installers verifying that systems are ready for T&B.
- D. Examination Report: Within 30 days of Contractor's Notice to Proceed, provide a summary report of the examination review required in Part 3 "Examination", if issues are discovered that may preclude the proper testing and balancing of the systems.
- E. Certified T&B reports: Within 14 days of completion of balancing work, submit AABC-certified T&B report.
 - 1. Submit one copy of the final T&B Report directly to the design professional of record. Provide five additional copies to the contractor.

1.5 QUALITY ASSURANCE

- A. T&B Agency Qualifications: Engage a T&B entity certified by AABC.
 - 1. T&B Field Supervisor: Employee of the T&B Agency who is certified by AABC.
 - 2. T&B Technician: Employee of the T&B Agency and who is certified by AABC as a TBT.
- B. T&B Conference: If requested by the Engineer or Owner after approval of the T&B Agency's submittals, meet to develop a mutual understanding of the details. The T&B agency shall be provided a minimum of 14 days' advance notice of scheduled meeting time and location.
 - 1. Agenda Items:
 - a. The examination report.
 - b. The Strategies and Procedures plan.
 - c. Systems readiness checklists.
 - d. Coordination and cooperation of trades and subcontractors.
 - e. Coordination of documentation and communication flow.
- C. TBT shall perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified T&B reports.
 - 2. Certify that the T&B team complied with the approved T&B plan and the procedures specified and referenced in this Specification.
 - 3. Certify the T&B report.
- D. T&B Report Forms: Use approved forms submitted with the Strategies and Procedures Plan.

- E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in the "AABC National Standards for Total System Balance."

1.6 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire T&B period. Cooperate with Owner during T&B operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during T&B operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 T&B AGENCY

- A. Subject to compliance with requirements, engage one of AABC certified T&B Agencies:

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper T&B of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- E. Examine equipment performance data including fan and pump curves.
- F. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed, and equipment with functioning controls is ready for operation.
- G. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected, configured by the controls contractor, and functioning.
- H. Examine strainers to verify that mechanical contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.

- I. Examine two-way valves for proper installation and function.
- J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine air vents to verify that mechanical contractor has removed all air from all hydronic systems.

3.3 PREPARATION

- A. Prepare a T&B plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Prepare system-readiness checklists, as described in the "AABC National Standards for Total System Balance," for use by systems installers in verifying system readiness for T&B. These shall include, at a minimum, the following:
 - 1. Airside:
 - a. Ductwork is complete with terminals installed.
 - b. Volume, smoke and fire 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' start-up 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.

3.4 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" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for T&B procedures.
- 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.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain approved submittals and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare single-line schematic diagram of systems for the purpose of identifying HVAC components.
- 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. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check condensate drains for proper connections and functioning.
- H. Check for proper sealing of air-handling-unit components.

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. 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.
 - 3. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 - 1. Measure airflow of submain and branch ducts.
 - 2. Adjust sub-main and branch duct volume dampers for specified airflow.
Re-measure each sub-main and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
 - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 - 2. Measure airflow at all inlets and outlets.
 - 3. Adjust each inlet and outlet for specified airflow.
 - 4. Re-measure each inlet and outlet after all have been adjusted.
- D. Verify final system conditions.
 - 1. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
 - 2. Re-measure and confirm total airflow is within design.
 - 3. Re-measure all final fan operating data, rpms, volts, amps, static profile.
 - 4. Mark all final settings.
 - 5. Test system in economizer mode. Verify proper operation and adjust, if necessary.
 - 6. Measure and record all operating data.
 - 7. Record final fan-performance data.

3.7 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Phse/Hertz (Hz)
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter size and thermal-protection-element rating.
 - 8. Service factor and frame size.
- B. Motors Driven by Variable-Frequency Controllers: Test the manual bypass of the controller to prove proper operation.

3.8 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
 - 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 - 4. Cooling-Water Flow Rate: Plus or minus 10 percent.

- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.9 FINAL TEST AND BALANCE REPORT

- A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the AABC technicians or test and balance engineers.

- B. The report must be organized by systems and shall include the following information as a minimum:

- 1. Title Page:

- a. AABC certified company name
- b. Company address
- c. Company telephone number
- d. Project identification number
- e. Location
- f. Project Architect
- g. Project Engineer
- h. Project Contractor
- i. Project number
- j. Date of report
- k. AABC Certification Statement
- l. Name, signature, and certification number of AABC TBE

- 2. Table of Contents.

- 3. AABC National Performance Guaranty.

- 4. Report Summary:

- a. The summary shall include a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.

- 5. Instrument List:

- a. Type.
- b. Manufacturer.
- c. Model.
- d. Serial Number.
- e. Calibration Date.

- 6. T&B Data:

- a. Provide test data for specific systems and equipment as required by the most recent edition of the "AABC National Standards."

- C. One copy of the final test and balance report shall be sent directly to the **design professional** of record. Provide five additional copies to the contractor.

3.10 VERIFICATION OF T&B REPORT

A. Final Verification:

1. After testing and balancing is complete and accurately documented in the final report, request that a final verification be made by Engineer.
2. The T&B Agency shall conduct the verification in the presence of Engineer.
3. Engineer 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.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final verification, the testing and balancing shall be considered incomplete.

3.11 REVERIFICATION

- A. T&B Agency shall recheck all measurements and make adjustments as required to complete the balancing. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second verification.
- B. If the second verification also fails, Owner/Engineer may contact AABC Headquarters regarding the AABC National Performance Guaranty.

3.12 ADDITIONAL TESTS

A. Sound Testing

1. After the systems are balanced and the spaces are architecturally complete, read and record sound levels at 10 locations as designated by the Engineer of record.
2. Instrumentation:
 - a. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
 - b. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (LEQ).
 - c. The sound-testing meter must be capable of using 1/3 octave band filters to measure mid-frequencies from 31.5 HZ to 8000 HZ.
 - d. The accuracy of the sound-testing meter shall be ± 1 decibel.
3. Test Procedures
 - a. Perform test at the quietest background noise period. Note any cause of unpreventable sound that may affect the test outcome.
 - b. Equipment should be operating at design values.
 - c. Calibrate the sound-testing meter prior to taking measurements.

- d. Use a microphone suitable for the type of noise levels measured that is compatible with the meter. Provide a windshield for outside or in-duct measurements.
 - e. Record a set of background measurements in dB(A), and sound pressure levels in the eight un-weighted octave bands [63 HZ to 8000 HZ (NC)] with the equipment off.
 - f. Take sound readings in dB(A), and sound pressure levels in the eight un-weighted octave bands [63 HZ to 8000 HZ (NC)] with the equipment on.
 - g. Take readings no closer than 3' from a wall or from the operating equipment, and approximately 5' from the floor, with the meter held or mounted on a tripod.
 - h. For outdoor measurements, move the sound-testing meter slowly and scan the area that has the greatest exposure to the noise source being tested. (This type of reading is generally performed using the A-Weighted scale).
4. Reporting
- a. The report must record: the location, the system tested, the dB(A) reading, and the sound pressure level in each octave band with equipment on and off.
 - b. Plot all the sound pressure levels on the NC work sheet, with the equipment on and off.
- B. Duct Leakage Testing:
- 1. Witness the duct pressure testing performed by the mechanical/installing contractor.
 - 2. Verify that proper test methods are used and that leakage rates are within specified tolerances.
 - 3. Report any deficiencies observed.
- C. Controls Verification
- 1. In conjunction with system balancing perform the following:
 - a. Work with the temperature control contractor to ensure the system is operating within the design limitations, and gain a mutual understanding of intended control performance.
 - b. Confirm that the sequences of operation are in compliance with the approved drawings.
 - c. Verify that controllers are calibrated and function as intended.
 - d. Verify that controller setpoints are as specified.
 - e. Verify the operation of lockout or interlock systems.
 - f. Verify the operation of all valve and damper actuators.
 - g. Verify that all controlled devices are properly installed and connected to the correct controller.
 - h. Verify that all controlled devices travel freely and are in the position indicated by the controller: open, closed, or modulating.
 - i. Verify the location and installation of all sensors to ensure they will sense only the intended temperatures, humidities, or pressures.
 - 2. Reporting
 - a. The report shall include a summary of verifications performed, remaining deficiencies, and any variations from specified conditions.

END OF SECTION 230593

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg (minus 500 to plus 2500 Pa). Metal ducts include the following:
 - 1. Rectangular ducts and fittings.
 - 2. Single-wall round spiral-seam ducts and formed fittings.
 - 3. Sheet metal materials.
 - 4. Duct liner.
 - 5. Sealants and gaskets.
 - 6. Hangers and supports.
- B. Related Sections include the following:
 - 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.

1.3 DEFINITIONS

- A. NUSIG: National Uniform Seismic Installation Guidelines.

1.4 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.5 SUBMITTALS

- A. Shop Drawings: CAD-generated and drawn to 1/4-inch equals 1 foot. Show fabrication and installation details for metal ducts.

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 2. Duct layout indicating sizes and pressure classes.
 3. Elevations of top and bottom of ducts.
 4. Dimensions of main duct runs from building grid lines.
 5. Fittings.
 6. Reinforcement and spacing.
 7. Seam and joint construction.
 8. Penetrations through fire-rated and other partitions.
 9. Equipment installation based on equipment being used on Project.
 10. Duct accessories, including access doors and panels.
 11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Ceiling suspension assembly members.
 2. Other systems installed in same space as ducts.
 3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
 4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- C. Welding certificates.
- D. Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," for hangers and supports and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. NFPA Compliance:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- C. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

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 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
- C. 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 (1524 mm) in Diameter: Flanged.
- D. 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 (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

- E. 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."

2.4 SHEET METAL MATERIALS

- A. 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: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
- D. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.5 DUCT LINER

- A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.
1. Manufacturers:
 - a. CertainTeed Corp.; Insulation Group.
 - b. Johns Manville International, Inc.
 - c. Knauf Fiber Glass GmbH.
 - d. Owens Corning.
 - e. Or approved equal.
 2. Materials: ASTM C 1071; surfaces exposed to air stream shall be coated to prevent erosion of glass fibers.

- a. Thickness: 1 inch.
- b. Thermal Conductivity (k-Value): 0.26 at 75 deg F (0.037 at 24 deg C) mean temperature.
- c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
- d. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- e. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
 - 1) Tensile Strength: Indefinitely sustain a 50-lb- (23-kg-) tensile, dead-load test perpendicular to duct wall.
 - 2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch (3 mm) into air stream.
 - 3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.6 SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
- B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.
- C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
- D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.
- E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.
- F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.7 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
- B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
 2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
 3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
 3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

2.8 RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
 2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Nexus Inc.
 - c. Ward Industries, Inc.
 - d. McGrill AirFlow LLC.
 - e. Or approved equal
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
1. Manufacturers:
 - a. Ductmate Industries, Inc.
 - b. Lockformer.
 - c. McGrill AirFlow LLC.
 - d. SEMCO LLC
 - e. Or approved equal

2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
 3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of non-braced panel area unless ducts are lined.

2.9 APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. 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.
- B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
- E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
- G. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
- H. 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:
 1. Fan discharges.
 2. Intervals of lined duct preceding unlined duct.
 3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.
- I. Terminate inner ducts with build outs attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated build outs (metal hat sections) or other build out means are optional; when used, secure build outs to duct walls with bolts, screws, rivets, or welds.

2.10 ROUND DUCT AND FITTING FABRICATION (WHERE INDICATED ON DRAWINGS)

- A. Round, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate exhaust air ducts of aluminum according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
 1. Manufacturers:

- a. McGill AirFlow Corporation.
- b. SEMCO Incorporated.
- c. Ductmate Industries, Inc.
- d. Spiral Manufacturing Co.
- e. Or approved equal

B. Duct Joints:

- 1. Ducts up to 20 Inches (500 mm) in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
- 2. Ducts 21 to 72 Inches (535 to 1830 mm) in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
- 3. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.

a. Manufacturers:

- 1) Ductmate Industries, Inc.
- 2) Lindab Inc.
- 3) SEMCO Incorporated.
- 4) McGill AirFlow Corporation.
- 5) Or Approved equal

C. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

D. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

E. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

- 1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- 2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):
 - a. Ducts 3 to 36 Inches (75 to 915 mm) in Diameter: 0.034 inch (0.85 mm).
 - b. Ducts 37 to 50 Inches (940 to 1270 mm) in Diameter: 0.040 inch (1.0 mm).
- 3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg (500 to 2500 Pa):
 - a. Ducts 3 to 26 Inches (75 to 660 mm) in Diameter: 0.034 inch (0.85 mm).
 - b. Ducts 27 to 50 Inches (685 to 1270 mm) in Diameter: 0.040 inch (1.0 mm).
- 4. Round Elbows 8 Inches (200 mm) and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only.

Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

5. Round Elbows 9 through 14 Inches (225 through 355 mm) in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
6. Die-Formed Elbows for Sizes through 8 Inches (200 mm) in Diameter and All Pressures 0.040 inch (1.0 mm) thick with 2-piece welded construction.
7. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
8. Pleated Elbows for Sizes through 14 Inches (355 mm) in Diameter and Pressures through 10-Inch wg (2500 Pa): 0.022 inch (0.55 mm).

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
 1. Return Ducts (Negative Pressure): 2 inch wg.
 2. Exhaust Ducts (Negative Pressure): 2-inch wg.
- B. All ducts shall be galvanized steel except exhaust air duct for chemical fume hood shall be aluminum construction.

3.2 DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- B. Install round ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, size, and shape and for connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of 3 screws in each coupling.
- F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
- 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 (25 mm), plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches (38 mm).
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section "Air Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Firestopping and Smokestopping."
- O. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
- P. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- Q. Paint interiors of metal ducts, that do not have duct liner, for 24 inches (600 mm) upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 SEAM AND JOINT SEALING

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
 - 1. For pressure classes lower than 2-inch wg (500 Pa), seal transverse joints.
- B. Seal ducts before external insulation is applied.

3.4 HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

- B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors according to Division 23 Section "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 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
 - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
 - 3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500 Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500 to 2500 Pa).
 - 4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

3.7 CLEANING NEW SYSTEMS

- A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.
- B. Use service openings, as required, for physical and mechanical entry and for inspection.
 - 1. Create other openings to comply with duct standards.
 - 2. Disconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling sections to gain access during the cleaning process.

- C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.
- D. Clean the following metal duct systems by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
- E. 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 or duct accessories.
- F. Cleanliness Verification:
 - 1. Visually inspect metal ducts for contaminants.
 - 2. Where contaminants are discovered, re-clean and reinspect ducts.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Control dampers.
 - 3. Fire dampers.
 - 4. Flange connectors.
 - 5. Turning vanes.
 - 6. Flexible connectors.
 - 7. Flexible ducts.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control-damper installations.
 - d. Fire-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90 (Z275).
- 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 (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
 - 5. Blade Axles: Galvanized steel.
 - 6. Bearings:

- a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 7. Tie Bars and Brackets: Galvanized steel.
- B. Low-Leakage, Steel, Manual Volume Dampers:
 - 1. Comply with AMCA 500-D testing for damper rating.
 - 2. Low-leakage rating with linkage outside airstream and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Angle shaped.
 - b. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
 - c. Mitered and welded corners.
 - d. 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, roll-formed steel, 0.064 inch (1.62 mm) thick.
 - 6. Blade Axles: Galvanized steel.
 - 7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Blade Seals: Neoprene.
 - 9. Jamb Seals: Cambered aluminum.
 - 10. Tie Bars and Brackets: Galvanized steel.
 - 11. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

2.4 FIRE DAMPERS

- A. Type: Static; rated and labeled according to UL 555 by an NRTL.
- B. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.39 inch (9.9 mm) thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.5 FLANGE CONNECTORS

- A. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

2.6 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.7 FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.

2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).
4. Insulation R-value: 4.2.

B. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.

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 and return 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.
 2. Install aluminum volume dampers in aluminum ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire dampers according to UL listing.
- G. Install flexible connectors to connect ducts to equipment.
- H. Connect terminal units to supply ducts with maximum 6-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- I. Connect flexible ducts to metal ducts with [adhesive plus sheet metal screws.
- J. Install duct test holes where required for testing and balancing purposes.
- K. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Dual-duct air terminal units.

1.2 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.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans and other details, drawn to scale, indicating the items described in this Section, and coordinated with all building trades.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Instructions for resetting minimum and maximum air volumes.
 - b. Instructions for adjusting software set points.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 DUAL-DUCT AIR TERMINAL UNITS

- A. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - 1. Anemostat Air Distribution; Anemostat, Inc.; Mestek, Inc.
 - 2. Krueger-HVAC; brand of Johnson Controls International plc, Global Products.
 - 3. Price Industries Limited.
 - 4. Titus; brand of Johnson Controls International plc, Global Products.
- B. Description: Mixing with two volume dampers inside unit casing with mixing attenuator section and control components inside a protective metal shroud.
- C. Casing: Minimum 22-gauge- thick galvanized steel.
 - 1. Casing Liner: Comply with requirements in "Casing Liner" Article below for "Casing Liner, Fibrous Glass" Paragraph .
 - 2. Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
 - 3. Air Outlet: S-slip and drive connections.
 - 4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
- D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
 - 1. Maximum Damper Leakage: AHRI 880 rated, 0.2 percent of nominal airflow at 3-inch wg inlet static pressure.
- E. Velocity Sensors: Multipoint array with velocity sensors in each air inlet and air outlet.
- F. Attenuator Section: Casing material and thicknesses matching associated air terminal unit casing. Provide attenuator integral with the air terminal unit, of noise transmission loss performance as required in schedules on Drawings.
- G. Pneumatic Controls:
 - 1. Pneumatic Damper Actuator: 0 to 13 psig spring range.
 - 2. Pneumatic Thermostat: Wall-mounted pneumatic type with appropriate mounting hardware.
 - 3. Pneumatic Air Volume Controller: Factory calibrated and field adjustable to minimum and maximum air volumes; provides consistent airflow to the space in response to pneumatic thermostat signal while compensating for inlet static-pressure variations of up to 4 inches wg; includes a multipoint velocity sensor at each air inlet.

- H. Terminal Unit Controller: Pressure-independent, VAV controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes.
 - 1. Occupied and unoccupied operating mode.
 - 2. Remote reset of airflow or temperature set points.
 - 3. Adjusting and monitoring with portable terminal.
 - 4. Communication with temperature-control system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
- I. Room Sensor: Wall mounted with temperature set-point adjustment and access for connection of portable operator terminal.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with Section 230529 "Hangers and Supports for HVAC Piping and Equipment" and Section 233113 "Metal Ducts" for hangers and supports.
- B. Install air terminal units according to NFPA 90A.
- C. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
- D. Install wall-mounted thermostats.

3.2 DUCTWORK CONNECTIONS

- A. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.
- B. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "Air Duct Accessories."

3.3 IDENTIFICATION

- A. Label each air terminal unit with drawing designation, nominal airflow, 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.

3.4 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks in accordance with 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.

3.5 ADJUSTING

- A. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air terminal unit testing, adjusting, and balancing.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: will engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Air terminal unit will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.7 DEMONSTRATION

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

END OF SECTION 233600

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes ceiling-mounted diffusers, registers, and grilles.
- B. Related Sections include the following:
 - 1. Division 23 Section "Air Duct Accessories" for fire dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

- A. Product Data: For each 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.
- B. Coordination Drawings ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. 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.
- C. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.
- D. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

PART 2 - PRODUCTS

2.1 DIFFUSERS AND REGISTERS

- A. Manufacturers:
 - 1. Titus
 - 2. Krueger
 - 3. Carnes
 - 4. Or Approved Equal
- B. Refer to drawings for types of diffusers, registers and grilles in this project. Model #'s and Mfr's names have been provided on the drawings.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable.

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 233713

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Grounding and bonding.
 - 2. Supports.
 - 3. Identification.

1.2 REFERENCES

- A. NFPA 70-93 -- National Electrical Code; National Fire Protection Association; 2014.
- B. Standard of Installation; National Electrical Contractors Association (NECA).

1.3 QUALITY ASSURANCE

- A. Conform to NFPA 70.
- B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents.
- C. Furnish products listed by Underwriters Laboratories Inc. and classified as suitable for installed use and environmental conditions.

1.4 SUBMITTALS

- A.
 - 1. Product Data for Credit Low-Emitting Materials: For all products, data sheets, MSDS, third-party certifications, or testing reports demonstrating compliance with relevant testing standards and VOC content limits.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Description: Engraved plastic.
- B. Nameplate Color: Black letters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces intended to support products.
- B. Verify that each product conforms to regulatory requirements and to specification requirements.

3.2 PREPARATION

- A. Clean surfaces to receive work.
- B. Protect surrounding elements from work of this section.

3.3 GROUNDING AND BONDING

- A. Make grounding electrode connections to meet regulatory requirements.
- B. Provide and use the following grounding electrode systems:
 - 1. Metal underground water pipe.
 - 2. Metal building frame.
 - 3. Concrete-encased electrode in building foundation.
- C. Make grounding and bonding connections to separately derived systems to meet regulatory requirements.

3.4 ANCHORS AND SUPPORTS

- A. Select fasteners and anchors that are suitable for surfaces to which they attach.
- B. Select fasteners and anchors with suitable load rating to support installed products.
- C. Do not use nails for permanent supports.
- D. Fasten supports to sheet metal framing channels using sheet metal screws.
- E. Fasten supports to metal surfaces and elements using machine screws and bolts or beam clamps.
- F. Do not use spring steel clips and clamps to fasten supports.
- G. Do not cut or drill structural elements.

3.5 IDENTIFICATION

- A. Secure nameplates to equipment and enclosures using noncorrosive screws or rivets, or appropriate adhesive.

3.6 FIELD QUALITY CONTROL

- A. Correction of Defective Work:

1. Replace defective products.

3.7 CLEANING

- A. Restore damaged corrosion-resistant coatings.

END OF SECTION 260500

SECTION 260501 - ELECTRICAL - GENERAL

PART 1 - GENERAL

1.1 Scope of Work:

- A. The scope of work under this section covers the electrical requirements of the heating system upgrading.
1. Contractor shall provide electric service to the new equipment as shown on the drawings.
 2. Contractor shall modify existing electric panels to allow connection of new equipment. Provide new electrical panels where indicated on the drawings.
 3. Contractor shall remove obsolete and abandoned circuits, conduit, and fittings.
 4. Contractor shall connect all new equipment with motor starters and disconnect switches as shown or required.
 5. Connect power and control wiring to new damper motors.
 6. Provide submittals, shop drawings, manufacturers cuts as required.
 7. All work to be performed in accordance with latest NEC and Local Electric Code and local authorities having jurisdiction.
 8. Provide electrical power to all new pumps and equipment in the Boiler Room.
 9. Provide and install new light fixtures at locations indicated on the drawings. Provide new switches and wiring to new circuit breaker in existing electrical panel.
 10. Contractor shall connect all terminal equipment (unit heater, RTU units, AHU units, etc.) and make all power and final control connections necessary for a complete and operating system.
 11. Provide new circuits required for temperature control system.
 12. Provide all required power supplies for all mechanical equipment, including starters, disconnects, and other required electrical devices, except where specified as furnished or factory installed by the manufacturer.
 13. Provide power supply to all temperature control modules, coordinate location with the Mechanical Contractor.
 14. All cutting and patching for the Electrical Contractor shall be performed by the Electrical Contractor.
 15. Furnish and install new duct smoke detectors as shown on the drawings. Perform NFPA reacceptance test of the existing fire alarm system upon completion of system upgrades. Provide Authority with copy of certification per NFPA standards.
 16. Electrical contractor shall coordinate the mechanical equipment demolitions with the mechanical contractor.

1.2 General:

- A. The entire installation shall be performed in a workmanlike manner, left completely connected, and ready to give proper and continuous service.
- B. All materials and work in connection with the foregoing items shall be as specified herein or as called for on the contract drawings.
- C. In furnishing a proposal, the Contractor confirms agreement to all items and conditions referred to herein and/or indicated on accompanying drawings; no consideration shall be granted for alleged misunderstanding.

1.3 Plans and Drawings:

- A. The Design Consultant's drawings, which constitute an integral part of this contract, shall serve as contract drawings. They indicate the general layout of the renovated electrical system and show arrangements of feeders, panelboards, switchboards, disconnects, conduits, service equipment, and other work.
- B. Field verification or correction of scale dimensions on plans is directed, since actual locations, distances, and levels are to be governed by local field conditions.
- C. Discrepancies shown on different plans, or between plans and actual field conditions shall be brought to the attention of the Design Consultant promptly for resolution.

1.4 Standards: All work, equipment, and materials furnished shall conform with the existing rules, requirements, and specifications of the Insurance Rating Organization having jurisdiction, the National Electric Code (NEC), the National Electric Manufacturer's Association (NEMA), the Institute of Electrical and Electronic Engineers (IEEE), the Insulated Power Cable Engineers Association (IPCEA), the American Society of Testing Materials (ASTM), the American National Standards Institute (ANSI), the requirements of the Occupational Safety Hazards Act (OSHA), and all other applicable Federal, State, and local laws and/or ordinances.

- A. All material and equipment shall bear the inspection labels of Underwriters' Laboratories, if the material and equipment is of the class inspected by said laboratories.
- B. Any paragraph of requirements in these specifications, or drawings, deviating from the rules, requirements, and specifications of the above organizations shall be invalid and their requirements shall hold precedent thereto. The rules, requirements, and specifications as set forth above and any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the bid price. Ignorance of any rule, requirement, or specification shall not be allowed as an excuse for non-conformity. Acceptance by the Design Consultant does not relieve the Contractor from any expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.
- C. Acceptance by the Design Consultant does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

1.5 Applicable Publications: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

A. Federal Specifications:

J-C-30A& Am-1	Cable and Wire, Electrical (Power, Fixed Installation)
W-B-811b&Am-2	Busway System, Power, Electrical, 600 Volts
W-F-406B&Int. Am-1 (GSA-FSS)	Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible
L-T-0075 (ARMY-MO)	Tape, Pipe-Coating; Pressure-Sensitive and Laminated
L-T-001512 (GSA-FSS)	Tape, Pressure Sensitive Adhesive, Pipe Wrapping
W-C-375a & Int. Am-4 (GSA-FSS)	Circuit Breaker, Molded Case; Branch Circuit & Service
W-C-538b	Conduit Boxes and Outlet Fittings, Floor, (for Rigid Metal Conduit)
W-C-596D/GEN	Connector, Plug, Receptacle and Cable Outlet, Electrical Power
W-C-1094	Conduit and Fittings; Non-Metallic, Rigid (Plastic)
W-F-406b & Int. Am-1	Fittings for Cable, Power, Electrical and Conduit, Metal Flexible
W-F-408C & Am-1	Fittings for Conduit, Metal, Rigid (Thick Wall and Thin Wall (EMT) Type)
W-J-800c	Junction Box, Extension, Junction and Am-3 Box; Cover, Junction Box (Steel, Cadmium, or Zinc Coated)
W-P-115a & Am-2	Panel, Power Distribution
W-P-455a & Am-4	Plate, Wall Electrical
W-S-610c	Splice Conductor.
W-S-893c & Int. Am-1 (GSA-FSS)	Switch, Toggle, and Mounting Strap, (Interchangeable)
W-S-986E	Switches, Toggle (Toggle & Lock) Flush Mounted (General Specification)
HH-1-510D	Insulation Tape, Electrical Friction
HH-1-553B	Insulation Tape, Electrical, (Rubber, Natural & Synthetic)

HH-1-595B	Insulation Tape, Electrical, and Am-1 Pressure Sensitive Adhesive, Plastic, General Purpose
WW-C-00540c	Conduit, Metal, Rigid: and (GSA-FSS) Coupling, Elbow, and Nipple, and Int. Am-1 Electrical Conduit: Aluminum (GSA-FSS)
WW-C-568A	Conduit, Metal, Rigid: Electrical Thin Wall Type (Electrical Metallic Tubing); Straight Lengths, Elbows and Bends.
WW-C-566b	Conduit, Metal Flexible
WW-C-581d & Am-3	Conduit, Metal, Rigid: and Coupling, Elbow and Nipple, Electrical Conduit: Zinc Coated

1.6 National Fire Protection Association (NEMA) Publication:

A. Latest Edition

1.7 National Fire Protection Association (NFPA) Publication:

A. No. 70 National Electrical Code - Latest Edition

1.8 Underwriters' Laboratories, Inc. (UL) Standards:

A. All equipment to be UL approved.

PART 2 - PRODUCTS

2.1 Materials and Equipment: Materials and equipment shall conform to the respective publications and other requirements specified below.

A. Other materials and equipment shall be as specified elsewhere herein and shall be the products of manufacturers regularly engaged in the manufacturing of such products.

Cable, Flexible: Federal Specification J-C-30.

Metallic Armored Cable: Type ACHH or ACT.

Non-Metallic Sheathed Cable: Type NM or NMC, with ground conductor.

Circuit Breakers:

Low Voltage Power Circuit Breakers: NEMA Standard SG 3.

Molded Case Circuit Breakers: Federal Specification W-C-375.

Conductors, Insulated: Federal Specification J-C-30, types as specified.

Conduit:

Zinc-coated Rigid Steel Conduit: Federal Specification WW-C-581.

Rigid Aluminum: Federal Specification WW-C-540

Connectors, Wire Pressure: Federal Specification W-S-610.

Device Plates: Federal Specification W-P-455.

Fittings, Cable and Conduit: Federal Specifications W-F-406 & W-F-408

Outlets:

Conduit, Cast Metal or Malleable Metal: Federal Specification W-C-586

Outlet Boxes:

Sheet-Steel Outlet Boxes: Federal Specification W-J-800

Panelboards: Dead-front construction, Federal Specification W-P-115

Lighting & Appliance Branch Circuit: Feeder and Distribution Panelboards, Class 1, Type as Specified Hereinafter
Load-Center Panelboards: Type 1, Class 2
Receptacles: Federal Specification W-C-596
Service Equipment: (Federal Specification W-S-865, Type NDD or NDS as indicated), (Federal Specification W-C-375), and Underwriters' Laboratories, Inc., Standard UL 869
Switches:
Enclosed Safety Switches: Federal Specifications W-S-865, Type NDS or NDD as indicated.
Toggle Switches, Multiple Type: Federal Specification W-S-893
Toggle Switches, Multiple Type: Federal Specification W-S-896
Tape:
Friction Tape: Federal Specification HH-1-510.
Plastic Tape: Federal Specification HH-1-595.
Rubber Tape: Federal Specification HH-1-553.

- 2.2 Approval of Materials and Equipment: Approval of materials and equipment shall be based on the manufacturer's published data. The label or listing of the Underwriters' Laboratories, Inc. will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this listing, the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements. A manufacturer's statement indicating complete compliance with the applicable Federal Specification, Military Specification, or standard of the American Society for Testing and Materials (ASTM), National Electrical Manufacturers, or other commercial standard is acceptable.
- 2.3 Shop Drawings: The Contractor shall submit complete manufacturer's data of all equipment, appurtenances and accessories, including the following:
- A. 3Ø, 60 Hz distribution and control equipment; lighting and receptacle panels; branch circuit feeders; luminaires; disconnect switches and starters; circuit breakers; all other electrical work items.
 - B. The Contractor shall submit all manufacturer's data at least one (1) month prior to the installation of the equipment. Equipment installation shall not be permitted until manufacturer's data has been reviewed by the Design Consultant.
- 2.4 Working Drawings: The contract drawings are not intended to serve as working or installation drawings. These drawings are for engineering and general arrangement purposes only. The Contractor shall prepare his own working drawings based on the contract drawings.
- A. With submittals the Contractor shall notify the Design Consultant of all departures from the contract drawings and specifications; otherwise, acceptance of such submittals will not constitute acceptance of the subject matter thereof only and not of any other structure, material or apparatus shown or indicated.
 - B. Materials or equipment shall not be ordered nor shall any work be performed by the Contractor before the materials, equipment, and the working drawings as herein required have been reviewed by the Design Consultant and the Contractor advised to furnish as submitted or furnish as otherwise noted.

- C. Upon completion of the work and as a condition precedent to obtaining final acceptance of the work, the Contractor shall furnish to the Design Consultant four (4) complete sets of instructions, technical bulletins, and any other printed matter, such as diagrams, prints, or drawings, containing full information required for the proper operation, maintenance, and repair of the equipment installed and for ordering spare parts.
 - D. All conduit 2" or greater in diameter shall be shown in scaled layout, both plan and elevations, to ascertain head clearances and to assure the avoidance of openings and other project components; i.e., doors, access openings, equipment, piping, instrumentation devices, vaults, etc.
- 2.5 Workmanship: All materials and equipment shall be installed in accordance with recommendations of the manufacturer as approved by the Design Consultant to conform with contract documents. The installation shall be accomplished by workmen skilled in this type of work.
- 2.6 Grounding: Except where specifically indicated otherwise, all exposed non-current carrying metallic parts of electrical equipment and neutral conductor of the wiring system shall be grounded.
- 2.7 Installation of Conduits and Fittings: Each piece of conduit installed shall be free from defects.
- A. The equivalent number of 90 degree bends in a single conduit run are limited to the following:

Runs in excess of 300 feet	0
Runs of 300 feet to 201 feet	1
Runs of 200 feet to 101 feet	2
Runs of 100 feet and less	3
 - B. Factory bent elbows or field bent elbows with approved tools may be used. Heating of conduit to facilitate bending is prohibited.
 - C. All exposed conduit shall be installed, either parallel or perpendicular to structural members, unless impractical, and shall be grouped wherever possible. Conduit shall be attached to structural components with approved supports spaced a maximum of six (6') apart and shall form a neat rigid installation. Conduit supported from building walls shall be installed with at least 1/4" clearance from the walls to prevent the accumulation of dirt and moisture behind the conduit.
 - D. Where conduit goes through a wall or floor, all openings will be core drilled in sufficient diameter to allow for the installation of a fireproof seal. All wall and floor penetration shall be fitted with a fireproof seal.
- 2.8 Conduit: Under this section the Contractor shall furnish and install all conduit and conduit fittings to complete the installation of all electrically operated equipment as specified herein and as shown on the contract drawings.
- A. Conduits passing through sleeves in interior walls and floors shall be tightly caulked.
- 2.9 Conductors: Under this section, the Contractor shall furnish and install all wires and cables for power, and lighting as required to complete the electrical installations.
- A. Each coil or reel of insulated wire and cable furnished shall bear a tag, containing the Underwriters' Laboratories approval stamp (providing cable is of the class inspected by the

said laboratory), name of manufacturer, trade designation, month and year of manufacture, and in no case shall be more than six months old. Wire and cable shall not have been stored in the weather outdoors.

- B. All conductors shall be copper and stranded.
- C. The following information for each size of wire and cable shall be submitted to the Design Consultant for acceptance:

Name of cable manufacturer;
 Minimum insulation resistance in megohms;
 Per 1000 ft. at 15.5 deg C;
 Number and size of strands in each conductor;
 Conductor insulation in mils;
 Sheath thickness in mils;
 Average OD of bare conductor;
 Average overall diameter of finished cable;
 Weight per 1000' of finished cable.

- D. Cable shall be shop tested in accordance with the latest standards and applicable test procedures of the specifications of the IPCEA and certified data shall be submitted in compliance with this requirement. Sample lengths of cable shall be submitted to the Design Consultant, if requested.

1. 600 V Single Conductor Cable:

- a. This cable shall be composed of stranded copper conductors insulated with a heat and moisture resistant cross linked synthetic polymer. Cables shall be rated not less than 600 V, and shall be for circuits operating in dry locations at a maximum conductor temperature of 90°C dry and temperature of 75°C wet. Cables shall be Underwriters' Laboratories listed as Type XHHW with flame resistant jacket, FR-1.
- b. The conductors shall be stranded annealed copper, the individual strands of which shall, before stranding, be in accordance with ASTM Designated B8 and B189.
- c. The conductors shall be insulated with properly flame-retardant, cross-linked synthetic polymer insulating compound.
- d. A suitable barrier tape shall be applied next to the conductor under the primary insulation, where needed to provide free stripping.
- e. The minimum average thickness of the insulation shall conform to the requirements of Table D. The insulation shall be circular in cross section and so centered that the minimum wall thickness shall be not less than the minimum average thickness shown in Table D.

TABLE D

Cable Type	Size of Conductor AWG & MCM	Insulation Thickness in Mils
Single Conductor	14 to 10	30
Heat and Moisture Resistant 600 V	8 to 2	45
For Conduit & Ducts	1 to 4/0	55

2. Color Coding: Conductor insulation shall be color coded as follows:
 - 208 Y/120 V System
 - Phase A - Black
 - Phase B - Red
 - Phase C - Blue
 - Neutral - White

Single conductor AC control wire shall be RED.

2.10 Labels:

- A. Panelboard Directories: Use new card provided by equipment manufacturer. Type identification of function and location for each new circuit using final room names and/or numbers as selected by District. Permanently fasten in place and protect behind glass or heavy gauge non-yellowing plastic cover. Permanently label equipment to match. As-built drawings shall include all circuit labeling, cabinet labeling and any other markings required. All labeling shall be neat and accurate.
- B. Operational Identification and Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of the electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install screw attached plastic signs or similar equipment identification, instruction or warning on switches, outlets and other controls, devices, and covers or electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for the intended purposes.

2.11 Outlet Boxes: The Contractor shall furnish and install all outlet boxes for power and lighting conforming with the requirements of this section.

- A. Products: All boxes shall be galvanized steel, octagonal or square standing boxes of sizes adequate for the number of conductors installed.

2.12 Pull and Junction Boxes:

A. Description:

1. The Contractor shall furnish and install all junction and pullboxes as shown on the contract drawings and as required to properly install the electrical systems.
2. Boxes specified in this section are of the type which must be utilized where standard octagonal and square sheet steel or cast boxes as specified in outlet box section cannot be used.
3. Indoor Locations:
 - a. Pull and junction boxes for indoor exposed use shall be galvanized sheet steel. Provide security screws on all boxes installed in public areas.
4. Installation:
 - a. All junction boxes and pull boxes shall be solidly attached to structural members prior to installation of conduit and set true and plumb. Wooden plastic plugs are not permitted for securing boxes to concrete.

- b. Where control wires must be interconnected in a junction box, terminal boards, consisting of an adequate number of screw type terminals shall be installed. Terminal board current carrying parts must be of ample capacity to carry the full load current of the circuits connected thereto. Approximately 20% of the total amount of terminals provided shall consist of spare terminals. Terminals shall be lettered and/or numbered to conform with the wiring diagrams.
- 2.13 Device Plates: Device plates shall be of the one piece type and shall be provided for all outlets and fittings to suit the devices installed. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel or cast metal having rounded or beveled edges. Plates on finished walls shall be stainless steel finish. Screws shall be of metal with countersunk heads in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates installed in wet locations shall be gasketed.
- 2.14 Receptacles and Switches:
 - A. Receptacles: Single receptacles NEMA 5-15 shall be specification grade rated at 15 amps as indicated, 125 volts, two pole, three wire, grounded type with polarized parallel slots, in accordance with Federal Specification W-C-596. Bodies shall be of brown phenolic compound supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side or back wired with two screws per terminal, or shall have pressure type screwless terminals with suitable conductor release arrangement. The third grounding pole shall be connected to the metal mounting yoke.
 - B. GFI-Type Receptacles:
 - 1. Furnish and install receptacles with ground fault circuit interrupters as indicated on the drawings and specifications.
 - 2. Receptacles shall be NEMA 5-20R configuration with 120 VAC, 15 ampere circuit rating and brown in color.
 - 3. All receptacles shall be of such depth as to permit mounting in outlet boxes 1 1/2" or greater in depth without the use of spacers. Units shall have line and load terminal screws such that connection to load terminals will provide ground fault protection for other receptacles or loads connected to these terminals.
 - 4. All receptacles shall accept standard duplex wall plates.
 - 5. All receptacles shall be noise suppressed to reduce nuisance tripping and shall be Underwriters' Laboratories listed.
 - C. Switches: Contractor shall use one-way, three-way, or four-way switches as required to match existing. Switches shall be rated 20A, 120-277 VAC.
- 2.15 Molded Case Circuit Breakers: Individual panelboard mounted circuit breakers shall be Molded Case Circuit Breakers.
 - A. General: Circuit breakers shall be UL listed and meet NEMA Standard No. AB1-1975, and Federal Specification No. W-C-375B/GEN where applicable. Breakers covered under this specification will be applied in panelboards.
 - B. Construction: Molded case circuit shall have over center, trip-free toggle-type operating mechanisms with quick-make, quick-break action and positive handle indication. Three pole breakers shall be common trip. Each circuit breaker shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole. The circuit breaker

shall be constructed to accommodate the supply connections at either end. Circuit breaker operating handles shall assume a center position when tripped. All breakers shall be calibrated for operation in an ambient temperature of 40°C. A button shall be provided on the cover for mechanically tripping the circuit breaker.

1. Circuit breakers shall be suitable for mounting and operating in any position.

C. Terminations: Breakers shall have removable lugs. Lugs shall be UL listed for copper only conductors. Breakers shall be UL listed for installation of crimp lugs.

2.16 Supporting Devices:

A. Steel Supports:

1. The contractor shall furnish and install structural steel supports for mounting and installing all electrical, lighting, and equipment furnished under this contract.
2. Where the weight of equipment exceeds 50 pounds and is supported from walls, ceilings, columns and/or beams, such supporting steel sizes, methods and locations shall be submitted to the Design Consultant for review.

B. Support Fastening and Locations:

1. All equipment fastenings to columns, steel beams, and trusses shall be by beam clamps or welded. No holes shall be drilled in the steel. Where supports or hangers are required for heavy electrical equipment, and where required, additional sections shall be provided for a safe installation.
2. All holes in hung ceilings for support rods, conduits and other equipment shall be made adjacent to bars where possible, to facilitate removal of ceiling panels.

2.17 Restoration of Surfaces:

A. Work Included: This Section covers the restoration of existing surfaces and related items which are damaged or disturbed as a result of the Contractor's operations.

B. Contractor's Responsibility:

1. General:
 - a. Except as otherwise specified or shown, grades, and surfaces shall be restored so as to be equal to or better than the original condition which existed at the time they were damaged or disturbed. The Contractor's obligation will not be considered as fulfilled until all restoration work has been approved by the Design Consultant and by public authorities having jurisdiction.
2. Conflicting Requirement: If any part of this specification is in conflict with the requirements of a public authority or public utility having jurisdiction over the work described, then the public authority's requirement shall govern.
 - a. However, where this specification exceeds the public authority requirement, and is acceptable to the public authority or public utility, then this specification shall govern.

2.20 Certification:

A. Upon completion of the work, the Contractor shall obtain certificates of inspection and approval from the National Board of Fire Underwriters' or similar inspection organization having jurisdiction and shall deliver same to the Design Consultant and Authority.

- B. All material and equipment shall bear the inspection labels of Underwriters' Laboratories, if the material and equipment is of the class inspected by said laboratories.
 - C. Any paragraph of requirement in these specifications or drawings, deviating from the rules, requirements and specifications of the above organizations shall be invalid and their requirements shall hold precedent thereto. The Contractor shall be held responsible for adherence to all rules, requirements and specifications as set forth above. Any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the bid price. Ignorance of any rule, requirement, or specification shall not be allowed as an excuse for non-conformity. Acceptance by the Design Consultant does not relieve the Contractor from the expense involved for the correction of any errors, which may exist in the drawings submitted or in the satisfactory operation of any equipment.
- 2.21 Inspection: The Contractor shall furnish all instruments and a qualified Design Consultant to properly perform all tests required. Written notice of all tests shall be given the Design Consultant at least two weeks in advance.
- A. Unless waived in writing by the Design Consultant, all tests shall be made in the presence of a duly authorized representative of the Design Consultant. When the presence of such representative is so waived, sworn statements, in duplicate, of the tests made and the results thereof, shall be furnished to the Design Consultant by the Contractor.
 - B. All electrical circuits shall be tested to insure circuit continuity, insulation resistance, proper slicing, and freedom improper grounds.
 - C. Necessary adjustments and testing shall be made in cooperation with the respective manufacturers and other contractors when necessary. All tests shall be made in accordance with the latest standards of the ANSI, IPCEA, IEEE and NEMA.
 - 1. Costs: Cost of all test shall be borne by this Contractor and shall be included in the contract price.
 - 2. 600V and Below Equipment: Each panel shall be tested with mains disconnected from the feeder, branches connected, branch circuit breakers closed, all fixtures in place and permanently connected, lamps removed or omitted from the sockets, and all wall switches closed. Feeders shall be tested with the feeders disconnected from the panels. Each individual power circuit shall be tested at the panel with the power equipment connected for proper operation.
 - 3. Megohmmeter tests of the insulation resistance of power feeders shall be conducted. The results will be accepted when the megohmmeter shows the insulation resistance to be not less than one megohm per 100 volts at 20°C using a 1000 volt megohmmeter
 - 4. The grounding system shall have a resistance to ground of two ohms or less when measured by a megohmmeter or similar device.
- 2.22 Operational Tests: The equipment shall be given an operational test to determine that all components including motors, controls, protective and switching devices and auxiliary associated equipment are in operable condition and can function as described and shown on relevant specifications, operating instructions, and drawings.
- A. After completion of work, the Contractor shall thoroughly test the entire electrical system, including electrical work required for instrumentation, control and power, and shall adjust electrical system as required.

- B. The Contractor shall include in his work the providing of necessary factory trained supervision to check over equipment for proper functioning before putting the equipment into operation. This shall include establishing a simulated fault on checking out the coordination of the protective devices.
- 2.23 Documentation Procedures: Signed commitments are required. The transfer of electrical systems to District for operation will not proceed until guarantees, warranties, performance certifications, maintenance agreements and similar commitments to be signed by Contractor and other entities have been executed and transmitted to Design Consultant for placement in the Authority's records.
- A. The work of this paragraph is in addition to and does not supersede testing and adjusting specified in other sections of the specifications. The Contractor shall submit to the Design Consultant, test records, and reports for all testing. Megohmmeter testing (Insulation Resistance Test) of all incoming and outgoing cables, distribution and power panels, motor control centers, etc., shall be done after the cables are in place, and just prior to final termination.
- B. The Contractor shall furnish all test equipment as required.
- 2.24 Closeout Procedures: General coordination is required. Close-out procedures shall be sequenced properly so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated.
- A. System performance test runs are required. Test runs of electrical systems shall be coordinated with test runs of equipment served thereby.
- B. A check of each item in each system shall be made to determine that it is set for proper operation. With Authority's Representative and Design Consultant present, the Contractor shall operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During or following test runs, the Contractor shall make final corrections or where possible, including noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. The Contractor shall provide testing or inspection devices requested for Design Consultant to permit observation of actual system performances and shall demonstrate that controls and items requiring service or maintenance area accessible.
- C. Cleaning and lubrication is required. After final performance test run of each electrical system, the Contractor shall clean system both externally and internally, shall comply with manufacturer's instructions for lubrication of both power and hand operated equipment, and shall remove excess lubrication, touch up minor damage to factory-painted finishes and other painting specified as electrical work, and shall refinish work where damage is extensive.
- D. General operating instructions are required. In addition, to specific training of District's operating personnel, specified in the individual sections, and in addition to preparation of written operating instructions and compiled maintenance manuals specified elsewhere in these specifications, the Contractor shall provide general operating instructions for each operational system and equipment item of electrical work, and coordinate instructions with instruction for mechanical work, and other equipment where associated with electrical systems or equipment.
- E. The Contractor shall describe each basic electrical system, and shall explain identification system, displayed diagrams, signals, alarms and audio visual provisions.

- F. The Contractor shall describe interfaces with mechanical equipment, including interlocks, sequencing, startup, shutdown, emergency, safety, system failures, security and similar provisions.
- G. The Contractor shall outline basic maintenance procedures and major equipment turnaround requirements, including adjustments to optimize output and efficiency of electrical systems.
- H. The Contractor shall display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage of extra materials, meter readings and similar service items.
 - 1. Continued Systems Operations: The Contractor shall coordinate District's takeover of electrical systems with takeover of mechanical systems, including the provision of skilled electrical operating and maintenance personnel until the time District's personnel take over operation of entire mechanical and electrical plant. The Contractor shall respond promptly with continued consultation and services (beyond takeover date) on electrical systems, matching required continued services on associated mechanical systems and equipment until the end of the warranty period.
 - 2. Cleaning: As the work progresses and also before the completion and final acceptance of the work, the Contractor shall remove all rubbish and unused materials resulting from the work and shall leave the structures and grounds in a neat condition satisfactory to the Design Consultant. Prior to final acceptance, the Contractor shall also remove all temporary structures which he may have erected for his own use.
 - 3. The Contractor will be responsible for safeguarding and protecting their own work, materials, tools, and equipment.

2.25 Guarantee:

- A. The following equipment is to be furnished under this section of the specifications and shall be guaranteed against defective materials, design, and workmanship for a period of one (1) year from the date of acceptance, either for beneficial use or final acceptance, whichever is earlier:
 - 1. Control Wiring;
 - 2. Receptacles & Switches;
 - 3. Circuit Breakers.

END OF SECTION 260501

SECTION 260519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 SUBMITTALS

- A. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Acceptable Manufacturers:
 - 1. Alcan Aluminum Corporation; Alcan Cable Div.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
 - 6. Or approved equal.
- B. Conductor Material: Copper complying with NEMA WC.
- C. Conductor Insulation Types: Type THHN-THWN complying with NEMA WC 5 or 7.
- D. Multi-conductor Cable: Metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Acceptable Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.

3. Hubbell/Anderson.
 4. O-Z/Gedney; EGS Electrical Group LLC.
 5. 3M Company; Electrical Products Division.
 6. Or approved equal.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type XHHW, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway Metal-clad cable, Type MC.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway Metal-clad cable, Type MC.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

3.2 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. 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.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 23.
- F. Seal around cables penetrating fire-rated elements according to Division 7.

- G. Identify and color-code conductors and cables according to Division 23.
- H. Make splices and taps that are compatible with conductor material and that possess comparable or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.3 FIELD QUALITY CONTROL

- A. Testing: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes grounding of electrical systems and equipment. Requirements specified in this Section may be supplemented by requirements of other Sections.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled under UL 467 as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
- C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

1.3 SUBMITTALS

- 1. Product Data for Credit Low-Emitting Materials: For all products, data sheets, MSDS, third-party certifications, or testing reports demonstrating compliance with relevant testing standards and VOC content limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Apache Grounding/Erico Inc.
 - 2. Boggs, Inc.
 - 3. Chance/Hubbell.
 - 4. Copperweld Corp.
 - 5. Dossert Corp.
 - 6. Erico Inc.; Electrical Products Group.
 - 7. Framatome Connectors/Burndy Electrical.
 - 8. Galvan Industries, Inc.
 - 9. Harger Lightning Protection, Inc.
 - 10. Hastings Fiber Glass Products, Inc.
 - 11. Heary Brothers Lightning Protection Co.
 - 12. Ideal Industries, Inc.
 - 13. ILSCO.
 - 14. Kearney/Cooper Power Systems.
 - 15. Korns, C. C. Co.; Division of Robroy Industries.
 - 16. Lightning Master Corp.
 - 17. Lyncole XIT Grounding.
 - 18. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - 19. Raco, Inc.; Division of Hubbell.
 - 20. Robbins Lightning, Inc.
 - 21. Salisbury, W. H. & Co.

- 22. Superior Grounding Systems, Inc.
- 23. Thomas & Betts, Electrical.
- 24. Or approved equal.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 23.
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare, Solid-Copper Conductors: ASTM B 3.
- G. Assembly of Bare, Stranded-Copper Conductors: ASTM B 8.
- H. Bare, Tinned-Copper Conductors: ASTM B 33.
- I. Copper Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
- J. Copper Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- K. Tinned-Copper Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- L. Ground Conductor for Overhead Distribution: No. 4 AWG minimum, soft-drawn copper.
- M. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulated spacer.
- N. Connectors: Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items. Bolted type or exothermic-welded type, in kit form, selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad.
 - 1. Size: 3/4 by 120 inches in diameter.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- D. Equipment Grounding Conductors: Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
 - 1. Install insulated equipment grounding conductors in feeders and branch circuits and receptacle circuits.
 - 2. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
 - 3. Air-Duct Equipment Circuits: Install an insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- E. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- F. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers or supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- G. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- H. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- I. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.
- J. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- K. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.
- L. Connections: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
6. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
7. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
8. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
9. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
10. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
11. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.2 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements. Test completed grounding system at each location where a maximum ground-resistance level is indicated and at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
2. Provide drawings locating each ground rod, ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Nominal maximum values are as follows:
 - a. Equipment Rated 500 kVA and Less: 10 ohms.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 SUBMITTALS

- A. Product Data: For steel slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Acceptable Manufacturers:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - h. Or approved equal.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Acceptable Manufacturers:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 5) Or approved equal.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Acceptable Manufacturers:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.

- 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 6) Or approved equal.
- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 5 for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. 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 single-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) 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, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in 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 (90 kg).
- 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 (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 5 for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 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 (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260534 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets indicated.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Acceptable Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Alfex Inc.
 - 3. Anamet Electrical, Inc.; Anaconda Metal Hose.
 - 4. Electri-Flex Co.
 - 5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 - 6. LTV Steel Tubular Products Company.
 - 7. Manhattan/CDT/Cole-Flex.
 - 8. O-Z Gedney; Unit of General Signal.
 - 9. Wheatland Tube Co.
 - 10. Or approved equal.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Set-screw or compression type.
- E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Acceptable Manufacturers:

1. American International.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arncorp Corp.
4. Cantex Inc.
5. Certaineed Corp.; Pipe & Plastics Group.
6. Condux International.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; Division of Hubbell, Inc.
12. Spiralduct, Inc./AFC Cable Systems, Inc.
13. Thomas & Betts Corporation.
14. Or approved equal.

B. ENT: NEMA TC 13.

C. PVC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

E. LFNC: UL 1660.

2.3 METAL WIREWAYS

A. Acceptable Manufacturers:

1. Hoffman.
2. Square D.
3. Or approved equal.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R as applicable.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Hinged type.

F. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

- A. Acceptable Manufacturers:
 - 1. Hoffman.
 - 2. Lamson & Sessions; Carlon Electrical Products.
 - 3. Or approved equal.
- B. Description: PVC plastic extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.5 SURFACE RACEWAYS

- A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.
 - 1. Acceptable Manufacturers:
 - a. Butler Manufacturing Co.; Walker Division.
 - b. Enduro Composite Systems.
 - c. Hubbell, Inc.; Wiring Device Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.
 - h. Or approved equal.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Acceptable Manufacturers:
 - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 - 2. Emerson/General Signal; Appleton Electric Company.
 - 3. Erickson Electrical Equipment Co.
 - 4. Hoffman.
 - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - 6. O-Z/Gedney; Unit of General Signal.
 - 7. RACO; Division of Hubbell, Inc.
 - 8. Robroy Industries, Inc.; Enclosure Division.
 - 9. Scott Fetzer Co.; Adalet-PLM Division.
 - 10. Spring City Electrical Manufacturing Co.
 - 11. Thomas & Betts Corporation.
 - 12. Walker Systems, Inc.; Wiremold Company (The).
 - 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
 - 14. Or approved equal.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Floor Boxes: Nonmetallic, nonadjustable, round.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic finished inside with radio-frequency-resistant paint.
- J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors:
 - 1. Exposed: EMT.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, nonmetallic.
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

- D. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- E. Do not install aluminum conduits embedded in or in contact with concrete.

3.2 INSTALLATION

- A. 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.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 23.
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- I. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- J. Tighten set screws of threadless fittings with suitable tools.
- K. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

- L. 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.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- O. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- Q. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260534

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.
2. Concrete-encased conduit, ducts, and duct accessories.
3. Boxes.

1.2 ACTION SUBMITTALS

A. Product Data: For ducts and conduits, duct-bank materials, manholes, handholes, and boxes, and their accessories.

B. Shop Drawings:

1. Factory-Fabricated Boxes Other Than Precast Concrete:
 - a. Include dimensioned plans, sections, elevations, accessory locations, and fabrication and installation details.
 - b. Include duct entry provisions, including locations and duct sizes.

1.3 INFORMATIONAL SUBMITTALS

A. Duct-Bank Coordination Drawings: Show duct profiles, locations of expansion fittings, and coordination with other utilities and underground structures on Drawings signed and sealed by a qualified professional engineer.

B. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

C. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.

D. Source quality-control reports.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

- A. Comply with ANSI C2.

2.2 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. RNC: NEMA TC 2, Type EPC-40-PVC and] Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Underground Plastic Utilities Duct: NEMA TC 2, UL 651, ASTM F 512, Type EPC-80 and Type EPC-40, with matching fittings complying with NEMA TC 3 by same manufacturer as the duct.
- B. Duct Accessories:
 - 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers.
 - 2. Warning Tape: Underground-line warning tape specified in Division 23.
 - 3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi red concrete and labeled "ELECTRIC."

PART 3 - EXECUTION

3.1 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80, Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- B. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.
- C. Underground Ducts Crossing Paved Paths, Walks and Driveways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.2 DUCT INSTALLATION

- A. Install ducts according to NEMA TCB 2.

- B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.
- C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 both horizontally and vertically, at other locations unless otherwise indicated.
- D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- E. Installation Adjacent to High-Temperature Steam Lines: Where duct banks are installed parallel to underground steam lines, perform calculations showing the duct bank will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct bank crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- F. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Division 26.
- G. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- H. Pulling Cord: Install 100-lbf-test nylon cord in empty ducts.
- I. Concrete-Encased Ducts: Support ducts on duct separators.
 - 1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms for pipes less than 6 inches in nominal diameter.
 - 2. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic.
 - 3. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
 - 4. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than five spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
 - 5. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
 - 6. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
 - b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

7. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
 8. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
 9. Concrete Cover: Install a minimum of 3 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.
 10. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Division 3. Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
- J. Warning Planks: Bury warning planks approximately 12 inches above direct-buried ducts and duct banks, placing them 24 inches o.c. Align planks along the width and along the centerline of duct bank. Provide an additional plank for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional planks 12 inches apart, horizontally.
- K. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches). Space additional tapes 12 inches apart, horizontally.

3.3 GROUNDING

- A. Ground underground ducts and utility structures according to this specification.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
 3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in this specification.
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.5 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI 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.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.

- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or comparable process.

D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.

2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.7 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 3. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs:
 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 3. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. Warning label and sign shall include, but are not limited to, the following legends:
 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
 3. Insert names and wording of warning signs or labels; e.g., arc-flash, multiple services and voltages, and others.

2.8 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
 1. Engraved legend with black letters on white face <Insert colors>.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or comparable process. Minimum letter height shall be 3/8 inch (10 mm).

- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or comparable process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or comparable process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 9 for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: 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. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

- G. Painted Identification: Comply with requirements in Division 9 for surface preparation and paint application.

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: Install labels at 30-foot (10-m) maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power – Red Labels with White Letters
 - 2. Power – Black Labels with White Letters
- 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 colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) 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. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

- G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- I. 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.
- J. 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.
- K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.
- L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Adhesive film label Self-adhesive, engraved, laminated acrylic or melamine label Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) 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 provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Single- and double-pole snap switches.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.
 - f. Or approved equal.
 - 2. Multi-outlet Assemblies:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Wiremold Company.
 - c. Or approved equal.

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.

- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade in accordance to MSS Standards section 5030.50 (B)1.
- C. GFCI Receptacles: Straight blade, non-feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.

2.3 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
- B. Snap Switches: General-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
 - 1. Switch: 20 A, 120/277-V ac.
 - 2. Receptacle: NEMA WD 6, Configuration 5-15R.

2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

2.5 FINISHES

- A. Color:
 - 1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- C. Remove wall plates and protect devices and assemblies during painting.
- D. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 23.
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 CONNECTIONS

- A. Ground equipment according to Division 23.
- B. Connect wiring according to Division 23.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, arranged by designation.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire 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.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:
- B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of luminaire.
- D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

2.2 LUMINAIRE REQUIREMENTS

- 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. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. CRI of minimum 80 ; CCT of 3500 K
- F. Rated lamp life of minimum 50,000 hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage – see Luminaire Schedule on plans.
- J. Housings:
 - 1. Aluminum or steel housing; finish.as per luminaire schedule on plans

2.3 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Division 23 for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, as per manufacturer's specifications..
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Aircraft cable shall be 1/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
 - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
 - 1. Ceiling mount with two minimum 5/32-inch diameter aircraft cable supports adjustable to 36 inches.
- H. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
 - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- I. Ceiling-Grid-Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- J. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 23.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265119

ESSEX COUNTY COMMUNITY COLLEGE CAFETERIA RENOVATIONS AT MEGA STRUCTURE

303 UNIVERSITY AVENUE, NEWARK, NJ 07102

Eng. No.	24047937500
Arch. No.	21AC00012400
Date	3/10/22
Checked	MTW
Drawn	RPC

MATTHEW T. WOLFE, AIA
THE REGISTERED ARCHITECT License No. NJ21A01963400

Revisions:

LAN ASSOCIATES
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445 GODWIN AVENUE, MIDLAND PARK, N.J. 07432 (201)447-6400

COVER SHEET
CAFETERIA RENOVATIONS AT MEGA STRUCTURE
 ESSEX COUNTY COMMUNITY COLLEGE
 303 UNIVERSITY AVENUE
 NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
 File No. 2030202T001

T0.01

SYMBOL LEGEND

	= PROJECT NORTH
	= ROOM NUMBER ROOM NAME
	= REVISION CLOUD
	= BREAK LINE
	= ENLARGED PLAN CALLOUT
	= ELEVATION CALLOUT
	= SECTION CALLOUT
	= EXISTING DOOR TO BE REMOVED
	= EXISTING DOOR
	= NEW DOOR
	= EXISTING WALL
	= NEW WALL (HATCH PATTERNS MAY VARY)
	= REMOVE PORTION OF EXISTING WALL
	= EXISTING OBJECT TO BE REMOVED
	= CONSTRUCTION KEYNOTE
	= WALL TYPE
	= DOOR TYPE

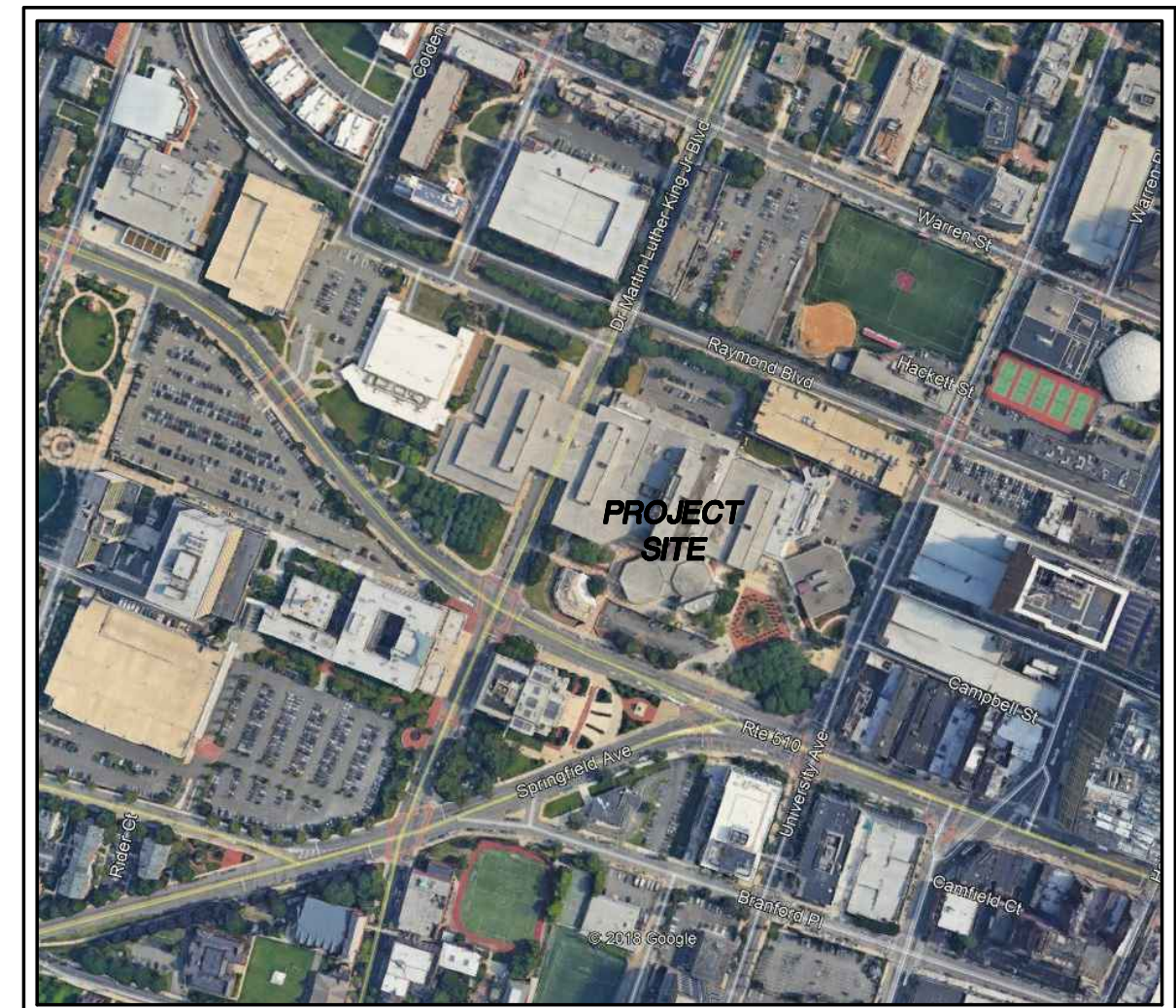
CODE REFERENCES

- JURISDICTION: STATE OF NEW JERSEY
- APPLICABLE CODES: INTERNATIONAL BUILDING CODE (IBC) 2018 - NJ EDITION
 NJAC 5-23-3.15 NATIONAL STANDARD PLUMBING CODE/2018
 IFCC INTERNATIONAL FUEL GAS CODE / 2018
 NJAC 5-23-3.16 NATIONAL ELECTRICAL CODE (NFPA 70)/2017
 ASHRAE 90.1-2016
 NJAC 5-23-3.20 INTERNATIONAL MECHANICAL CODE/2018
 NJAC 5-23-6 REHABILITATION CODE
- ICC A117.1-2017 USE GROUP CLASSIFICATION: ASSEMBLY GROUP A-3.

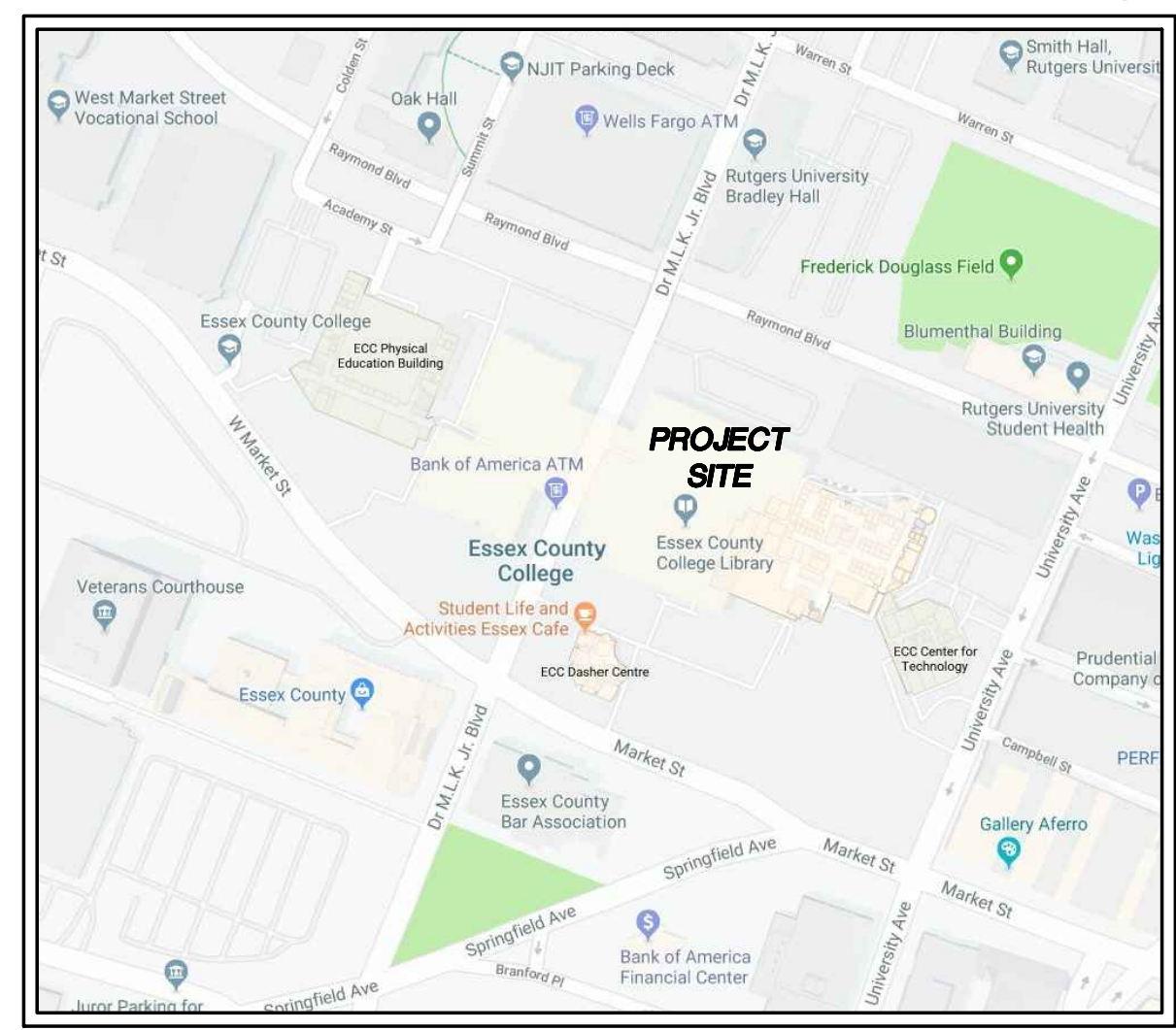
GENERAL NOTES

- ALL WORK SHALL CONFORM TO THE 2018 INTERNATIONAL BUILDING CODE / NJ EDITION AND ALL OTHER APPLICABLE CODES, ORDINANCES, ETC. FOR NEW JERSEY STATE AND THE LOCAL AUTHORITY HAVING JURISDICTION.
- CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE AND FAMILIARIZING HIMSELF WITH THE EXISTING CONDITIONS AND SCOPE OF THE WORK PRIOR TO SUBMITTING BIDS AND COMMENCING WORK.
- CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL SAFE WORKING CONDITIONS AND SHALL OBSERVE ALL SAFETY REQUIREMENTS ESTABLISHED BY JURISDICTIONAL AGENCIES AND THE OWNER. WHERE CONFLICTS EXIST, THE MORE STRINGENT REQUIREMENT SHALL APPLY. CARE SHALL BE EXERCISED TO AVOID ENDANGERING PERSONNEL OR STRUCTURES.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION METHODS, PROCEDURES AND JOB SITE CONDITIONS INCLUDING SAFETY. CONSTRUCTION SHALL BE PERFORMED IN SUCH A MANNER TO PROTECT WORKMEN, OCCUPANTS AND THE PUBLIC FROM INJURY AND ADJOINING PROPERTY SHALL BE PROTECTED FROM DAMAGE BY USE OF SCAFFOLDING, UNDERPINNING OR OTHER APPROVED METHOD. THE CONTRACTOR SHALL REPAIR ANY AND ALL DAMAGE CAUSED DURING OR RESULTING FROM HIS OPERATIONS IN KIND TO THE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST TO THE OWNER.
- THE CONTRACTOR SHALL MAINTAIN THE JOB SITE IN A CLEAN, DEBRIS FREE CONDITION. THE DUST RESULTING FROM REMOVALS SHALL BE CONTROLLED SO AS TO PREVENT ITS SPREAD TO OCCUPIED PORTIONS OF THE BUILDING AND TO AVOID CREATION OF A NUISANCE IN THE SURROUNDING AREA.
- CONTRACTOR SHALL SECURE AND PAY FOR ALL REQUIRED PERMITS, FEES, APPROVALS, ETC. PRIOR TO COMMENCING WORK AND SHALL SECURE CERTIFICATE OF OCCUPANCY UPON COMPLETION OF WORK.
- CONTRACTOR SHALL BE RESPONSIBLE TO DISPOSE OF ALL DEMOLISHED MATERIAL OFF SITE IN AN APPROVED MANNER. THE OWNER SHALL BE CONSULTED PRIOR TO DISPOSAL OF ANY SALVAGED OR EXCESS MATERIALS AT THE COMPLETION OF THE PROJECT.
- UPON COMPLETION OF WORK, ALL EXCESS MATERIAL, DEBRIS, ETC. SHALL BE REMOVED AND THE WORK AREA SHALL BE LEFT CLEAN TO THE OWNER'S SATISFACTION.
- ALL WORK SHALL BE SCHEDULED IN COMPLIANCE WITH THE OWNER'S REQUIREMENTS FOR THE USE OF THE EXISTING FACILITY.
- CONTRACTOR SHALL FURNISH ALL EQUIPMENT THAT MAY BE REQUIRED TO PERFORM THE WORK INDICATED IN A SAFE AND ORDERLY MANNER.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE RELOCATION AND TEMPORARY SUPPORT OF ANY UTILITIES ENCOUNTERED DURING THE COURSE OF HIS WORK AND TO ENSURE THE OWNER'S FACILITY TO BE OPERATIONAL.
- THE CONTRACTOR SHALL REVIEW DRAWINGS AND FIELD VERIFY ALL DIMENSIONS, CONDITIONS AND ELEVATIONS PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES AND ADDRESS ALL QUESTIONS TO ARCHITECT PRIOR TO COMMENCING WORK.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING, PATCHING, FILLING AND CLEANING UPON COMPLETION OF WORK.
- THE CONTRACTOR SHALL NOT SCALE DRAWINGS FOR DIMENSIONS. ALL WRITTEN OR DIMENSIONED INFORMATION TAKES PRECEDENCE OVER THE DRAWING.
- THE CONTRACTOR SHALL SUBMIT, WHERE REQUIRED, SHOP DRAWINGS TO THE ARCHITECT FOR APPROVAL PRIOR TO THE START OF FABRICATION OF THOSE ITEMS. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- THE CONTRACTOR SHALL PROVIDE THE OWNER AND ARCHITECT WITH CERTIFICATES OF INSURANCE PRIOR TO STARTING THE WORK.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR SHORING AND BRACING OF EXISTING STRUCTURES AS NEEDED TO COMPLETE THE NEW WORK.
- ALL MANUFACTURER'S MATERIALS, COMPONENTS, FASTENERS, ASSEMBLIES, ETC. SHALL BE HANDLED AND INSTALLED IN ACCORDANCE TO WITH MANUFACTURERS INSTRUCTIONS AND RECOMMENDATIONS. WHERE BRAND NAMES AND MANUFACTURED PRODUCTS ARE CALLED FOR, APPROVED EQUALS WHICH MEET APPLICABLE STANDARDS AND SPECIFICATIONS MAY BE SUBSTITUTED WITH WRITTEN PERMISSION OF THE ARCHITECT AND THE OWNER. WHENEVER BRAND NAMES OR SPECIFIC PRODUCT SYSTEMS ARE INDICATED IT SHALL BE CLEARLY UNDERSTOOD THAT SUCH IDENTIFICATION IS FOR THE PURPOSE OF ILLUSTRATING THE TYPE OF PRODUCT AND DEGREE OF QUALITY DESIRED. SUCH IDENTIFICATION IN NO WAY PRECLUDES THE CONTRACTOR FROM USING PRODUCTS OF OTHER MANUFACTURERS WHICH CAN BE SHOWN IN ADVANCE TO BE OF LIKE AND OF EQUAL QUALITY.
- ALL CHANGES SHALL BE REQUESTED IN WRITING AND MAY ONLY BE APPROVED IN WRITING BY THE ARCHITECT AND THE OWNER PRIOR TO ANY CHANGES BEING MADE.
- THE ARCHITECT HAS THE RIGHT TO REJECT ANY PORTION OF WORK THAT IS POORLY INSTALLED, DOES NOT MEET INDUSTRY STANDARD, UNAUTHORIZED, OR WORK DONE CONTRARY TO THE THE INTENT OF THE CONTRACT DOCUMENTS. SUCH WORK SHALL BE REPLACED, REPAIRED OR REMOVED AT THE CONTRACTOR'S EXPENSE.
- THE CONTRACTOR SHALL GUARANTEE ALL HIS WORK AND THE WORK OF HIS SUBCONTRACTORS FOR A PERIOD ONE YEAR AFTER RECEIVING FINAL ACCEPTANCE AND DO ALL REPAIR WORK AND REPLACEMENT NECESSARY DURING THAT PERIOD AT THE CONTRACTOR'S EXPENSE.
- IN NO EVENT SHALL STRUCTURAL MEMBERS BE CUT OR DRILLED WITHOUT THE WRITTEN APPROVAL OF A LICENSED STRUCTURAL ENGINEER.
- THE CONTRACTOR SHALL PROVIDE SAFE AND SANITARY CONDITIONS WHERE DEMOLITION AND WRECKING OPERATIONS ARE BEING CARRIED ON. WORK SHALL BE EXECUTED IN SUCH A MANNER THAT HAZARD FROM FIRE, POSSIBILITY OF INJURY, DANGER TO HEALTH AND CONDITIONS WHICH MAY CONSTITUTE A PUBLIC NUISANCE SHALL BE MINIMIZED.
- SHOULD CONFLICTS EXISTING DRAWINGS OR BETWEEN DRAWINGS & SPECIFICATIONS, THE MORE STRINGENT SHALL APPLY.

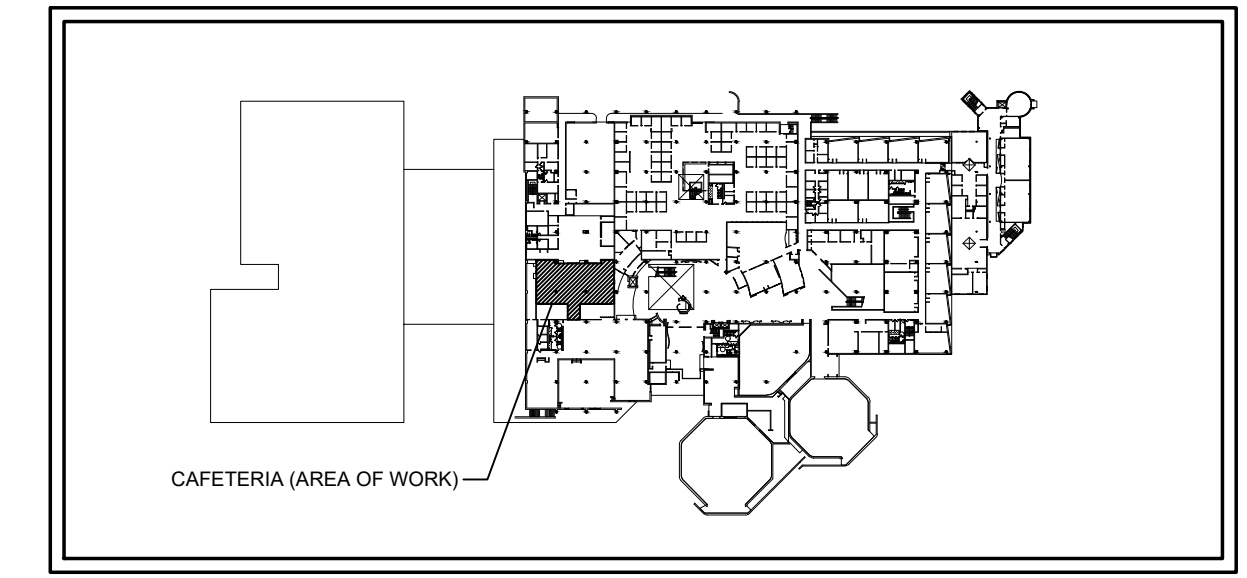
AERIAL MAP



LOCATION MAP

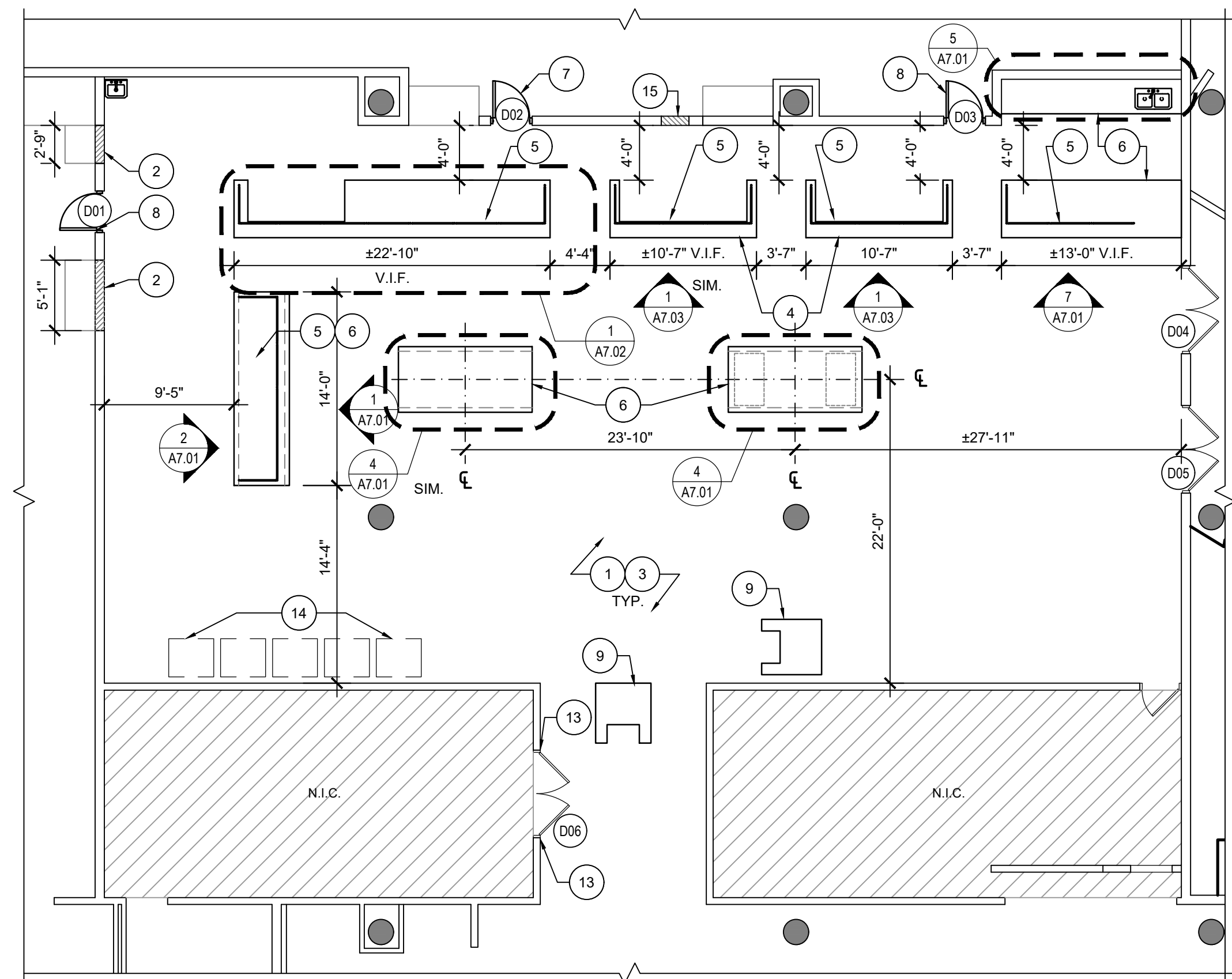


2ND FLOOR KEY PLAN

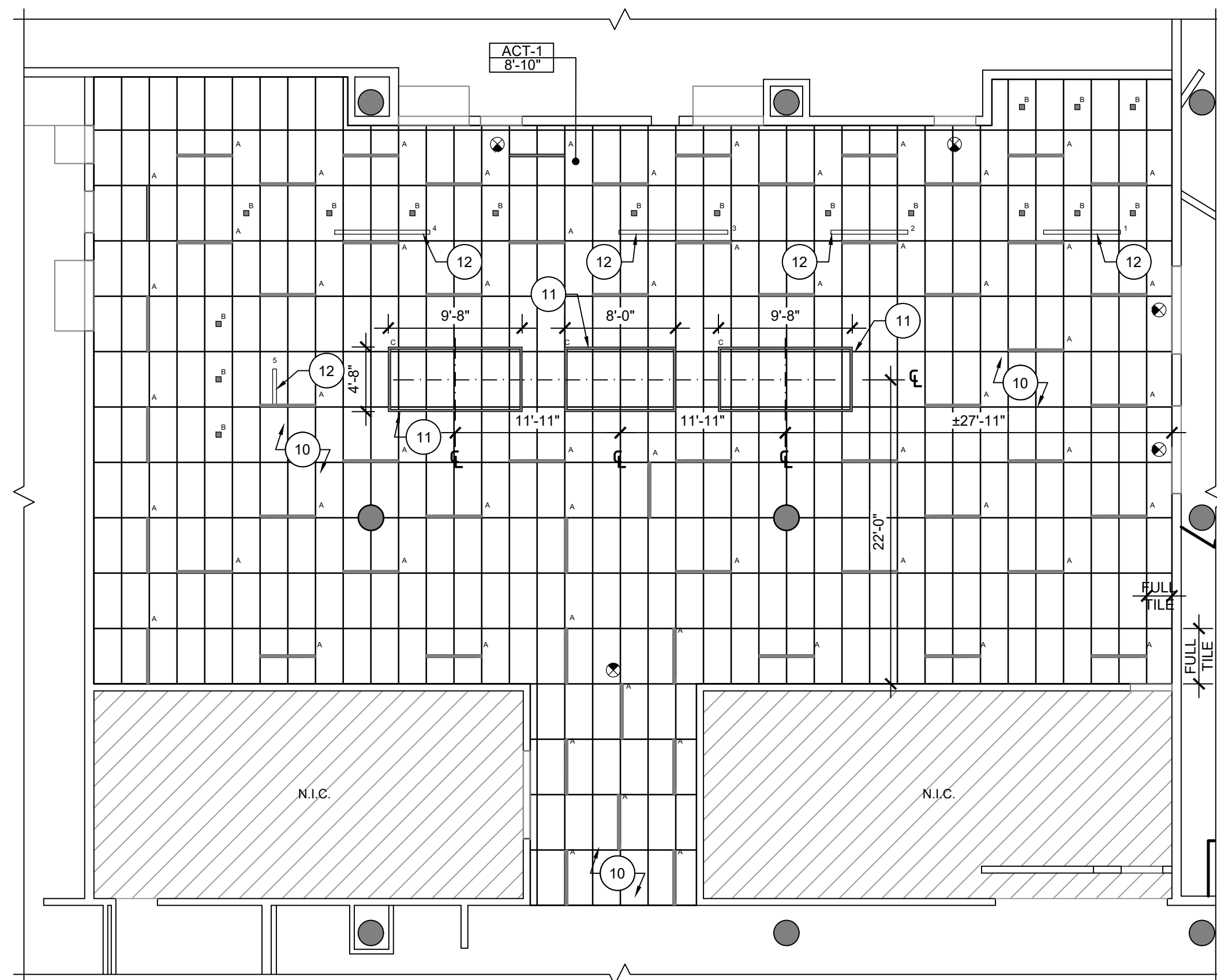


DRAWING INDEX

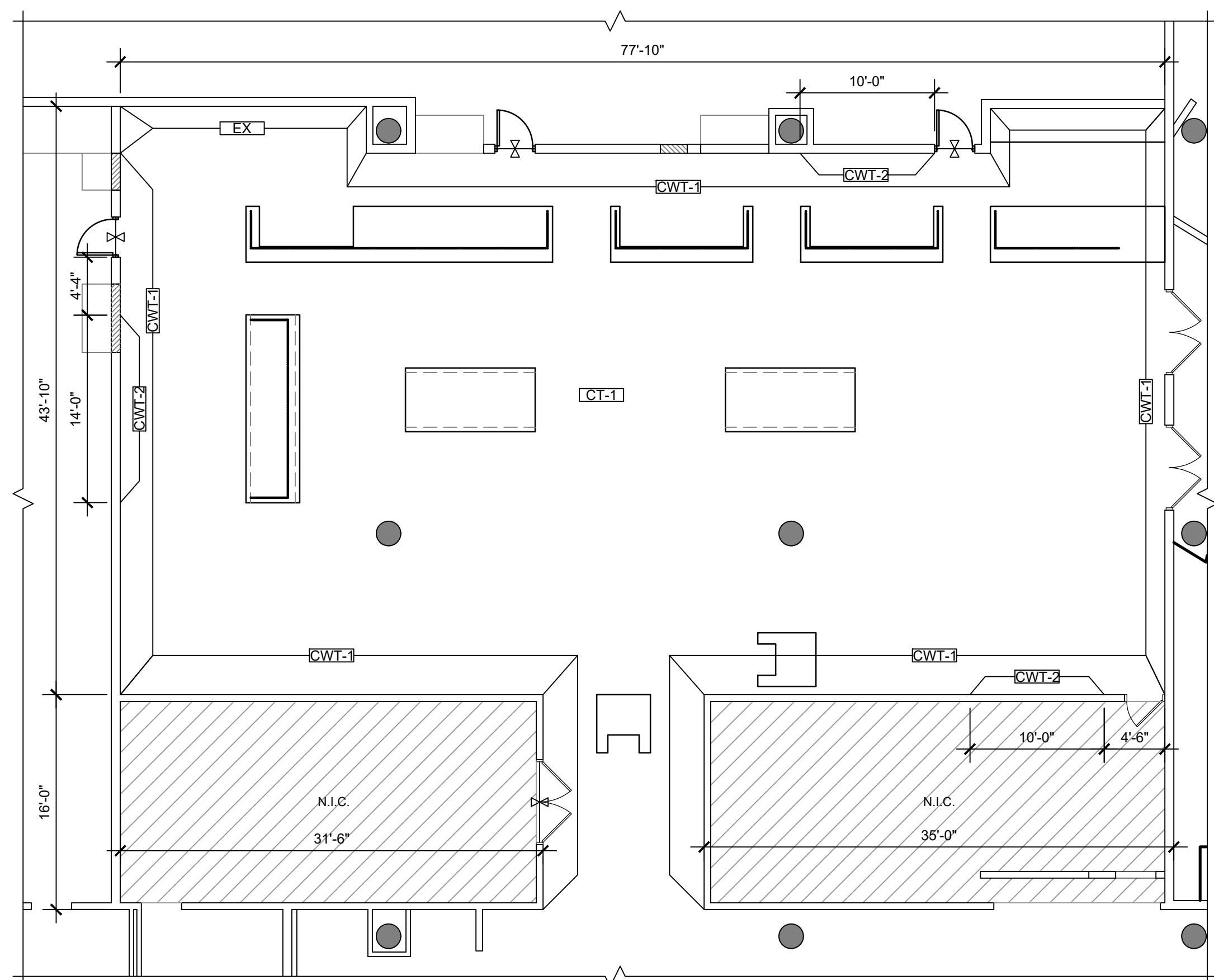
SHT. NO.	DESCRIPTION
T0.01	COVER SHEET
A1.01	DEMOLITION FLOOR AND CEILING PLANS
A2.01	PROPOSED FLOOR AND CEILING PLANS
A2.02	PROPOSED EQUIPMENT PLAN & SCHEDULE
A6.01	DOOR SCH. & DETAILS, MISC. DETAILS
A7.01	MILLWORK DETAILS I
A7.02	MILLWORK DETAILS II
A7.03	MILLWORK DETAILS III
M0.01	HVAC GENERAL NOTES, SYMBOLS & ABBREVIATIONS
M2.01	HVAC PROPOSED FLOOR PLAN
M6.01	HVAC DETAILS
P1.01	PLUMBING DEMOLITION PLANS & NOTES
P2.01	PROPOSED FLOOR PLAN
E0.01	NOTES, ABBREVIATIONS & SYMBOL LIST
E1.01	ELECTRICAL DEMOLITION FLOOR PLANS
E2.01	ELECTRICAL PROPOSED FLOOR PLANS



1 PROPOSED FLOOR PLAN
1/8" = 1'-0"



2 PROPOSED REFLECTED CEILING PLAN
1/8" = 1'-0"



3 PROPOSED FINISH PLAN
1/8" = 1'-0"

ABBREV.	DESCRIPTION	MANUFACTURER
PT-#	PAINT (INTERIOR): PROMAR 200 HP ZERO VOC INTERIOR LATEX, EGGSHELL FINISH PT-1: DOOR FRAME (SW 7070 SITE WHITE) PT-2: COLUMN (SW 7070 SITE WHITE)	SHERWIN WILLIAMS
CWT-1	4"x16" CERAMIC WALL TILE: (FIELD - HORIZONTAL RUNNING BOND) MATERIAL & COLOR: 4"x16" TILE - IBIZA SNOW (GLOSS) GROUT: COLORSTUK BLANCO	PORCELANOSA
CWT-2	24"x24" CERAMIC WALL TILE: (ACCENT - PATTERNED MONOLITHIC) MATERIAL & COLOR: 24"x24" TILE - NOA-R TANZANIA ALMOND GROUT: EPOTECH NATURE OAK	PORCELANOSA
CT-1	6"x35" CERAMIC FLOOR TILE: (FIELD- PLANK PATTERN) MATERIAL & COLOR: 6"x35" TILE - SMART TANZANIA ALMOND GROUT: EPOTECH NATURE OAK	PORCELANOSA
EX	EXISTING TO REMAIN	N/A
QT-1	QUARTZ CALACATTA ULTRA BY MSI	MSI
PL-1	PLASTIC LAMINATE BY WILSONART - RIDGEWOOD FINISH - 79" IN BLACK 1595	WILSONART
WB-1	RUBBER WALL BASE - 4" NO TOE PROFILE BY ALLSTATE RUBBER COLOR: A08	ALLSTATE RUBBER

SYMBOL LEGEND	
	EXISTING DOOR TO BE REMOVED
	EXISTING DOOR TO REMAIN
	NEW DOOR, SEE DOOR SCHEDULE
	EXISTING ITEM TO BE REMOVED
	EXISTING WALL TO REMAIN
	NEW WALL CONSTRUCTION, SEE PARTITION TYPES FOR MORE INFO
	INTERIOR ELEVATION TAG
	DEMOLITION KEYNOTE
	CONSTRUCTION KEYNOTE
	EXISTING LIGHT FIXTURE TO BE REMOVED
	INDICATES MECH. DIFFUSER (SEE MECH. DWGS.)
	INDICATES SMOKE DETECTOR
	INDICATES TYPE OF CEILING
	INDICATES CEILING HEIGHT OF SPECIFIC FINISH ABOVE FINISHED FLOOR.
	DENOTES DOOR TYPES INDICATED ON PROPOSED PLANS, SEE DOOR ELEVATION TYPE & DOOR SCHEDULE
	DENOTES PARTITION TYPE. SEE PARTITION TYPES FOR MORE INFORMATION.
	CEILING MOUNTED SIGNAGE, SEE DETAILS ON SHEET A2.02
	FLOOR FINISH TRANSITION STRIP

PROPOSED KEYNOTES

- PATCH AND PREPARE EXISTING WALLS AND INFILLED OPENINGS, AS REQUIRED, TO PROVIDE A SMOOTH, FLUSH SURFACE TO ACCEPT NEW WALL FINISHES. REFER TO FINISH PLAN FOR MORE INFORMATION.
- INFILL EXISTING WALL OPENING, AS REQUIRED, TO PROVIDE A SMOOTH AND UNIFORM SUBSTRATE TO ACCEPT NEW WALL FINISHES TO MATCH ADJACENT EXISTING WALL. REFER TO FINISH PLAN FOR NEW FINISH INFORMATION AND TO DETAIL 8/A6.01.
- CONTRACTOR TO PATCH AND PREPARE EXISTING FLOOR SLAB AS REQUIRED TO ACCEPT NEW FLOOR FINISH. LEVEL OUT SLAB WITH ARDEX UNDERLAYMENT. PROVIDE CONCRETE INFILL TO REPLACE MUDSET, UP TO 3" THICK, AS REQUIRED. PROVIDE AND INSTALL NEW FLOORING. REFER TO FINISH SCHEDULE FOR MORE INFORMATION.
- NEW LOW STUDWALL WITH SOLID SURFACE TOP AND WATERFALL SIDES. REFER TO DETAILS ON SHEET A7.03 FOR MORE INFORMATION.
- PROVIDE AND INSTALL NEW SNEEZE-GUARDS. INSTALL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- PROVIDE AND INSTALL NEW MILLWORK AS INDICATED. REFER TO DETAILS ON SHEET A7.01 TO A7.03 FOR MORE INFORMATION.
- PROVIDE AND INSTALL NEW HOLLOW METAL DOOR, DOOR FRAME AND DOOR HARDWARE. REFER TO DOOR SCHEDULE ON SHEET A6.01 AND SPECIFICATIONS FOR MORE INFORMATION.
- PROVIDE AND INSTALL NEW HOLLOW METAL DOOR AND DOOR HARDWARE. REFER TO DOOR SCHEDULE ON SHEET A6.01 AND SPECIFICATIONS FOR MORE INFORMATION.
- PROVIDE AND INSTALL NEW POINT OF SALE COUNTER. REFER TO EQUIPMENT SCHEDULE FOR MORE INFORMATION.
- PROVIDE AND INSTALL NEW SUSPENDED ACOUSTICAL CEILING SYSTEM AS INDICATED. REFER TO DETAILS ON SHEET A6.01 AND SPECIFICATIONS FOR MORE INFORMATION.
- PROVIDE AND INSTALL NEW PENDANT LIGHT FIXTURES AS INDICATED. INSTALL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. NEW FIXTURES TO BE ALIGNED WITH ISLAND COUNTERS BELOW.
- PROVIDE AND INSTALL NEW 10" TALL, CEILING MOUNTED DIMENSIONAL LETTERING. REFER TO A2.02 FOR MORE INFORMATION.
- PROVIDE AND INSTALL SCHLUTER STRIPS BETWEEN DOOR FRAME AND NEW FINISH WALL TILE, TYPICAL AT ALL DOOR FRAMES. SEE DETAIL 8/A6.01 FOR MORE INFORMATION.
- LOCATION OF FUTURE GRAB N' GO VENDING MACHINES TO BE SUPPLIED AND INSTALLED BY OWNER. SHOWN FOR COORDINATION PURPOSES ONLY.
- REMOVE EXISTING PASS-THRU FRAME AND ASSOCIATED ITEMS. INFILL ROUGH OPENING AS REQUIRED TO PROVIDE A SMOOTH AND UNIFORM SURFACE, TO RECEIVE PROPOSED FINISHES. INFILL TO MATCH EXISTING WALL CONSTRUCTION.

GENERAL NOTES

- CONTRACTOR SHALL INSTALL THROUGH-PENETRATION FIRESTOPS, DRAFT-STOPS, FIRE CAULKING, ETC. AS REQUIRED AT ALL ROOF/WALL PENETRATIONS TO ENSURE THE CONTINUOUS FIRE RATING OF THE ASSEMBLY.
- ALL DIMENSIONS ARE FROM FACE OF FINISH MATERIALS.
- CONTRACTOR SHALL FIELD VERIFY ALL EXISTING AND PROPOSED DIMENSIONS PRIOR TO INSTALLATION/CONSTRUCTION.
- CONTRACTOR SHALL PATCH AND REPAIR ALL WALLS (AFFECTED BY DEMOLITION) TO ACCEPT NEW SCOPE OF WORK.
- CONTRACTOR SHALL PREPARE ALL SUBSTRATE SURFACES, AS REQUIRED, TO ACCOMMODATE NEW SCOPE OF WORK.

GENERAL CEILING NOTES

- ALL CONTRACTORS (I.E. MECHANICAL, ELECTRICAL, PLUMBING, SPRINKLER) ARE REQUIRED TO COORDINATE THEIR WORK WITH INDIVIDUAL CEILING FINISHES. ALL DISTURBED AREAS RESULTING FROM CONTRACTORS OPERATIONS SHALL BE PATCHED AND REPAIRED TO MATCH.
- FIELD VERIFY ALL DIMENSIONS AND CLEARANCES. COORDINATE INSTALLATION OF LIGHTING, EQUIPMENT, MECHANICAL, ETC.
- PATCH AND REPAIR ALL DAMAGED SURFACES TO MATCH EXISTING.
- CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY ACCESSORIES INCLUDING PERIMETER MOLDINGS, FASTENERS, SUPPORT WIRES, TRIM, ETC. TO INSURE COMPLETE INSTALLATION OF SYSTEM.
- ALL CEILING HEIGHTS SHALL BE FIELD VERIFIED WITH EXISTING CEILING HEIGHTS. PLEASE NOTIFY ARCHITECT OF ANY OBSTRUCTION ABOVE CEILINGS.

CEILING TYPES LEGEND

	ACT-1: USG SQUARE LAY-IN TILE
	24" x 48" ACT W/ DXLA 1/2" EXPOSED TEE GRID
	MARS HEALTHCARE PANELS, CLIMAPLUS PERFORMANCE, MODEL # 88189

LIGHT FIXTURE SCHEDULE

SYMBOL	DESCRIPTION	MANUFACTURER
	3.5" LINEAR LED	REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION
	2' x 2' RECESSED LED	REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION
	8' x 4'-9" LED PENDANT	REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION

NJ Certificate of Authorization
 Eng. No. 24047937500
 Arch. No. 21A000012400
 Date 3/10/22
 Checked MTW
 Drawn MP

MATTHEW T. WOLFE, AIA
 THE REGISTERED ARCHITECT
 License No. NJZ1A01963400

Revisions:

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PROPOSED FLOOR AND CEILING PLANS
 CAFETERIA RENOVATIONS AT MEGA STRUCTURE
 ESSEX COUNTY COMMUNITY COLLEGE
 303 UNIVERSITY AVENUE
 NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
 File No. 2030202A201

A2.01

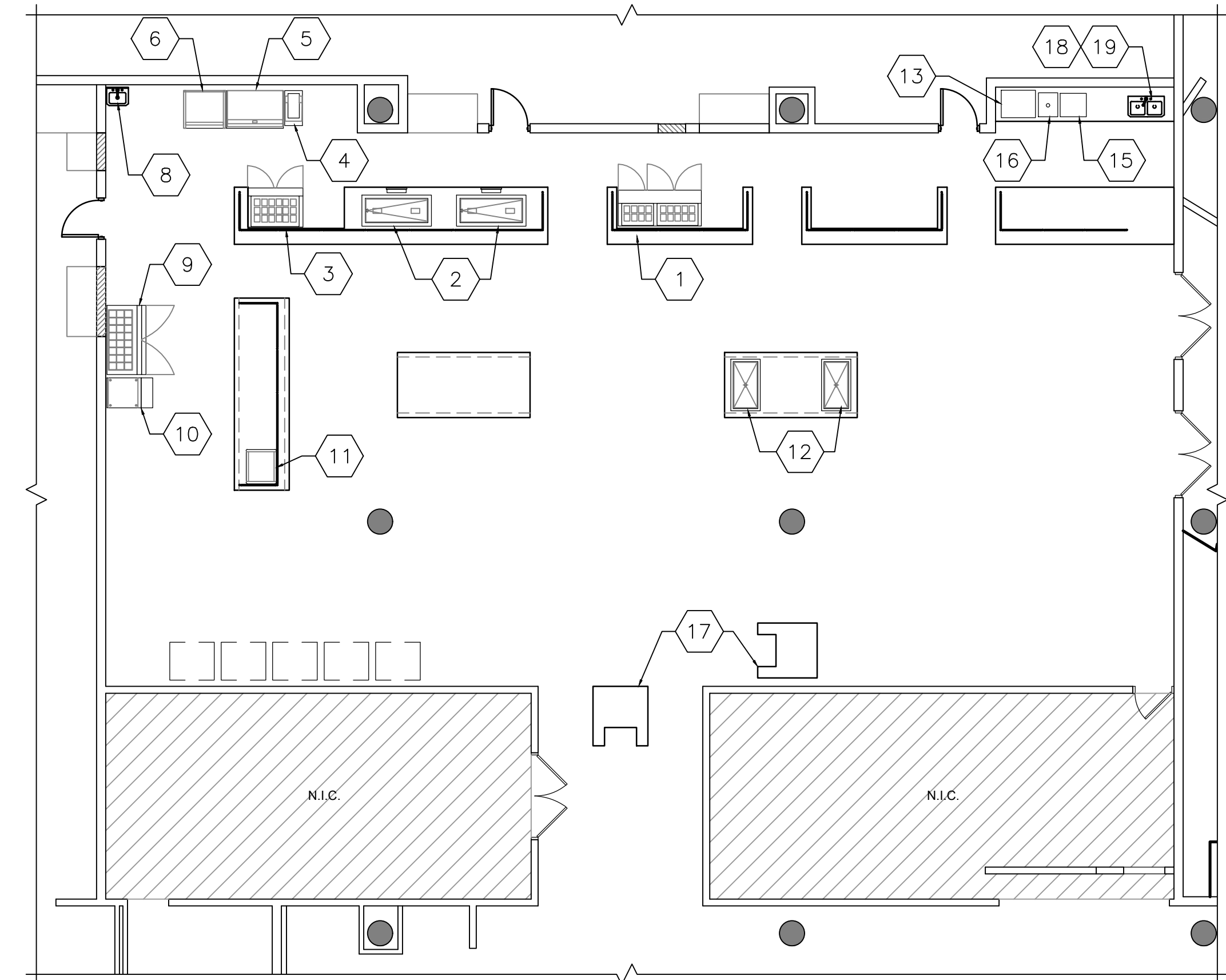
CAFETERIA EQUIPMENT SCHEDULE																			
Item No.	Qty.	Equipment Category	Manufacturer	Model Number	Amps	KW	HP	Volts	Phase	Cycle	Plug	NEMA	Cold Water Size (in.)	Hot Water Size (in.)	Direct Drain Size (in.)	Indirect Drain Size (in.)	Gas Size (in.)	MBTUH	
1	1	Refrigerator, Sandwich/Salad Prep	Continental Refrigerator	SW72N18	9.0		0.2	115	1	60	X	5-15P							
2	2	Hot Food Well Unit, Drop-In, Electric	Wells	HRCP-7400	6.4	0.6	1/2	115	1	60			1/2						
3	1	Refrigerator, Sandwich/Salad Prep	Continental Refrigerator	SW48N18M	7.1		0.2	115	1	60	X	5-15P							
4	1	Fryer, Dump Station	Vulcan	VX15				120	1	60	X	5-15P					1/2	120	
5	1	Griddle, Gas	Vulcan	948RX	1.0			120	1	60							3/4	108	
6	1	Broiler, Under-Fired, Gas, Counter	Vulcan	VACB36													3/4	108	
7	1	Reach-In Refrigerator	Continental Refrigerator		5.2			115	1	60		5-15P							
8	1	Sink, Hand, Wall Mount	Krowne	HS-26L									1/2	1/2		1-1/2			
9	1	Refrigerator, Sandwich/Salad Prep	Continental Refrigerator	SW60N24M-HGL	8.2		0.2	115	1	60	X	5-15P							
10	1	Oven, Convection, Electric	TurboChef	HHB-8603-1 (High H Batch 2)	24.0	5		208	1	60	X	6-30P							
11	1	DisplayCase, Heated	Hatco	GR2DS-24D	13.7	1.6		120	1	60	X	5-15P							
12	2	Drop-In, Cold Pan	Wells	RCP-300	7.0	0.8	0.2	120	1	60	X	5-15P							
13	1	Ice Maker w/o Bin	Manitowoc Ice	IYT0750A	11.1	1.3		208	1	60			1/2			1/2			
14	1	Slicer, Food, Electric	Globe Food Equipment	S13A	2.5		0.5	115		60	X	5-15P							
15	1	Brewer	Starbucks	SKU#011006201	30			120/240	1		X		1/2						
16	1	Espresso Machine	Starbucks	CFS4350-SUSA	30			250	1		X	L6-30P	1/2		1				
17	1	Cashier/Merchandising Station*	Vollrath	75679															
18	1	Stainless Steel Double Basin Sink	Elkay	DSE233194															
19	1	Commercial Faucet	Elkay	T9FB380621									1/2	1/2					

* w/ optional tray rest and optional (3) sided laminate base. Color to be selected by Owner

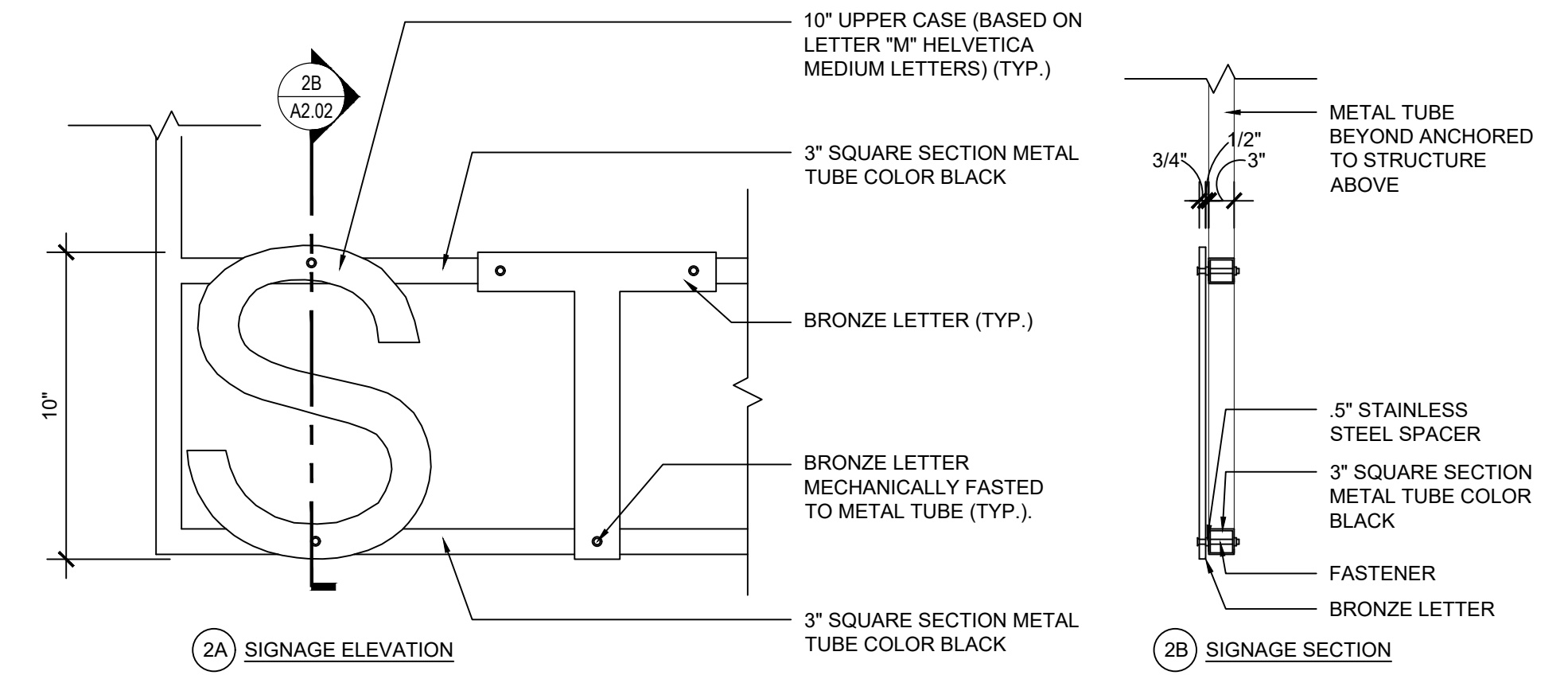
FOR MORE EQUIPMENT INFORMATION, CONTACT:

JOHNSON RESTAURANT EQUIPMENT & SUPPLIES, INC.
 WALTER RIEGER
 1100 ROUTE 33
 NEPTUNE, NJ 07753
 PHONE: (732) 775-1660

1 EQUIPMENT SCHEDULE



2 PROPOSED EQUIPMENT PLAN
1/8" = 1'-0"



3 SIGNAGE DETAIL
1/8" = 1'-0"

SIGNAGE SCHEDULE	
No.	SIGN LETTERING
1	STARBUCKS
2	HOT & COLD
3	GLOBAL FLAVOR
4	BIG CITY GRILL
5	PIZZA

- NOTES:
- FINAL INSTALLED LOCATIONS TO BE COORDINATED WITH OWNER'S REPRESENTATIVE.
 - CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR APPROVAL BY ARCHITECT PRIOR TO ORDERING/FABRICATION.
 - SIGN LETTERING INDICATED ARE FOR PRICING PURPOSES ONLY. FINAL SIGN LETTERING TO BE APPROVED BY OWNER'S REPRESENTATIVE.

4 SIGNAGE SCHEDULE
1/8" = 1'-0"

NJ Certificate of Authorization
 Eng'r. No. 24047937500
 Arch. No. 21A00012400
 Date 3/10/22
 Checked MTW
 Drawn MP

MATTHEW T. WOLFE, AIA
 THE REGISTERED ARCHITECT
 License No. NJZ1A01963400

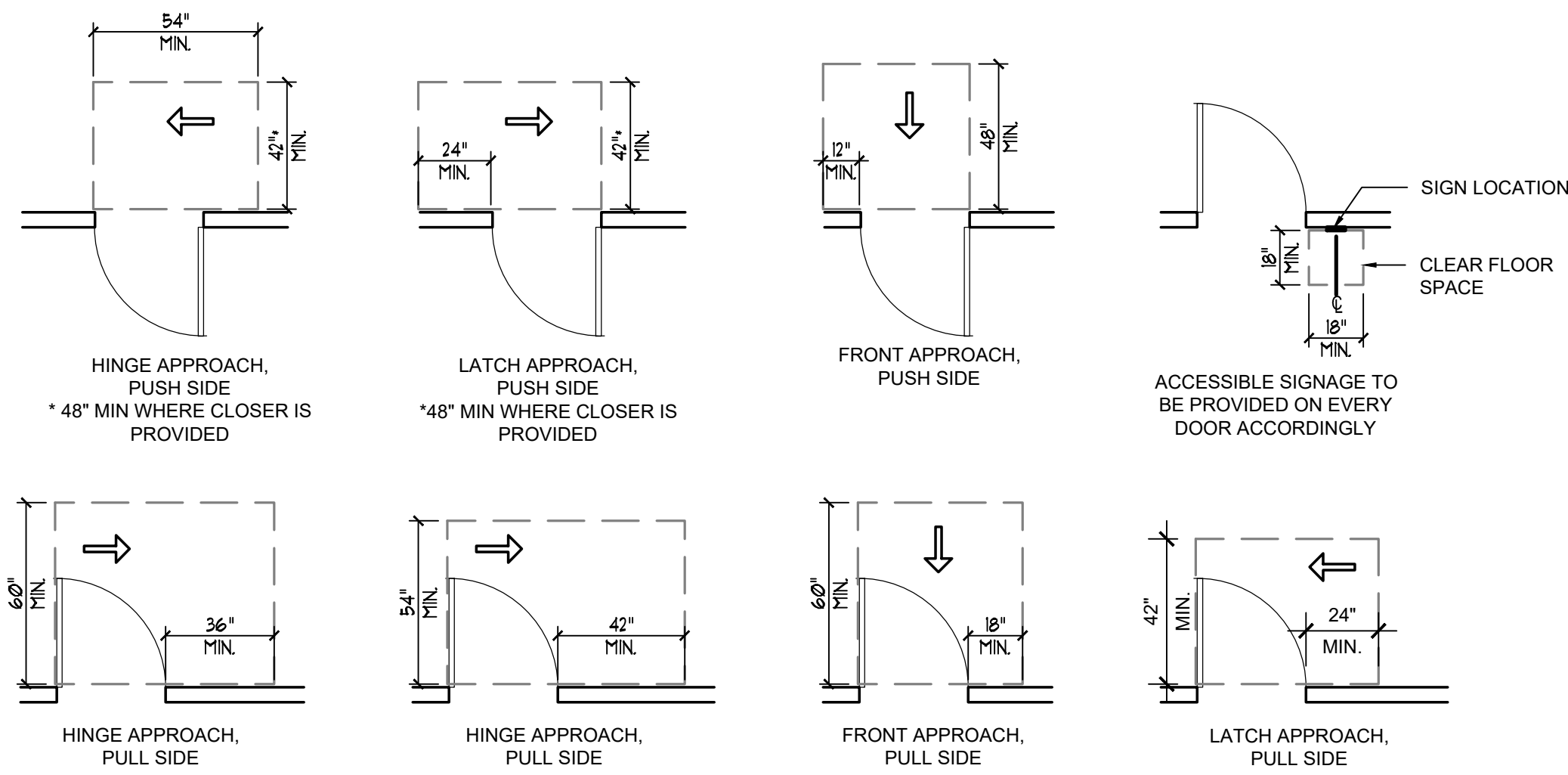
Revisions:

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PROPOSED EQUIPMENT PLAN & SCHEDULE
 CAFETERIA RENOVATIONS AT MEGA STRUCTURE
 ESSEX COUNTY COMMUNITY COLLEGE
 303 UNIVERSITY AVENUE
 NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
 File No. 2030202A201

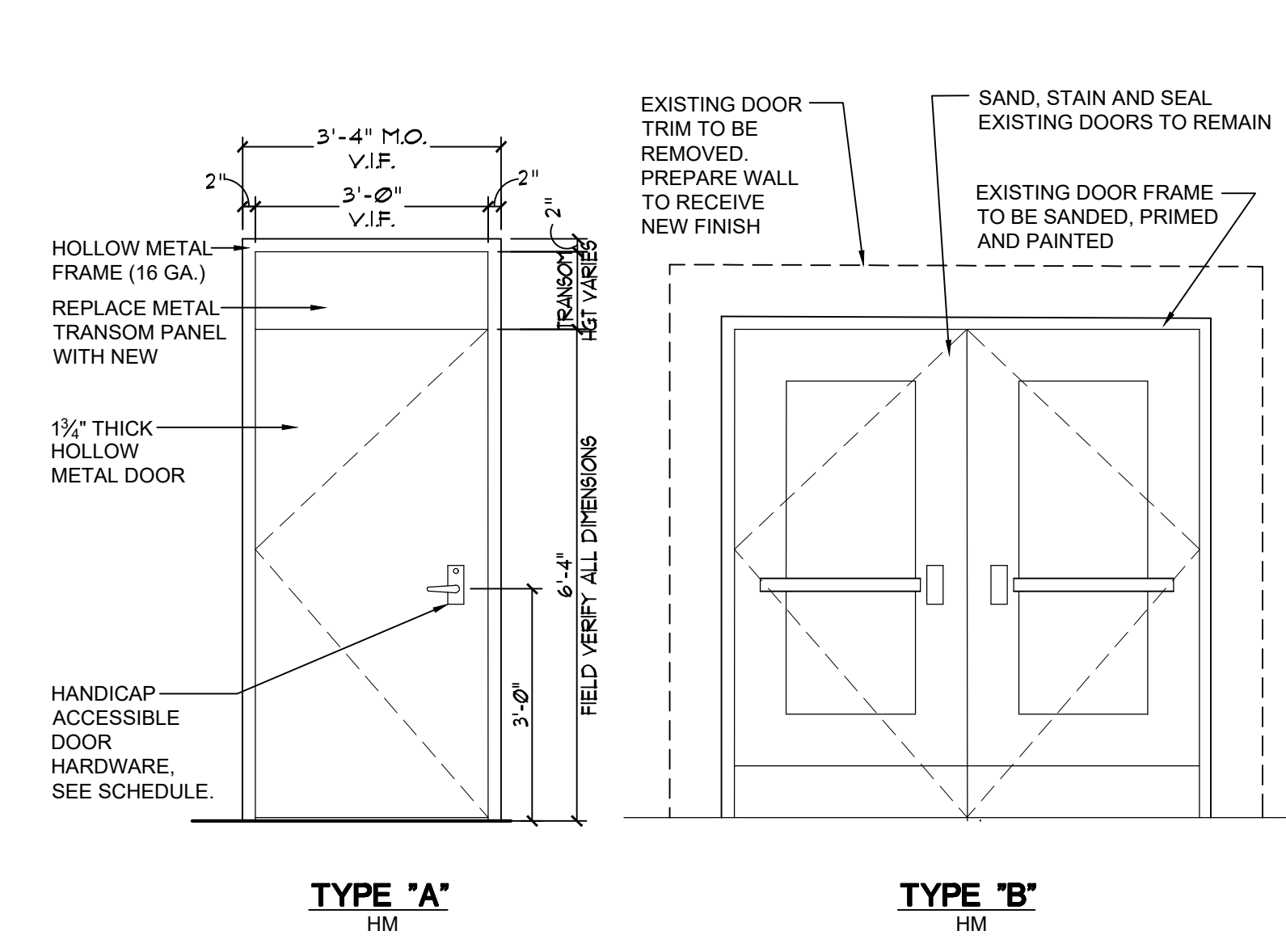
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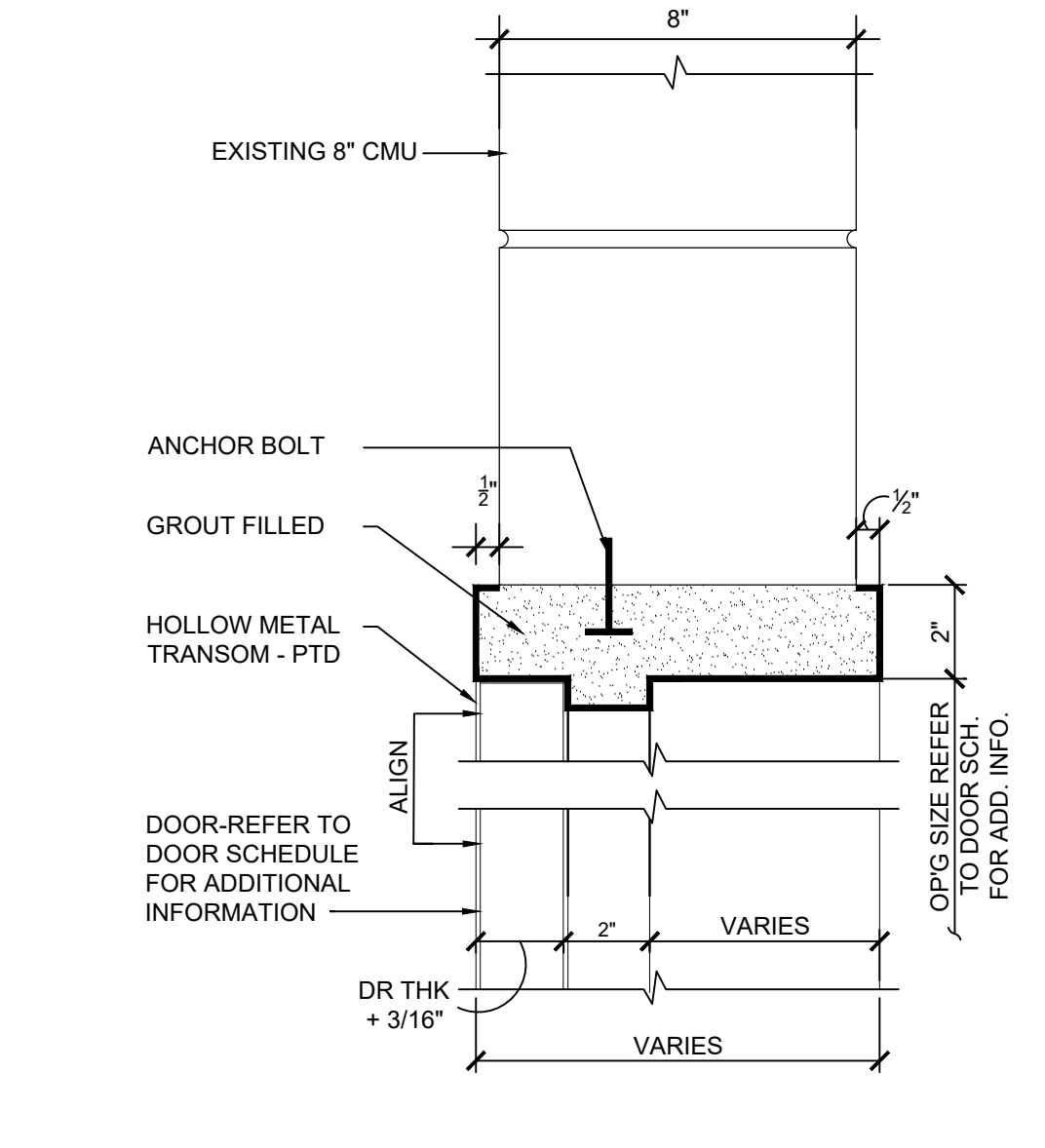
1 MANEUVERING CLEARANCES AT DOOR SWINGS
1/4" = 1'-0"

DOOR SCHEDULE																
DOOR NO.	DOOR TYPE	ROOM NAME/ NUMBER	DOOR					FRAME			SILL	HARDWARE (SEE SPECS)	NOTES			
			ACTION	MATERIAL	DOOR FINISH	MASONRY OPENING		DOOR SIZE		TRANSOM METAL PANEL (PAINTED)				DETAIL NO.		
						WIDTH	HEIGHT	WIDTH	HEIGHT							
LEVEL #1																
D01	A	CAFETERIA	SINGLE SWING	HOLLOW METAL	PAINTED	3'-4"	9'-0"	3'-0"	6'-10"	■	EXIST.	EXIST.	EXIST.	4/A6.01	1	NOTE 1, 2, 4, 5, 6, 7, 8
D02	A	CAFETERIA	SINGLE SWING	HOLLOW METAL	PAINTED	3'-4"	9'-0"	3'-0"	6'-10"	■	HM	3/A6.01	7/A6.01	4/A6.01	1	NOTE 1, 2, 3, 4, 5, 7, 8
D03	A	CAFETERIA	SINGLE SWING	HOLLOW METAL	PAINTED	3'-4"	9'-0"	3'-0"	6'-10"	■	EXIST.	EXIST.	EXIST.	4/A6.01	1	NOTE 1, 2, 4, 5, 6, 7, 8
D04	B	CAFETERIA	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.		EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	SAND & STAIN DOOR WITH INTERIOR STAIN BY SHERWIN WILLIAMS COLOR NW435 (OAKWOOD)
D05	B	CAFETERIA	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.		EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	SAND & STAIN DOOR WITH INTERIOR STAIN BY SHERWIN WILLIAMS COLOR NW435 (OAKWOOD)
D06	EXIST.	CAFETERIA	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	EXIST.		EXIST.	EXIST.	EXIST.	EXIST.	EXIST.	EXIST. FRAME TO BE SANDED, PRIMED AND PAINTED

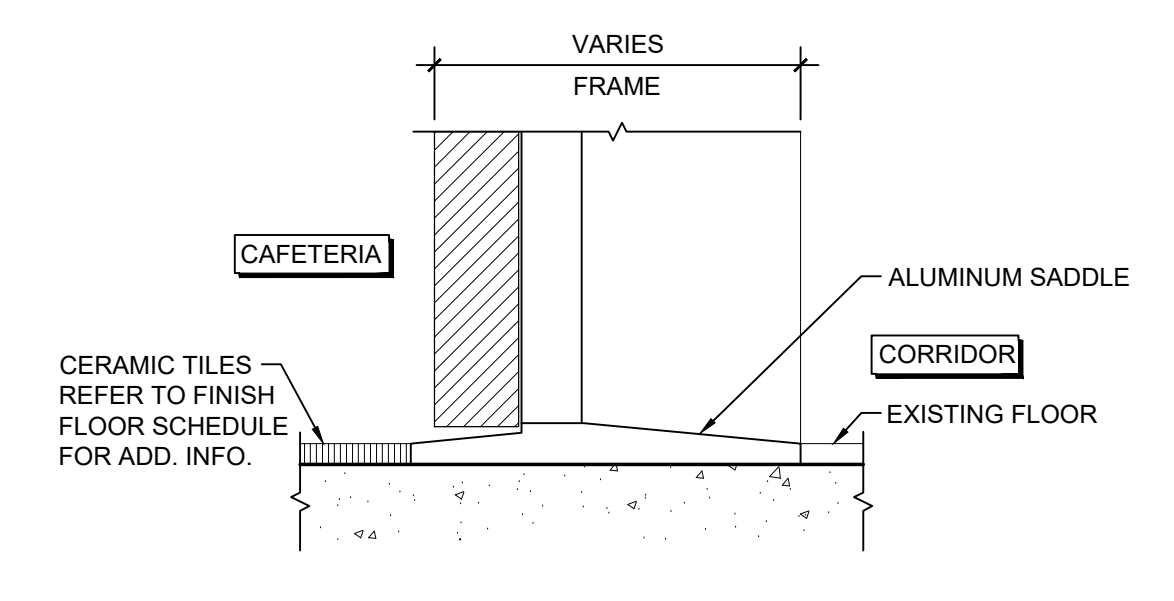
- DOOR NOTES**
- REFER TO ADA DOOR MANEUVERING CLEARANCES ON THIS SHEET.
 - ALL DIMENSIONS FOR DOORS WITH EXISTING FRAMES OR IN EXISTING MASONRY OPENINGS ARE TO BE VERIFIED IN FIELD PRIOR TO FABRICATIONS.
 - REMOVE AND REPLACE EXISTING DOOR AND DOOR FRAME. PROVIDE AND INSTALL NEW 60 MIN FIRE-RATED DOOR, DOOR FRAME, AND DOOR HARDWARE.
 - WHENEVER BRAND NAMES OR SPECIFIC PRODUCT SYSTEMS ARE INDICATED IT SHALL BE CLEARLY UNDERSTOOD THAT SUCH IDENTIFICATION IS FOR THE PURPOSE OF ILLUSTRATING THE TYPE OF PRODUCT AND DEGREE OF QUALITY DESIRED. SUCH IDENTIFICATION IN NO WAY PRECLUDES THE CONTRACTOR FROM USING PRODUCTS OF OTHER MANUFACTURERS WHICH CAN BE SHOWN IN ADVANCE TO BE OF LIKE KIND AND OF EQUAL QUALITY.
 - REFER TO HARDWARE SPECIFICATION FOR HARDWARE SET INFORMATION.
 - SAND DOOR FRAME TO A SMOOTH AND UNIFORM SURFACE, U.O.N.
 - VERIFY IN FIELD ALL DOORS AND FRAMES DIMENSIONS PRIOR TO FABRICATION.
 - PREPARE DOOR FRAME AND TRANSOM PANEL TO ACCEPT (1) COAT PRIMER AND (2) COATS FINISH PAINT. PAINT PT-1. (CAFETERIA SIDE ONLY)



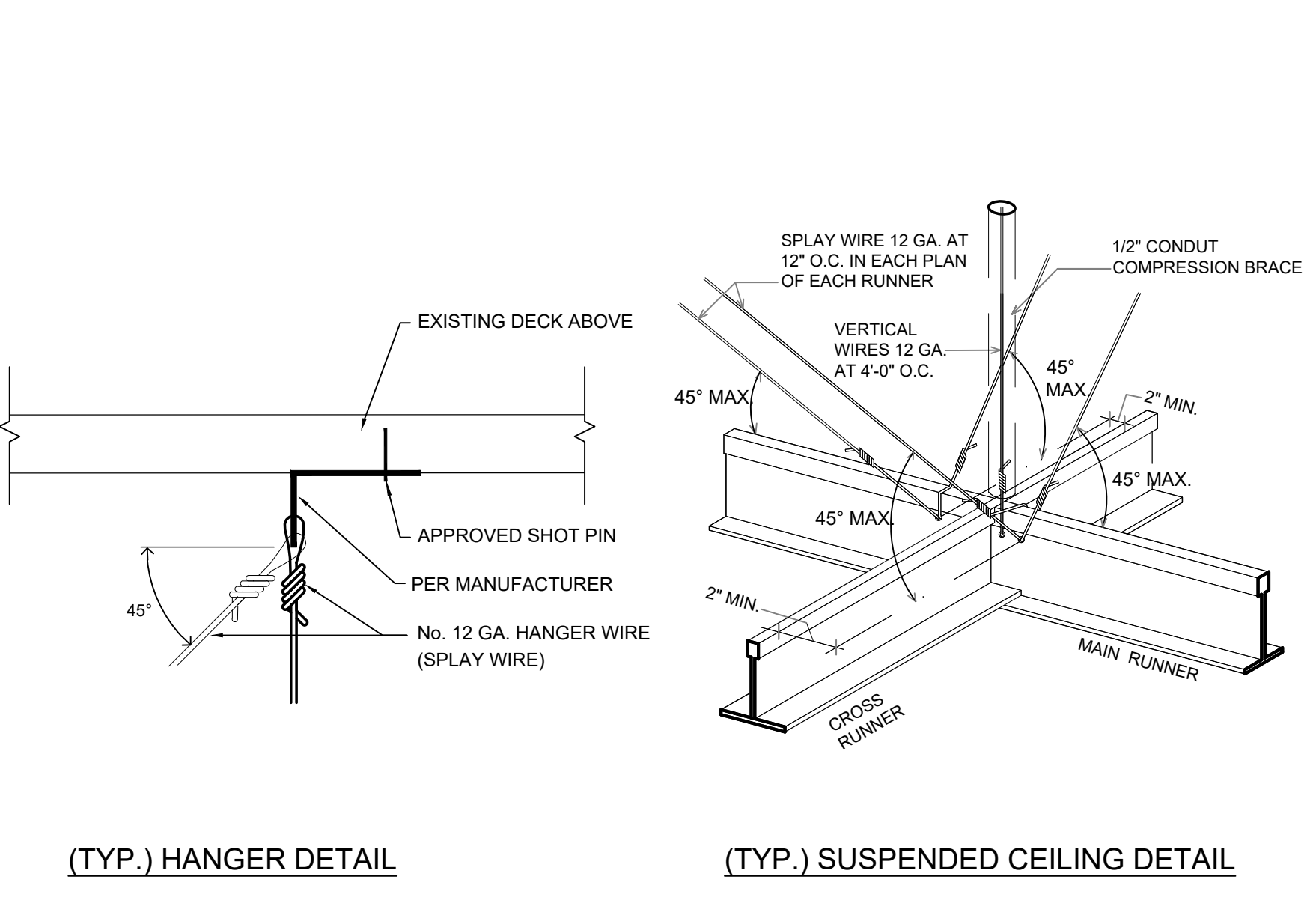
2 DOOR ELEVATION
1/4" = 1'-0"



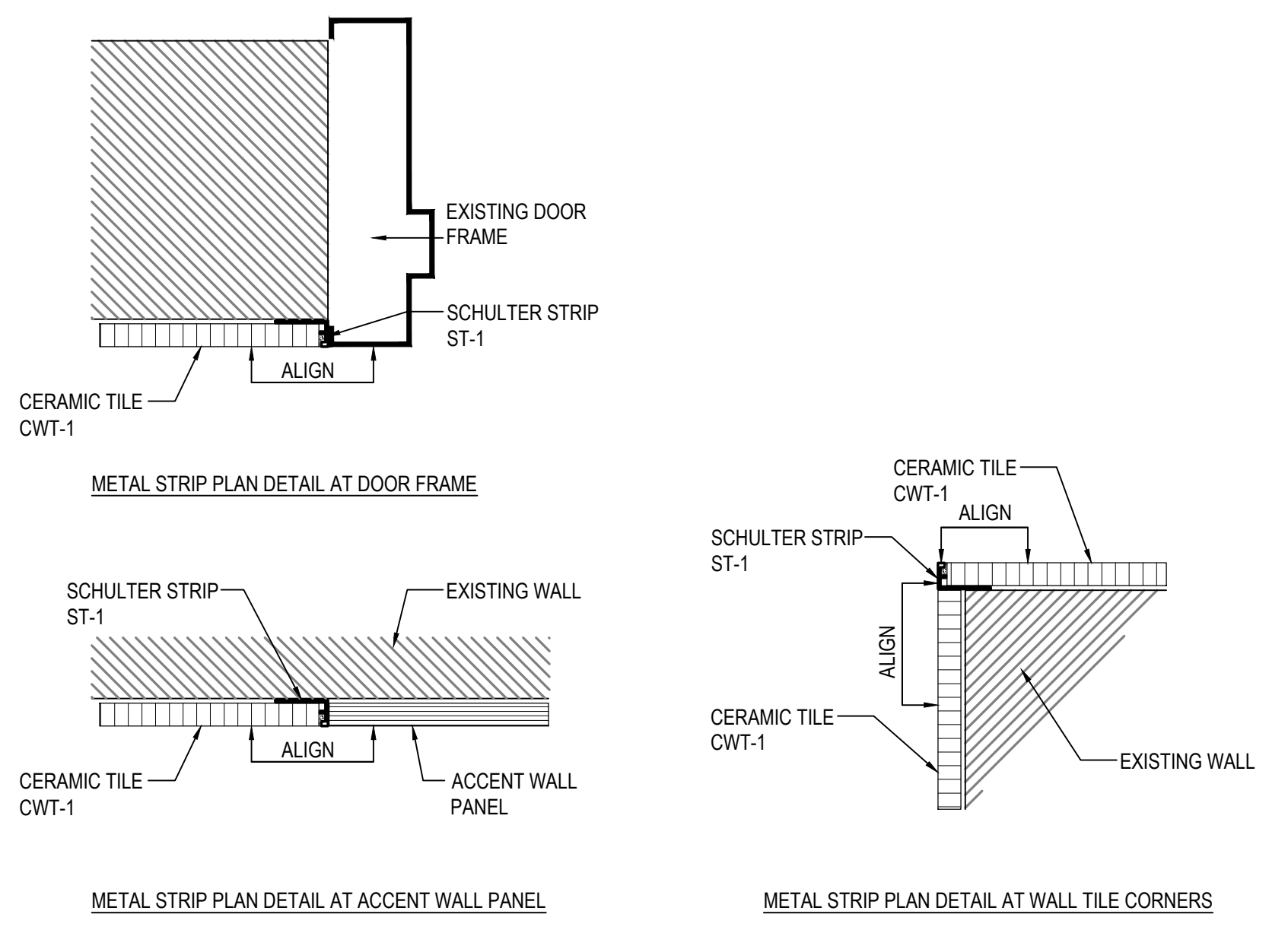
3 HEAD & TRANSOM DETAIL
3" = 1'-0"



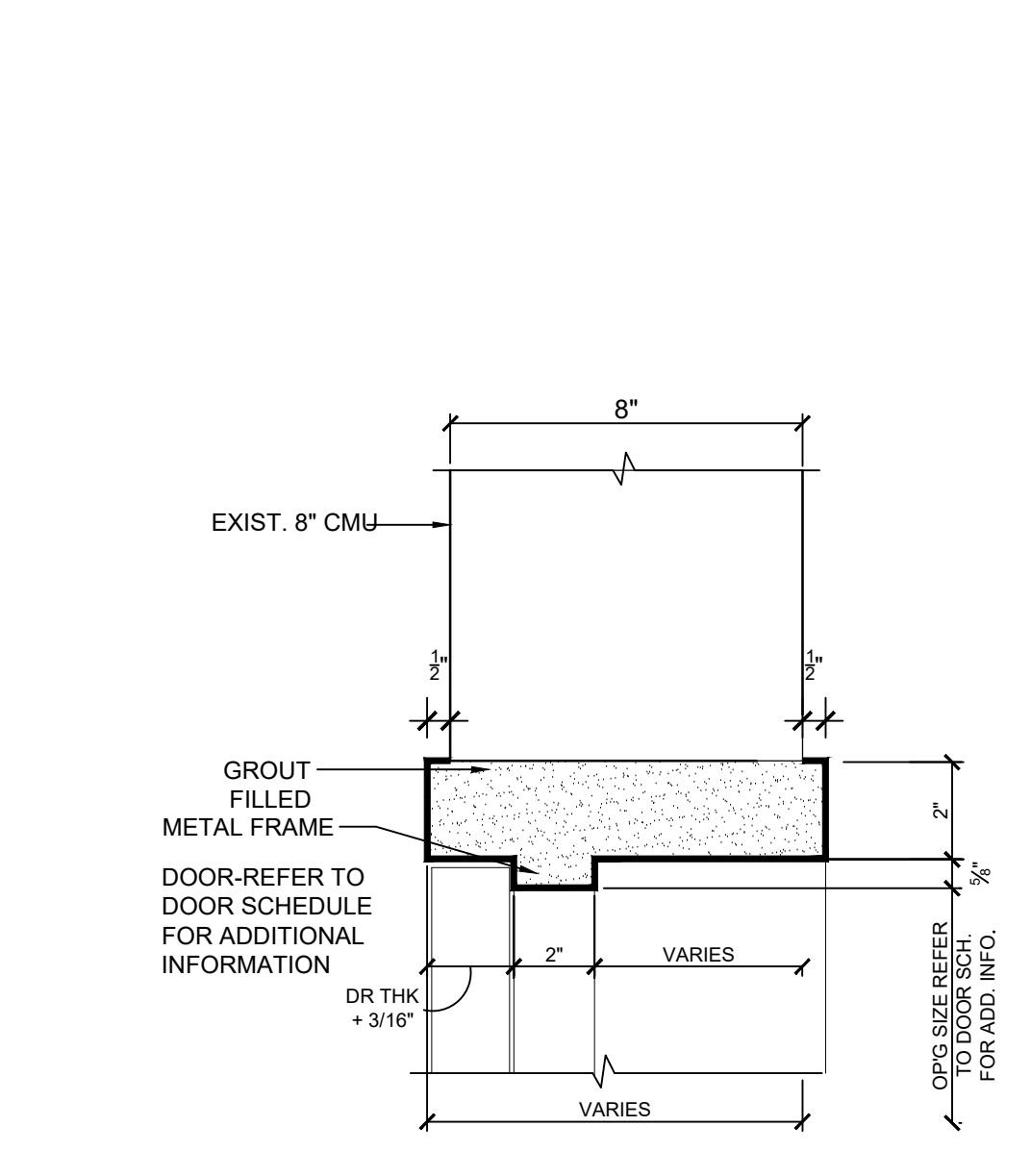
4 SILL DETAIL
N.T.S.



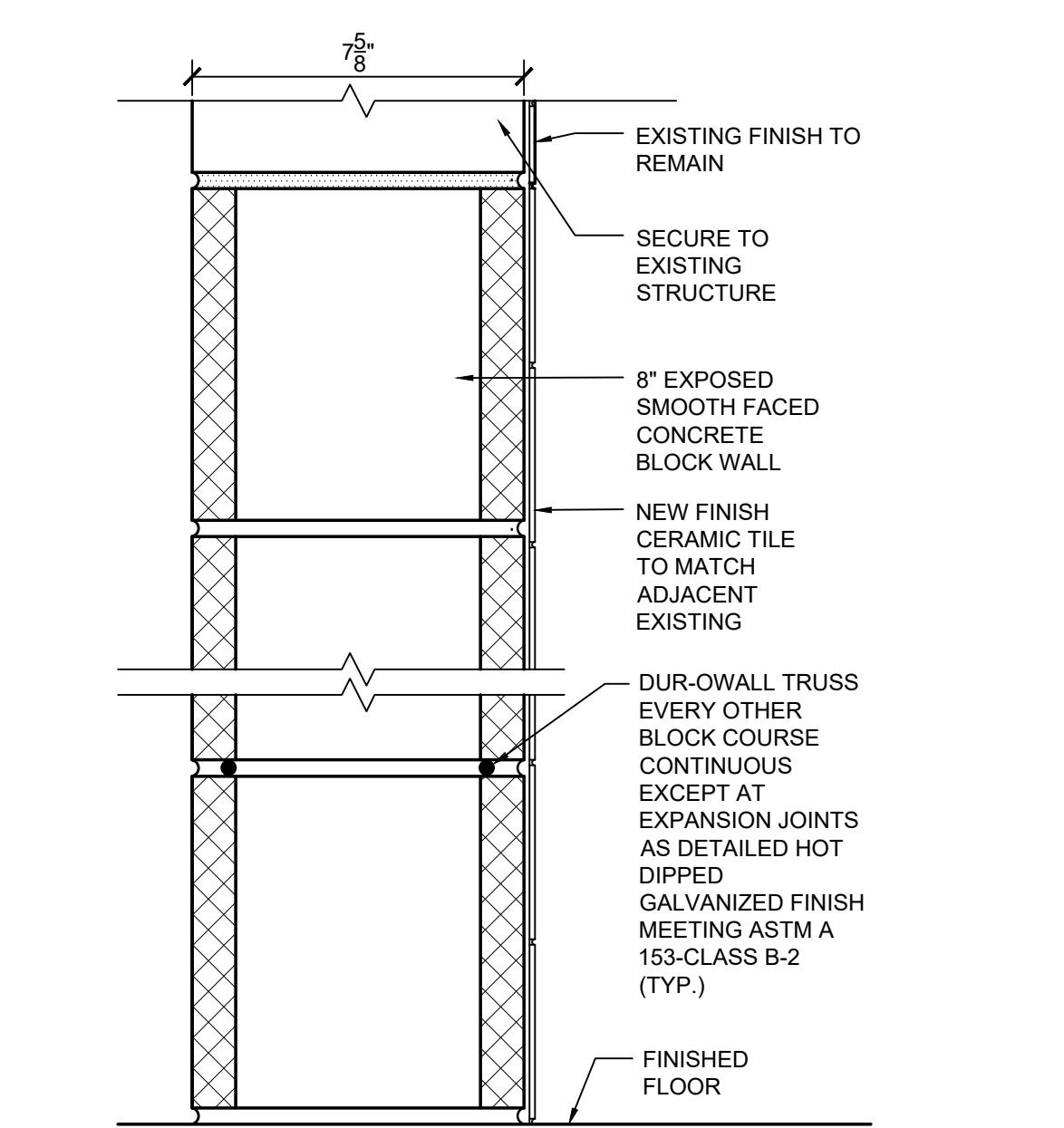
5 TYPICAL CEILING DETAILS
N.T.S.



6 METAL STRIP DETAILS
1/4" = 1'-0"



7 JAMB DETAIL
N.T.S.



8 PARTITION TYPE
3" = 1'-0"

NJ Certificate of Authorization
 Eng. No. 24627937500
 Arch. No. 21A020012400
 Date 3/10/22
 Checked MTW
 Drawn RPC

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 REGISTERED ARCHITECT
 License No. NJZ1A01963400

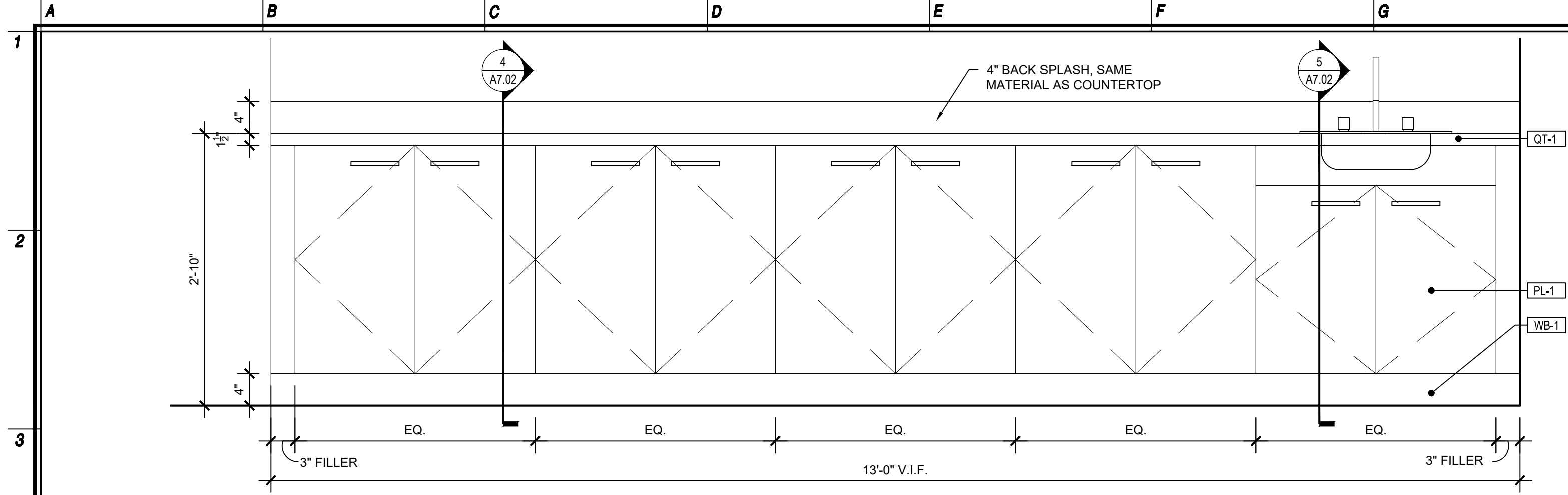
Revisions:

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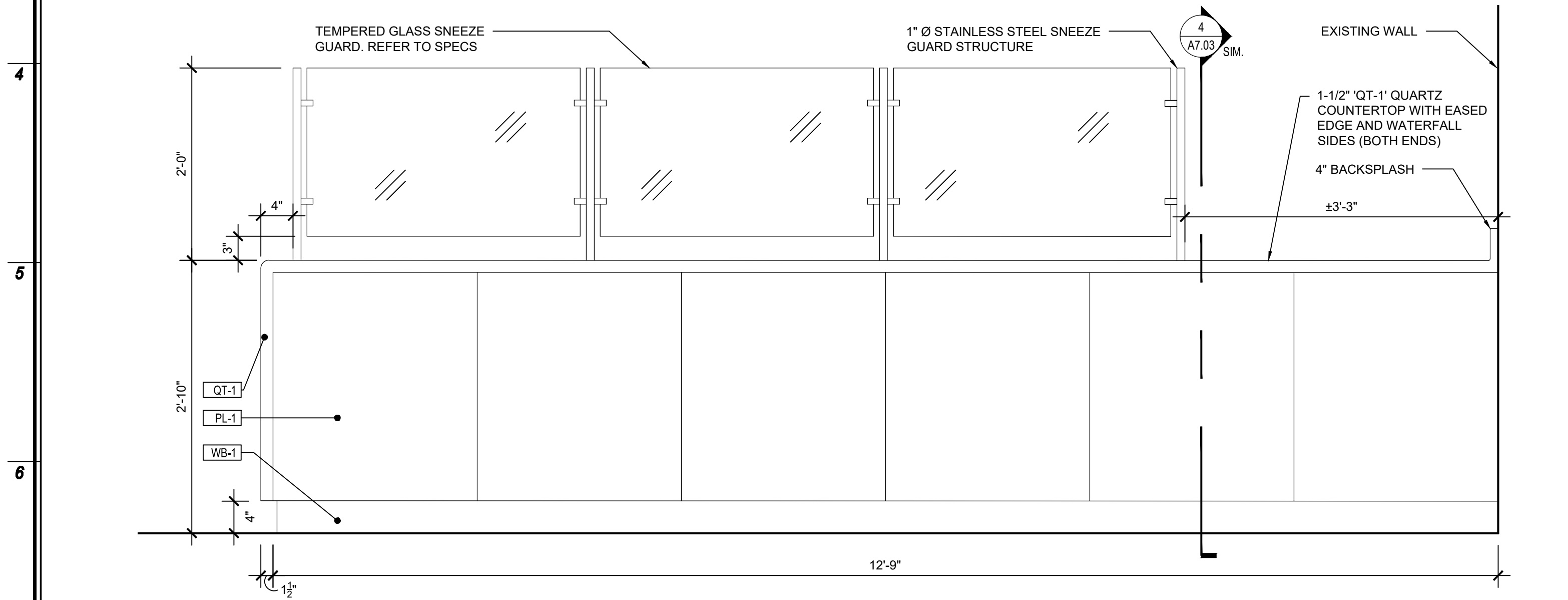
DOOR SCH. & DETAILS, MISC. DETAILS
 CAFETERIA RENOVATIONS AT MEGA STRUCTURE
 ESSEX COUNTY COMMUNITY COLLEGE
 303 UNIVERSITY AVENUE
 NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
 File No. 2030202A201

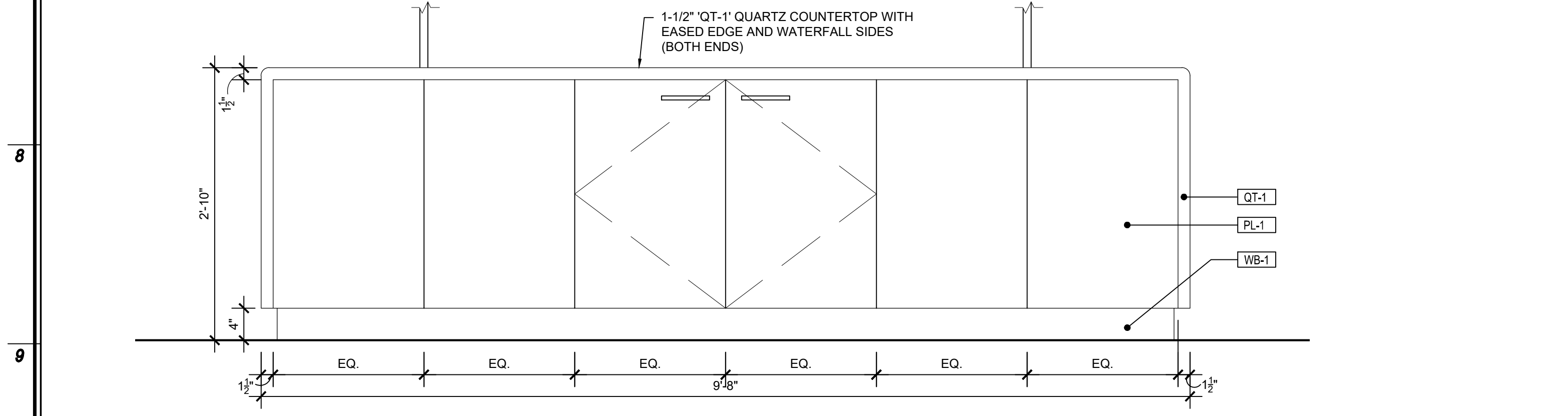
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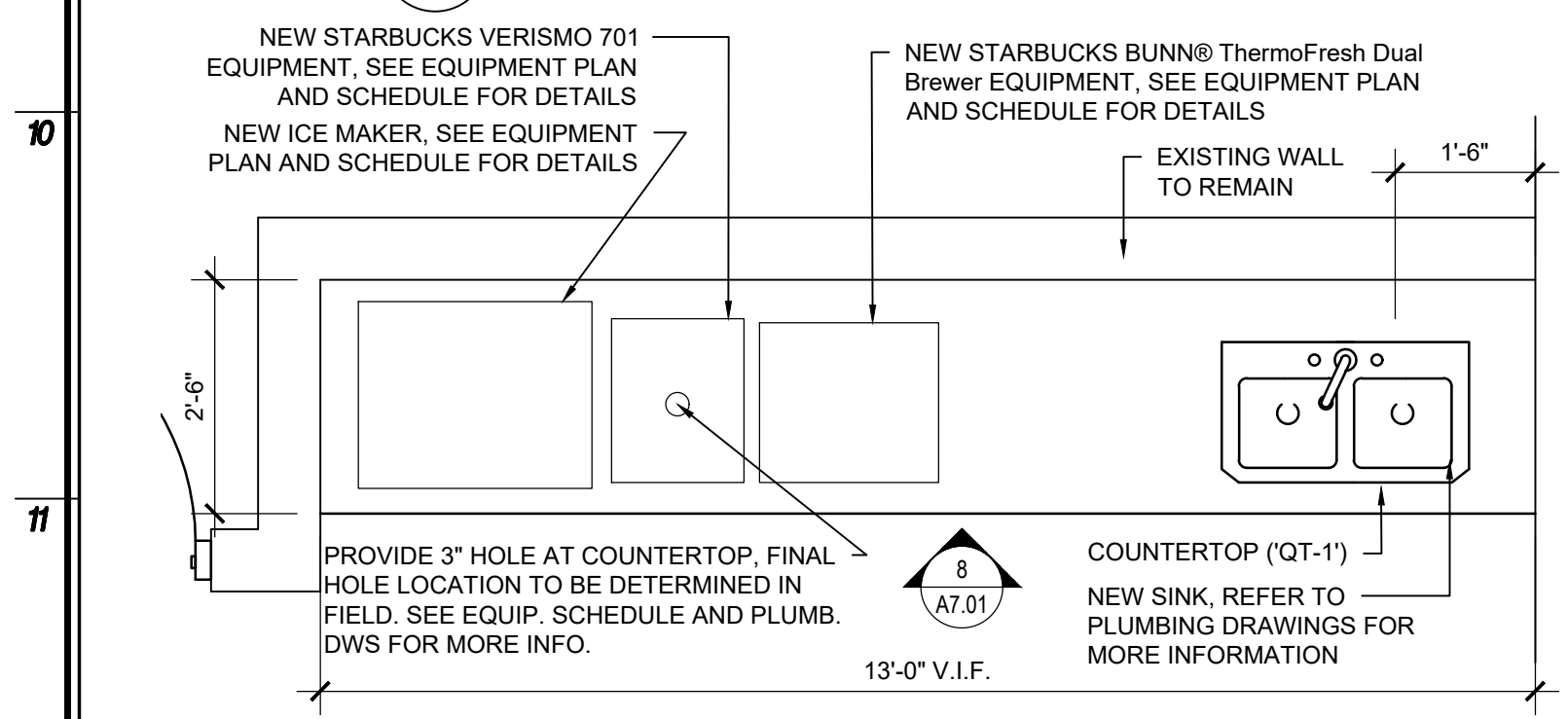
8 MILLWORK ELEVATION
1" = 1'-0"



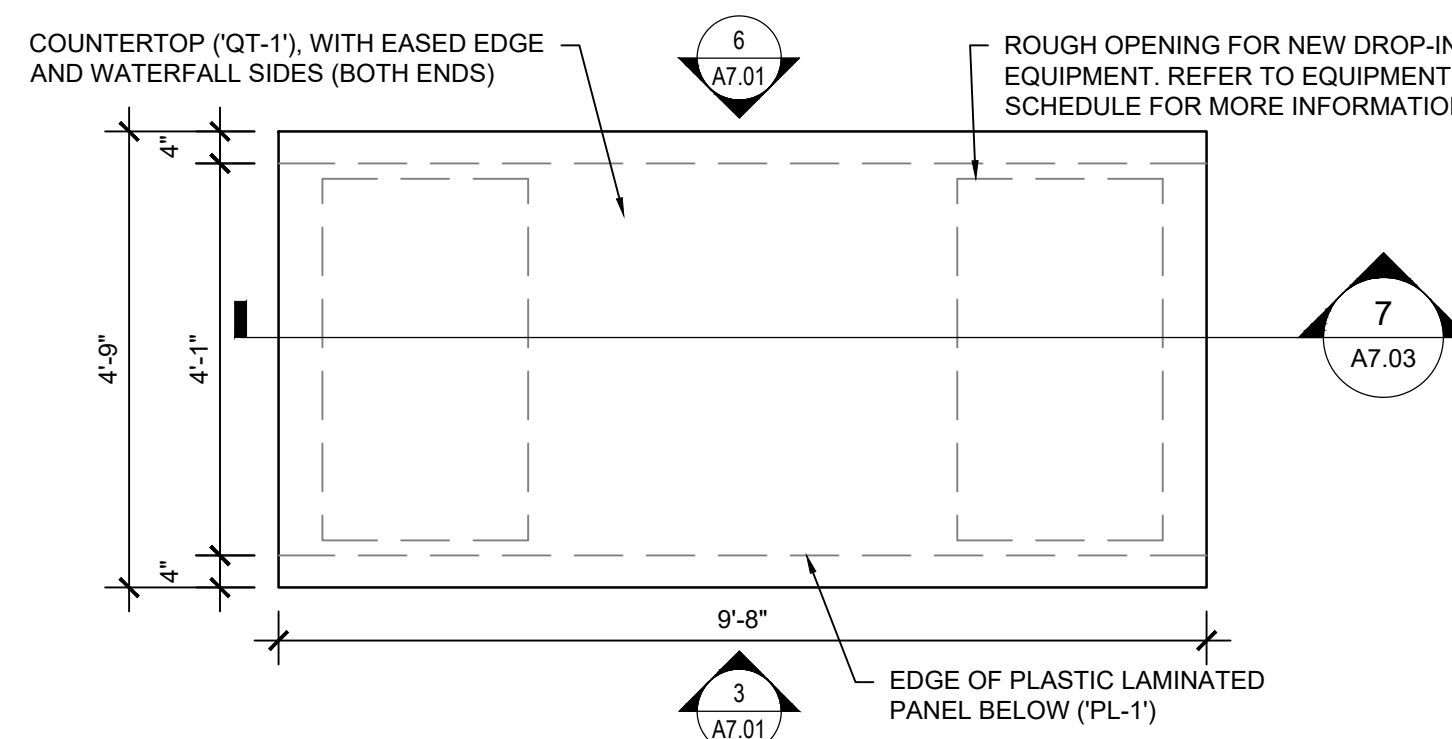
7 MILLWORK ELEVATION
1" = 1'-0"



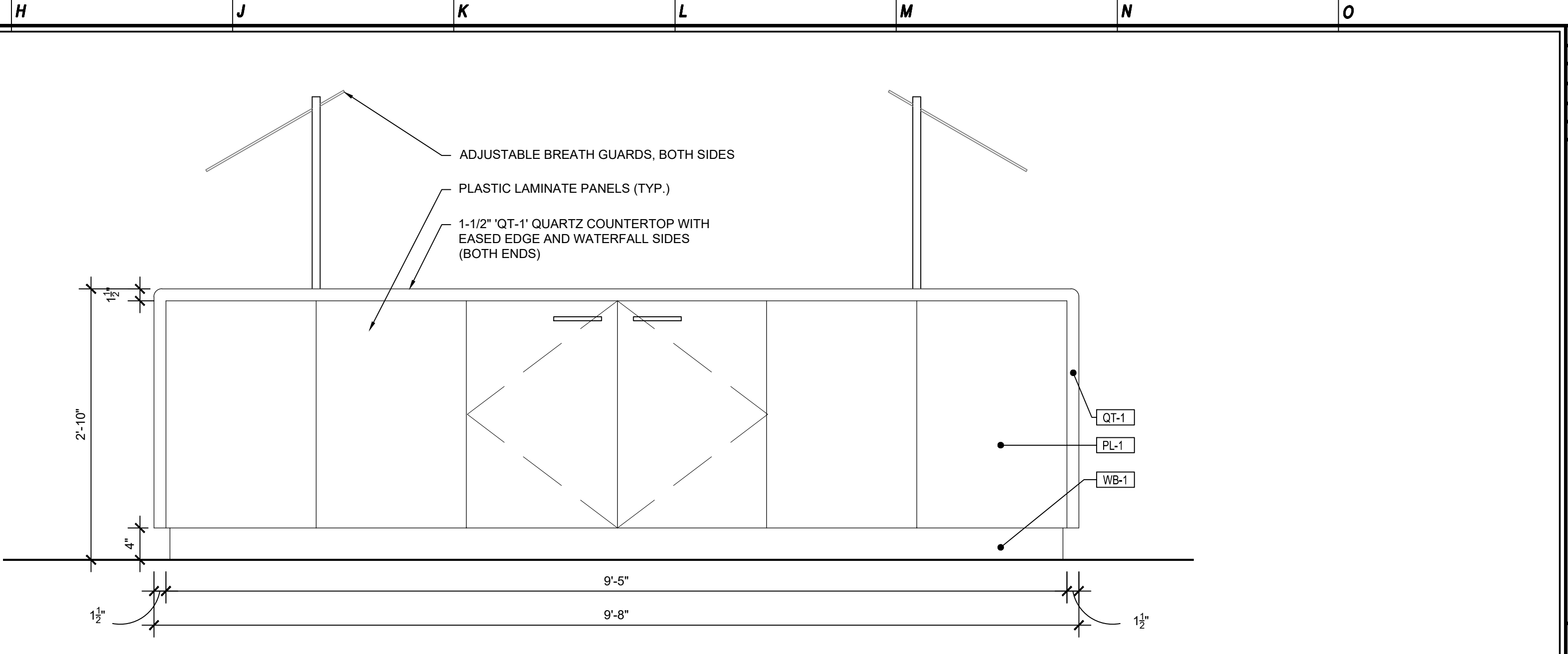
6 ISLAND BAR ELEVATION
1" = 1'-0"



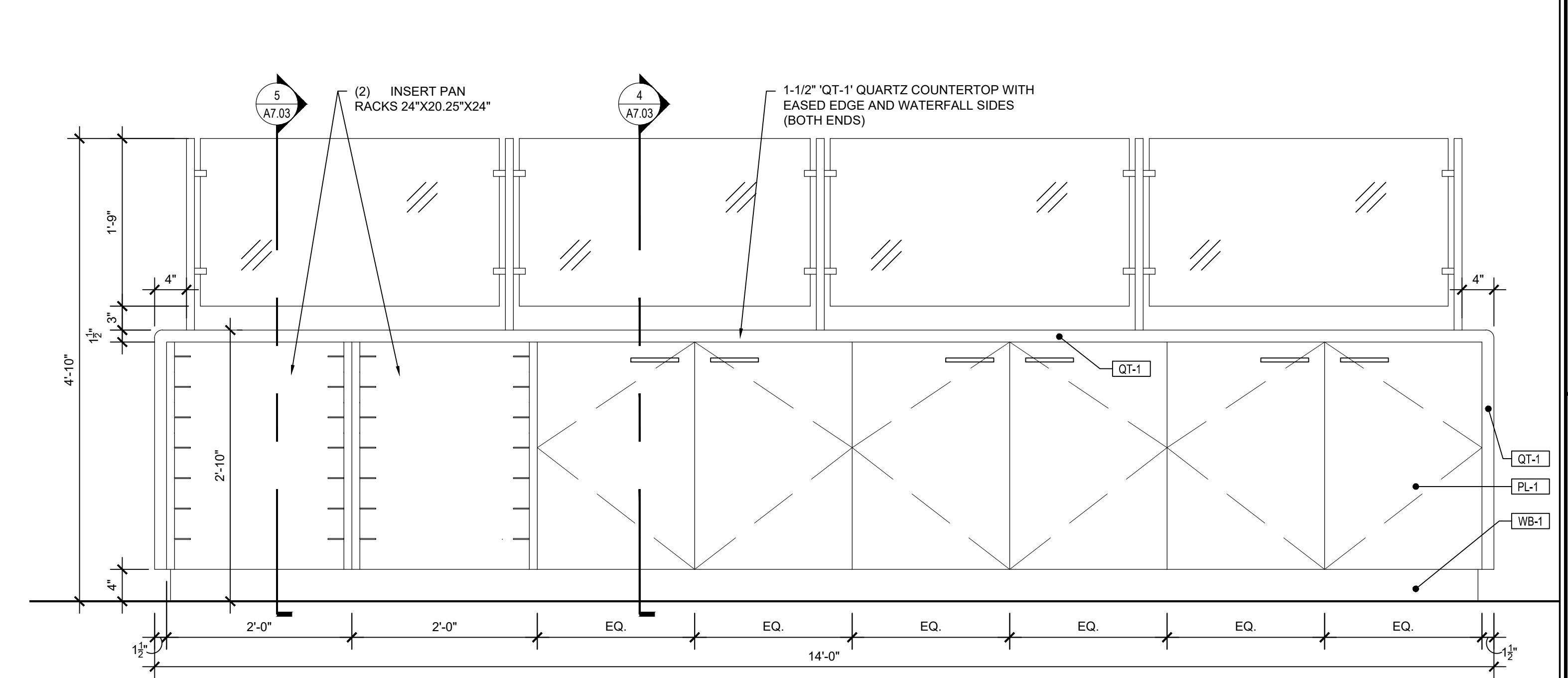
5 MILLWORK PLAN
1/2" = 1'-0"



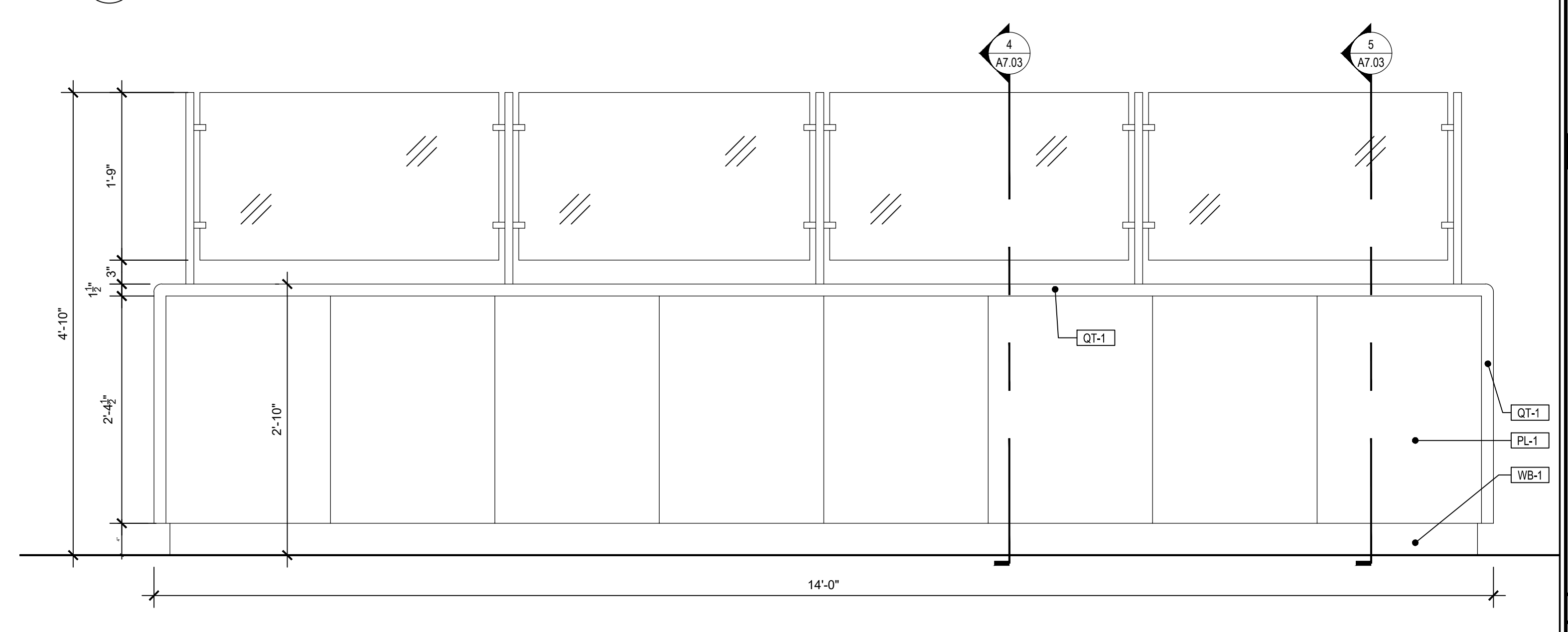
4 MILLWORK PLAN
1/2" = 1'-0"



3 ISLAND BAR ELEVATION
1" = 1'-0"



2 MILLWORK ELEVATION
1" = 1'-0"



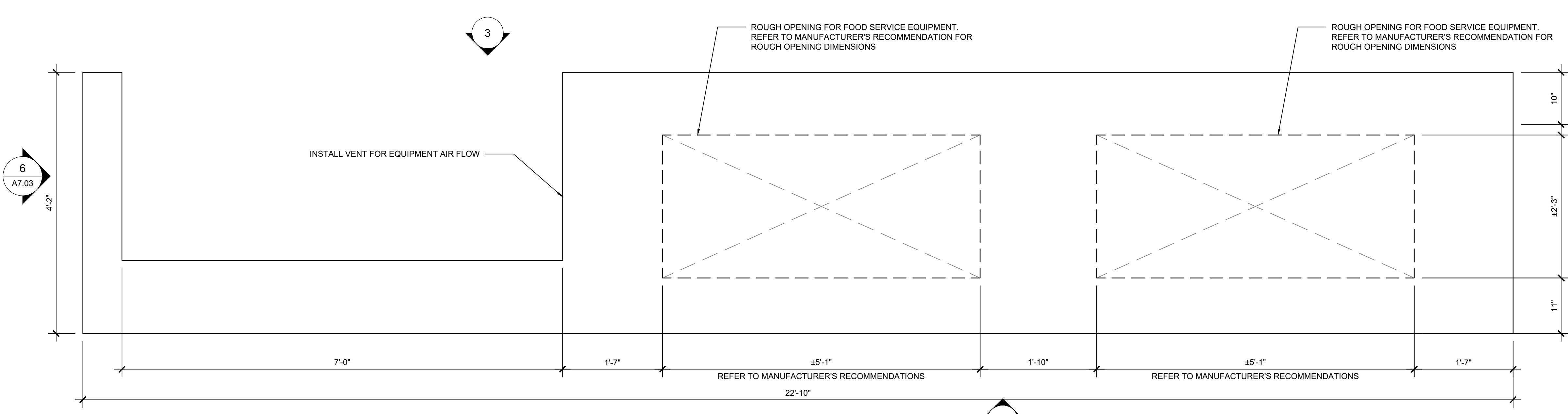
1 MILLWORK ELEVATION
1" = 1'-0"

NJ Certificate of Authorization	
Eng. No.	24047937500
Arch. No.	21A020012400
Date	3/10/22
Checked	MTW
Drawn	RPC
MATTHEW T. WOLFE, AIA THE REGISTERED ARCHITECT License No. NJZ1A01963400	
Revisions:	
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MILLWORK DETAILS	
CAFETERIA RENOVATIONS AT MEGA STRUCTURE ESSEX COUNTY COMMUNITY COLLEGE 303 UNIVERSITY AVENUE NEWARK, NEW JERSEY 07102	
Job No.	2.20302.02
File No.	2030202A201
A7.01	

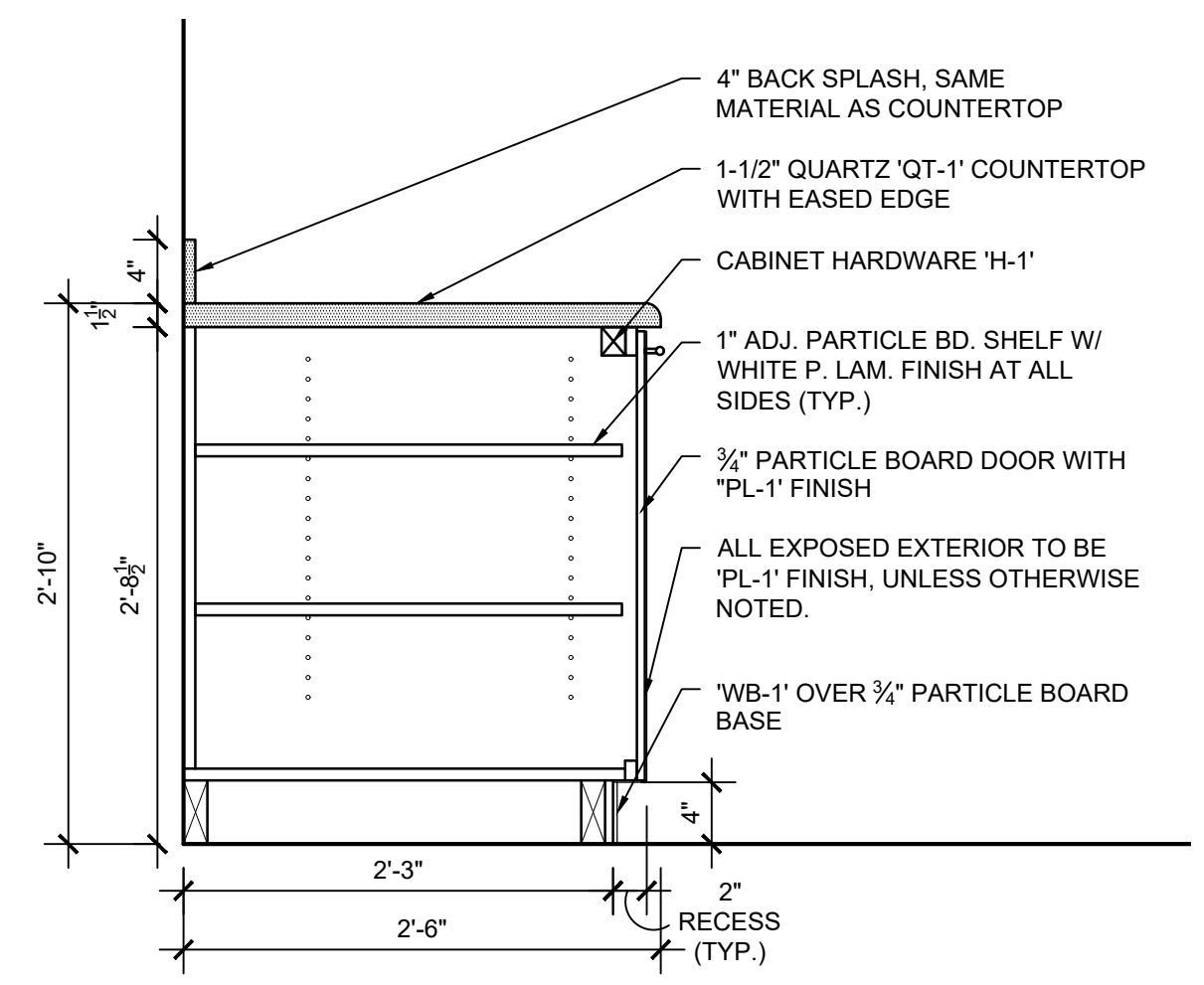
NJ Certificate of Authorization	
Eng. No.	24627937500
Arch. No.	21A020012400
Date	3/10/22
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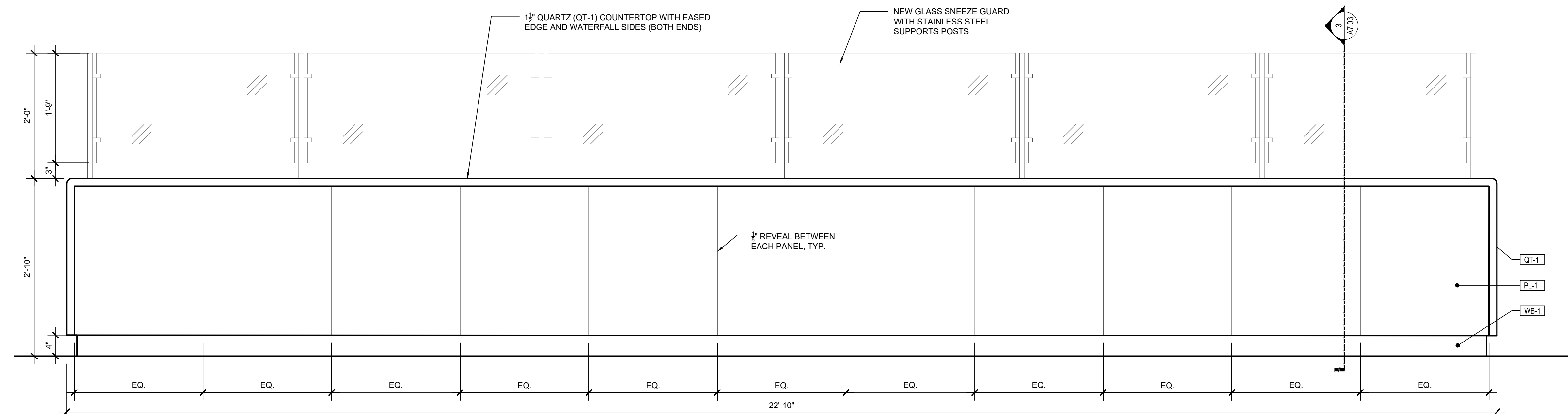
Revisions:



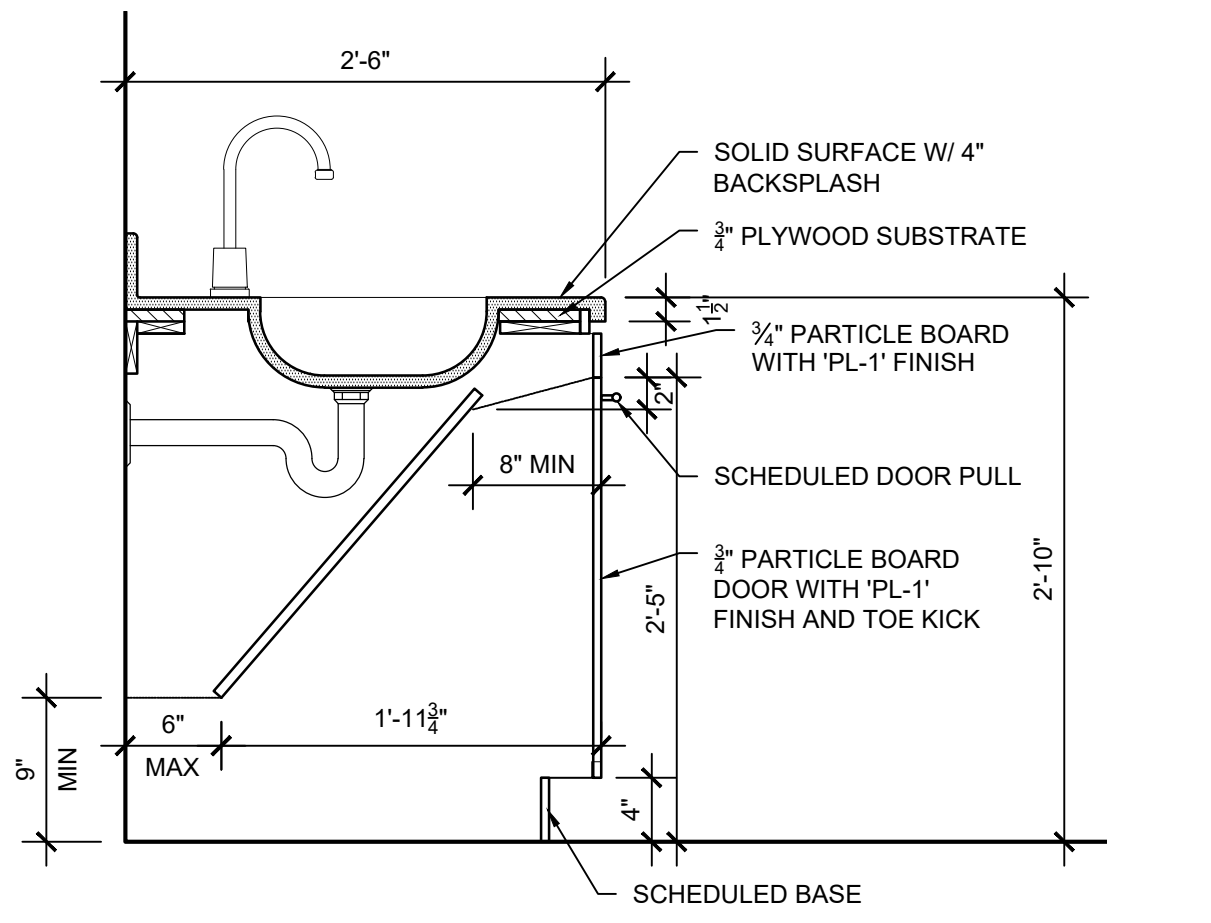
1 PLAN DETAIL
1" = 1'-0"



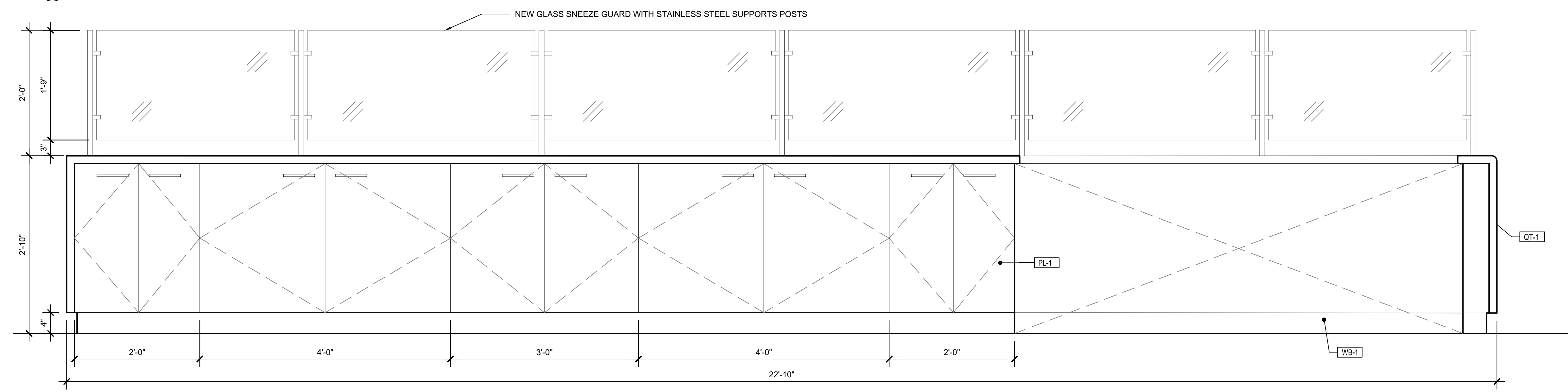
4 SECTION DETAIL
1" = 1'-0"



2 FRONT ELEVATION
1" = 1'-0"



5 SECTION DETAIL
1" = 1'-0"



3 REAR ELEVATION
1" = 1'-0"

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MILLWORK DETAILS
 CAFETERIA RENOVATIONS AT MEGA STRUCTURE
 ESSEX COUNTY COMMUNITY COLLEGE
 303 UNIVERSITY AVENUE
 NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
 File No. 2030202A201

A7.02

Eng. No.	24627937500
Arch. No.	214200012400
Date	3/10/22
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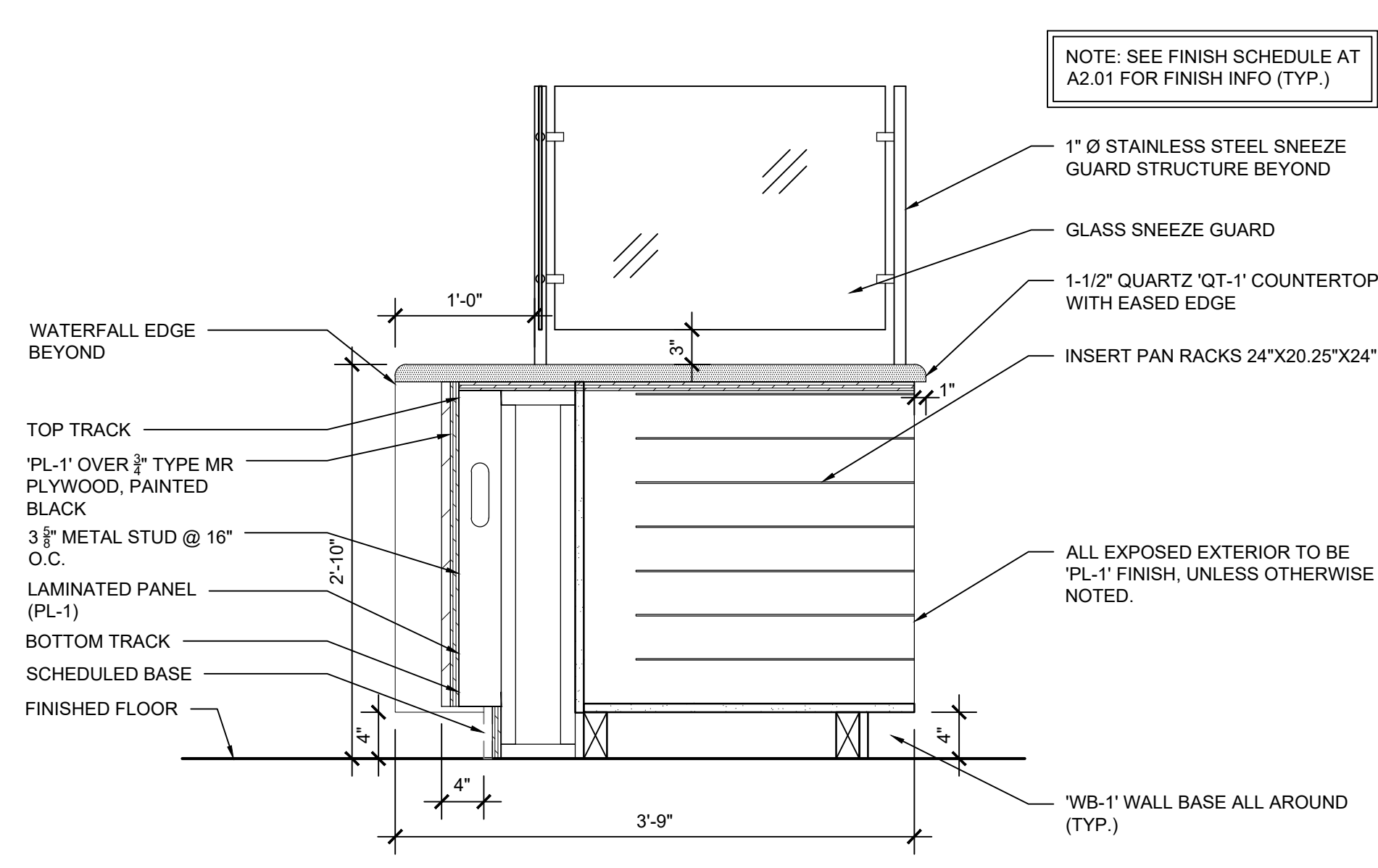
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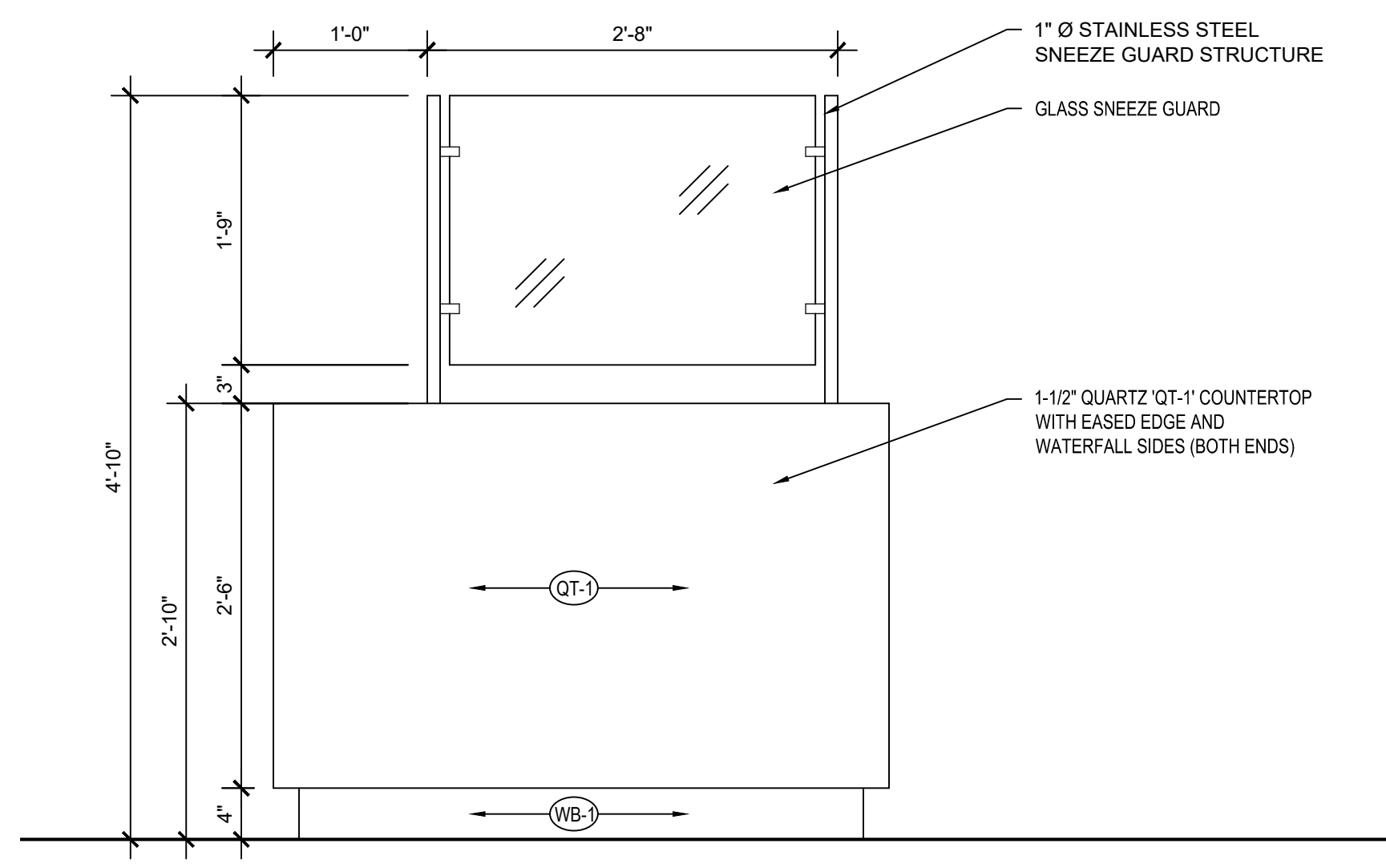
MILLWORK DETAILS
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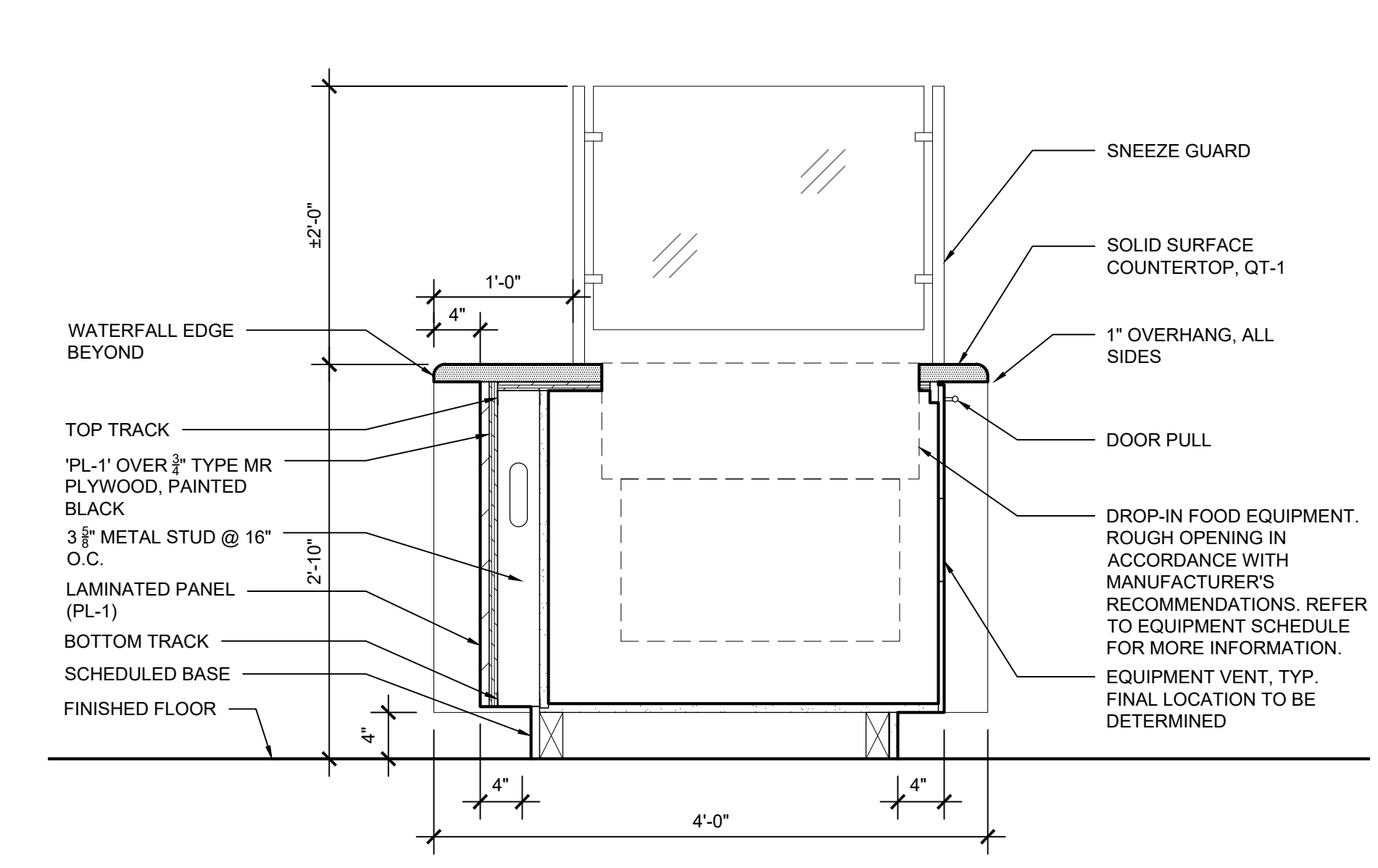
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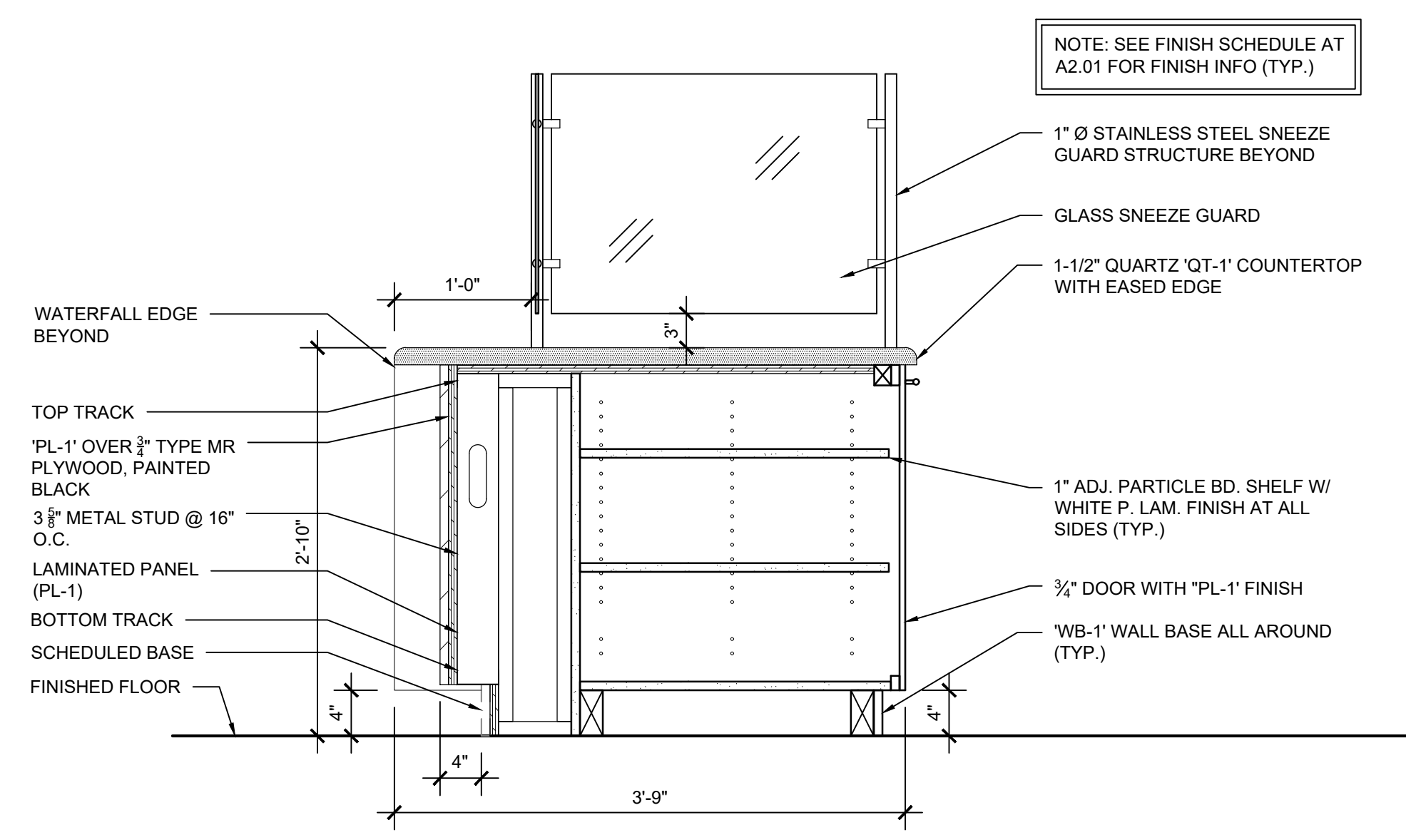
5 SECTION DETAIL
 1" = 1'-0"



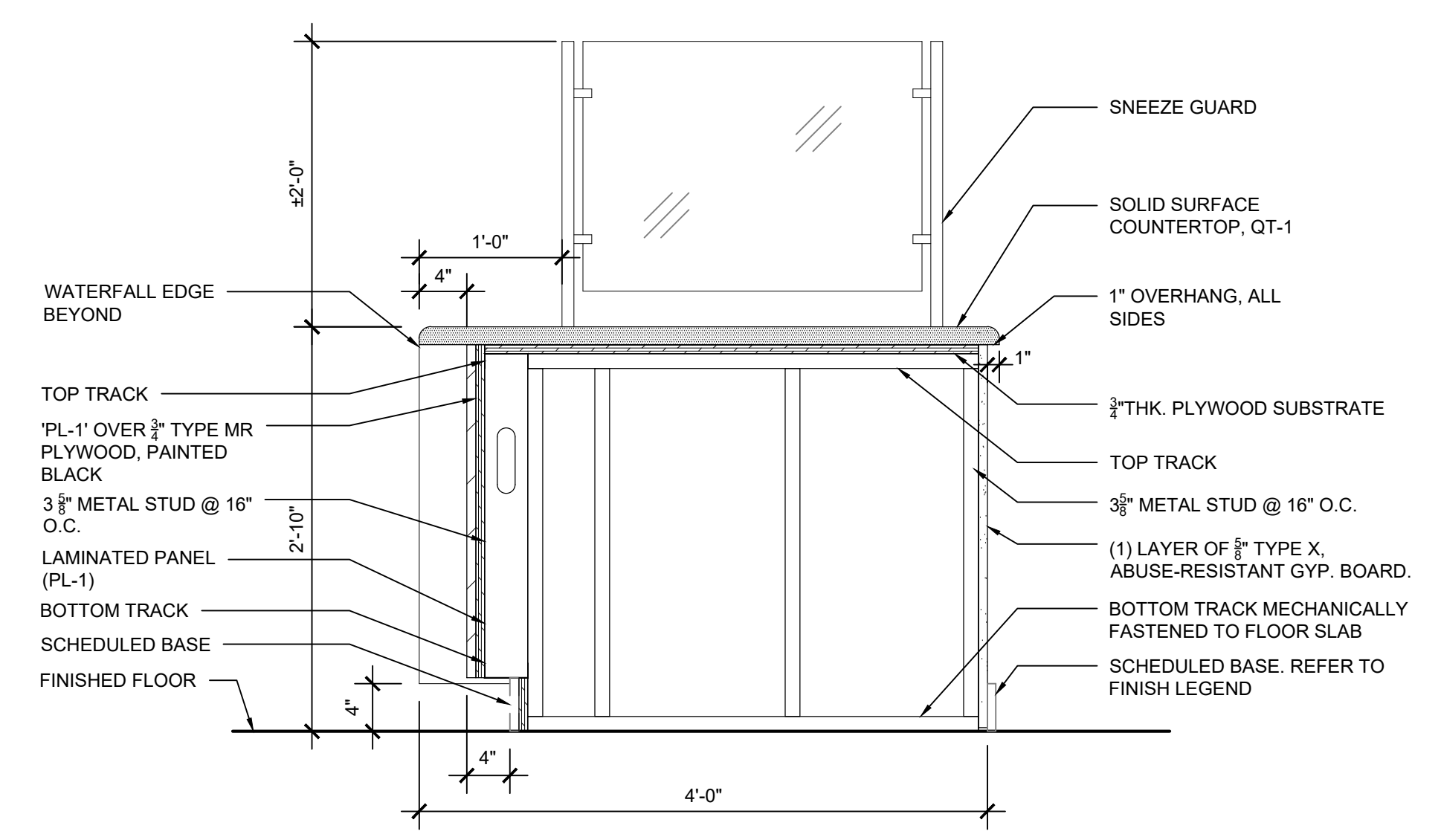
6 ELEVATION DETAIL
 1" = 1'-0"



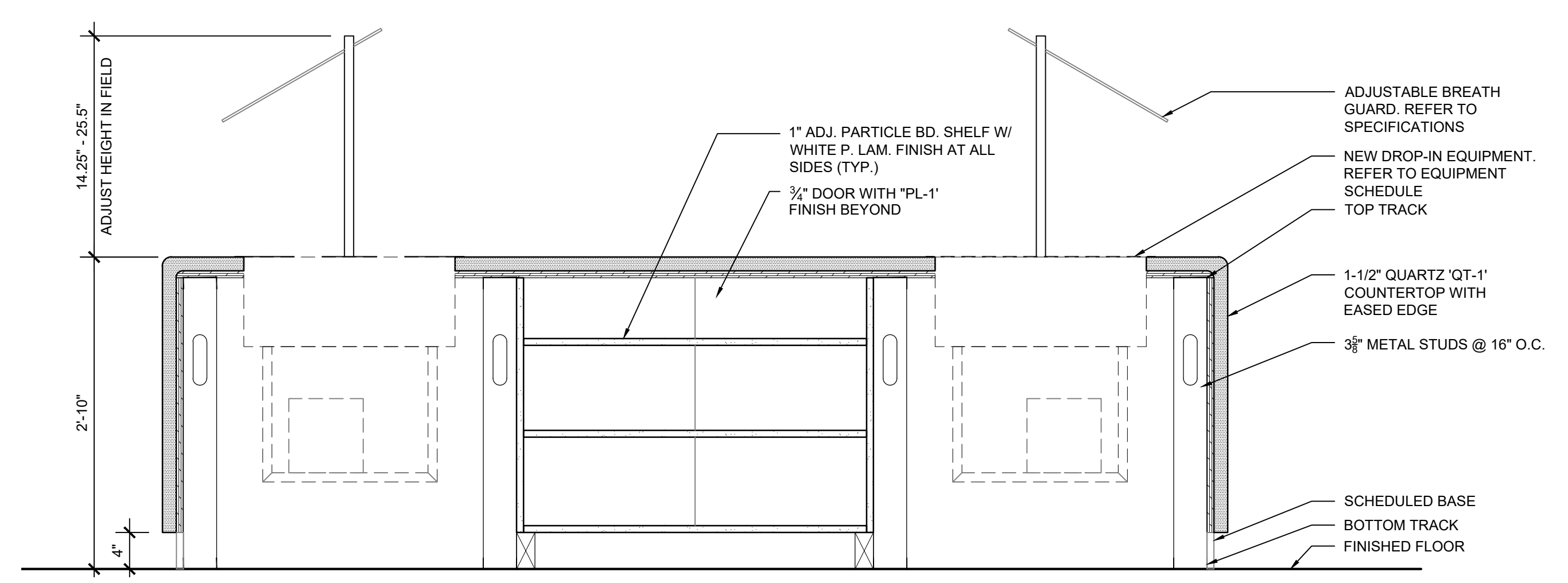
3 MILLWORK SECTION @ DROP-IN EQUIPMENT
 1" = 1'-0"



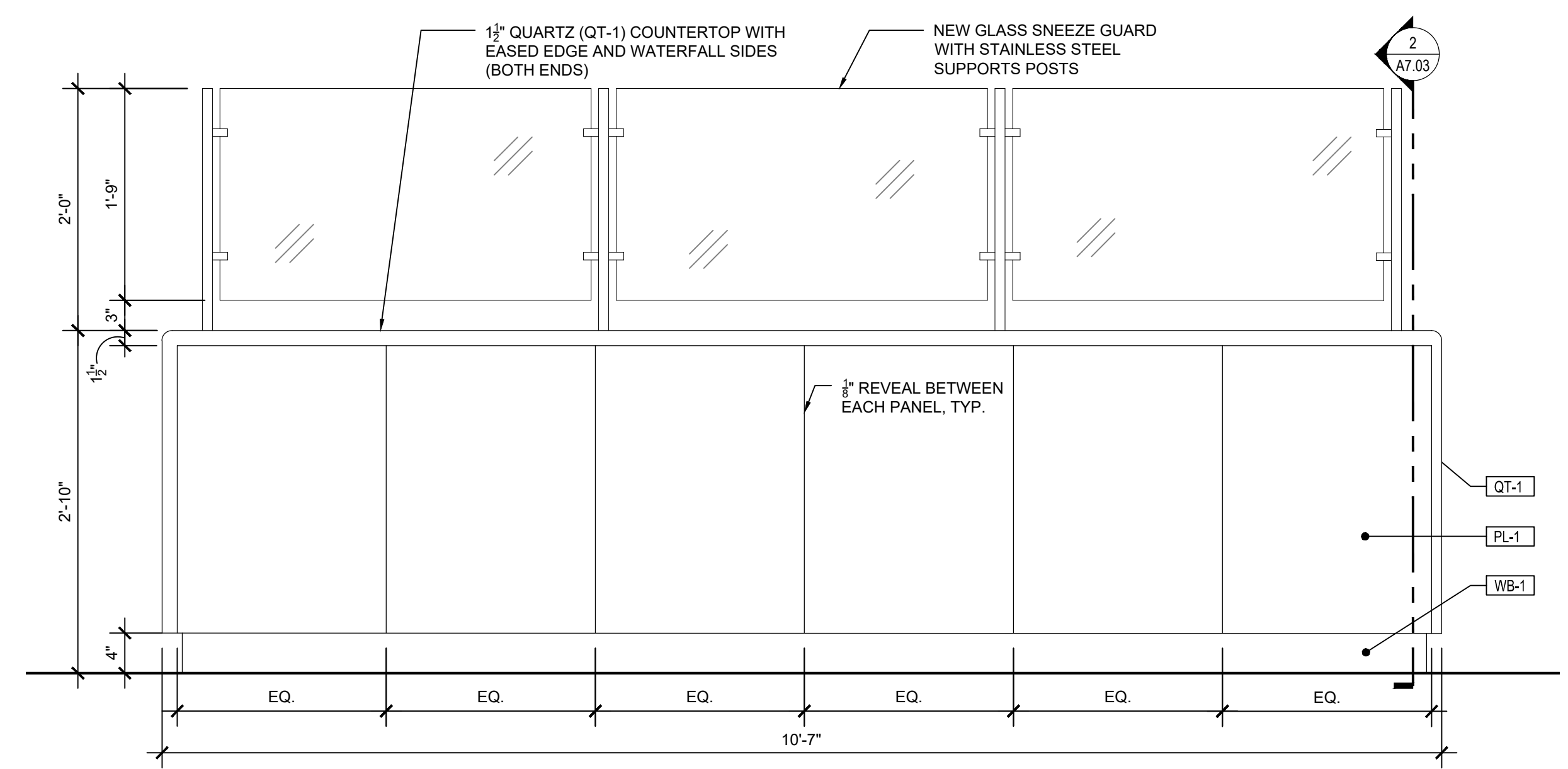
4 SECTION DETAIL
 1" = 1'-0"



2 KNEE WALL SECTION
 1" = 1'-0"



7 SECTION AT ISLAND BAR
 1" = 1'-0"



1 KNEE WALL ELEVATION
 1" = 1'-0"

H.V.A.C. GENERAL NOTES

1. PROCURE AND PAY ALL NECESSARY PERMITS AND LICENSES REQUIRED TO CARRY OUT THE WORK SHOWN. OBTAIN AND PAY FOR ALL FEES.
2. COMPLY WITH ALL FEDERAL, STATE AND MUNICIPAL LAWS AND CODES, ORDINANCES, RULES AND REGULATIONS OF HEALTH, PUBLIC OR OTHER AUTHORITIES CONTROLLING OR LIMITING THE METHODS, MATERIALS TO BE USED OR ACTIONS OF THOSE EMPLOYED.
3. GUARANTEE H.V.A.C. SYSTEMS FOR A PERIOD OF TWO YEARS FROM OWNER'S ACCEPTANCE TO BE FREE FROM DEFECTS AND REPAIR OR REPLACE, AT NO COST TO OWNER, FAILURES OR DEFECTS.
4. H.V.A.C. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ALL HIS DEBRIS.
5. BALANCE AIR SYSTEMS TO QUANTITIES INDICATED. CONTRACTOR TO SUBMIT SIX (6) SETS OF AIR AND UNIT BALANCING REPORT TO ARCH./ENGR./OWNER PRIOR TO FINAL ACCEPTANCE OF THE SYSTEM.
6. BIDDERS FOR THIS WORK SHALL VISIT THE PREMISES AND CAREFULLY EXAMINE ALL EXISTING CONDITIONS BEFORE SUBMITTING BIDS. NOT ALL EXISTING CONDITIONS HAVE BEEN IDENTIFIED ON DRAWINGS. CONTRACTOR SHALL NOTIFY ARCH. & ENGR. OF ALL DISCREPANCIES PRIOR TO SUBMITTING BID.
7. ALL BIDDERS SHALL ALSO FAMILIARIZE THEMSELVES WITH THE MEANS OF ENTRANCE AND EXIT AT THE PROPERTY AND ALL OTHER INFORMATION NECESSARY TO PROPERLY CARRY OUT THE WORK.
8. THE CONTRACTOR SHALL, WITH THE APPROVAL OF THE ENGINEER AND WITHOUT ADDITIONAL COST TO THE OWNER, MAKE ALL NECESSARY CHANGES OR MODIFICATIONS TO LOCATIONS AS MAY BE NECESSARY TO SUIT REQUIREMENTS AND CONDITIONS FOR THE PROPER AND CONVENIENTLY ACCESSIBLE LOCATIONS OF ALL PARTS OF EACH SYSTEM.
9. SMALL DETAILS ARE NOT USUALLY SHOWN OR SPECIFIED BUT ALL MATERIALS & COMPONENTS NECESSARY FOR THE PROPER INSTALLATION AND OPERATION OR WORK SHALL BE FURNISHED AND INSTALLED AT NO ADDITIONAL COST.
10. THE CONTRACTOR SHALL NOTE THAT ALL SERVICE CONNECTIONS MAY NOT BE SHOWN IN TRUE POSITIONS. EACH BIDDER IS CAUTIONED, THEREFORE, TO VERIFY SAME WITH FIELD CONDITIONS.
11. CONTRACTOR SHALL CHECK FOR INTERFERENCE AND VERIFY ALL DIMENSIONS PRIOR TO FABRICATION OR INSTALLATION OF PIPING AND DUCTWORK.
12. IF AN ITEM OF EQUIPMENT OTHER THAN THE ITEM(S) SPECIFIED IS APPROVED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ADDITIONAL COST ARISING OUT OF ADDITIONAL OR CHANGED GENERAL CONSTRUCTION AND MECHANICAL WORK REQUIRED TO ACCOMMODATE THE SUBSTITUTED EQUIPMENT.
13. ALL EQUIPMENT INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURERS DIRECTIONS AND RECOMMENDATIONS.
14. PROVIDE ONE SET OF SPARE FILTERS FOR ALL INSTALLED HV/HVAC UNITS TO THE OWNER FOR ATTIC STOCK.
15. PROVIDE TWO YEAR MAINTENANCE SERVICE FOR ALL INSTALLED HV/HVAC MECHANICAL SYSTEMS. THIS INCLUDES A MINIMUM OF THREE PERIODIC SERVICE VISITS TO INSPECT, TEST & CHECK ALL COMPONENTS OF HV/HVAC UNITS AND ANY ADDITIONAL VISITS REQUIRED IF ANY HV/HVAC UNIT FAILS. ALL NECESSARY BELT ALIGNMENTS, PROPER OPERATIONS OF ALL DAMPERS, ETC IS INCLUDED IN THIS SCOPE OF WORK.
16. PROVIDE FIRE DAMPERS/ACCESS DOORS AT ALL DUCT PENETRATIONS THROUGH CORRIDORS, SLABS AND OTHER RATED PARTITIONS, IRRESPECTIVE OF WHETHER IT IS INDICATED ON THE DRAWINGS OR NOT.
17. PROVIDE FIRE STOPPING AROUND ALL OPENINGS FOR DUCT, PIPING, CONDUIT, ETC. PENETRATIONS THROUGH CORRIDORS, SLABS AND OTHER RATED PARTITIONS.
18. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR ALL DEMOLITION AND RESTORATION OF AREAS OF MECHANICAL REMOVALS.
19. MECHANICAL CONTRACTOR IS RESPONSIBLE FOR ALL CONTAINER SERVICES AND LABOR TO KEEP THE BUILDING FREE OF DEBRIS.
20. CONTRACTOR TO THOROUGHLY CLEAN ALL EXISTING DUCTWORK WHICH IS TO REMAIN WITHIN THE SCOPE OF WORK AREA (SUPPLY, RETURN AND OUTDOOR AIR). PROVIDE SIX (6) COPIES OF REPORT INCLUDING COLOR PHOTOS INDICATING DUCTWORK CONDITION BEFORE & AFTER CLEANING.
21. PROVIDE NEW VOLUME DAMPERS IN EXISTING DUCTWORK (SUPPLY/RETURN/EXHAUST) WHICH IS TO BE REUSED WHERE THERE ARE NO EXISTING VOLUME DAMPERS (TYPICAL FOR ALL).
22. CONTRACTOR TO PROVIDE NEW WALL MOUNTED THERMOSTATS IN TAMPER PROOF ENCLOSURES FOR ALL VAV BOXES, ETC. IRRESPECTIVE OF WHETHER THEY ARE INDICATED ON ALL DRAWINGS OR NOT. CONTRACTOR TO INDICATE THERMOSTAT LOCATIONS ON ALL SHOP DRAWINGS.
23. CONTRACTOR TO SUBMIT SIX (6) SETS OF OPERATION & MAINTENANCE MANUALS, INCLUDING A SUMMARY SHEET OF ALL EQUIPMENT MFRS/MODEL #/SERIAL #/S, SHOP DRAWING SUBMITTALS, WARRANTY INFORMATION, O&M MANUALS, PROJECT INFORMATION, CONTACT DETAILS & AS-BUILT DRAWINGS.
24. CONTRACTOR TO PROVIDE SIX (6) SETS AND AN ELECTRONIC COPY OF AS-BUILT DRAWINGS OF THE ENTIRE SYSTEM.
25. PROVIDE PROPER IDENTIFICATION TAGS, ARROWS, AND LABELS FOR ALL EQUIPMENT INCLUDING VAV BOXES, DUCTWORK, ELECTRICAL PANELS, ETC.
26. CONTRACTOR TO PROVIDE A MINIMUM OF TWO (2) TRAINING SESSIONS (TWO HOURS EACH) THAT ARE TO BE VIDEOTAPED FOR THE OWNERS USE, TO OWNER'S MAINTENANCE STAFF ON PROPER OPERATION, MAINTENANCE & COMMON TROUBLE-SHOOTING GUIDELINES.

GENERAL CONSTRUCTION NOTES

1. CONTRACTOR'S RESPONSIBILITIES, INCLUDING BUT NOT LIMITED TO CUTTING, PATCHING, CORE DRILLING, POWER & LIGHTING DISCONNECTS, CEILING REMOVALS, TRENCHING, ETC.
2. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH THE EXTENT AND SCOPE OF THE WORK PRIOR TO SUBMITTING BIDS OR COMMENCING WORK.
3. CONTRACTORS SHALL REVIEW DRAWINGS AND FIELD VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS PRIOR TO COMMENCING WORK. THE CONTRACTORS SHALL REPORT ANY DISCREPANCIES, AND ADDRESS ALL QUESTIONS TO ARCHITECT/ENGINEER PRIOR TO COMMENCING WORK.
4. THE CONTRACTORS SHALL SECURE AND PAY FOR ALL REQUIRED PERMITS, FEES AND INSPECTIONS PRIOR TO COMMENCING WORK. UPON COMPLETION OF WORK THE CONTRACTOR SHALL SECURE CERTIFICATE OF OCCUPANCY.
5. CONTRACTORS SHALL BE RESPONSIBLE TO DISPOSE OF ALL DEMOLISHED MATERIAL OF SITE IN AN APPROVED MANNER.
6. CONTRACTOR SHALL PROVIDE TEMPORARY STORAGE TANK(S) WITH SUITABLE STORAGE CAPACITY IN THE BOILER ROOM AND CONNECT TO EXISTING DHW HEATER. CONTRACTOR HAS THE OPTION OF USING NEW INDIRECT DHW HEATER HWG-2 AS TEMPORARY STORAGE TANK AND CONNECT TO EXISTING DHW HEATER. REUSE EXISTING CIRCULATING PUMP.
7. DOWN-TIME FOR THE TIE-IN OR SWITCHOVER SHALL BE KEPT TO A MINIMUM. COORDINATE SCHEDULE WITH THE OWNER.
8. PROVIDE PIPE IDENTIFICATION TAGS ON ALL NEW & EXISTING PIPING IN THE MECHANICAL ROOMS.

H.V.A.C. MATERIALS

EQUIPMENT:

- REFER TO SCHEDULES FOR UNIT MANUFACTURER, SIZE, AND CAPACITY DATA.

DUCTWORK:

- INDOOR SUPPLY, RETURN AND EXHAUST DUCTWORK, EXCEPT AS INDICATED BELOW, SHALL BE GALVANIZED STEEL CONSTRUCTION. WEIGHTS AND CONSTRUCTION DETAIL SHALL BE IN ACCORDANCE WITH THE LATEST ASHRAE GUIDE AND/OR SMACNA STANDARDS.
- FLEXIBLE DUCTWORK: SHALL NOT EXCEED FOUR (4) FEET IN LENGTH. FOR ANY HORIZONTAL FLEX DUCT BRANCH TO A CEILING DIFFUSER, FURNISH A 90° BRACE TO MAINTAIN A LONG RADIUS ELBOW TO THE DIFFUSER ("TITUS" MAKE, MODEL "FLEXRIGHT").
- FIRE DAMPER: GREENHECK MAKE, MODEL FD-150 TYPE B (BLADES OUT OF AIRSTREAM), 1-1/2 HOUR RATED (UNLESS OTHERWISE NOTED) UL-555 LABELED DAMPER WITH STANDARD FRAME OR APPROVED EQUAL. PROVIDE WITH A RETAINING ANGLE AND AN ACCESS DOOR.

AIR DEVICES:

- SAD: TITUS MAKE, MODEL OMNI, OR APPROVED EQUAL.
- RAR: TITUS MAKE, MODEL 350RL OR APPROVED EQUAL (STEEL CONSTRUCTION).

INSULATION:

- EXTERNAL DUCT INSULATION: 1.5" THICK, MIN. 1.5 LB. DENSITY FIBERGLASS DUCT INSULATION WITH REINFORCED FOIL FACED FLAME RESISTANT KRAFT VAPOR BARRIER, ADHERED TO DUCT W/ SEALED LAPS AND TAPED JOINTS.
- INTERNALLY LINED DUCT: 1" THICK, MIN. 1.0 LB. DENSITY RIGID INSULATION ADHERED TO DUCT. DUCTS WIDER THAN 12" TO HAVE WELDED PINS AND WASHERS. DUCT DIMENSIONS AS INDICATED ARE CLEAR INSIDE DUCT DIMENSIONS.
NOTES:
 1. ALL SUPPLY & RETURN AIR DUCTWORK SHALL BE INTERNALLY LINED FOR A MIN. OF 25' TO AND FROM ANY RTU OR AHU.
 2. ALL SUPPLY AIR DUCTWORK SHALL BE INTERNALLY LINED FOR A MINIMUM OF 15' DOWNSTREAM OF ALL VAV BOXES.
- DUCT INSULATION NOTE: PROVIDE A MINIMUM 6" OVERLAP WHERE INTERNAL INSULATION ENDS AND EXTERNAL INSULATION BEGINS.
- ALL CONDENSATE DRAIN PIPING SHALL BE INSULATED WITH 1" THICK FLEXIBLE ELASTOMERIC ("AP ARMAFLEX BLACK LAPSEAL")
- FRESH AIR INTAKE AND EXPOSED DUCT: 1" THICK, MIN. 2 LB. DENSITY RIGID FIBERGLASS DUCT INSULATION WITH FOIL FACING VAPOR BARRIER FASTENED WITH WELDED CLIPS, CEMENTED JOINTS WITH ALUMINUM TAPE.

ACCESS DOORS

- FURNISH AND INSTALL ACCESS DOORS AT ALL LOCATIONS WHERE VALVES, DAMPERS, CONTROLS, VENTS, DRAINS, ETC. ARE TO BE INSTALLED ABOVE OR BEHIND ANY INACCESSIBLE SURFACE (GYPSUM BOARD, CMU, ETC.), IRRESPECTIVE OF WHETHER THEY ARE INDICATED ON ALL DRAWINGS OR NOT. ACCESS DOORS SHALL BE A SUITABLE SIZE TO MAINTAIN, OPERATE, REPAIR, AND REPLACE ALL EQUIPMENT. ACCESS DOORS SHALL BE FACTORY PRIMED AND PAINTED TO MATCH THE SURFACE IN WHICH THEY ARE INSTALLED.

ABBREVIATIONS

&	=	AND	HVAC	=	HEAT/VENT/AIR COND
@	=	AT	ID	=	INSIDE DIAMETER (DIM)
Ø	=	DIAMETER OR ROUND	IN	=	INCH
ABV	=	ABOVE	INSL	=	INSULATION
AC	=	AIR CONDITIONING UNIT	MAX	=	MAXIMUM
ACCU	=	AIR COOLED CONDENSING UNIT	MD	=	MOTORIZED DAMPER
AD	=	ACCESS DOOR	MECH	=	MECHANICAL
ADD'L	=	ADDITIONAL	MEP	=	MECHANICAL/ELECTRICAL/PLUMBING
ADJ	=	ADJUSTABLE	MFR	=	MANUFACTURER
AHU	=	AIR HANDLING UNIT	MIN	=	MINIMUM
ALT	=	ALTERNATE	MISC	=	MISCELLANEOUS
AS	=	AIR SEPARATOR	N.A.	=	NOT APPLICABLE
B	=	BOILER	NK	=	NECK SIZE
BDD	=	BACK DRAFT DAMPER	NTS	=	NOT TO SCALE
BLDG	=	BUILDING	OA	=	OUTSIDE AIR
BOD	=	BOTTOM OF DUCT	OC	=	ON CENTER
C	=	CONVECTOR	OD	=	OUTSIDE DIAMETER
CAH	=	CABINET HEATER	OPG	=	OPENING
CD	=	CONDENSATE DRAIN	P	=	PUMP
CFM	=	CUBIC FEET PER MINUTE	R	=	RISER
CH	=	CHILLER	RA	=	RETURN AIR
CHWP	=	CHILLED WATER PUMP	RAD	=	RADIUS
CHWR	=	CHILLED WATER RETURN	RAG	=	RETURN AIR GRILLE
CHWS	=	CHILLER WATER SUPPLY	RAR	=	RETURN AIR REGISTER
CL	=	CLOSET	RM	=	ROOM
CLG	=	CEILING	RTU	=	ROOF TOP HV/HVAC UNIT
CORR	=	CORRIDOR	SA	=	SUPPLY AIR
CTR	=	CENTER	SAD	=	SUPPLY AIR DIFFUSER
CW	=	CONDENSER WATER	SAG	=	SUPPLY AIR GRILLE
CWP	=	CONDENSER WATER PUMP	SAR	=	SUPPLY AIR REGISTER
DIA	=	DIAMETER	SECT	=	SECTION
DIM	=	DIMENSION	SPEC	=	SPECIFICATION
DN	=	DOWN	STD	=	STANDARD
DWG	=	DRAWING	STG	=	STORAGE
EA	=	EXHAUST AIR	TOD	=	TOP OF DUCT
EAR	=	EXHAUST AIR REGISTER	TYP	=	TYPICAL
EF	=	EXHAUST FAN	VAV	=	VARIABLE AIR VOLUME BOX
ELEC	=	ELECTRIC	VD	=	VOLUME DAMPER
ENGR	=	ENGINEER (ING)	VFD	=	VARIABLE FREQUENCY DRIVE
EQUIP	=	EQUIPMENT	VIF	=	VERIFY IN FIELD
ET	=	EXPANSION TANK	W	=	WITH
(E)EXIST	=	EXISTING	W/O	=	WITHOUT
FAI	=	FRESH AIR INTAKE	WT	=	WEIGHT
FD	=	FIRE DAMPER			
FF	=	FINISHED FLOOR			
FLR	=	FLOOR			
FP	=	FIRE PROTECTION			
FSD	=	FIRE/SMOKE DAMPER			
GALV	=	GALVANIZED			
GPM	=	GALLONS PER MINUTE			
GRG	=	GRAVITY RETURN GRILLE			

SYMBOLS

NOT TO SCALE

	=	SUPPLY AIR CEILING DIFFUSER (SAD) WITH NECK SIZE AND AND CFM INDICATED ON PLANS
	=	RETURN AIR REGISTER (RAR) WITH NECK SIZE AND CFM INDICATED ON PLANS
	=	EXHAUST AIR REGISTER (EAR); GRAVITY RELIEF GRILLE (GRG) WITH NECK SIZE AND CFM INDICATED ON PLANS
	=	SUPPLY AIR WALL REGISTER/GRILLE (SAR) WITH NECK SIZE AND CFM INDICATED ON PLANS
	=	RETURN AIR WALL REGISTER (RAR) WITH NECK SIZE AND CFM INDICATED ON PLAN
	=	POINT OF CONNECTION OF NEW PIPING/DUCTWORK TO EXISTING
	=	POINT OF DISCONNECTION OF NEW PIPING/DUCTWORK TO EXISTING
	=	INDICATES HARD DUCT WITH INTERNAL LINING (DIMENSIONS ARE INSIDE CLEAR WIDTH & DEPTH)
	=	INDICATES HARD DUCT (DIMENSIONS ARE INSIDE CLEAR WIDTH & DEPTH)
	=	INDICATES FLEXIBLE DUCT (DIMENSIONS ARE INSIDE CLEAR DIAMETER; LENGTH NOT TO EXCEED FOUR (4) FEET)
	=	DUCT TURN UP (SUPPLY, RETURN, EXHAUST)
	=	DUCT TURN DOWN (SUPPLY, RETURN, EXHAUST)
	=	FIRE DAMPER WITH ACCESS DOOR
	=	FIRE/SMOKE DAMPER WITH ACCESS DOOR
	=	VOLUME DAMPER
	=	BACK DRAFT DAMPER
	=	MOTORIZED DAMPER
	=	INDICATES NEW WALL MOUNTED THERMOSTAT.
	=	PROJECT NORTH
	=	ROOM NAME ROOM NUMBER
	=	REVISION

Eng. No.	24027837500
Arch. No.	210200012400
Date	3/10/22
Checked	TW
Drawn	SS

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Revisions:

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MECHANICAL NOTES, SYMBOLS, AND ABBREVIATIONS
CAFETERIA RENOVATIONS AT MEGA STRUCTURE
ESSEX COUNTY COMMUNITY COLLEGE
303 UNIVERSITY AVENUE
NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
Rev. No. 2030202M001

M0.01

DUAL DUCT VARIABLE AIR VOLUME MIXING BOX SCHEDULE

(KRUEGER AS STANDARD)

TAG	AREA SERVED	QUANTITY	SIZE	CFM	MIN. CFM %	NC LEVELS		STATIC PRESSURE (IN. W.G.)			MODEL	UNIT INFORMATION HAND	MANUFACTURER	NOTES
						RAD.	DISCH.	INLET	DOWN	MIN.				
DDVAV-A	SERVING AREA	3	16	3400	50%	32	33	1.2	0.5	0.68	LMHDT	RH	KRUEGER	SEE NOTE(S) BELOW

NOTES:

1. PROVIDE ACOUSTIC INSULATION DOWNSTREAM OF ALL VAV BOXES FOR A MINIMUM LENGTH OF 15'-0".
2. PROVIDE PNEUMATIC ACTUATORS.
3. ALL THERMOSTATS SHALL BE PROGRAMMABLE TYPE AND IN A TAMPER PROOF ENCLOSURE.
4. ALL VAV BOXES SHALL BE ACOUSTICALLY LINED WITH IAQ LINER.
5. ROOM NC LEVEL SHOWN INCLUDES ATTENUATION TRANSFER FUNCTIONS OBTAINED FROM TABLES IN AHRI STANDARD 885. "-" INDICATES A VALUE LESS THAN 10.

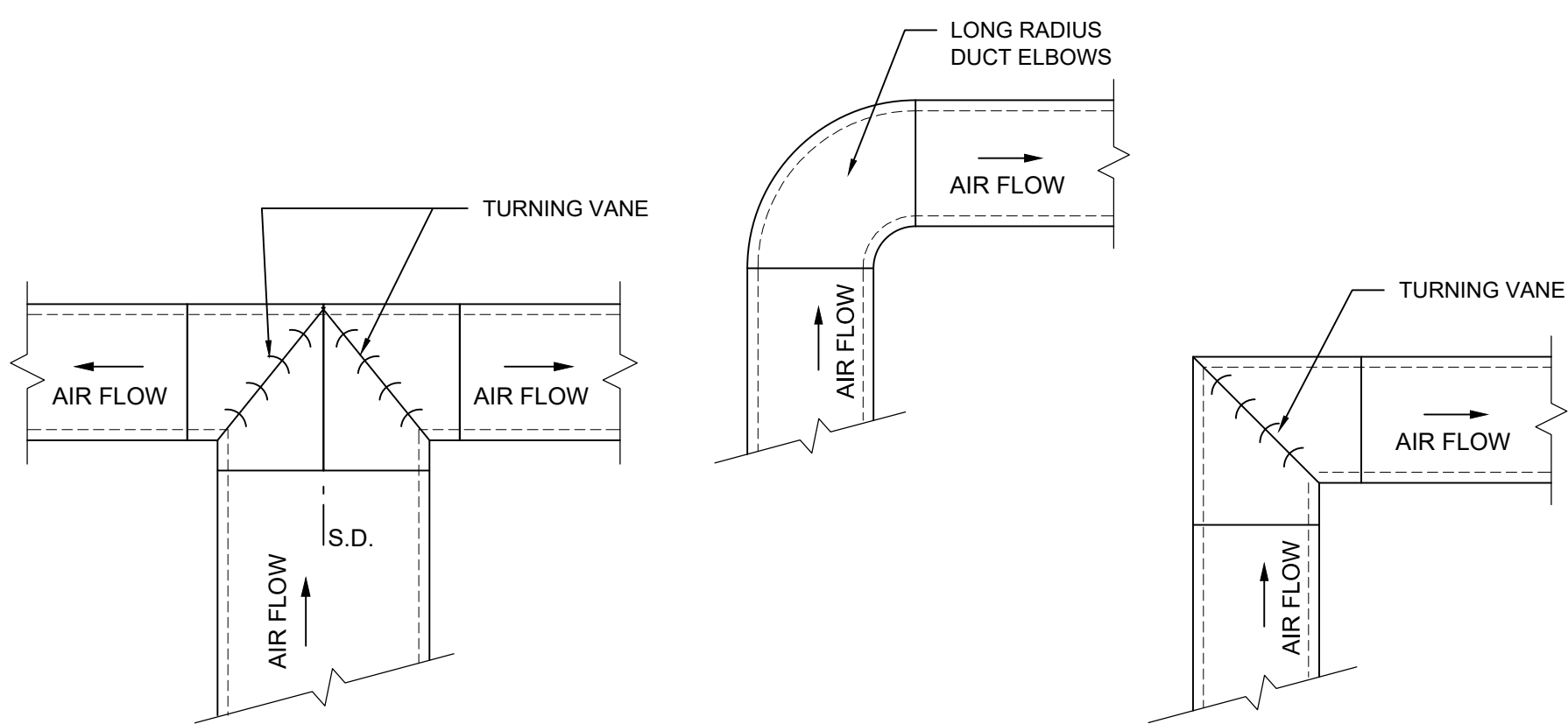
AIR OUTLET/INLET SCHEDULE

(TITUS AS STANDARD)

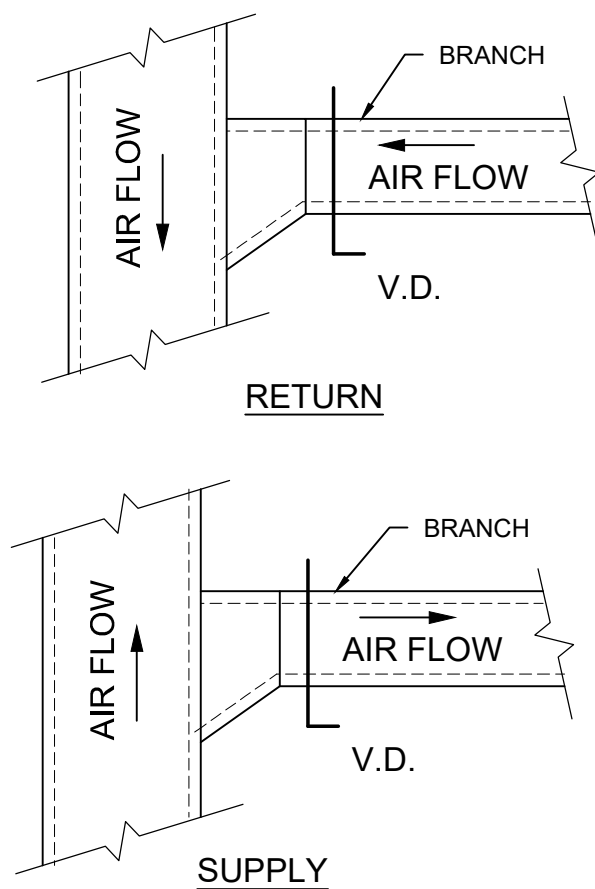
TAG	QTY.	MANUFACTURER	CFM RANGE	NECK SIZE (IN.)	NOMINAL FACE SIZE (IN.)	DISCHARGE PATTERN	MODEL	NOTES
SAD-A	15	TITUS	680	14" Ø	24" x 24"	4-WAY	OMNI	SEE NOTE(S) BELOW
RAR-A	2	TITUS	2000 - 2500	48" x 24"	48" x 24"	-	350RL	SEE NOTE(S) BELOW

NOTES:

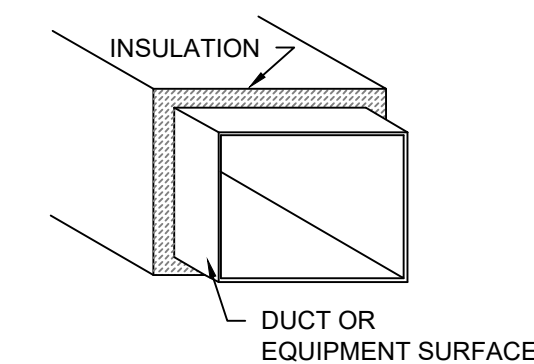
1. CONTRACTOR TO VERIFY AND COORDINATE BORDERS, FRAMING, AND FINISHES WITH ARCHITECT.
2. ALL AIR OUTLETS SHALL BE SUITABLE FOR THE TYPE OF CEILING OR WALL CONSTRUCTION USED.
3. COORDINATE BORDER STYLE & FRAMING WITH ARCHITECT.



1 DUCT TURN DETAIL
N.T.S.

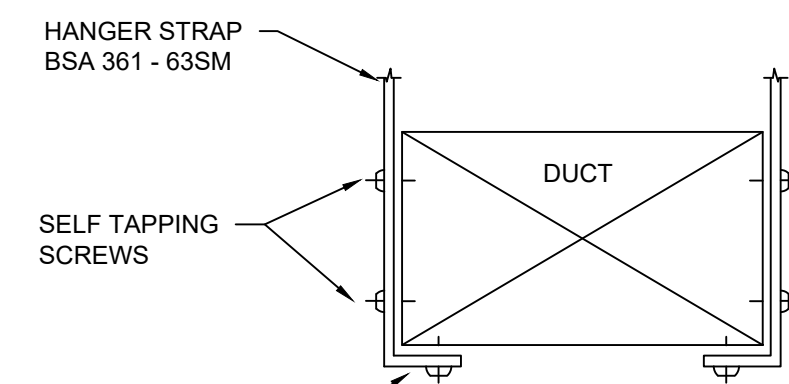


2 DUCT / DIFFUSER TAKE-OFF DETAIL
N.T.S.



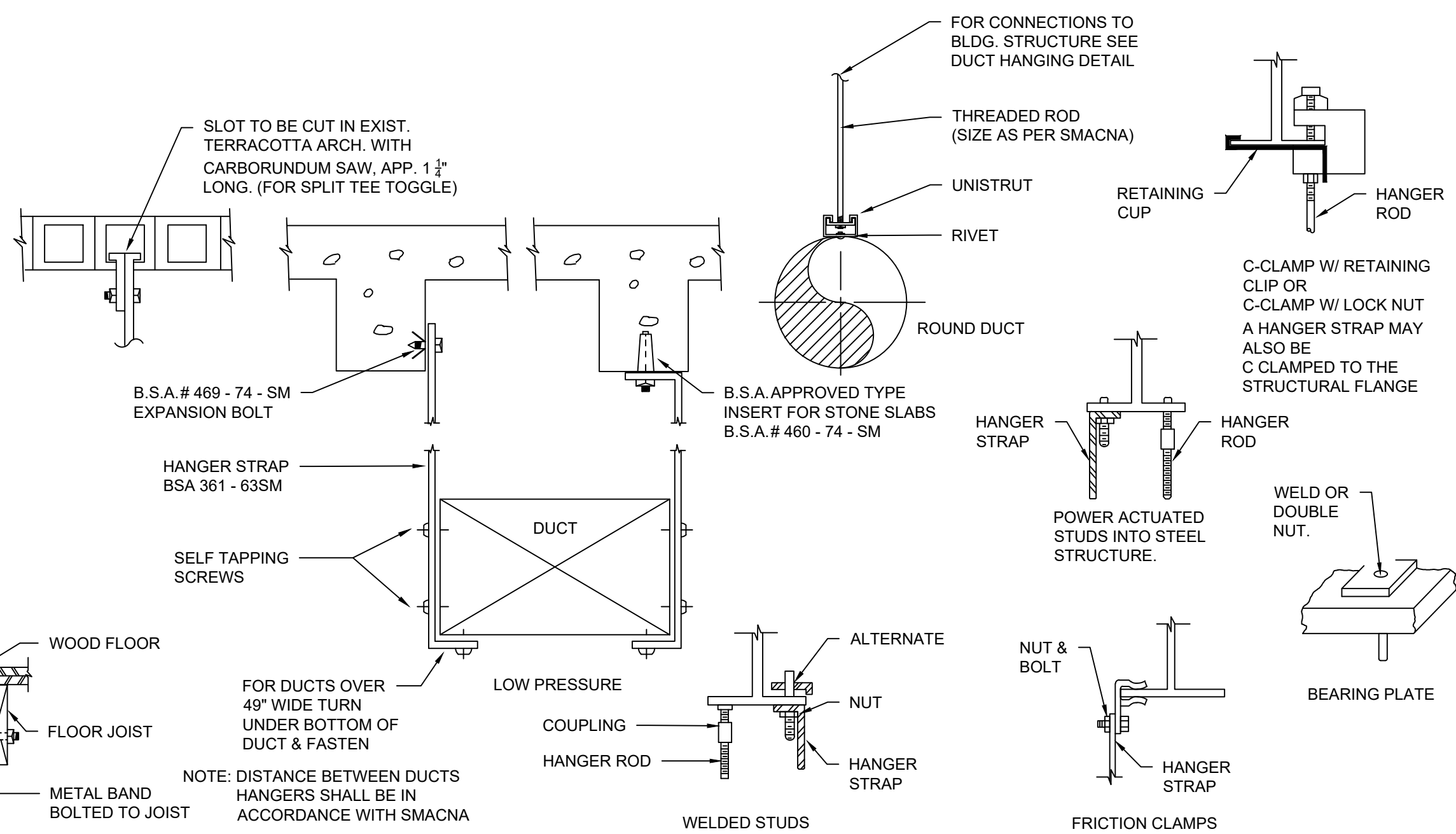
DB EXTERNAL DUCT INSULATION: BLANKET TYPE: BLANKET TYPE LIGHT DENSITY GLASS FIBER INSULATION WITH REINFORCED ALUMINUM FOIL VAPOR BARRIER FACING.

3 DUCT INSULATION DETAILS
N.T.S.

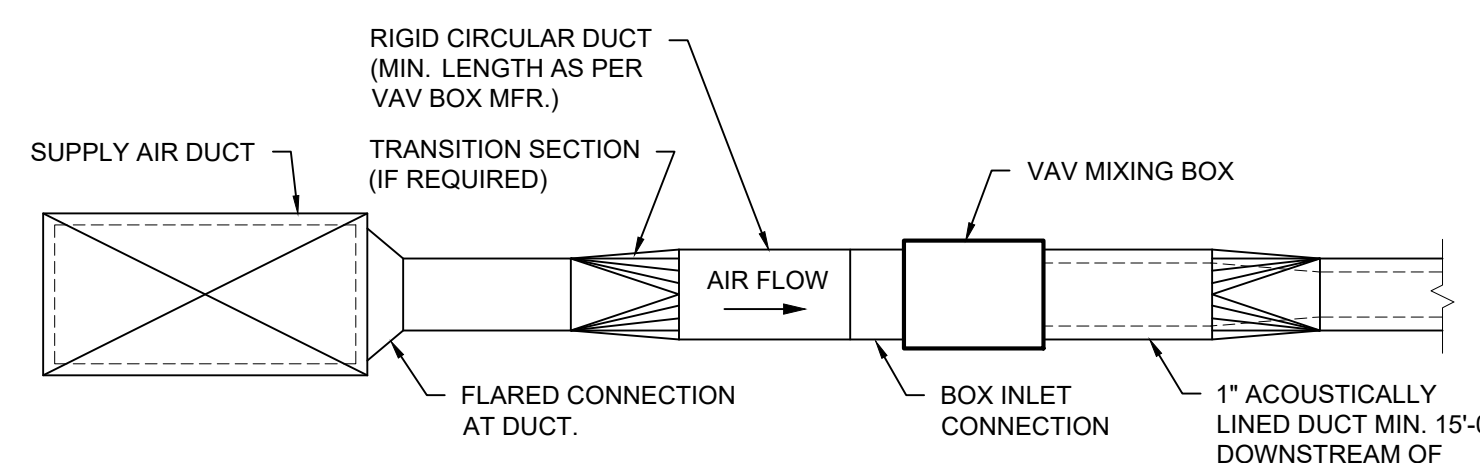


NOTE: DISTANCE BETWEEN DUCTS HANGERS SHALL BE IN ACCORDANCE WITH SMACNA

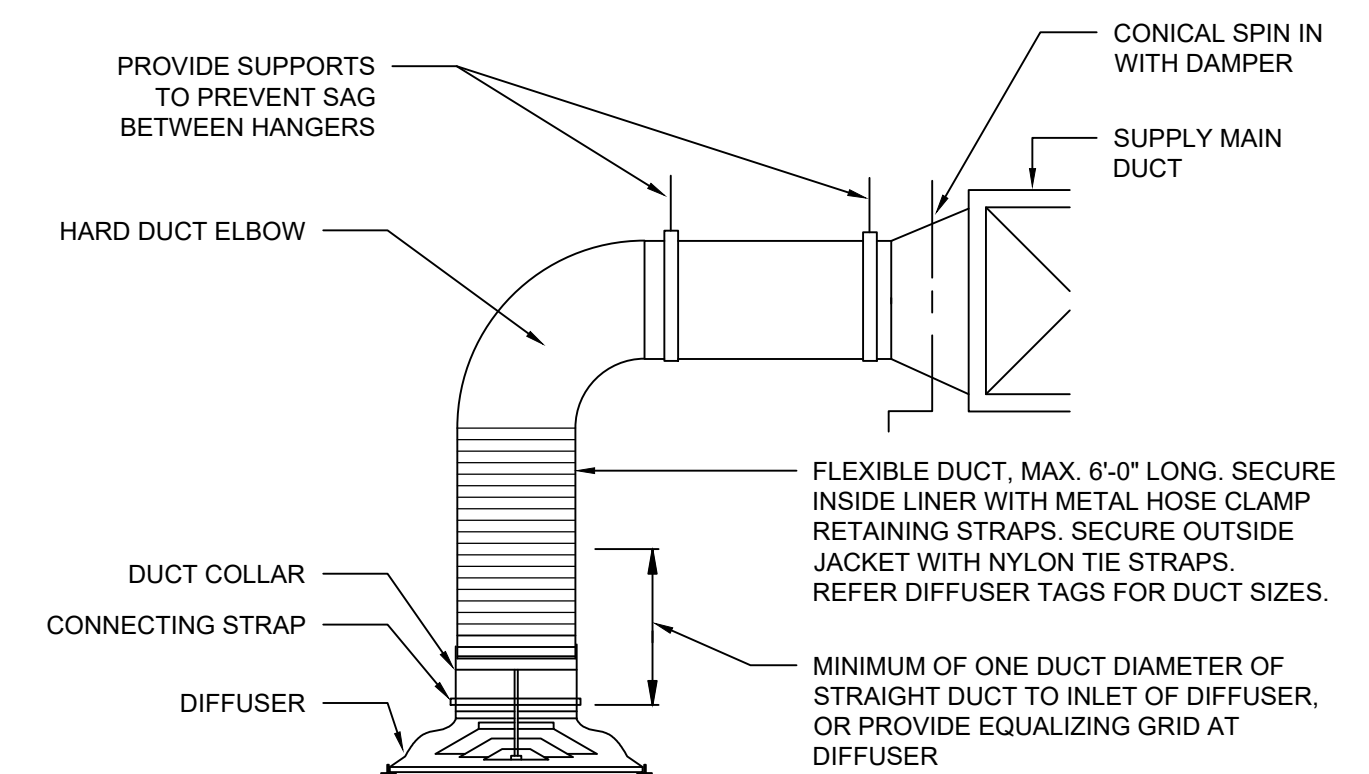
4 DUCT SUPPORT DETAIL
N.T.S.



5 DUCT HANGING DETAILS
N.T.S.



6 VAV BOX CONNECTION DETAIL
N.T.S.



7 DIFFUSER FLEXIBLE DUCT CONNECTION
N.T.S.

NJ Certificate of Authorization
 Eng. No. 24027937500
 Arch. No. 21A00012400
 Date 3/10/22
 Checked TW
 Drawn SS

MATTHEW T. WOLFE, AIA
 LICENSE NO. NJZ1A01963400
 REGISTERED ARCHITECT

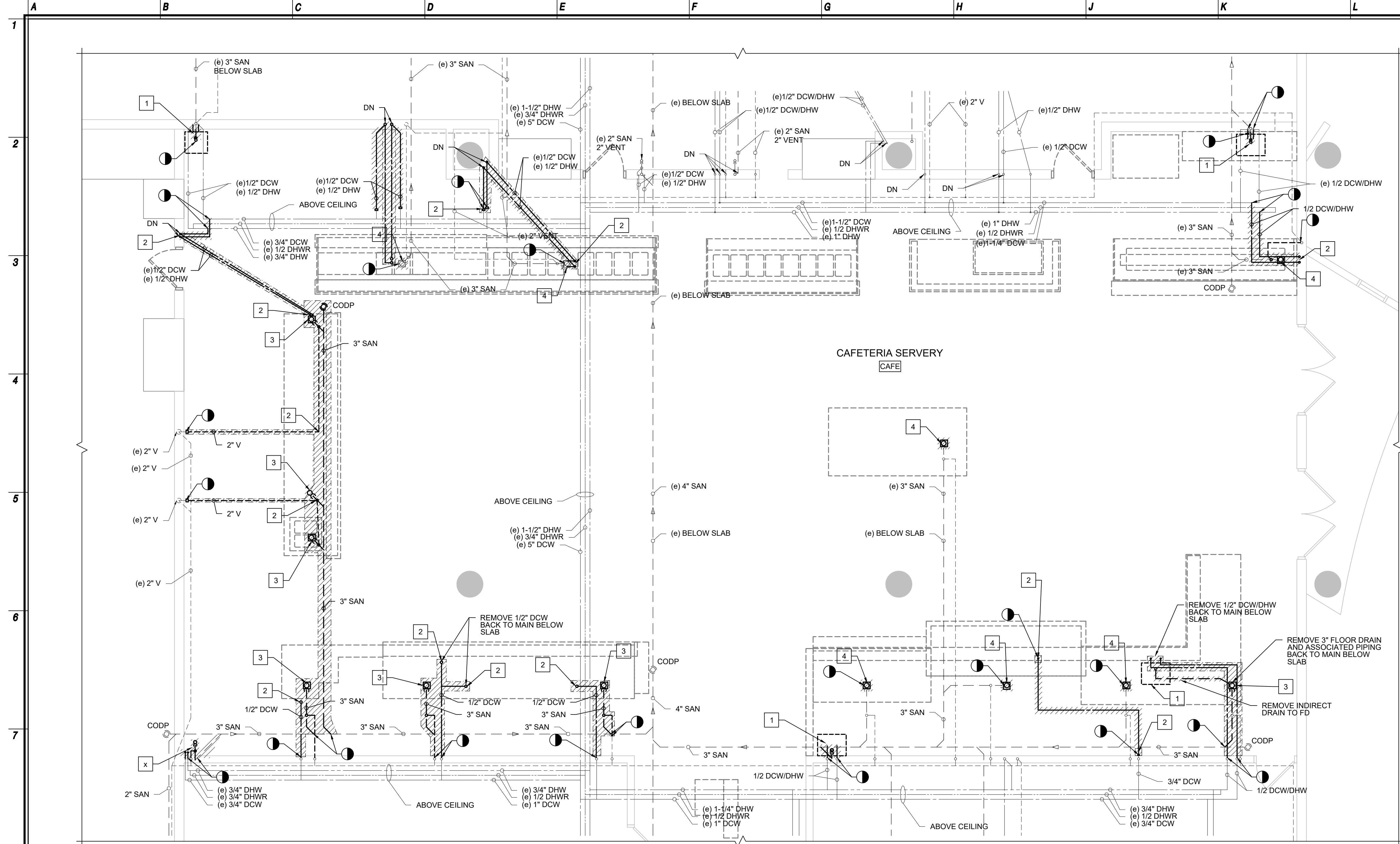
Revisions:

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MECHANICAL SCHEDULES & DETAILS
 CAFETERIA RENOVATIONS AT MEGA STRUCTURE
 ESSEX COUNTY COMMUNITY COLLEGE
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 NEWARK, NEW JERSEY 07102

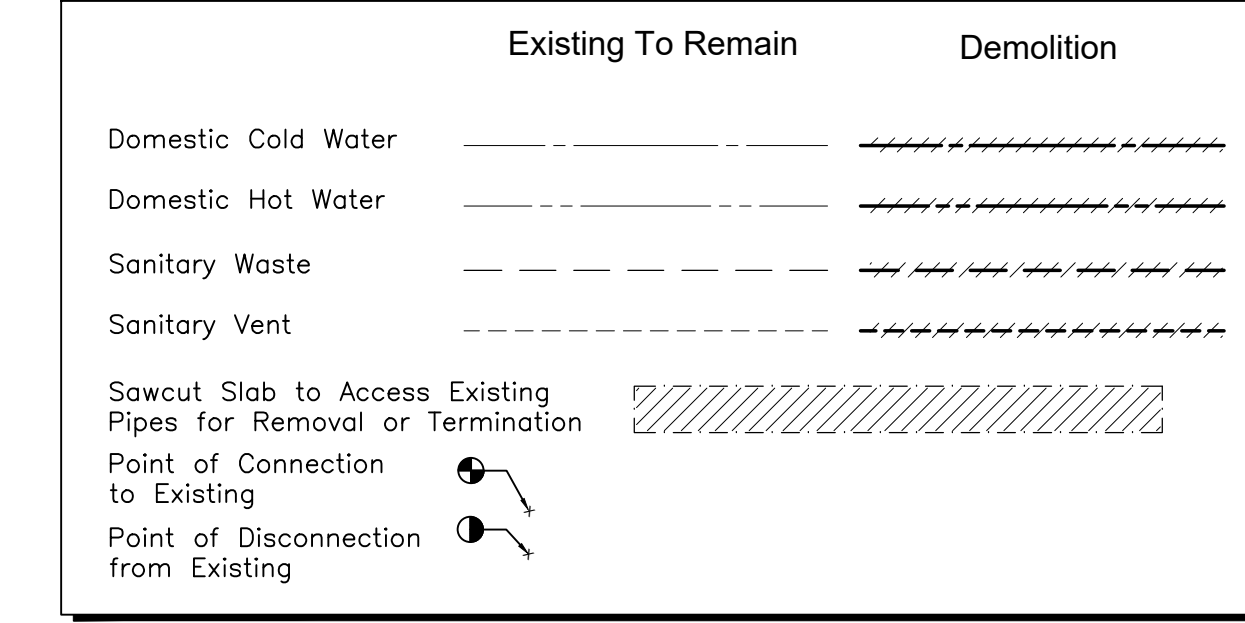
Job No. 2.20302.02
 File No. 2030202M601

M6.01



1 PLUMBING DEMOLITION PLAN
 1/4" = 1'-0"

- GENERAL PLUMBING DEMOLITION NOTES**
- CONTRACTOR TO NOTE THAT LOCATIONS & SIZES OF EXIST. PLUMBING PIPING SHOWN (WASTE, VENT, DCW, DHW, DHWR, ETC) ARE BASED ON FIELD OBSERVATIONS AND AVAILABLE BLUEPRINTS AND ARE APPROXIMATE. CONTRACTOR SHALL INVESTIGATE/TRACE (WITH CAMERA OR ELECTRONIC DEVICES) THE EXISTING SANITARY WASTE LINES TO BE REMOVED/REPLACED OR RESCHEDULED TO BE REUSED. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER OF ANY DISCREPANCIES. EXISTING VENTING AND WATER LINES ARE SHOWN GRAPHICALLY TO GIVE AN HONEST REPRESENTATION OF THE EXISTING CONDITIONS. THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY ALL SIZES & LOCATIONS IN FIELD.
 - ALL SANITARY LINES BEING DEMOLISHED SHALL BE REMOVED BACK TO THE MAINS. DEAD END SHALL NOT EXCEED THE MAXIMUM LENGTH PER LATEST PLUMBING CODE.
 - ALL DOMESTIC WATER LINES BEING DEMOLISHED SHALL BE REMOVED BACK TO THE MAINS. DEAD END SHALL NOT EXCEED THE MAXIMUM LENGTH PER LATEST PLUMBING CODE.
 - REMOVE ALL EXIST. ABANDONED ROUGH-IN PIPING, WHETHER THEY ARE SHOWN OR NOT ON THE DRAWING. PATCH EXISTING FLOOR OPENINGS WHERE ARE NOT REUSED FOR NEW PIPE PENETRATIONS. PAINT TO MATCH EXISTING CEILING FINISH.
 - ANY CUTTING, PATCHING, OR FINISH REPAIR WORK REQUIRED FOR PLUMBING DEMOLITION IS THE RESPONSIBILITY OF THE PLUMBING SUBCONTRACTOR.
 - CONTRACTOR SHALL BE RESPONSIBLE FOR SHUTDOWN AND/OR TO ISOLATE SECTIONS OF PLUMBING SYSTEM, AND DRAIN WATER FROM THE SYSTEM TO ACCOMMODATE FOR DEMOLITION. RESTORE THE SYSTEM AS REQUIRED.
 - ANY SHUT-DOWNS MUST BE COORDINATED WITH THE OWNER MIN 72 HOURS IN ADVANCE. THE CONTRACTOR SHALL NOT SHUT DOWN ENTIRE SECTIONS OF THE BUILDING AT ONE TIME. PROVIDE BYPASS LINES AS NECESSARY TO WORK ON INDIVIDUAL BATHROOMS WHILE MAINTAINING THE INTEGRITY OF THE REST OF THE PLUMBING SYSTEM.
 - SAWCUT EXIST. WALLS/CHASES/FLOOR SLABS/CEILING AS REQUIRED FOR DEMOLITION OF ALL EXIST. PLUMBING FIXTURES & PIPING. PATCH TO MATCH EXISTING.



- PLUMBING DEMOLITION KEY NOTES**
- REMOVE EXISTING SINK, ASSOCIATED CARRIERS & ALL RELATED FAUCET, PIPING, VALVES, FITTINGS, SUPPORTS, ETC. REMOVE ALL RELATED PIPING WITHIN WALL/CHASE. SAWCUT EXISTING MASONRY WALL AS REQUIRED TO ALLOW REMOVAL OF EXISTING AND INSTALLATION OF NEW SCOPE OF WORK. CUT, CAP AND MODIFY EXISTING PLUMBING AND SANITARY LINES AS REQUIRED TO ACCOMMODATE NEW SCOPE OF WORK
 - REMOVE DOMESTIC WATER PIPE & ALL RELATED VALVES, FITTINGS, SUPPORTS, ETC. CAP SECURELY ALL RELATED PIPING WITHIN WALL/CHASE. SAWCUT EXISTING FLOOR AS REQUIRED TO ALLOW REMOVAL OF EXISTING AND INSTALLATION OF NEW SCOPE OF WORK IF ANY. CUT, CAP AND MODIFY EXISTING PLUMBING AND SANITARY LINES AS REQUIRED TO ACCOMMODATE NEW SCOPE OF WORK
 - REMOVE EXISTING FLOOR DRAIN, ASSOCIATED, PIPING, VENTING, FITTINGS, SUPPORTS, ETC. REMOVE ALL RELATED PIPING WITHIN WALL/CHASE. SAWCUT EXISTING SLAB AS REQUIRED TO ALLOW REMOVAL OF EXISTING. PATCH FLOOR SLAB TO MATCH EXISTING AS REQUIRED TO ACCOMMODATE NEW SCOPE OF WORK
 - REPLACE EXISTING FLOOR DRAIN STRAINER W/ NEW. PATCH FLOOR SLAB TO MATCH EXISTING.

NJ Certificate of Authorization
 Eng'r. No. 24627937500
 Arch. No. 21AC00012400
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MATTHEW T. WOLFE, AIA
 THE REGISTERED ARCHITECT
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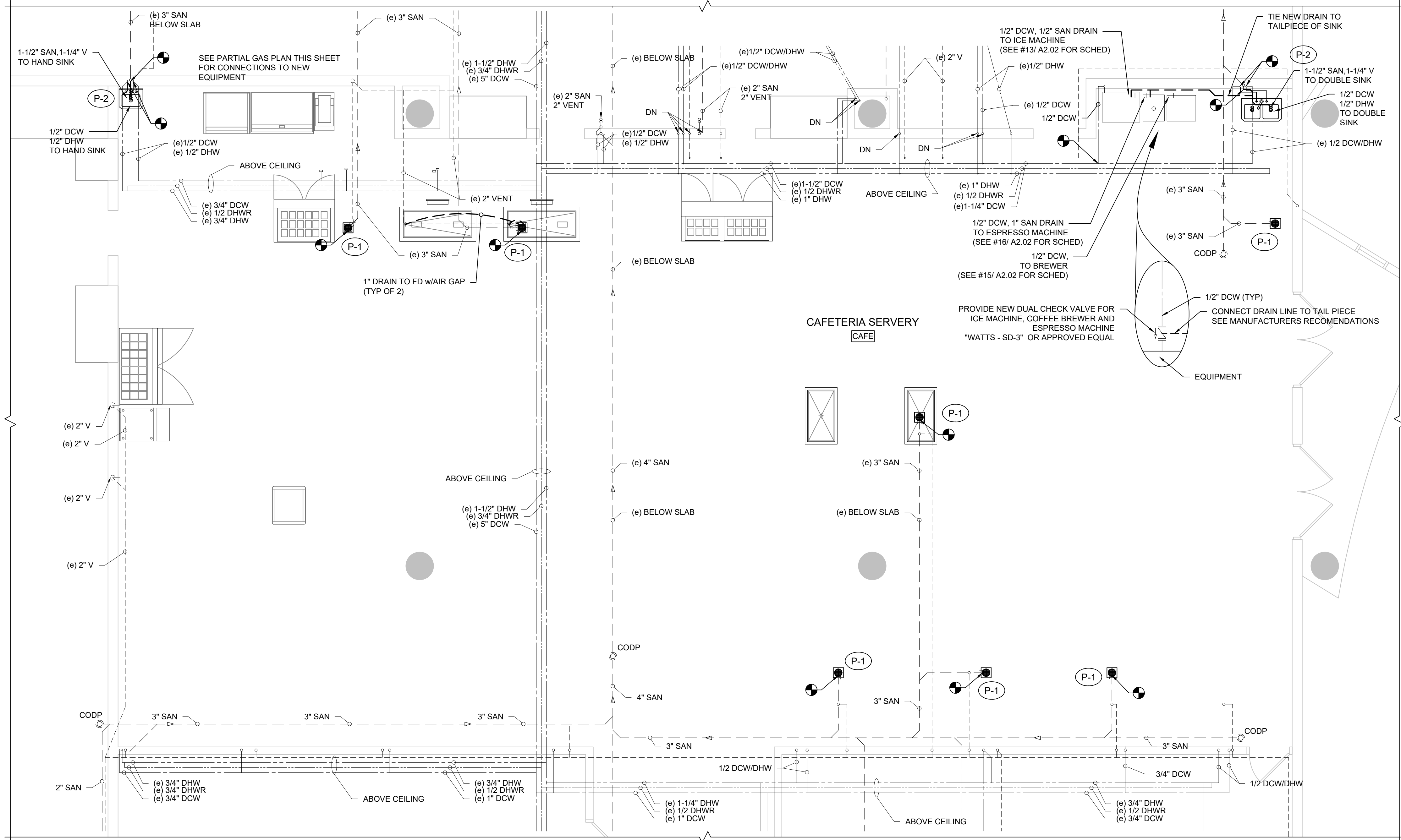
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PLUMBING DEMOLITION PLAN & NOTES
 CAFETERIA RENOVATIONS AT MEGA STRUCTURE
 ESSEX COUNTY COMMUNITY COLLEGE
 303 UNIVERSITY AVENUE
 NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
 File No. 2030202P101

P1.01



PROPOSED PLUMBING KEY NOTES

SINK (P-2) NEW HAND OR DOUBLE SINK WITH NEW WALL CARRIER (IF REQUIRED). PROVIDE WASTE, VENT AND DCW & DHW PIPING. SEE KITCHEN EQUIPMENT SCHEDULE FOR SIZE/MODEL & TIE INTO EXISTING.

FLOOR DRAIN (P-1) NEW STRAINER ON EXISTING FLOOR DRAIN. CONTRACTOR TO CLEAN/CLEAR AND SNAKE EXISTING LINES TO ENSURE PROPER FLOW OF EXISTING SYSTEM. FIELD VERIFY EXISTING SIZE/STYLE.

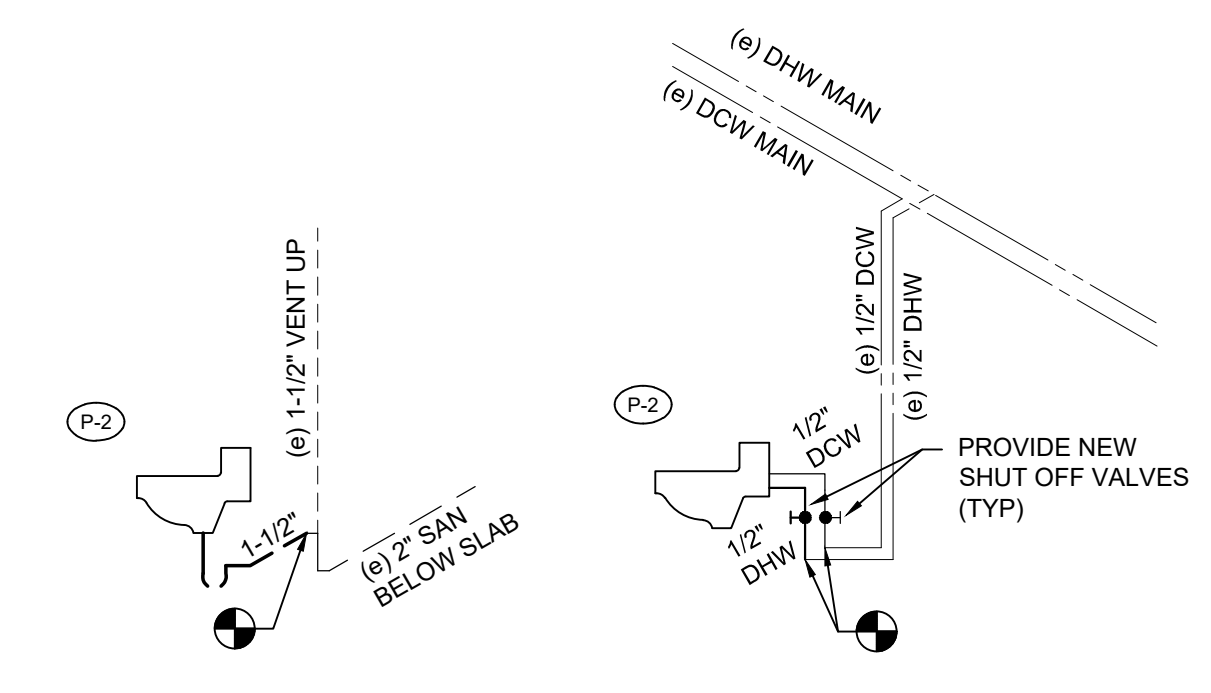
SEE A2.02 FOR EQUIPMENT SCHEDULE

NOTE:
CONTRACTOR SHALL SNAKE, SCOPE, AND TELEVIEW ALL EXISTING WASTE LINES THAT ARE TO BE REUSED TO ENSURE THEY ARE CLEAR AND FREE FROM DEBRIS, DEFECTS, CRACKS, ETC. CONTRACTOR SHALL BE RESPONSIBLE FOR TELEVIEWING ALL WASTE LINES FOR A MINIMUM OF FIFTY (50') FEET FROM THE END OF LINE CLEANOUT AT A GROUP OF FIXTURES. CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER IMMEDIATELY IF DEFECTS IN THE EXISTING PIPING ARE FOUND.

Existing To Remain	Proposed
Domestic Cold Water	-----
Domestic Hot Water	-----
Sanitary Waste	-----
Sanitary Vent	-----

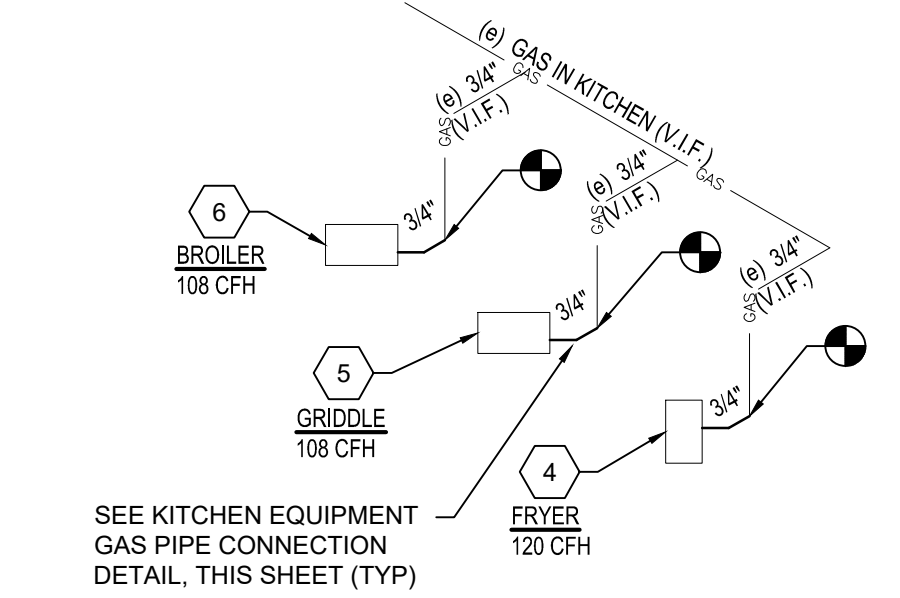
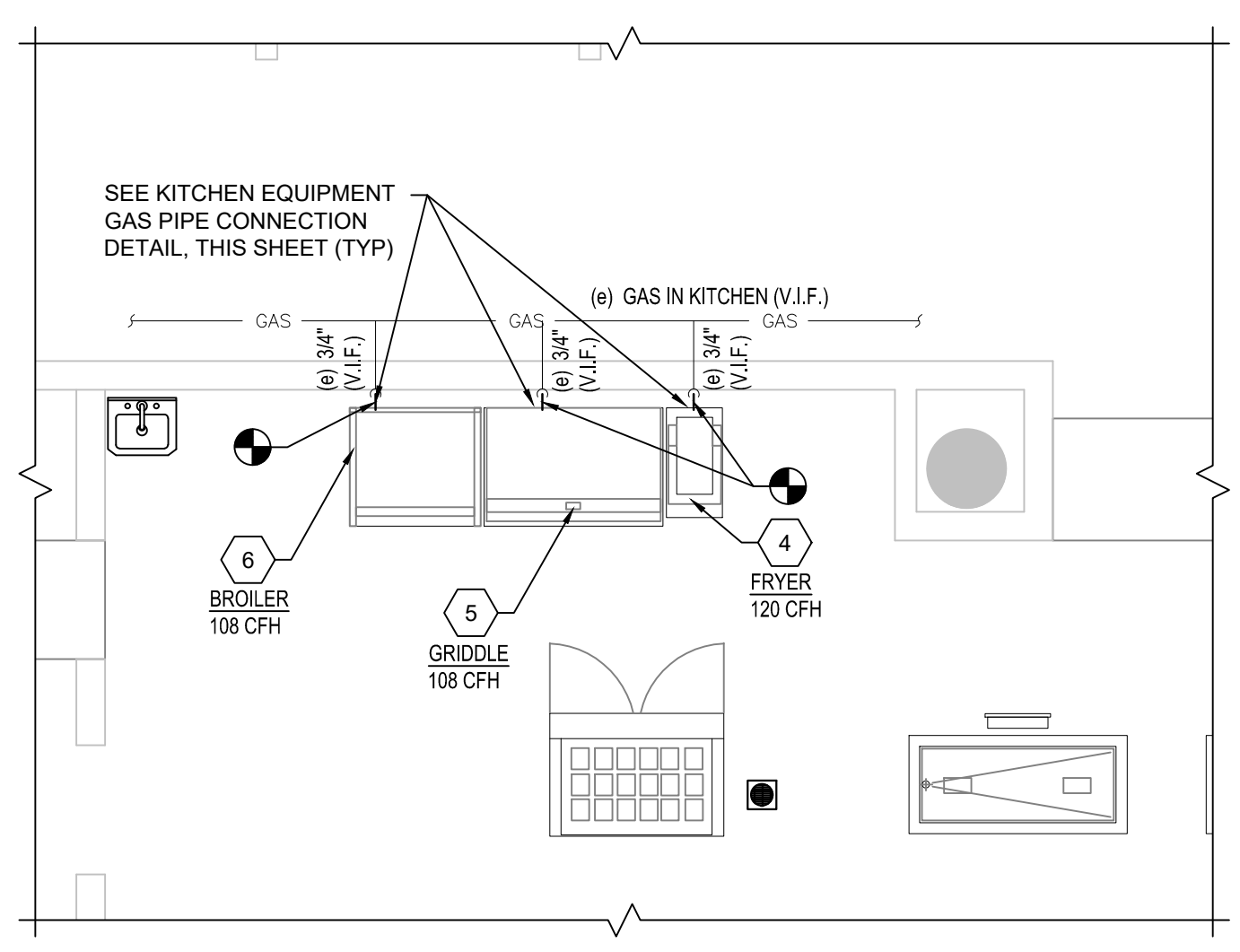
Point of Connection to Existing

Point of Disconnection from Existing



TYPICAL SINK RISER
N.T.S.

1 PROPOSED PLUMBING PLAN
1/4" = 1'-0"

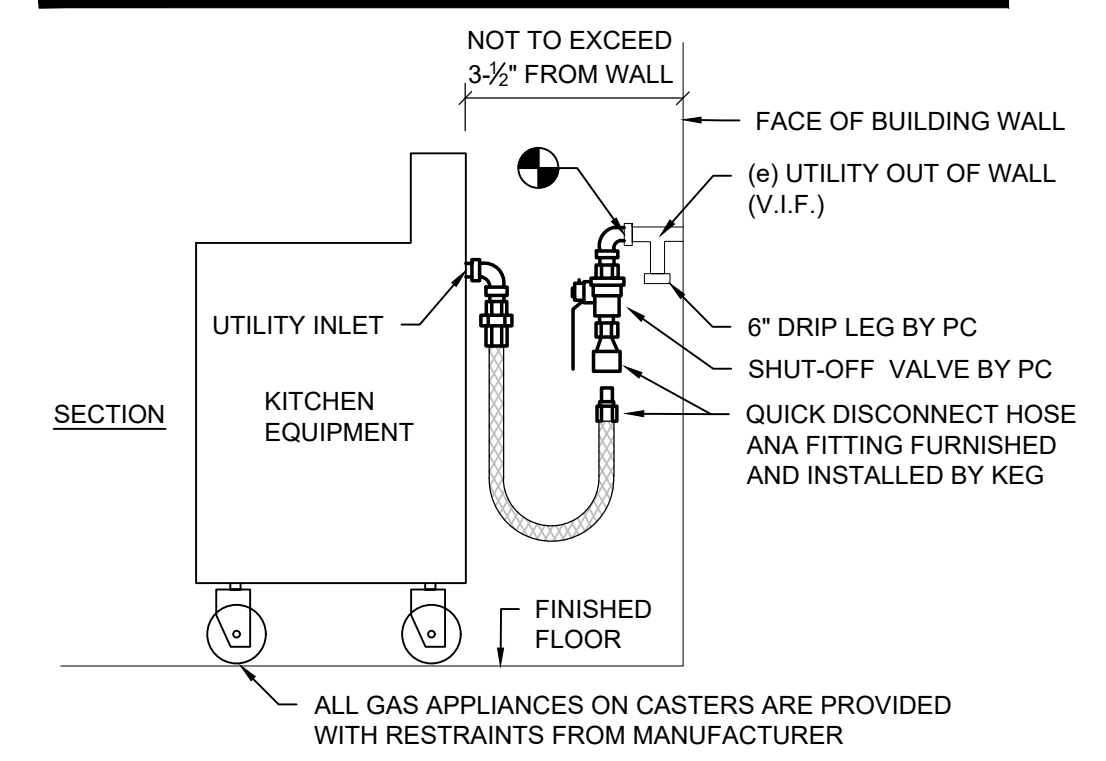


GAS RISER
N.T.S.

EQUIPMENT TAG -
SEE A202 FOR EQUIPMENT SCHEDULE

- GAS PIPING NOTES:**
1. GAS PIPING ABOVE GRADE SHALL BE BLACK STEEL SCHEDULE #40 WITH MALLEABLE IRON THREADED FITTINGS FOR PIPE 1" DIAMETER AND SMALLER, 1-1/4" AND LARGER PIPE SHALL HAVE WELDED FITTINGS AND JOINTS.
 2. PIPING SHOULD BE RIGIDLY MOUNTED AND PROTECTED AGAINST VIBRATION.
 3. INSTALL NORMALLY CLOSED NATURAL GAS SOLENOID VALVE (LISTED SAFETY SHUT OFF VALVE).
 4. INSTALL BOTH MANUAL AND ELECTRIC (BATTERY-POWERED) SHUT OFF VALVE AHEAD OF THE FLEXIBLE FUEL HOSE. THE MANUAL VALVE SHALL BE THE INDICATING TYPE.
 5. INSTALLED PIPING MUST BE PROPERLY PURGED AND LEAK TESTED, IN ACCORDANCE WITH APPLICABLE STANDARDS.
 6. ALL GAS PRESSURE REGULATORS SHALL BE LOCKUP TYPE.
 7. PROVIDE GAS SHUTOFF BALL VALVES FOR PIPE SIZES 2-1/2" & SMALLER.
 8. ALL INDOOR GAS PIPING SHALL BE PAINTED YELLOW (1 PRIMER & 2 FINISH COATS). ALL OUTDOOR GAS PIPING SHALL BE PAINTED GRAY (1 PRIMER & 2 FINISH COATS).
 9. ALL INDOOR GAS VENTS SHALL BE PAINTED BLACK (1 PRIMER & 2 FINISH COATS). ALL OUTDOOR GAS VENTS SHALL BE PAINTED TO MATCH EXTERIOR FINISH (1 PRIMER & 2 FINISH COATS).

NOTE:
IF UTILITY INLET IS NOT INSTALLED AT HEIGHT SHOWN, PLUMBING CONTRACTOR SHALL PROVIDE PIPING WITH ELBOWS TO RAISE INLET.



KITCHEN EQUIPMENT GAS PIPE CONNECTION DETAIL
N.T.S.

- PLUMBING GENERAL NOTES**
1. ALL WORK SHALL CONFORM TO NEW JERSEY STATE ENERGY CODE, NATIONAL STANDARD PLUMBING CODE 2018, AND ALL OTHER APPLICABLE CODES, ORDINANCES, AND LOCAL AUTHORITY HAVING JURISDICTION.
 2. CONTRACTORS SHALL FAMILIARIZE THEMSELVES WITH THE EXTENT AND SCOPE OF THE WORK PRIOR TO SUBMITTING BIDS OR COMMENCING WORK.
 3. CONTRACTOR SHALL REVIEW DRAWINGS AND FIELD VERIFY ALL DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES, AND ADDRESS ALL QUESTIONS TO ARCHITECT/ENGINEER PRIOR TO COMMENCING WORK.
 4. CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING UP WORK AREAS UPON COMPLETION OF WORK.
 5. THE CONTRACTOR SHALL SECURE AND PAY FOR ALL REQUIRED PERMITS, FEES AND INSPECTIONS PRIOR TO COMMENCING WORK. UPON COMPLETION OF WORK THE CONTRACTOR SHALL SECURE CERTIFICATE OF OCCUPANCY.
 6. CONTRACTOR SHALL BE RESPONSIBLE TO DISPOSE OF ALL DEMOLISHED MATERIAL OF SITE IN AN APPROVED MANNER.

- PLUMBING SYSTEM MATERIALS**
- PIPING:**
ABOVE GROUND WASTE & VENT PIPING SHALL BE NO-HUB SERVICE WEIGHT CAST IRON PIPE WITH STAINLESS STEEL, SHIELDED COUPLINGS.
UNDERGROUND WASTE & VENT PIPING SHALL BE BELL AND SPIGOT SERVICE WEIGHT CAST IRON PIPE WITH NEOPRENE (TY-SEAL) GASKETS.
HOT AND COLD WATER PIPING ABOVE GRADE SHALL BE TYPE "L" COPPER WITH WROUGHT COPPER SOLDER FITTINGS. SILVABRITE 100 LEAD-FREE SOLDER. HOT AND COLD WATER PIPING BELOW GRADE SHALL BE TYPE "K" COPPER WITH NO FITTINGS.
GAS PIPING ABOVE GRADE SHALL BE BLACK STEEL SCHEDULE #40 WITH MALLEABLE IRON SCREWED FITTING. GAS PIPING BELOW GRADE SHALL BE AS MANUFACTURED BY PLEXCO OR TRAC PIPE.
- INSULATION:**
ALL HOT AND COLD WATER PIPING SHALL BE INSULATED WITH FIBERGLASS PIPE INSULATION WITH ASJ JACKET. REFER TO SPECIFICATIONS FOR INSULATION REQUIREMENTS.
- ACCESSIBLE PIPE INSULATION:**
INSTALL INSULATION AT EXPOSED PIPING AT ALL LAVATORIES AS FOLLOWS: LAVATORY P-TRAP AND ANGLE VALVE ASSEMBLIES SHALL BE INSULATED WITH "HANDI LAV-GUARD" FULLY MOLDED PVC INSULATION KIT #102 BY TRUEBRO OR APPROVED EQUAL.
- FIXTURE MOUNTING:**
INSTALL CONCEALED ARM CARRIERS FOR ALL FIXTURES AS REQUIRED, J.R. SMITH MODEL #0700 OR APPROVED EQUAL.
- * WHEN THE DISCREPANCY OCCURS BETWEEN DESIGN DRAWINGS AND SPECIFICATIONS, THE MOST STRINGENT REQUIREMENTS SHALL BE APPLIED FOR THE PROJECT.

NJ Certificate of Authorization
Eng. No. 24647937500
Arch. No. 214200012400
Date 3/10/22
Checked TW
Drawn RJS

MATTHEW T. WOLFE, AIA
THE REGISTERED ARCHITECT
License No. NJZ1A01963400

Revisions:

LAN ASSOCIATES
engineering • planning • architecture • surveying
445 GODWIN AVENUE, MIDLAND PARK, N.J. 07432 (201)447-6400

PROPOSED PLUMBING PLANS & NOTES
CAFETERIA RENOVATIONS AT MEGA STRUCTURE
ESSEX COUNTY COMMUNITY COLLEGE
303 UNIVERSITY AVENUE
NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
Rev. No. 2030202P101

P2.01

ELECTRICAL GENERAL NOTES:

- 1. The electric installation shall be in accordance with the current edition of the National Electrical Code (NEC), National Electrical Safety Code (NESC), American Electricians' Handbook, International Building Code (IBC), Americans with Disabilities Act (ADA) and NEC Standard of Installation. All equipment shall be listed by a nationally recognized testing laboratory (NRTL).
- 2. Code compliance is mandatory. Nothing in these Drawings and Specifications permits work not conforming to these codes. Where work is shown to exceed minimum code requirements, comply with drawings and specifications.
- 3. When differences in utility specifications or standards, governmental ordinances or codes occur, the more stringent requirements shall govern the installation.
- 4. The electrical installation shown is diagrammatically only. The locations of equipment, devices, switchboards, panelboards, partitions, openings, etc. are approximate and are subject to modifications caused by existing structural conditions and existing equipment. The location are subject to such modifications as may be found necessary or desirable at the time of installation in order to meet field conditions. Coordinate all work in the field. Determine roughing locations required to effect such coordination. The electrical contractor without extra charge shall make such changes.
- 5. Drawings shall not be scaled. Drawings indicate the general arrangement of systems and requirements of the work. Although size and location of equipment is drawn to scale wherever possible, contractor shall make use of all data in all of the contract documents and verify information at the project site.
- 6. Contractor shall field verify all site dimensions in field prior to bid and starting work.
- 7. The circuit numbers are for identification only. The contractor shall be responsible for correctly phasing the circuits in panels.
- 8. Contractor shall supply all labor, power cables, as noted on the drawings, conduit boxes, fittings, wiring materials, hardware, supports, and miscellaneous items for a complete electrical installation.
- 9. Any cutting, patching, or finish repair work required for the electrical installation is the responsibility of the contractor.
- 10. Contractor shall confirm to all safety rules and other regulations, etc. pertaining to construction work on the client's premises. Contractor shall be responsible to ensure that all rules and regulations have been met and coordinate this work with responsible client's personnel.
- 11. The contractor shall make a final inspection of all electrical equipment to ensure that there are no loose electrical connections or electrical circuits subject to electrical break down due to the presence of foreign material. This shall include inspection of all connections made under this contract.
- 12. All type MC cables routed within the ceiling cavity must be secured. Bridle rings, J-hooks, or other appropriate means of securing the cable must be used. The cable must not lay on dropped ceiling panels be fastened to existing electrical conduits, steam pipes, sprinkler pipes, insulated pipes, or be routed in such a fashion as to obstruct access hatches, doors, utility access panels, mechanical service work areas or fittings and shall not be routed through fire doors, ventilating shafts, or grates.
- 13. All conductors shall be in a surface mounted raceway or metallic conduit when not routed in the ceiling cavities. Any locations that do not have accessible or dropped ceilings will require the use of surface mounted raceways. No exposed cable may be installed.
- 14. The contractor shall obtain all permits required, have the work inspected for code compliance and pay all fees for inspection and certification.
- 15. The contractor shall deliver certificates of electrical and other inspections or copies thereof, to the client at the completion of the project with copies to the Engineer/architect.
- 16. Provide adequate temporary electrical light and power for the project work.
- 17. Electrical Contractor shall be responsible for the removal of debris generated by his work and workers at the end of each working day and for general good housekeeping by his workers. Electrical Contractor shall provide required refuse containers.
- 18. All new wiring is to be run concealed wherever possible. Provide pullboxes (size per code) and locate in conduit runs as required. See floor plans for suggested routing of new panel feeders.
- 19. All wiring shall be copper conductor, 600 volts THHN/THWN in EMT raceway with approved fittings unless otherwise indicated. Feeder and branch circuit wiring shall be minimum #12 AWG unless otherwise indicated. Feeder and branch circuit wiring larger than #10 AWG shall be stranded conductor; #10 AWG and smaller, shall be solid conductor.
- 20. Use the following conductor color codes:
Phase A: 480Y/277 Volt
Black, Brown
Phase B: Red, Orange
Phase C: Blue, Yellow
Neutral: White, Gray
Equip. Ground: Green
- 21. All equipment shall be as indicated or as approved by the Engineer/architect.
- 22. Arrange connections for single phase circuits to achieve three phase load balance within 20% of the average phase load current. Ungrounded conductors using a common neutral must originate from different phases.
- 23. Install outdoor equipment to be weatherproof (NEMA3R).
- 24. Provide and maintain a clear working space about electrical equipment (switchboards, panelboards, etc.) in accordance with NEC articles 110.26 and 110.34.
- 25. Coordinate work with other trades to avoid conflict and to provide correct rough in and connection for equipment furnished under trades that require electrical connections. Inform Contractors of other trades of the required access to and clearances around electrical equipment to maintain serviceability and code compliance.
- 26. All openings and penetrations shall be sealed upon completion of the electrical installation to prevent the spread of smoke and fire through openings. Seal around conduit and raceway penetrations through interior walls and floor separating areas to restore original fire rating; use a UL classified fire sealant. Seal penetrations through roof and exterior walls to make waterproof. Request inspection of fire seals by electrical inspector from authority having jurisdiction before and after placement of fire seal materials. All openings shall be coordinated with the other trades to limit interference and obstruction.
- 27. Grounding shall be installed in accordance with the National Electrical Code in accordance with electrode, grounding and bonding requirements for service, equipment and enclosures. Install an insulated equipment ground conductor in each raceway or conduit. Size equipment ground conductor in accordance with NEC Table 250.122. Bond raceways and the frames and enclosures of motors, breakers, switches, and other electrical equipment to the building grounding system.
- 28. All panels shall have permanent directories. Circuit changes shall be reflected on "as-built" drawings.
- 29. All circuits and circuit modifications must be legibly identified as to their clear, evident, and specific purpose. The identification must include sufficient detail to allow each circuit to be distinguished from all others, and the identification must be on a circuit directory located on the face or inside of the door of a panelboard. Circuit directories containing multiple entries with only "lights" or "outlets" do not provide the sufficient detail required by the NEC.
- 30. Provide circuit breakers with UL listed interrupting rating (RMS symmetrical amperes) greater than the available fault current. "Series rated" equipment shall not be accepted.
- 31. Provide padlocking provisions for each two and three pole circuit breaker.
- 32. These drawings and specifications illustrate the work to be performed. The Engineer is not responsible for the means, methods, techniques, sequences, and procedures used to do the work, or the safety aspects of constructions, and nothing on these drawings expressed or implied changes this condition. The contractor shall determine all conditions at the site and shall be responsible for knowing how they affect the work. Submittal of a bid to perform this work is an acknowledgement of these responsibilities, and that they have been fully considered in planning of the work, and the bid price. No claims or extra charges due to these conditions will be forthcoming.

Application of Raceways

The following applications must be adhered to except as otherwise required by Code.

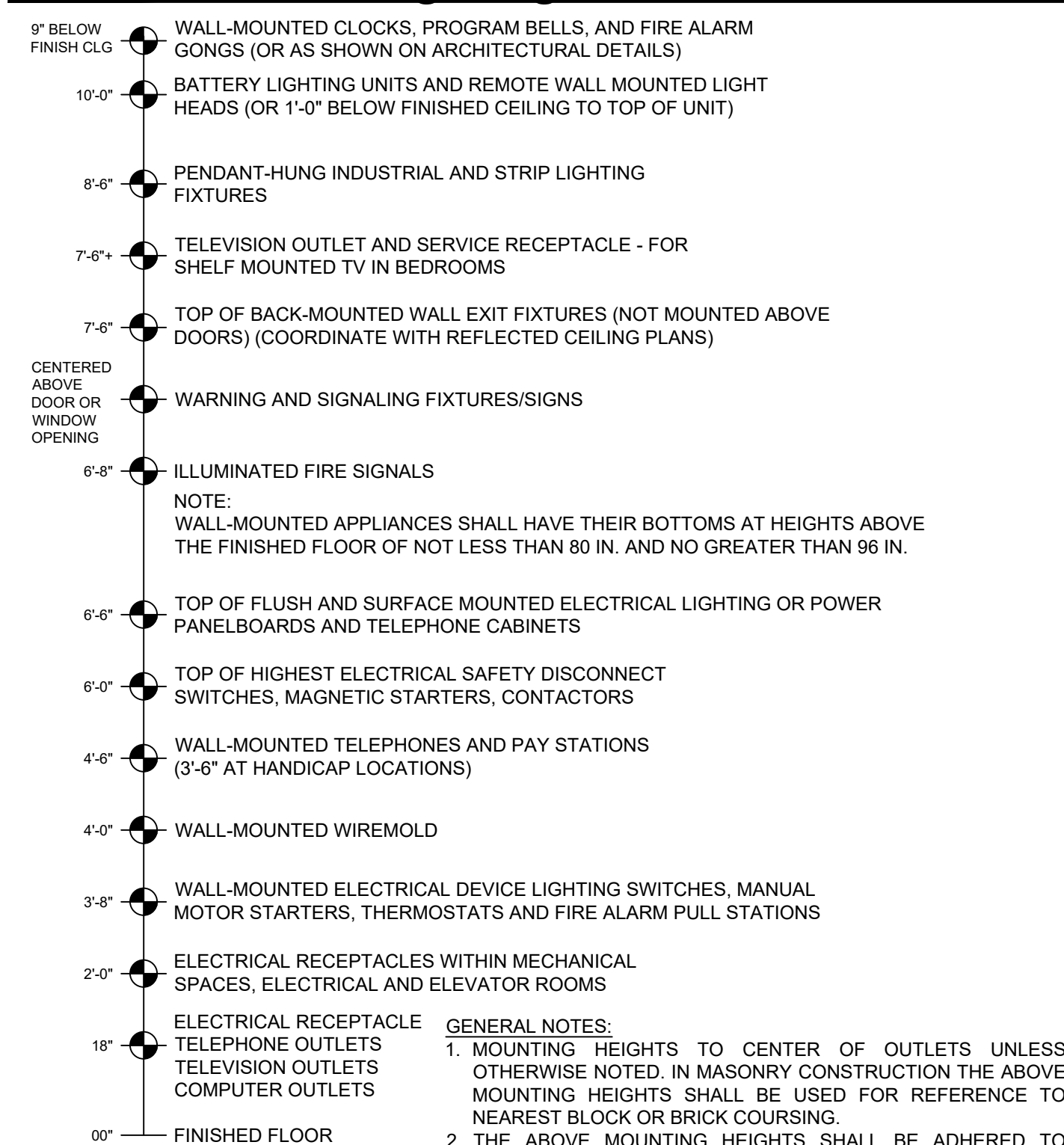
Table with 2 columns: RACEWAY TYPES and APPLICATION. Rows include RIGID STEEL CONDUIT, I.M.C., E.M.T., FLEX. METAL CLAD CABLES, TYPE MC FLEXIBLE STEEL, LIQUID-TIGHT FLEXIBLE CONDUIT, NON-METALLIC CONDUIT, and WIREWAYS AND AUXILIARY GUTTERS.

Electrical Grounding Requirements

THE CONTRACTOR SHALL PROVIDE A GROUNDING CONDUCTOR FOR ALL BRANCH FEEDERS AND CIRCUITS IN ACCORDANCE WITH THE FOLLOWING CHART:

Table with 8 columns: Line and Neutral Conductor Size, Ground Conductor Size, Line and Neutral Conductor Size, Ground Conductor Size, Line and Neutral Conductor Size, Ground Conductor Size, Line and Neutral Conductor Size, Ground Conductor Size. Rows show conductor sizes for #12, #10, #8, and 4/0.

Electrical Mounting Heights



GENERAL NOTES:
1. MOUNTING HEIGHTS TO CENTER OF OUTLETS UNLESS OTHERWISE NOTED. IN MASONRY CONSTRUCTION THE ABOVE MOUNTING HEIGHTS SHALL BE USED FOR REFERENCE TO NEAREST BLOCK OR BRICK COURSING.
2. THE ABOVE MOUNTING HEIGHTS SHALL BE ADHERED TO UNLESS SPECIFICALLY NOTED OR DETAILED OTHERWISE ON THE DRAWINGS OR SPECIFICATIONS.
3. A "CTR" DESIGNATION BESIDE A DEVICE INDICATES DEVICE MOUNTED ABOVE COUNTER OR CASEWORK. REFER TO ARCHITECTURAL AND CASEWORK DETAILS FOR ACTUAL ELEVATION.
4. A "*" SYMBOL BESIDE A DEVICE INDICATES THE MOUNTING HEIGHT ABOVE FINISHED FLOOR.

Sound System Symbols

- M = DESKTOP MICROPHONE
PA = TELEPHONE PAGING AMPLIFIER
SPx = DROP-IN CEILING SPEAKER
SPy = FOREGROUND LOUDSPEAKER

Telecommunication

- V = COMBINATION VOICE AND DATA TELEPHONE OUTLET
V2 = DUAL DATA OUTLET
V1 = SINGLE DATA OUTLET
Vc = DUAL DATA OUTLET MOUNTED FLUSH IN HUNG CEILING.
V = TELEPHONE OUTLET, RUN 3/4 CONDUIT TO ABOVE HUNG CEILING
WAP = WIRELESS ACCESS POINT (FBO)

Security Symbols

- C = PROVIDE BACK BOX & 3/4 EMPTY CONDUIT WITH DRAG LINE UP TO HUNG CEILING SPACE FOR SECURITY CAMERA
C = ROUND DOME CEILING AND WALL MOUNTED SECURITY CAMERA (F) INDICATES FIXED
C = CAMERA
DC = SECURITY DOOR CONTACT
IC = SECURITY INTERCOM STATION
IR = IDENTIFICATION READER
DR = PUSH BUTTON DOOR RELEASE
ML = MAGNETIC LOCK

ELECTRICAL DEMOLITION NOTES:

- 1. Electrical Contractor shall coordinate the mechanical equipment demolition with the Mechanical Contractor for all equipment to be demolished and schedule time for electrical demolition.
2. Remove abandoned electrical distribution equipment, utilization equipment, outlets, wiring, raceway systems, and cables back to the source panelboard, switchboard, switchgear, etc. Abandoned wiring and raceways can result from actions that include the following:
a) Equipment is removed or relocated.
b) Fixtures are removed or relocated.
c) System is no longer used.
d) There is no demonstrable near term future use for the existing circuit or raceway system.
3. Unused electrical equipment and material should only be left in place if one or more of the following conditions exist:
a) The removal requires the demolition of other structures or equipment that is still in use. An example is conduit embedded in walls or ductbanks.
b) The cost of removal is excessive due to hazards, construction methods, or restricted access.
4. Extend existing equipment connections using materials and methods compatible with the existing electrical installation and identified in the Electrical Specifications.
5. Restore the original fire rating of floors, walls, and ceilings after electrical demolition.
6. Demolition drawings are diagrammatic and indicated the general intent and scope.
7. All equipment shall be disconnected and removed back to power source of origination unless otherwise noted.
8. Contractor shall verify extent of demolition work in the field prior to bid. Contractor shall include all labor and materials in base bid including all temporary connections, conduit and wire in order to accommodate construction and provide continuous service to devices. Systems that are to remain temporary or permanently and require the shutdown of the building power shall be performed during overtime and shall be included in the base bid.
9. Circuit breakers, conduit and conductor sizes indicated shall be field verified prior to bid.
10. All existing electrical equipment no longer in use, such as disconnect switches, motor controllers, motor starter panels, etc. shall be removed U.O.N.
11. All disconnected and removed items that are not being reused shall be returned to the owner or disposed of as directed by the owner.
12. The contractor shall include in the base bid all labor and materials required for the extensions, re-routing and relocation of existing system components, equipment, wiring, conduits and cabling to maintain operation of all systems throughout the building during demolition and construction phases.
13. The contractor shall furnish all labor and materials required to complete the demolition and removal of all items indicated on the drawings or otherwise directed by the client.
14. The contractor shall report to the client any and/or all conditions that may interfere with or otherwise affect or prevent the proper execution and completion of the work on this contract.
15. The contractor shall execute all work within the regulations of the building for demolition and removal of debris. Overtime work required will be at no extra cost to the client.
16. All work demolished shall be removed from the premises except items to be reused or returned to the client or as otherwise directed.
17. The contractor shall at all times protect the property of the client and the building owner, including but not limited to windows, floor and ceiling tiles, public toilets, elevators, doors, bucks, electrical and air conditioning equipment, convactor enclosures, etc.
18. Upon completion of the demolition work, the contractor shall provide that all areas be left broom clean.
19. Before commencing with work, Electrical Contractor shall inspect the project site, determine the conditions under which demolition is to be accomplished along with kind and amount of materials being removed.
20. Temporarily relocate electrical equipment as required to accommodate the construction schedule. All areas not under construction must be kept operational during construction. To accomplish this, provide the necessary temporary electrical services. Remove temporary devices upon completion of the project.
21. Relocate or remove all electrical devices in accordance with the NEC. When relocation or removal of an electrical device interrupts the continuity of a circuit, reroute/modify these circuits as required to maintain circuit continuity. When circuits are interrupted by the removal of a panelboard, the Electrical Contractor shall rewire devices to the nearest panelboard of same voltage requirements with available space. Furnish and install new circuit breakers or utilize spare circuit breakers as required.
22. Furnish and install knockout plugs on all existing panels, equipment, and outlet box openings created by the removal or relocation of existing raceways.
23. Disconnect and remove all ballasts from fluorescent light fixtures that do not have a labels stating "BALLAST DOES NOT CONTAIN PCBs" or similar label (BALLAST MAY CONTAIN PCBs). Place PCB ballasts in D.O.T. approved containers. Properly dispose of containers with a federally approved disposal contractor. Disposal shall involve segregation of components for recycling and incineration of PCB contents. All disposal documentation shall be provided to the owner upon completion of the project. Contractor shall maintain an owner approved log sheet for each run.
24. Remove all mercury-containing lamps, do not break or crush. Retain services of a state approved lamp recycling facility able to accept waste D009. Coordinate packaging required and package, secure, and deliver lamps as required by the selected recycling facility to insure minimum lamp breakage. Minimum of 95% of lamp material must be shipped intact. Contractor must comply with all reporting and paperwork requirements of state laws regarding the handling, transportation, and disposal of hazardous waste including but not limited to filing the required paperwork and manifest with the state and owners as required by law. All disposal documentation shall be provided to the owner upon completion of the project.
25. Do not disable or disrupt building fire or life safety systems without written permission from the Owner. In all cases, permission shall have been granted not less than ten (10) working days prior to the intended interruption.
26. Inventory each panelboard where circuits are indicated to be reused. Sequentially consolidate existing circuits within each panelboard with regard to area served. Maximize capacity for service to the project area by including existing spares with the group of circuits breakers to be disconnected as a result of this selective demolition. Prepare a current directory, post demolition, for each panelboard as the base upon which the final directories will be compiled.

Fire Alarm Symbols

- P = PULL STATION
AV = AUDIO/VISUAL DEVICE
V = VISUAL DEVICE
BR = BEAM DETECTOR RECEIVER
BT = BEAM DETECTOR TRANSMITTER
D = HEAT DETECTOR AC = ABOVE CEILING
R = HEAT DETECTOR WITH RELAY
CO = CO2 DETECTOR
S = SMOKE DETECTOR
R = SMOKE DETECTOR WITH RELAY
W = WALL MOUNTED SMOKE DETECTOR
D = DUCT SMOKE DETECTOR
A = FIRE ALARM ANNUNCIATOR PANEL
F = FLOW SWITCH
T = TAMPER SWITCH
H = MAGNETIC DOOR HOLDER

ABBREVIATIONS LIST:

Table with 3 columns: Symbol, Description, and Power Symbols. Lists abbreviations for electrical components like AMPERES, ABOVE FINISHED FLOOR, AMPERE FRAME, AMPERE TRIP, AUTOMATIC TRANSFER SWITCH, AMERICAN WIRE GAUGE, BUILDING MANAGEMENT SYSTEM, CONDUIT - RACEWAY, CIRCUIT, CURRENT TRANSFORMER, COPPER, CIRCUIT BREAKER, DRAWING, CIRCUIT, EXISTING TO REMAIN, EXISTING TO BE RELOCATED, EXISTING TO BE REMOVED, EMPTY CONDUIT, ELECTRICAL CONTRACTOR, EXHAUST FAN, EMERGENCY, GROUND OR GROUNDING, GROUND FAULT CIRCUIT INTERRUPTER, GROUND FAULT PROTECTION, ISOLATED GROUND, KILO AMPERE INTERRUPTING CAPACITY, KILOVOLT AMPERES, KILOWATTS, LIGHTING, MAIN CIRCUIT BREAKER, MIL CIRCULAR MILS, MISCELLANEOUS, MAIN DISTRIBUTION PANELBOARD, MAIN LUGS ONLY, MEDIUM VOLTAGE, NEUTRAL, NATIONAL ELECTRICAL CODE, NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION NIGHT LIGHT, NORMALLY OPEN, NOT TO SCALE, PHASE, PANEL OR PANELBOARD, FURNISH AND INSTALL, RECEPTACLE, ROOM, SWITCHBOARD, SWITCHGEAR, TIME CLOCK, TYPICAL, UNLESS NOTED OTHERWISE, VOLT, WIRE, WIRE GUARD, WATER HEATER, WEATHER PROOF, TRANSFORMER.

SYMBOL LIST NOTES:
1. THIS IS A GENERAL LIST OF SYMBOLS ON THE SHEET. SOME SYMBOLS MAY NOT BE APPLICABLE TO THIS PROJECT.

Professional seal for Matthew T. Wolfe, AIA, Registered Architect, License No. NJZ1A01963400.

Revisions:

Table for Revisions with columns for Revision Number, Description, and Date. Includes entries for General Receipt and Computer Receipt.

Professional seal for LAN ASSOCIATES, Inc., engineering, architecture, planning, surveying, 44-5 GOWDIN AVENUE, MIDLAND PARK, N.J. 07432, (201)447-6400.

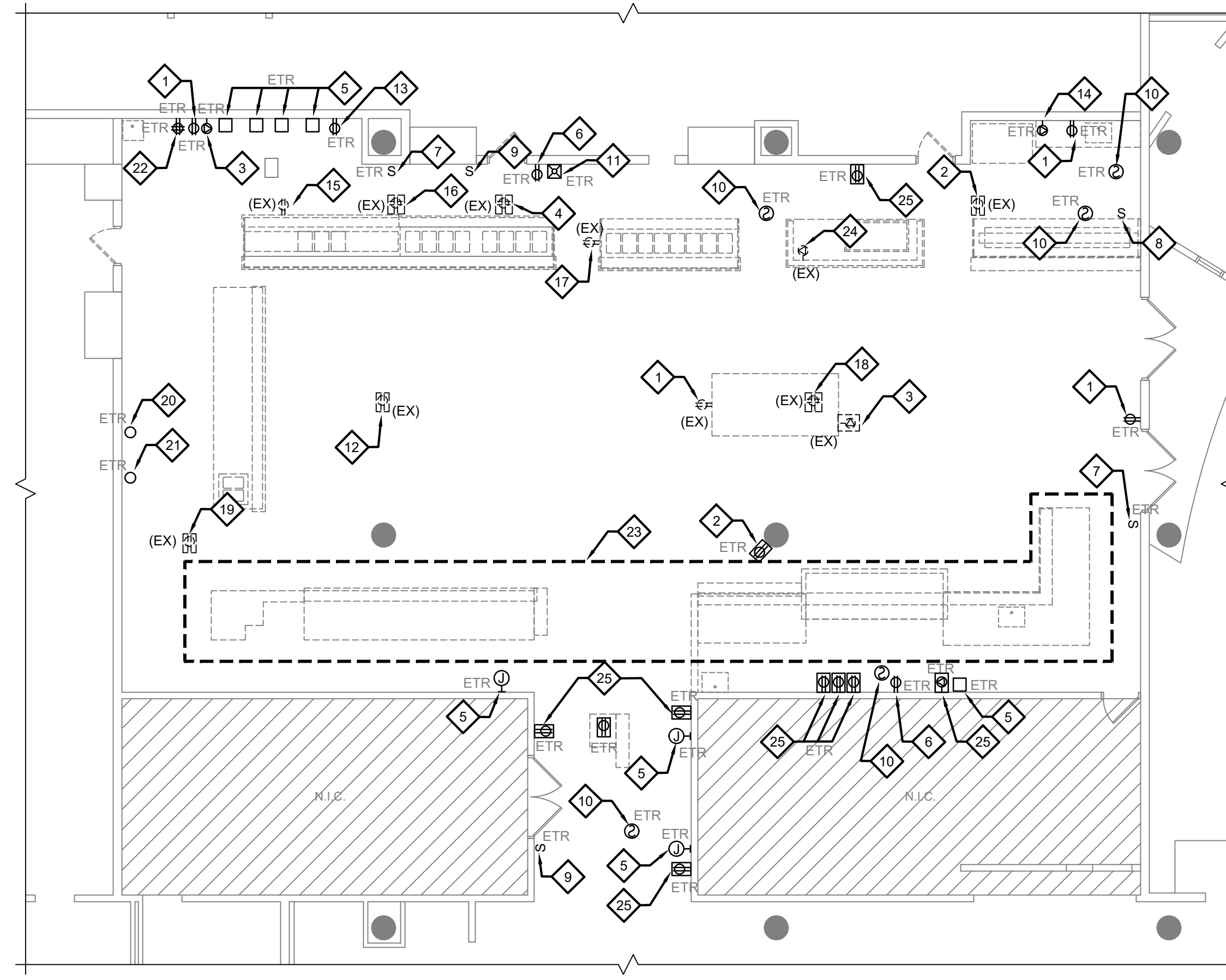
NOTES, ABBREVIATIONS & SYMBOL LIST for CAFETERIA RENOVATIONS AT MEGA STRUCTURE, ESSEX COUNTY COMMUNITY COLLEGE, 303 UNIVERSITY AVENUE, NEWARK, NEW JERSEY 07102.

Job No. 2.20302.02
File No. 2030202E001

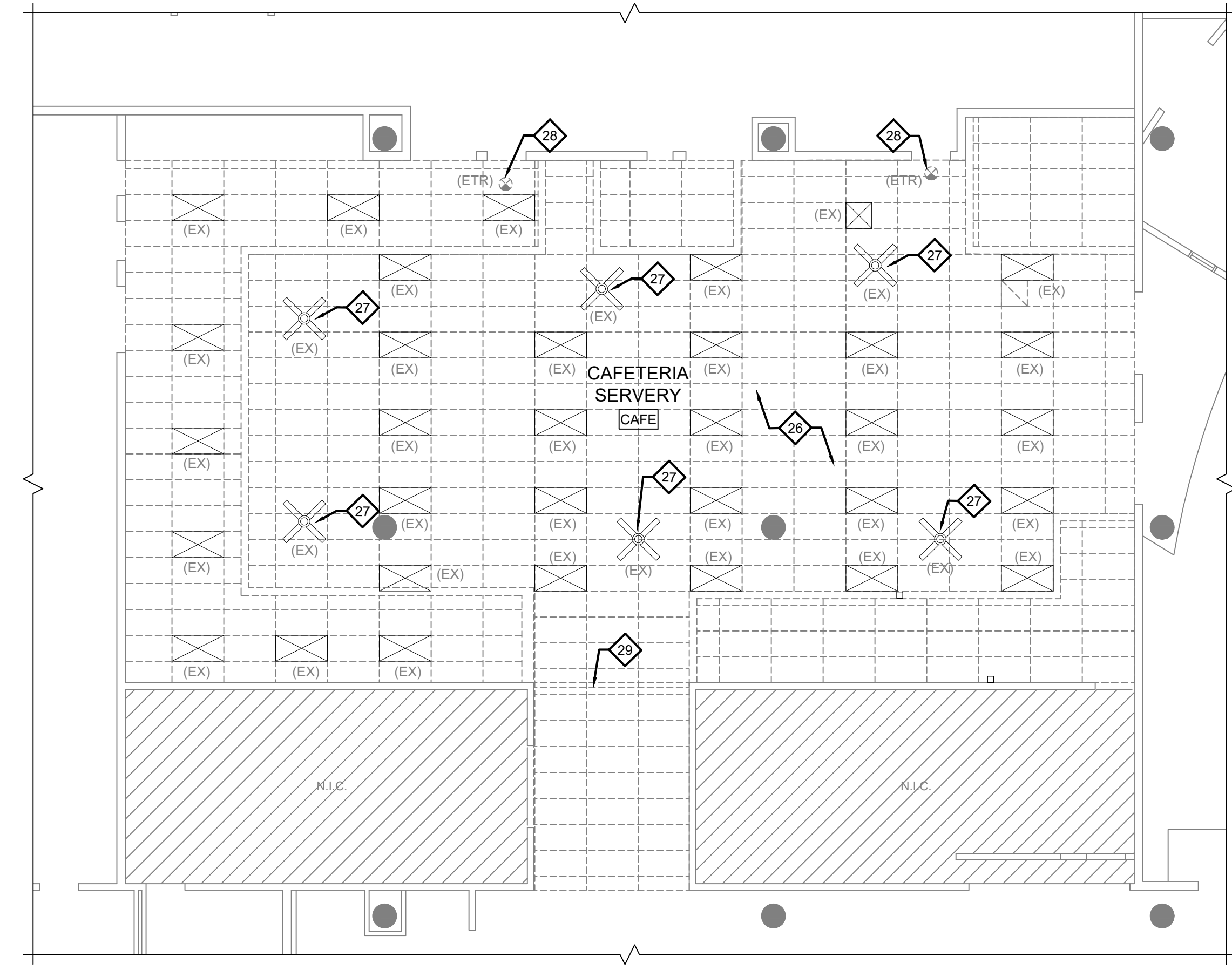
E0.01

GENERAL DEMOLITION NOTES:

- REFER TO SHEET E0.01 FOR NOTES, ABBREVIATIONS & SYMBOL LIST.
- CONTRACTOR SHALL CONDUCT A THOROUGH EXAMINATION OF THE PREMISES PRIOR TO PREPARING A PROPOSAL. ANY CHANGES TO THE DESIGN MADE NECESSARY BY FIELD CONDITIONS SHALL BE CONVEYED TO THE ENGINEER PRIOR TO PREPARING A PROPOSAL. NO ADDITIONAL COSTS BEYOND THE PROPOSAL PRICE WILL BE ACCEPTED FOR FIELD CONDITIONS THAT COULD HAVE BEEN DETERMINED BY AN INSPECTION OF THE PREMISES.
- PLANS ARE GENERALLY DIAGRAMMATIC. CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISCONNECTION AND REMOVAL OF ALL AFFECTED ELECTRICAL EQUIPMENT, DISCONNECT SWITCHES, FIXTURES, CONDUITS, WIRING, ASSOCIATED ELECTRICAL SUPPORTS, ETC. WITHIN THE DEMOLITION AREAS IDENTIFIED ON PLANS.
- CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING EXISTING CABLES SERVING DEMOLITIONED EQUIPMENT BACK TO OVERCURRENT DEVICE IN PANEL. BRANCH CIRCUITS REMAINING IN SERVICE SHALL BE SPliced IN ACCESSIBLE U.L APPROVED JUNCTION BOXES, SIZED PER NEC 2017.
- ALL CIRCUITS ELIMINATED DURING DEMOLITION SHALL BE PROPERLY IDENTIFIED AND TAGGED AT JUNCTION BOX AND IDENTIFIED AS SPARE IN ELECTRICAL PANEL.
- EXISTING CIRCUITS, CONDUITS, AND SYSTEMS PASSING THROUGH THE REMODELED AREAS WHICH SERVE UNREMODELED AREAS SHALL REMAIN AND BE PROTECTED DURING REMODELING AND DEMOLITION.
- ABANDONED ELECTRICAL OUTLET BOXES SHALL BE REMOVED COMPLETELY UNLESS NOTED OTHERWISE ELSEWHERE ON THESE PLANS.
- EXISTING FIRE ALARM SYSTEM 'HONEYWELL' SHALL BE OPERATIONAL AT ALL TIMES.
- PROVIDE U.L. APPROVED FIRE STOPPING AT ALL PENETRATIONS AT DESIGNATED FIREWALLS PER CODE.



1 ELECTRICAL DEMOLITION FLOOR PLAN
1/8" = 1'-0"



2 DEMOLITION REFLECTED CEILING PLAN
1/8" = 1'-0"

Electrical Demolition Key Notes

SYMBOL INDICATES ELECT. KEY NOTE

- EXISTING RECESSED DUPLEX RECEPTACLE.
- EXISTING DUPLEX RECEPTACLE. SURFACE MOUNTED.
- EXISTING SPECIAL PURPOSE RECEPTACLE. SURFACE MOUNTED.
- EXISTING QUAD. SURFACE MOUNTED.
- EXISTING SURFACE MOUNTED ELECTRICAL BOXES SHALL BE REMOVED AND RE-INSTALLED RECESSED MOUNTED. PROVIDE NEW BOXES, CONDUITS, HARDWARE.
- EXISTING RECESSED DUPLEX RECEPTACLE. MOUNTED CLOSE TO CEILING.
- EXISTING LIGHT SWITCH.
- EXISTING EQUIPMENT SWITCH.
- EXISTING SWITCHES.
- EXISTING CEILING MOUNTED SMOKE DETECTOR.
- EXISTING STROBE.
- EXISTING RECEPTACLE AND CONDUIT FROM CEILING.
- EXISTING RECESSED DUPLEX RECEPTACLE SHALL BE REUSED FOR NEW WORK. REFER TO ELECTRICAL KEY NOTE 1 ON SHEET E2.01.
- EXISTING SPECIAL PURPOSE RECEPTACLE. BRANCH CIRCUIT WIRING SHALL BE REUSED FOR NEW WORK. REFER TO ELECTRICAL KEY NOTE 2 ON SHEET E2.01.
- EXISTING DUPLEX RECEPTACLE. DISCONNECT WIRING AND REMOVE RECEPTACLE AND BOX. THE CONDUIT BELOW THE FLOOR SHALL BE INTERCEPTED AND EXTENDED FOR NEW WORK. REFER TO ELECTRICAL KEY NOTE 3 ON SHEET E2.01.
- EXISTING QUAD RECEPTACLE. DISCONNECT WIRING AND REMOVE RECEPTACLE AND BOX. THE CONDUIT RUNNING IN TRENCH SHALL BE INTERCEPTED AND EXTENDED FOR NEW WORK. REFER TO ELECTRICAL KEY NOTE 4 ON SHEET E2.01.
- EXISTING DUPLEX RECEPTACLE. DISCONNECT WIRING AND REMOVE RECEPTACLE AND BOX. THE CONDUIT RUNNING IN TRENCH SHALL BE INTERCEPTED AND EXTENDED FOR THE NEW WORK. REFER TO ELECTRICAL KEY NOTE 5 ON SHEET E2.01.
- EXISTING QUAD RECEPTACLE. REMOVE THE QUAD RECEPTACLE AND BOX AND REUSE THE EXISTING WIRING FOR THE NEW WORK. REFER TO ELECTRICAL KEY NOTE 6 ON SHEET E2.01.
- EXISTING RECEPTACLE, WIRING, AND BOX SHALL BE REMOVED. THE BRANCH CIRCUIT SHALL BE REUSED AND THE CONDUIT RUNNING IN TRENCH SHALL BE INTERCEPTED FOR THE NEW WORK. REFER TO ELECTRICAL KEY NOTE 7 ON SHEET E2.01.
- EXISTING CABLE. REFER TO ELECTRICAL KEY NOTE 8 ON SHEET E2.01.
- EXISTING CABLE FEEDING OVEN. REFER TO ELECTRICAL KEY NOTE 9 ON SHEET E2.01.
- DISCONNECT WIRING FROM QUAD AND REMOVE QUAD RECEPTACLE FROM BOX. THE WIRING SHALL BE USED FOR NEW WORK. REFER TO ELECTRICAL KEY NOTE 14 ON SHEET E2.01.
- ALL THE RECEPTACLES, WIRING, ELECTRICAL BOXES, AND CONDUITS INSTALLED IN THE MILLWORK TO BE DEMO SHALL BE REMOVED COMPLETELY. THE WIRING SHALL BE REMOVED BACK TO THE LAST BOX THAT REMAINS OR BACK TO THE OVERCURRENT DEVICE IN PANEL.
- EXISTING SPECIAL PURPOSE RECEPTACLE. REFER TO ELECTRICAL KEY NOTE 21 ON SHEET E2.01.
- EXISTING SURFACE MOUNTED RECEPTACLES SHALL BE REMOVED AND RE-INSTALLED RECESSED MOUNTED. PROVIDE NEW RECEPTACLES, BOXES, CONDUITS, HARDWARE.
- REMOVE THE EXISTING LIGHTING FIXTURES. THE BRANCH CIRCUIT SERVING THE EXISTING LIGHTING FIXTURES SHALL REMAIN AND REUSED FOR THE NEW WORK.
- EXISTING CEILING FAN. REMOVED AND SALVAGED. THE EXISTING BRANCH CIRCUIT WIRING SHALL REMAIN AND REUSED FOR FUTURE WORK.
- EXISTING EXIT SIGN. REMOVE AND SALVAGE. REINSTALL IN SAME LOCATION ON NEW CEILING.
- EXISTING ROLL-UP SECURITY GATE MOTOR TO BE REMOVED. REMOVE ASSOCIATED JUNCTION BOX(ES) AND EXISTING CIRCUIT BACK TO SOURCE.

Eng. No.	24047937500
Arch. No.	21A00012400
Date	3/10/22
Checked	WH
Drawn	HP

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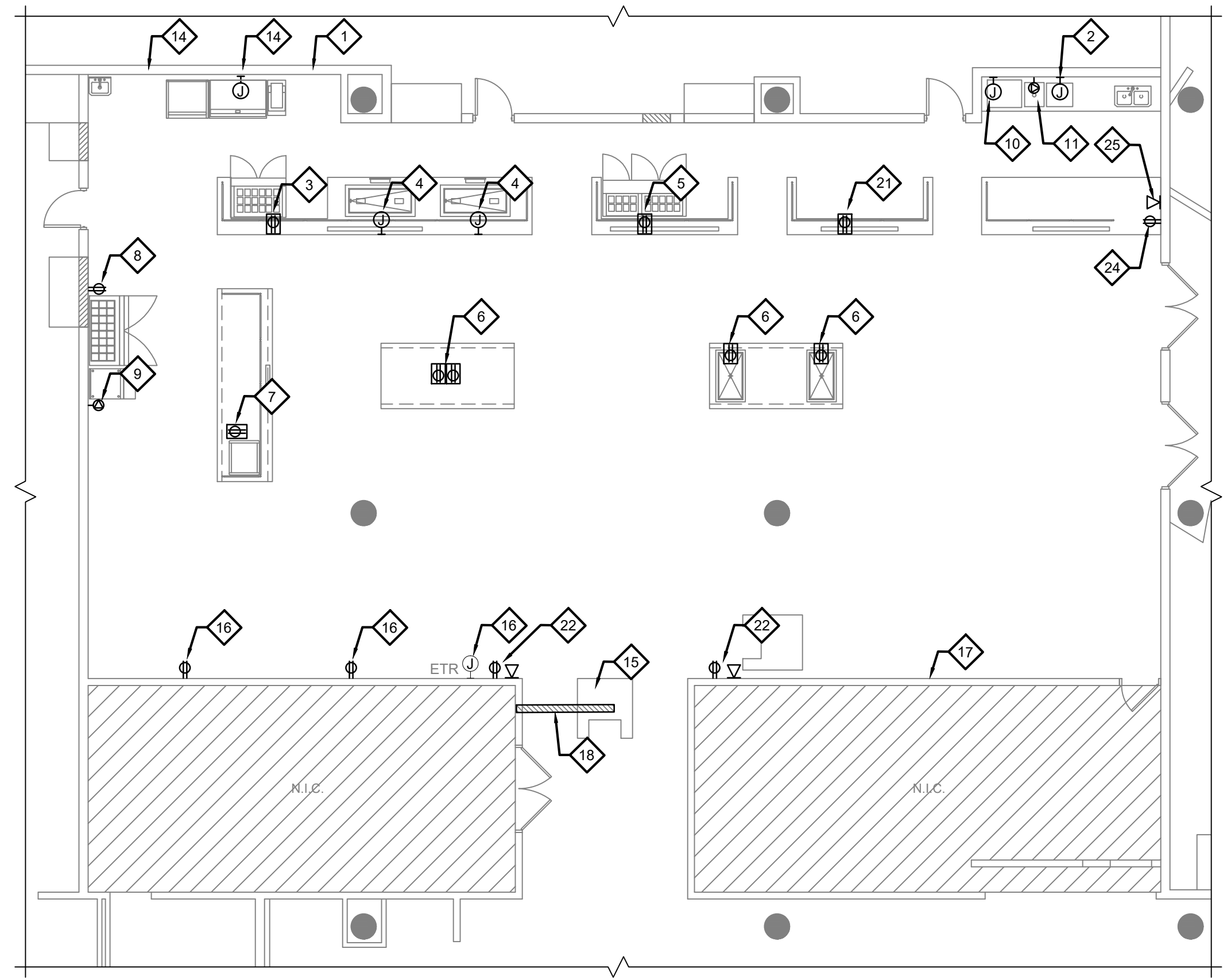
Revisions:

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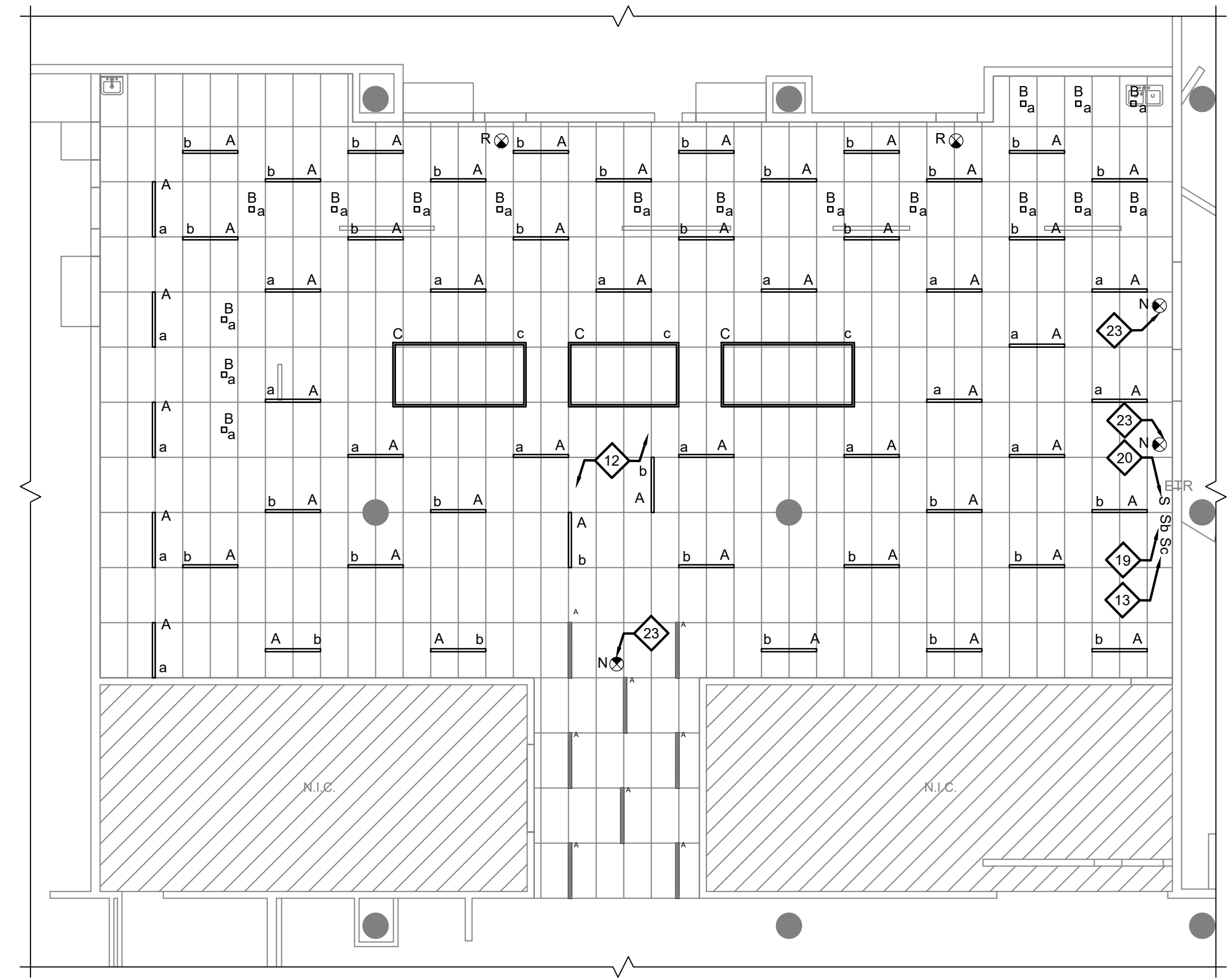
ELECTRICAL DEMOLITION FLOOR PLANS
CAFETERIA RENOVATIONS AT MEGA STRUCTURE
ESSEX COUNTY COMMUNITY COLLEGE
303 UNIVERSITY AVENUE
NEWARK, NEW JERSEY 07102

Job No. 2.20302.02
File No. 2030202E101

E1.01



1 PROPOSED ELECTRICAL FLOOR PLAN
1/8" = 1'-0"



2 PROPOSED REFLECTED CEILING PLAN
1/8" = 1'-0"

Electrical Key Notes

- EXISTING RECESSED DUPLEX RECEPTACLE SHALL BE REUSED TO FEED THE FRYER. REFER TO DEMOLITION KEY NOTE 13 ON E1.01
- REFER TO DEMOLITION KEY NOTE 14 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED THE BREWER. VERIFY IN THE FIELD IF THE UNIT REQUIRES TO BE HARDWIRED OR PLUGGED IN. MODIFY IF NECESSARY AND COMPLY WITH THE BREWER MANUFACTURER REQUIREMENTS.
- REFER TO DEMOLITION KEY NOTE 15 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED THE REFRIGERATOR. THE EXISTING CONDUIT IN TRENCH SHALL BE EXTENDED TO TERMINATE IN THE NEW RECEPTACLE MOUNTED IN THE MILLWORK DEDICATED TO THE REFRIGERATOR. PROVIDE NEW RECEPTACLE, BOX, CONDUIT, AND WIRES.
- REFER TO DEMOLITION KEY NOTE 16 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED THE HOT FOOD WELL UNITS. THE EXISTING CONDUIT IN TRENCH SHALL BE EXTENDED TO TERMINATE IN THE NEW JUNCTION BOX, SURFACE MOUNTED IN THE MILLWORK DEDICATED TO THE HOT FOOD WELL UNITS. PROVIDE NEW RECEPTACLE, BOX, CONDUIT, AND WIRES.
- REFER TO DEMOLITION KEY NOTE 17 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED THE REFRIGERATOR. THE EXISTING CONDUIT SHALL BE EXTENDED TO THE LOCATION OF NEW JUNCTION BOX, SURFACE MOUNTED IN THE MILLWORK DEDICATED TO THE REFRIGERATOR. PROVIDE NEW RECEPTACLE, BOX, CONDUIT, AND WIRES.
- REFER TO DEMOLITION KEY NOTE 18 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED THE DROP-IN COLD PAN AND GENERAL USE OUTLET. THE EXISTING CONDUIT IN TRENCH SHALL BE EXTENDED TO THE NEW RECEPTACLE, SURFACE MOUNTED IN THE MILLWORK DEDICATED TO THE DROP-IN COLD PAN AND GENERAL USE OUTLET. PROVIDE NEW RECEPTACLES, BOXES, CONDUITS, AND WIRES.
- REFER TO DEMOLITION KEY NOTE 19 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED THE DISPLAY CASE HEATED. THE EXISTING CONDUIT IN TRENCH SHALL BE EXTENDED TO THE LOCATION OF THE NEW RECEPTACLE, SURFACE MOUNTED IN THE MILLWORK DEDICATED TO THE DISPLAY CASE HEATED. PROVIDE NEW RECEPTACLE, BOX, CONDUIT, AND WIRES.
- REFER TO DEMOLITION KEY NOTE 20 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED ONLY THE REFRIGERATOR, SANDWICH/SALAD PREP. EXTEND THE WIRING IF NECESSARY TO TERMINATE IN THE RECEPTACLE RECESSED MOUNTED DEDICATED TO THE UNIT.
- REFER TO DEMOLITION KEY NOTE 21 ON SHEET E1.01. THE EXISTING CIRCUIT SHALL BE REUSED TO FEED ONLY THE OVEN. EXTEND THE WIRING IF NECESSARY TO TERMINATE IN THE RECEPTACLE THAT WILL SERVE THE OVEN. VERIFY IN THE FIELD THAT THE BRANCH CIRCUIT BREAKER AND THE WIRE COMPLY WITH THE NEC REQUIREMENTS, REPLACE IF NECESSARY. PROVIDE RECEPTACLE L6-30R, RECESSED MOUNTED.
- PROVIDE NEW WIRING 2# 12AWG, 1# 12 AWG GROUND AND CONDUIT TO FEED ICE MAKER. USE BRANCH CIRCUIT ON PANEL 'P2 THAT BECOME AVAILABLE AFTER DEMOLITION. RECESSED MOUNT.
- PROVIDE NEW WIRING 2#10AWG, 1#10AWG GROUND AND CONDUIT TO FEED EXPRESSO MACHINE. USE BRANCH CIRCUIT ON PANEL 'P2 THAT BECOME AVAILABLE AFTER DEMOLITION. PROVIDE RECEPTACLE L6-30R. RECESSED MOUNT.
- REUSE THE EXISTING WIRING AND BRANCH CIRCUITS THAT BECOME AVAILABLE AFTER DEMOLITION TO FEED THE NEW LIGHTING FIXTURES. EXTEND THE WIRING IF NECESSARY. COMPLETE THE INSTALLATION PER NEC REQUIREMENTS.
- NEW SWITCH 'S_c' TO CONTROL LIGHTING FIXTURES WITH 'c' DESIGNATION. REUSE THE EXISTING BRANCH CIRCUIT AND WIRING THAT BECOMES AVAILABLE AFTER DEMO OF THE EXISTING CEILING FANS. EXTEND THE WIRES IF NECESSARY.
- REFER TO DEMOLITION KEY NOTE 22 ON SHEET E1.01. PROVIDE CONDUIT AND WIRING IN EXISTING BOX TO TERMINATE THE WIRING IN NEW JUNCTION BOX DEDICATED TO FEED THE GRIDDLE, GAS.
- REUSE THE EXISTING RECEPTACLE TO FEED THE CASHIER/MERCHANDISING STATION.
- USE EXISTING JUNCTION BOX TO FEED TWO (2) NEW RECEPTACLES RECESSED MOUNTED. PROVIDE WIRES AND CONDUITS.
- THE EXISTING RECEPTACLES SURFACE MOUNTED SHALL BE REMOVED AND RE-INSTALLED EQUALLY SPACED ALONG THE WALL AND SHALL BE RECESSED MOUNTED. EXTEND THE WIRES IF NECESSARY. PROVIDE CONDUITS AND WIRING, RECESSED MOUNTED.
- TRENCH FOR DATA CABLE. PATCH FLOOR TO MATCH EXISTING. FURNISH AND INSTALL OUTLET WITH 3/4" CONDUIT STUBBED 6" ABOVE ACCESSIBLE CEILING.
- NEW SWITCH 'S_b' TO CONTROL LIGHTING FIXTURES WITH 'b' DESIGNATION. CONNECT TO BRANCH CIRCUIT THAT BECOMES AVAILABLE AFTER DEMO OF THE EXISTING LIGHTING FIXTURES. PROVIDE WIRING, BOXES, AND CONDUIT. RECESSED MOUNT.
- REFER TO DEMOLITION KEY NOTE 7 ON SHEET E1.01. THE EXISTING SWITCH TO CONTROL THE LIGHTING FIXTURES WITH 'a' DESIGNATION. REUSE THE BRANCH CIRCUIT AND WIRING THAT BECOMES AVAILABLE AFTER DEMO OF THE EXISTING LIGHTING FIXTURES. EXTEND THE WIRES IF NECESSARY. PROVIDE WIRES, BOXES, AND CONDUITS. RECESSED MOUNT.
- REFER TO DEMOLITION KEY NOTE 24. REUSE THE EXISTING BRANCH CIRCUIT TO FEED THE NEW RECEPTACLE, SURFACE MOUNTED IN THE MILLWORK DEDICATED TO NEW EQUIPMENT.
- RECEPTACLES AND DATA, DEDICATED TO CASH REGISTERS. VERIFY IN THE FIELD EXISTING PANEL AND BRANCH CIRCUITS THAT BECOME AVAILABLE AFTER DEMO. FURNISH AND INSTALL 2 #12, 1 #12G, IN 3/4" C TO EACH CASH REGISTER.
- NEW EXIT SIGN SHALL BE INTERCONNECTED WITH EXISTING EXIT SIGNS. PROVIDE NEW WIRE, BOXES AND CONDUIT.
- CONTRACTOR TO FIELD VERIFY A CIRCUIT THAT BECOMES AVAILABLE AFTER DEMOLITION. PROVIDE NEW 20AMP CIRCUIT BREAKER AND RUN NEW WIRES AND CONDUIT. FURNISH AND INSTALL 2 #12, 1 #12G, IN 3/4" CONDUIT.
- EXTEND EXISTING DATA LINE TO LOCATION OF NEW DATA OUTLET.

GENERAL ELECTRICAL NOTES:

- REFER TO SHEET E0.01 FOR NOTES, ABBREVIATIONS & SYMBOL LIST.
- CONTRACTOR SHALL CONDUCT A THOROUGH EXAMINATION OF THE PREMISES PRIOR TO PREPARING A PROPOSAL. ANY CHANGES TO THE DESIGN MADE NECESSARY BY FIELD CONDITIONS SHALL BE CONVEYED TO THE ENGINEER PRIOR TO PREPARING A PROPOSAL. NO ADDITIONAL COSTS BEYOND THE PROPOSAL PRICE WILL BE ACCEPTED FOR FIELD CONDITIONS THAT COULD HAVE BEEN DETERMINED BY AN INSPECTION OF THE PREMISES.
- PLANS ARE GENERALLY DIAGRAMMATIC. CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISCONNECTION AND REMOVAL OF ALL AFFECTED ELECTRICAL EQUIPMENT, DISCONNECT SWITCHES, FIXTURES, CONDUITS, WIRING, ASSOCIATED ELECTRICAL SUPPORTS, ETC. WITHIN THE DEMOLITION AREAS IDENTIFIED ON PLANS.
- CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING EXISTING CABLES SERVING DEMOLITIONED EQUIPMENT BACK TO OVERCURRENT DEVICE IN PANEL. BRANCH CIRCUITS REMAINING IN SERVICE SHALL BE SPLICED IN ACCESSIBLE UL APPROVED JUNCTION BOXES, SIZED PER NEC 2017.
- ALL CIRCUITS ELIMINATED DURING DEMOLITION SHALL BE PROPERLY IDENTIFIED AND TAGGED AT JUNCTION BOX AND IDENTIFIED AS SPARE IN ELECTRICAL PANEL.
- EXISTING CIRCUITS, CONDUITS, AND SYSTEMS PASSING THROUGH THE REMODELED AREAS WHICH SERVE UNREMODELED AREAS SHALL REMAIN AND BE PROTECTED DURING REMODELING AND DEMOLITION.
- ABANDONED ELECTRICAL OUTLET BOXES SHALL BE REMOVED COMPLETELY UNLESS NOTED OTHERWISE ELSEWHERE ON THESE PLANS.
- FURNISH AND INSTALL WIRING, BOXES, CONDUITS, HARDWARE TO COMPLETE THE INSTALLATION PER NEC REQUIREMENTS.
- EXISTING FIRE ALARM SYSTEM SHALL BE OPERATIONAL AT ALL TIMES.
- PROVIDE U.L. APPROVED FIRE STOPPING AT ALL PENETRATIONS AT DESIGNATED FIREWALLS PER CODE.
- CONTRACTOR SHALL PROVIDE WIRING, BOXES, CONDUITS, HARDWARE TO COMPLETE THE INSTALLATION PER NEC.

GENERAL ELECTRICAL NOTES:

- ALL 15- AND 20-AMPERE, 125-VOLT RECEPTACLES IN NON-DWELLING-TYPE KITCHENS (KITCHEN AREAS, BAR, ETC.) SHALL BE GFCI PROTECTED.
- ALL 15 AMP AND 20 AMP 125 VOLT -2P-3W RECEPTACLES IN KITCHEN AREAS SHALL BE GFCI TYPE RECEPTACLES PER NEC 210-8(B).
- ALL COVER PLATES SHALL BE STAINLESS STEEL.
- ALL ELECTRICAL WORK FOR FOOD SERVICE EQUIPMENT SHALL BE COMPLETELY CONNECTED AND WIRED BY THE ELECTRICAL CONTRACTOR. FINAL CONNECTIONS TO EQUIPMENT JUNCTION BOXES OR PULL BOXES, AND ALL ELECTRICAL WORK FROM PANELBOARDS TO BE BY THE ELECTRICAL CONTRACTOR.
- ELECTRICAL CONTRACTOR TO FURNISH THE STALL, ALL PLUGS AND CORDS REQUIRED. ALL CORDS SHALL BE NEMA RATED AND UL APPROVED FOR MANUFACTURER AND EQUIPMENT.
- THE ELECTRICAL SYSTEM IS DESIGNED FOR 208 VOLTS, 3 PHASE, 4 WIRE AND 60 HERTZ.
- ELECTRICAL CONNECTIONS AND OUTLETS HAVE BEEN LOCATED AS ACCURATELY AS POSSIBLE AND ARE INTENDED TO SUIT THE EQUIPMENT TO BE SUPPLIED. THE ELECTRICAL PLANS ARE SCHEMATIC AND SUBJECT TO FIELD CONDITIONS. COORDINATION REQUIREMENTS AMONG TRADESMEN, CHANGES NECESSARY BY LOCAL BUILDING CODES OR ORDINANCES, OR SUBSTITUTIONS, OR ALTERATIONS SHOWN ON THIS PLAN. THE CONTRACTOR SHALL MAKE ALLOWANCES FOR THE REQUIRED FINAL CONNECTIONS AND SUPPLY ALL NECESSARY FITTINGS, STARTERS, ETC., EXCEPT WHERE SPECIFICALLY NOTED ON THE DRAWINGS OR SPECIFICATIONS.
- ELECTRICAL CONTRACTOR TO FURNISH AND INSTALL ALL JUNCTION BOXES, PVC OR METAL CONDUIT, CONVENIENCE OUTLETS WITH COVERS, SWITCHES, CONNECTORS, CONTROLS AND OTHER ACCESSORIES THAT ARE NOT AN INTEGRAL PART OF THE FOODSERVICE EQUIPMENT AS REQUIRED TO MAKE FINAL CONNECTIONS TO THE FOODSERVICE EQUIPMENT FOR A COMPLETE AND FUNCTIONAL OPERATION MEETING ALL COMPLETABLE APPLICABLE NATIONAL STATE AND LOCAL CODES ORDINANCES.
- HEIGHT OF OUTLET IS GIVEN FROM FINISHED FLOOR TO CENTERLINE OF OUTLET, AS APPLICABLE.
- ALL 115 VOLT OUTLETS NOT DESIGNATED WITH SPECIFIC LOADS TO BE RATED 20 AMPS. ALL 208/230 VOLT OUTLETS NOT DESIGNATED TO BE RATED AT 3/4 HP.
- ALL ELECTRICAL POWER NOT OTHERWISE NOTED TO BE SINGLE PHASE.
- ELECTRICIAN TO "SIZE" ALL ELECTRICAL JUNCTION BOXES. ELECTRICIAN TO PROVIDE ALL JUNCTION BOXES. ELECTRICAL CONVENIENCE OUTLETS SHALL BE LOCATED IN WALLS. FIXTURE FABRICATOR TO LOCATE ALL CONVENIENCE OUTLETS AND SWITCHES WHERE PART OF FIXTURE, BUT INTERNAL WIRING FOR SUCH BOXES TO BE INSTALLED AND SUPPLIED BY THE ELECTRICAL CONTRACTOR. ALL CONVENIENCE OUTLETS IN WALLS TO BE FLUSH WITH FINISHED WALL UNLESS NOTED OTHERWISE. ELECTRICAL CONTRACTOR TO PROVIDE AND FIELD MOUNT ALL JUNCTION BOXES LOCATED IN ACCESS AREAS OF FIXTURES. ELECTRICAL CONTRACTOR TO SUPPLY AND INSTALL ALL CONDUIT AND FIXTURES. CONDUIT WHERE STUBBED UP OUT OF FLOOR TO EXTEND A MINIMUM OF 2" ABOVE FLOOR OR CURB.

GENERAL ELECTRICAL NOTES:

- DRAWINGS DEPICT THE LOCATION OF OUTLETS, TYPE OF CONNECTION FOR EQUIPMENT AND ELECTRICAL LOAD. ELECTRICAL CONTRACTOR MUST COMPLY WITH ALL CODES RELATED TO THE INSTALLATION, WIRING AND FINAL CONNECTIONS OF EQUIPMENT.
- CONTRACTOR SHALL CONNECT ALL EQUIPMENT AND FIXTURES AND PERFORM INTERNAL WIRING WITHIN KITCHEN EQUIPMENT FIXTURES. ELECTRICIAN SHALL COORDINATE WITH KITCHEN EQUIPMENT FIXTURE FABRICATOR ON PROGRESS OF FABRICATION AND SHALL BE RESPONSIBLE FOR ANY REQUIRED INSPECTION OF INACCESSIBLE AREAS BEFORE SUCH AREAS ARE PERMANENTLY CLOSED OR SEALED.
- THE ELECTRICAL CONTRACTOR TO PROVIDE CONNECTION FOR EXHAUST FANS AND MAKE-UP AIR FANS AND LOCATE SWITCHES, AND FOR PILOT LIGHTS WHERE SHOWN ON PLANS. DISCONNECT SWITCHES TO BE MOUNTED CONVENIENT TO HOODS. EXHAUST AND MAKE-UP AIR FANS TO BE SWITCHED ON ONE SWITCH.
- ELECTRICAL CONTRACTOR TO FURNISH INSTALLED DISCONNECTS OR CIRCUIT BREAKERS AS REQUIRED BY CODE FOR EACH CONNECTION. COORDINATE LOCATIONS WITH THE EQUIPMENT. KITCHEN EQUIPMENT CONTRACTOR.
- ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL LOCKOUT DEVICES ON ALL BREAKERS FOR CLOCKS, REFRIGERATION, CONTROL WIRING AND FIRE EXHAUST SYSTEM CONTROLS.
- WHERE SYMBOLS ARE INDICATED FOR A SOLID CONNECTION, A 4'-0" SECTION OF LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT TYPE LFNC SHALL BE STUBBED OUT AT THE PROPER LOCATION AND SHALL BE CONNECTED TO "J" BOXES LOCATED IN A CONVENIENT POSITION ON EQUIPMENT AFTER EQUIPMENT HAS BEEN PLACED IN POSITION.
- ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL THE FOLLOWING:
 - ALL JUNCTION-BOXES, ELECTRICAL OUTLETS, COVER PLATES, SWITCHES, ETC. NOT BUILT INTO FIXTURES OR EQUIPMENT. ALL OUTLETS, JUNCTION-BOXES, COVER PLATES, ETC. IN DISHWASHING AREAS, OR AS INDICATED ON SCHEDULES, MUST BE VAPOR-PROOF.
 - ALL PLUGS AND CORDS AS NOTED ON SCHEDULE. ALL CORDS SHALL BE NEMA RATED AND UL APPROVED FOR MANUFACTURED AND/OR FABRICATED EQUIPMENT.
 - ALL COMPONENTS, EXCEPT FOR THE GAS SOLENOID VALVE, FOR THE AUTOMATIC GAS FUEL SHUT-OFF, ELECTRICAL RELEASES FOR FOOD SERVICE EQUIPMENT BELOW HOODS/VENTILATORS AS REQUIRED BY NFPA AND LOCAL CODES.
 - DISCONNECTS OR OTHER DEVICES AS REQUIRED BY CODE.

LIGHTING NOTES:

- FIXTURES MUST BE NSF-APPROVED LIGHTING PRODUCTS.
- AS THE FIXTURE IS EVALUATED AND TESTED, THE FIXTURE MUST MEET SPECIFIC CRITERIA FOR NSF CERTIFICATION IN FOOD AND BEVERAGE FACILITIES:
- NSF-APPROVED LIGHTING PRODUCTS MUST DELIVER LIGHT OUTPUT (FOOTCANDLE) LEVELS THAT ARE ADEQUATE FOR FOOD PREPARATION AND FOOD STORAGE AREAS.
- THESE PRODUCTS MUST BE SHATTERPROOF TO ENSURE THAT NO BROKEN GLASS SPLINTERS OVER FOOD OR OTHER EQUIPMENT.
- FIXTURES MUST BE EASILY ACCESSIBLE, RESISTANT TO THE INTRUSION OF DUST, WATER AND OTHER HAZARDS, AND DESIGNED FOR EASY CLEANING TO MINIMIZE THE BREEDING OF BACTERIA OR MOLD. A FIXTURE THAT IS IP69K RATED MEETS THESE CRITERIA. THE 6 MEANS IT IS DUST TIGHT (ALLOWING NO INGRESS OF DUST) AND THE 9 MEANS IT IS PROTECTED AGAINST CLOSE-RANGE HIGH PRESSURE, HIGH TEMPERATURE SPRAY DOWNS.

LIGHTING FIXTURE SCHEDULE

TYPE	SYMBOL	DESCRIPTION	MANUFACTURER
A		3.5" LINEAR LED	FINELITE HP-X-R-D-4FT-H-835-F-120-SC-FC-1% XX-FE-SW-R56
B		2' x 2' RECESSED LED	USA LIGHTING B4SDF-16C3-3K5S-50-S-WH-FTIC-UNV-D6E-R56
C		HIGH PERFORMANCE 2" APERTURE (HP-2) PENDANT 8' x 4'-9" LED	FINELITE HP-2-P-ID-XX-V-H-837-SMC-WSQ-DSO-96LG-120-SC-FC-1%-FAXX-R56

NJ Certificate of Authorization
 Eng'r. No. 24627937500
 Arch. No. 21A200012400
 Date 3/10/22
 Checked WH
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Revisions:

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