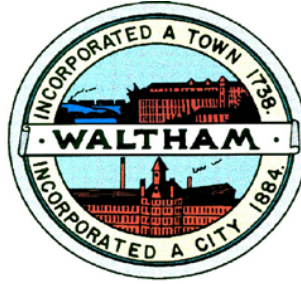


The City of Waltham



**Invites
Interested Parties
To propose the best offer and or bid
For the service or product herewith described:**

**Waltham Community Cultural Center (WCCC)
HVAC Improvements**

Bid Opening for GCs will be held: 10:00 AM Tuesday October 24, 2017,

Bid Opening for Filed Sub-Bids: 2:00 PM Monday October 16, 2017

(HVAC, Electric & Plumbing)

Last day for written questions: 12 Noon Tuesday October 10, 2017.

(Via email ONLY to jpedulla@city.waltma.ma.us)

A pre-bid conference will be held: 10:00 AM on Friday October 6 2017

(Meet on site at 510 Moody Street, Waltham, MA 02452)

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Not Used

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DIVISION 00

**SECTION 000020
NOTICE TO BIDDERS**

**WALTHAM COMMUNITY CULTURAL CENTER HVAC IMPROVEMENTS
510 Moody Street
WALTHAM, MASSACHUSETTS**

The City of Waltham, Massachusetts invites sealed bids from Contractors for the **WALTHAM COMMUNITY CULTURAL CENTER HVAC IMPROVEMENTS, 510 Moody Street Waltham, Massachusetts.**

PLANS, SPECIFICATIONS and other Contract Documents may be obtained by visiting the City's Web Site at www.city.waltham.ma.us/open-bids

Copies of Addenda will be e- mailed to the registered Bidders without charge. Addenda will also be posted on the web site above

Sealed **GENERAL BIDS** for this project will be accepted from eligible bidders at the Purchasing Department, Waltham City Hall, 610 Main Street, Waltham, MA 02452 until **10:00 AM October 24, 2017**, at which place and time they shall be publicly opened, read aloud and recorded for presentation to the Awarding Authority.

Sealed **FILED SUB BIDS** for **HVAC, Electric and Plumbing** trades will be accepted from eligible bidders at the Purchasing Department, Waltham City Hall, 610 Main Street, Waltham, MA 02452 until **2:00 PM on October 16, 2017**, at which place and time they shall be publicly opened, read aloud and recorded for presentation to the Awarding Authority.

A **PRE-BID CONFERENCE AND SITE INSPECTION** will be held for all interested parties at **10:00 AM on October 6, 2017** at the site of the **WALTHAM COMMUNITY CULTURAL CENTER HVAC IMPROVEMENTS 510 Moody Street Waltham MA 02453**. Attendance at this pre-bid conference is strongly recommended but not mandatory for parties submitting a bid. It will be the only opportunity to visit the site prior to the bid opening.

LAST DAY FOR WRITTEN QUESTIONS is at 12 noon October 10, 2017. Questions are to be sent via e-mail only to Jpedulla@city.waltham.ma.us

THE BUDGET for this entire project is **NOT TO EXCEED \$2,400,000.00.**

Each general bid shall be accompanied by a bid deposit in the form of a bid bond, certified check, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the City of Waltham in the amount of five percent (5%) of the value of the bid

Bids shall be made on the basis of the Minimum Wage Rates as determined by the Commissioner of Labor and Industries, Pursuant to the Provisions of Chapter 149, Sections 26 to 27D inclusive of Massachusetts General Laws, a copy of which is found in the City's Web site at www.city.waltham.ma.us/open-bids .

Bidders' selection procedures and contract award shall be in conformity with the rules of Commonwealth of Massachusetts statute Chapter 149 §44A-44M

Performance and Labor and Materials payment bonds in the full amount of the contract price will be required from the successful bidder.

The Awarding Authority reserves the right to reject any or all general bids, if it be in the public interest to do so, and to reject any sub-bid on any sub-trade if it determines that such sub-bid does not represent the sub-bid of a person competent to perform the work as specified or that less than three such sub-bids were received and that the prices are not reasonable for acceptance without further competition.

The successful bidder will be required to furnish a Certificate of Insurance, naming the City of Waltham as an Additional Named Insured with a waiver of subrogation, for General Liability and Vehicle Liability in the amount of \$1,000,000 per occurrence and \$1,000,000 in the aggregate and Worker's Compensation Insurance as prescribed by law.

In accordance with the laws of the Commonwealth of Massachusetts the undersigned certifies that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by OSHA that is at least 10 hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

CITY ORDINANCE. APPROVAL OF CONTRACTS BY MAYOR, SEC. 3-12 OF THE CITY ORDINANCES.

All contract made by any department, board or commission where the amount involved is two thousand dollars (\$2,000) or more shall be in writing, and no such contract shall be deemed to have been made or executed until the approval of the Mayor is affixed thereto. Any construction contract shall, and all other contracts may, where the contract exceed five thousand dollars (\$5,000) be required to be accompanied by a bond with sureties satisfactory to the Mayor.

CITY OF WALTHAM

Joseph Pedulla, CPO
Purchasing Department
City Hall, 610 Main Street
Waltham, MA 02452

SECTION 000025 INSTRUCTION TO BIDDERS

PART 1 - GENERAL

1.01 SCHEDULE OF DATES

- A. Advertisement appears in Central Register, Plans and Specifications ready for Bidders at the Offices of the Waltham Purchasing Agent after 4:30 P.M. on January 14, 2015.
- B. **Pre-bid walkthrough and site inspection: October 6, 2017 at 10:00 AM.** Meet at **510 Moody St. Waltham.**
- C. **Questions** and requests for interpretations may be submitted in writing via e-mail ONLY to Jpedulla@city.waltham.ma.us up to **12:00 noon October 10, 2017.**
- D. Addenda will be issued with interpretations as determined by the Purchasing Department only via e-mail and posting on the web site.
- E. **General Bids Deadline: 10:00 A.M. October 24, 2017,** in the Purchasing Department, City Hall, 610 Main Street, Waltham, MA 02452, Attn: J. Pedulla, CPO, where the bids will be publicly open and read.

1.02 BIDDING PROCEDURE

- A. Bids for the work are subject to the provisions of General Laws, Chapter 30, § 39M, as amended. Regulations governing the bidding procedures as set forth in the above mentioned amended General Laws must be followed.
- B. In the event of any inconsistencies between any of the provisions of these Contract Documents and of the cited statute, anything herein to the contrary notwithstanding, the provisions of the said statute shall control.
- C. No General Bid received by the Awarding Authority after the time respectively established herein for the opening of General Bids will be considered, regardless of the cause for the delay in the receipt of any such bid.

1.03 WITHDRAWAL OF BIDS

- A. Bids may be withdrawn prior to the time respectively established for the opening of General Bids only on written request to the Awarding Authority.

1.04 INTERPRETATION OF CONTRACT DOCUMENTS

- A. No oral interpretation will be made to any bidder. All questions or requests for interpretations must be made in writing to the Architect.

- B. Every interpretation made to a bidder will be in the form of an Addendum to the drawings and/or specifications, which will be made available to all persons to whom Contract Documents have been issued.
- C. Failure of the Awarding Authority to send, or of any bidder to receive any such Addendum shall not relieve any bidder from obligation under his bid as submitted.
- D. All such Addenda shall become a part of the Contract Documents.

1.05 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- A. Each bidder may visit the site of the proposed work and fully acquaint himself with conditions as they exist, and may also thoroughly examine the Contract Documents. Failure of any bidder to visit the site and acquaint himself with the Contract Documents shall not relieve any bidder from any obligation with respect to his bid.
- B. By submitting a bid, the bidder agrees that the Contract Documents are adequate and that the required result for a full and complete installation can be produced. The successful bidder shall furnish any and all labor, materials, insurance, permits and all other items needed to produce the required result to the satisfaction of the Awarding Authority.

1.06 BID SECURITY

- A. The General Contractor's bid must be accompanied by bid security in the amount of five percent (5%) of the bid.
- B. At the option of the bidder, the security may be bid bond, certified, treasurer's or cashier's check issued by a responsible bank or trust company. No other type of bid security is acceptable.

Bid Bonds shall be issued by a Surety Company qualified to do business under the laws of the Commonwealth of Massachusetts.

- C. Certified, Treasurer's or Cashier's check shall be made payable to the City of Waltham, Massachusetts.
- D. The bid security shall secure the execution of the Contract and the furnishing of a Performance and Payment Bond by the successful General Bidder for 100% of the contract value.
- E. Should any General Bidder to whom an award is made fail to enter into a contract therefore within five (5) days, Saturdays, Sundays and Legal Holidays, excluded, after notice of award has been mailed to him or fail within such time to furnish a Performance Bond and also a Labor and Materials or Payment Bond as required, the amount so received from such General Bidder through his Bid Bond, Certified, Treasurer's or Cashier's check as bid deposit shall become the property of the City of

Waltham, Massachusetts as liquidated damages; provided that the amount of the bid deposit, which becomes the property of the City of Waltham, Massachusetts, shall not in any event exceed the difference between his bid price and the bid price of the next lowest responsible and eligible bidder; and provided further that, in case of death, disability, bona fide clerical error or mechanical error of a substantial nature, or other unforeseen circumstances affecting the General Bidder, his deposit shall be returned to him.

1.07 BID FORM

- A. General Bids shall be submitted on the "FORM FOR GENERAL BID" enclosed. Erasures or other changes must be explained or noted over the signature of the bidder.
- B. Bid forms must be completely filled in. Bids which are incomplete, conditional, or obscure, or which contain additions not called for will be rejected.
- C. General Bidders shall submit one set of executed bid forms to the Awarding Authority.

1.08 SUBMISSION OF BIDS AND BID SECURITIES

- A. Each bid submitted by a General Contractor shall be enclosed in a sealed envelope that shall be placed with the bid security in an outer envelope. The outer envelope shall be sealed and clearly marked as follows:

(Firm Name): _____
General Bid and Bid Security for:
WALTHAM COMMUNITY CULTURAL CENTER HVAC IMPROVEMENTS

1.09 AWARD OF CONTRACT

- A. The Contract shall be awarded to the lowest responsible and eligible General Bidder on the basis of competitive bids in accordance with the procedure set forth in the provision of Chapter 30, §39M of the General Laws of the Commonwealth of Massachusetts.
- B. If the bidder selected as the General Contractor fails to perform his agreement to execute a contract in accordance with the terms of his General Bid, and furnish a Performance Bond and also a Labor and Materials or Payment Bond, as stated in his General Bid an award shall be made to the next lowest responsible and eligible bidder.
- C. The words "lowest responsible and eligible bidder" shall be the bidder whose name is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work and who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed, or to be employed, on the work. Essential information in regard to such qualifications shall be submitted in such form as the Awarding Authority may require.

- D. Action on the award will be taken within sixty (60) days, Saturdays, Sundays and Legal Holidays excluded after the opening of the bids.

1.10 SECURITY FOR FAITHFUL PERFORMANCE

- A. The successful bidder must deliver to the Awarding Authority simultaneously with his delivery of the executed contract, an executed Performance Bond, and also a Labor and materials or Payment Bond, each issued by a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority and each in the sum of One Hundred Percent (100%) of the Contract Price, as surety for the faithful performance of his contract, and for the payment of all persons performing labor or furnishing materials in connection therewith. Said bonds shall provide that, if the General Contractor fails or refuses to complete the Contract, the Surety Company will be obligated to do so.
- B. Premiums are to be paid by the General Contractor, and are to be included in the Contract Price.

1.11 EQUAL OPPORTUNITY

- A. The City of Waltham is an Equal Opportunity employer and will require compliance with the minority business enterprise plan (MBE) on file in the Purchasing Department

1.12 PRE-BID WALK-THRU

- A. A pre-bid conference will be held at the site on **October 6, 2017 at 10:00 AM.** at the **WALTHAM COMMUNITY CULTURAL CENTER HVAC IMPROVEMENTS, 510 Moody Street, Waltham.** Interested parties are encouraged to attend given that this will be the only time the site is available prior to the submission of bids. Further, prior to the bid opening, potential bidders may not go onto the site any time other than the aforementioned pre-bid conference.

1.13 SITE VISITS

- A. Prospective bidders are prohibited from going onto the site prior to the Bid Opening or any time other than the pre-bid walk-thru, as set forth in Section 1.12 above, unless authorized by the Architect in an Addendum to the bid documents.

1.14 CONTRACT DOCUMENTS

- A. The Awarding Authority shall make available the bid documents and addenda in the City Web site at www.city.waltham.ma.us/open-bids. No plans will be mailed.

1.15 EQUALITY

- A. Except where otherwise specifically provided to the contrary, the words "or approved equal" are hereby inserted immediately following the name or description of each

article, assembly, system, or any component part thereof in the Contract Documents. It is the Contractor's responsibility to provide all the research and documentation that would prove a product or assembly is "equal". Failure to provide research or documentation does not alleviate the Contractor's responsibility to meet the schedule.

1.16 TAX FREE NUMBER

- A. The City of Waltham has a tax-free number.

1.17 SCHEDULE

- A. The work of the Contract shall be Fully Completed in **270 calendar days** after the date of the Notice-to-Proceed.

1.18 GENERAL CONDITIONS CHARGES.

General Condition charged to the Payment application for AIA 702 shall be spread over a period of 7 months or 7 Payment application cycles whichever is later

1.19 WEEKLY JOB MEETINGS

- A. There will be a weekly job meeting at the site on the same agreed-upon day and time. Time will be provided to discuss and view the progress of the work and to answer questions. The Contractor's job Superintendent and Project Manager shall attend each meeting. The City reserves the right to have job meetings conducted in the location of its choosing.

1.20 PROJECT SUPERINTENDENT

- A. The Contractor shall provide the same person as Superintendent for the entire duration of the project. Failure to maintain the same person in this position shall result in a One Thousand Dollar (\$1,000.00) penalty per incident which shall cover the Architect's time to re-orient new personnel.

1.21 AWARD

- A. The Awarding Authority reserves the right to reject any or all bids if it be in the public interest to do so, and to act upon the bids and make its award in any lawful manner.

1.22 PREVAILING WAGE SCHEDULE

- A. Bids shall be made on the basis of the Prevailing Wage Schedule, as determined by the Federal Government and the Commissioner of Labor and Industries, pursuant to the provision of the Massachusetts General Laws. The Prevailing Wage Schedules for this project can be found in the City's web Site at www.city.waltham.ma.us/open-bids

1.23 CONFLICT OF INTEREST

- A. A bidder filing a proposal thereby certifies that the proposal is made in good faith, without fraud, collusion, or connection of any kind with any other bidder for the same work, and that the bidder is competing solely on its own behalf without connection with, or obligation to, any undisclosed person or firm.

1.24 PROCEED ORDERS

- A. No bidder is to proceed without a proceed order as set out in the contract.

1.25 INTENTIONALLY LEFT BLANK

1.26 COMPLIANCE WITH MASSACHUSETTS GENERAL LAWS

- A. Pursuant to Massachusetts General Laws, Chapter 62C, Section 49A, I certify under the penalty of perjury that I, to the best of my knowledge and belief have filed all state tax returns and paid all the state taxes required under law.

1.27 CONSTRUCTION BARRICADES

- A. The General Contractor shall provide all barricades to enclose the work area to prevent unauthorized access to the site.
 - 1. The barricades shall provide enough room for all construction activities to be performed while separated from pedestrians, students, and staff on site.
 - 2. Safety is the sole responsibility of the Contractor and any barricades necessary to protect the work and the public shall be provided.
 - 3. Provide entrance protection.

1.28 INSURANCE

- A. The contractor shall purchase and maintain, at his expense all insurance required by the Contract. Documents and all insurance required by the applicable laws of Massachusetts, including but not limited to, General Laws, Chapter 146, in connection with all hoisting equipment.
- B. The Contractor shall purchase and maintain such insurance as will protect him from claims under workmen's compensation acts and from claims for damages because of bodily injury, including death and all property damage including, without limitation, damage to buildings and adjoining the site of construction which might arise from and during operations under this contract, whether such operations be by himself or by any subcontractor or anyone directly or indirectly employed by either of them including:
 - 1. Statutory Worker's Compensation and Employer's Liability

The contractor shall provide insurance for the payment of compensation and the furnishing of other benefits under Chapter 152 of the General Laws (so-called Worker's Compensation Act) to all persons to be employed under this contract and shall continue in force such insurance as aforesaid shall be deemed a material breach of this Contract and shall operate as an immediate termination thereof. The contractor shall, without limiting the generality of the foregoing, conform to the provisions of Section 34A of Chapter 149 of the General Laws, which Section is incorporated herein by reference and made a part of hereof.

2. Comprehensive General Liability Insurance
Minimum bodily injury limits of \$ 1,000,000 per person and \$ 1,000,000 per accident, and property damage limits of \$ 500,000 per accident and \$ 1,000,000 aggregate during any 12 month period, shall include the following:
 - a. Public liability (bodily injury and property damage)
 - b. X.C.U. (explosion, collapse, and underground utilities)
 - c. Independent contractor's protective liability.
 - d. Products and completed operations.
 - e. Save harmless agreement for Owner and Architects set forth in ARTICLE 10.11 of the GENERAL CONDITIONS.
3. Comprehensive All Risk Motor Vehicle Liability Insurance
Minimum bodily injury limits of \$ 500,000 per person, \$ 1,000,000 per accident, and property damage limit of \$ 1,000,000 per accident.
4. All Risk Insurance
Covering all Contractors' equipment with a provision for Waiver of Subrogation against the Owner.
5. Excess Liability Insurance in Umbrella Form with combined Bodily Injury and Property Damage Limit of \$ 1,000,000.
6. **City of Waltham shall be a Named Additional Insured for General Liability only with a Waiver of Subrogation on the insurance policy for this project.**

1.29 SITE ACCESS

- A. The General Contractor shall gain access to the site via routes approved by the Owner.
 1. The General Contractor as part of the bid price will restore all roads, curbs, driveways, walks and grassed or landscaped areas damaged during construction.

1.30 CONSTRUCTION TRAILER

- A. The General Contractor shall locate the construction trailer at locations approved by the Owner.
- B. The General Contractor shall locate all on site stored or staged materials within the enclosed area designated by the Owner.

1.31 INTENTIONALLY LEFT BLANK

1.32 COMPLETE BID FORMS

A. Please Note: Each bidder must fill in all the blanks on all the bid forms, even if the information is “zero dollars” or “not applicable”. Also, please acknowledge all Addenda issued by the Awarding Authority

2.00 FUNDS APPROPRIATION and LOAN AUTHORIZATION.

A THE CONTRACT OBLIGATION ON BEHALF OF THE CITY IS SUBJECT TO PRIOR APPROPRIATION OF MONIES FROM THE GOVERNMENTAL BODY AND AUTHORIZATION BY THE MAYOR.

3.0 CITY ORDINANCE. APPROVAL OF CONTRACTS BY MAYOR, SEC. 3-12 OF THE CITY ORDINANCES.

A All contract made by any department, board or commission where the amount involved is two thousand dollars (\$2,000) or more shall be in writing, and no such contract shall be deemed to have been made or executed until the approval of the Mayor is affixed thereto. Any construction contract shall, and all other contracts may, where the contract exceed five thousand dollars (\$5,000) be required to be accompanied by a bond with sureties satisfactory to the Mayor

Signature of Individual or Corporate Name

By:

(Signature of Corporate Officer if applicable)

Title: _____

Social Security Number or Federal Identification Number: _____

END OF SECTION

FORM 000091

COMPLIANCE FORMS

(PLEASE COMPLETE AND SUBMIT THESE FORMS WITH YOUR RESPONSE)

NON-COLLUSION FORM AND TAX COMPLIANCE FORM

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word “person” shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity or group of individuals. The undersigned certifies that no representations made by any City officials, employees, entity, or group of individuals other than the Purchasing Agent of the City of Waltham was relied upon in the making of this bid

_____, _____
(Signature of person signing bid or proposal) Date

(Name of business)

TAX COMPLIANCE CERTIFICATION

Pursuant to M.G.L. c. 62C, & 49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

_____, _____
Signature of person submitting bid or proposal Date

Name of business

NOTE

Failure to submit any of the required documents, in this or in other sections, with your bid response package may cause the disqualification of your proposal.

**WEEKLY PAYROLL RECORDS REPORT
& STATEMENT OF COMPLIANCE**

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided, A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract. In addition, every contractor and subcontractor is required to submit, on a weekly basis, a copy of his or her weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those reports for three years. In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen days after completion of its portion of the work, a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

_____, 201__

I _____, _____
(Name of signatory party) (Title)

I do hereby state that I pay or supervise the payment of the persons employed by

_____ On the _____
(Contractor, subcontractor or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.

Signature _____, Title _____

Print _____, Date _____

DEBARMENT CERTIFICATION

In connection with this bid and all procurement transactions, by signature thereon, the respondent certifies that neither the company nor its principals are suspended, debarred, proposed for debarment, declared ineligible, or voluntarily excluded from the award of contracts, procurement or non procurement programs from the Commonwealth of Massachusetts, the US Federal Government and /or the City of Waltham. "Principals" means officers, directors, owners, partners and persons having primary interest, management or supervisory responsibilities with the business entity. Vendors shall provide immediate written notification to the Purchasing Agent of the City of Waltham at any time during the period of the contract of prior to the contract award if the vendor learns of any changed condition with regards to the debarment of the company or its officers. This certification is a material representation of fact upon which reliance will be placed when making the business award. If at any time it is determined that the vendor knowingly misrepresented this certification, in addition to other legal remedies available to the City of Waltham, the contract will be cancelled and the award revoked.

Company Name _____

Address _____

City _____, State _____, Zip Code _____

Phone Number (____) _____

E-Mail Address _____

Signed by Authorized Company Representative: _____

_____ Print name. Date _____

10 HOURS OSHA TRAINING CONFIRMATION

Chapter 306 of the Acts of 2004

CONSTRUCTION PROJECTS

AN ACT RELATIVE TO THE HEALTH AND SAFETY ON PUBLIC

The undersigned hereby certifies that all employees to be employed at a worksite for construction, reconstruction, alteration, remodeling, repair, installation, demolition, maintenance or repair of any public work or any public building estimated to cost more than \$10,000.00 have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first payroll report for each employee and will comply with all laws and regulations applicable to awards of subcontracts subject to section 44F.

Company Name: _____

Address: _____

Signature: _____

Title: _____

Print Name _____

Date _____

See following Chapter 306 of the Acts of 2004

NOTE

Failure to submit any of the required documents, in this or in other sections, with your bid response package will be cause for the disqualification of your company.

CERTIFICATE OF AUTHORITY LIMITED LIABILITY COMPANY

The undersigned, being (a/the) duly elected, qualified and active (member / manager) of _____, a Massachusetts limited Liability Company (hereinafter “the Company”)

Does Hereby Certify that

1. The Articles of Organization of the Company were duly filed with the Office of the Secretary of State of the State of Massachusetts on _____, and the Articles of Organization have not been (further) amended.
2. The Company has complied with the publication requirements contained in Section 67 of the Limited Liability Company Law.
3. There exists an Operating Agreement of the Company and that the said Operating Agreement has not been amended or repealed and that the said Operating Agreement remains in full force and effect as of this date.
4. Neither the Articles of Organization nor the Operating Agreement (as amended) require any further act to be taken or a meeting to be held by its members other than as follows:
5. All said requirements, whether as contained in the Articles of Organization or in the Operating Agreement or by operation of law as to the transaction of _____, 20__ have been met.
6. The following person or persons has/have been duly authorized by the Company to execute all documents in connection with said transaction and that the signature appearing to the right of their name(s) is his/her genuine signature.

NAME	OFFICE HELD	SIGNATURE
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

IN Witness Whereof, the undersigned has executed this Certificate of Authority this _____ day of _____, 20____.

(Signature)

STATE OF MASSACHUSETTS, COUNTY OF _____

On the ____ day of _____, 20____, before me, the undersigned personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/ they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public: _____

My Commission Expires: _____

Notary Stamp:

PROVIDE THREE (3) SERVICE APPROPRIATE REFERENCES

1. Company Name:

Address:

Contact Name:

Phone #

Type of service/product provided to this Company:

Dollar value of service provided to this Company:

2. Company Name:

Address:

Contact Name:

Phone #

Type of service/product provided to this Company:

Dollar value of service provided to this Company:

3. Company Name:

Address:

Contact Name:

Phone #

Type of service/product provided to this Company:

Dollar value of service provided to this Company:

NOTE

Failure to submit any of the required documents, in this or in other sections, with your bid response package will be cause for the disqualification of your company.

**SECTION 001010
FORM FOR GENERAL BID**

A. The undersigned proposes to furnish all labor and materials required for the project

Waltham Community and Cultural Center, HVAC Improvements
510 Moody Street
Waltham, MA

In accordance with the documents dated June 15, 2017 prepared by

Livermore Edwards and Associates
14 Spring Street
Waltham, MA 02451

B. This bid includes Addenda numbered _____, _____, _____, _____, _____, _____, _____.

C. The Proposed Contract Price is:

_____ Dollars

Bid Amount in words

\$ _____

Bid Amount in Numbers

For Alternates:

Alternate #1: ADD \$ _____ Deduct \$ _____

D. The subdivision of the proposed contract price is as follows:

ITEM 1. (The work of the General Contractor, being all work other than that covered by Item 2.)

TOTAL OF ITEM 1:\$ _____

ITEM 2. Sub-Bids as follows:

Sub- Trade	Name of Filed Sub-Bidder	Sub- Bid Amount
<u>PLUMBING</u>	_____	_____
<u>HVAC</u>	_____	_____
<u>ELECTRICAL</u>	_____	_____
_____	_____	_____

TOTAL OF ITEM 2:\$_____

The undersigned agrees that each of the above named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums for the performance and payment bonds furnished by sub-bidders as requested herein and that all of the cost of all such premiums is included in the amount set forth in Item I of this bid.

The undersigned agrees that if selected as general contractor, they will promptly confer with the awarding authority on the question of sub-bidders; and that the awarding authority may substitute for any sub-bid listed above a sub-bid filed with the awarding authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidders at the amounts named in their respective sub-bids and be in every way as responsible for them and their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

- E. The undersigned agrees that, if selected as general contractor, he will within five days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price, provided, however, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this

subsection the word "person" shall mean natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

F Final Completion

1. The work of the Contract shall be Completed in Two hundred and Seventy **(270) calendar days from the date of the Notice-to-Proceed (NTP).**

G. In accordance with M.G.L., the undersigned certifies that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by OSHA that is at least 10 hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

Sincerely,

(Bidder)

(Address of Bidder)

By:

(Title - Owner*, Partner*)

(Seal, if Corporation)

By:

(If Corporation - Name and Office)

* If the business owned by the individual or partnership is conducted under a trade or assumed name, a certified copy of doing business under an assumed name should be annexed.

Date _____

(Name of Bidder)

By _____

(Title)

(Business Address)

END OF SECTION

**SECTION 001020
FORM FOR SUB-BID**

TO ALL GENERAL BIDDERS EXCEPT THOSE EXCLUDED:

- A. The undersigned proposes to furnish all labor and materials required for the project:

Waltham Community and Cultural Center, HVAC Improvements
510 Moody Street
Waltham, MA

In accordance with the documents dated June 15, 2017 prepared by:

Livermore Edwards and Associates
14 Spring Street
Waltham, MA 02451

- B. This bid includes Addenda numbered _____, _____, _____, _____, _____, _____.

- C. The Proposed Contract Price is:

_____ Dollars

Bid Amount in words

\$ _____

Bid Amount in Numbers

Alternate #1: ADD \$ _____ Deduct \$ _____

- D. This Sub-Bid may be used by any General Bidder EXCEPT:

This Sub-Bid may ONLY be used by the following General Bidders:

The undersigned agrees that, if selected as a sub-bidder, they will, within five days, Saturdays, Sundays and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested to do so in the general bid by such general bidder, who shall pay the premiums therefor, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the section of the specifications for this sub-trade require a listing in this paragraph, including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specification the name of each such class of work or part thereto and the bid price for such class of work or part thereof are:

NAME	CLASS OF WORK	BID PRICE
_____	_____	\$ _____
_____	_____	\$ _____
_____	_____	\$ _____

The undersigned agrees that the above list of bids of the undersigned represents bona fide bids based on hereinbefore described plans, specifications and addenda, and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

The undersigned further agrees to be bound to the general contractor by the terms of the hereinbefore described plans, specifications (including all general conditions stated therein) and addenda, and to assume toward him all the obligations and responsibilities that the contractor, by those documents, assumes toward the owner.

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F.

The undersigned further certifies under penalty of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated there under.

Date _____

(Name of Bidder)

By _____
(Title)

(Business Address)

(Signature)

END OF PROPOSAL FORM

Section 004343

Massachusetts State Wage Rates

**State and Federal (Davis-Bacon) prevailing wage
rates for this project are found at
www.city.waltham.ma.us/open-bids**

SECTION 005000

AGREEMENT

CITY OF WALTHAM

ARTICLE 1. This agreement, made this _____ day of _____, 2017 by and between the CITY OF WALTHAM, party of the first part, hereinafter called the CITY, by its MAYOR, and

hereinafter called the CONTRACTOR.

ARTICLE 2. Witnesseth, that the parties to this agreement, each in consideration of the agreement on the part of the others herein contained, do hereby agree, the CITY OF WALTHAM for itself, and said contractor for his heirs, executors, administrators and assigns as follows:

To furnish all equipment, machinery, tools and labor, to furnish and deliver all materials required to be furnished (except as otherwise specified) and deliver in and about the project and to do and perform all work in strict conformity with the provisions of this Contract and of the Notice to Bidders, bid, Project Manual, and Drawings hereto annexed. The said Notice to Bidders, bid, Project Manual, and Drawings are hereby made a part of this contract as fully and to the same effect as if the same had been set forth at length and incorporated in the contracts.

ARTICLE 3. In consideration of the foregoing premises the CITY agrees to pay and the CONTRACTOR agrees to receive as full compensation for everything furnished and done by the CONTRACTOR under this contract, including all work required by not included in the items herein mentioned, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, such prices as are set forth in the accompanying bid.

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

CITY OF WALTHAM, MASSACHUSETTS

FOR THE CITY

Jeannette A. McCarthy, MAYOR,
City of Waltham
Date: _____

John Cervone, City Solicitor
Date: _____
APPROVED AS TO FORM ONLY

Nick Abruzzi, Recreation Director
Date: _____

Joseph Pedulla, Purchasing Agent
Date: _____

Paul Centofanti, Auditor
Date: _____

I CERTIFY THAT SUFFICIENT FUNDS
ARE AVAILABLE FOR THIS CONTRACT

FOR THE COMPANY

CONTRACTOR (Signature),
Date: _____

Company

Address

SECTION 00503

GENERAL CONDITIONS

1. INFORMATION

All information shall come from the Office of the City Purchasing Agent. The Contractor shall inquire at this office for any information needed. Wherever the words “or equal as approved” are used, it is to be understood that the opinion of the City Purchasing Agent shall govern.

2. SUITS

The Contractor shall assume defense of and shall indemnify and hold the City and its agents harmless from all suits and claims against the City and its sub-contractors arising from the use of any invention, patent right labor or employment, or from any act of omission or neglect of the City, its agents, employees or any subcontractor in performing the work, under this contract.

3. LAWS AND REGULATIONS

The Contractor shall conform to all the applicable rules, regulations, laws and ordinances of the City of Waltham, the Commonwealth of Massachusetts, the United States of America and all agencies having jurisdiction over this contract.

4. PROTECTION OF PROPERTY

The Contractor shall take all proper precautions to protect the City’s property from damage and unnecessary inconvenience. Any City property damaged by the Contractor in carrying out the provisions of this contract shall be restored to its original condition, by and at the expense of the Contractor.

5. PROTECTION OF PERSONS

The Contractor shall take all proper precautions to protect persons from injury, unnecessary inconvenience, and shall be responsible for his failure to do so. The Contractor agrees to hold the City harmless from any and all liabilities of every nature and description, which may be suffered through bodily injury, including death, to any person, by reason of negligence of the Contractor, his agents or employees, or any subcontractor.

6. INSURANCE

A. **WORKMAN’S COMPENSATION:** The Contractor shall provide by insurance for the payment of compensation and furnishing of other benefits under Chapter 152 of the General Laws of the Commonwealth of Massachusetts to all persons to be employed under this contract, the premiums for which shall be paid by the Contractor.

B. **COMPREHENSIVE GENERAL LIABILITY**

Bodily Injury:	\$1,000,000 Each Occurrence
	\$2,000,000 Aggregate
Property Damage:	\$1,000,000 Each Occurrence
	\$2,000,000 Aggregate

C. **AUTOMOBILE (VEHICLE) LIABILITY**

Bodily Injury	\$2,000,000 Each Occurrence
Property Damage	\$1,000,000 Aggregate

D. **UMBRELLA POLICY**

General liability	\$2,000,000
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Your bid response must include a Certificate of Insurance with the above limits as a minimum. In addition, the Certificate of Insurance must have the following text contained in the bottom left box of the Certificate: **“The City of Waltham is a Named Additional Insured for all Insurance”**. The Certificate of Insurance must be mailed directly to:

Office of the Purchasing Agent
Purchasing Department
City of Waltham
610 Main Street
Waltham, MA 02452

7. LABOR AND MATERIALS BOND

The Contractor agrees to execute and deliver to the City, a Performance Bond and a Labor and Materials Bond EACH equal to 100% of the contract value. This contract shall not be in force until said bond has been delivered and accepted by the City. Bond to be issued by a company licensed by the Commonwealth of Massachusetts.

8. PERSONNEL:

The Contractor shall employ a competent supervisor and all properly licensed personnel necessary to perform the services required in this contract. The City Purchasing Agent shall have the right to require the Contractor to remove and/or replace any of the personnel for nonperformance or for unprofessional behavior. The City Purchasing Agent may require the Contractor to submit a weekly performance record of the areas and of the work performed, on forms approved by the City Purchasing Agent. The Contractor or his supervisor shall be available to inspect such work as required by the City Purchasing Agent.

9. PREVAILING WAGES

The Contractor is required to pay the prevailing wages as determined by the Federal Government (Davis-Bacon) and by Chapter 149, Sections 26 and 27D of the Massachusetts General Laws, including the submission of weekly payrolls to the awarding authority. Copies of the Prevailing Wage Schedule is found on line at www.city.waltham.ma.us/open-bids

10. MATERIALS

The City or its Agent reserves the right to approve or reject any supplies, material or equipment used by the Contractor. The Contractor agrees to replace any supplies, material or equipment used by the Contractor. The Contractor agrees to replace any rejected supplies, materials or equipment, to the satisfaction of the City or its Agents.

11. TERMINATION OF CONTRACT

This contract may be terminated by the City upon deliverance to the Contractor of a five-day written notice of said termination.

12. CONTRACT OBLIGATIONS

Contract obligations on behalf of the City are subject to an annual appropriation to cover the contract obligation and shall be in force until the date of Final acceptance excluding any guarantee period.

13. BIDDER EXPERIENCE EVALUATION

Each bidder shall submit with his bid, all the information relative to their experience and qualifications in performing the work required under this contract and shall have been in business for a minimum of five (5) years, in order for their bid to be considered.

14. NOT-TO-EXCEED AMOUNT

The bid amount proposed in your company's response is a "not-to- Exceed" amount unless the City makes changes, in writing, to the scope of work to be performed. The Change Order must be signed and approved by the City's Purchasing Agent, City Auditor, Law Department and the Mayor prior to

the commencement of the change order work. No work is to begin until the proper approvals have been obtained. A change order will be priced at the unit price. Failure to comply with this procedure will result in the cancellation of the contract and the non-payment of services provided

16. FINANCIAL STATEMENTS.

The City may require, within five (5) days after the bid opening, a complete and detailed Financial Statement prepared by a Certified Public Account, to determine a bidder's financial stability.

17 BREACH OF CONTRACT/ NON PERFORMANCE

If the Contractor shall provide services in a manner, which is not to the satisfaction of the City, the City may request that the Contractor refurnish services at no additional cost to the City until approved by the City. If the Contractor shall fail to provide services, which are satisfactory to the City, the City in the alternative may make any reasonable purchase or Contract to purchase services in substitution for those due from the Contractor. The City may deduct the cost of any substitute Contract for nonperformance of services together with incidental and consequential damages from the Contract price and shall withhold such damages from sums due or to become due to the Contractor. If the damages sustained by the City exceed sums due or to become due, the Contractor shall pay the difference to the City upon demand. The Contractor shall not be liable for any damages sustained by the City due to the Contractor's failure to furnish services under the terms of this Contract if such failure is in fact caused by the occurrence of a contingency the nonoccurrence of which was a basic assumption under which this Contract was made, including a state of war, embargoes, expropriation of labor strike or any unanticipated federal, state or municipal governmental regulation of order, provided that the Contractor has notified the City in writing of such cause within seven (7) days after its occurrence.

18 RIGHT TO AUDIT

The City of Waltham has the right to review and audit documents related to this contract. This right extends to any subcontractor, supplier or other entity used by the prime contractor to fulfill the obligations under this contract.

19. CITY ORDINANCE. APPROVAL OF CONTRACTS BY MAYOR, SEC. 3-12 OF THE CITY ORDINANCES.

All contract made by any department, board or commission where the amount involved is two thousand dollars (\$2,000) or more shall be in writing, and no such contract shall be deemed to have been made or executed until the approval of the Mayor is affixed thereto. Any construction contract shall, and all other contracts may, where the contract exceed five thousand dollars (\$5,000) be required to be accompanied by a bond with sureties satisfactory to the Mayor.

20. BID OPENING INCLEMENT WEATHER

If, at the time of the originally scheduled bid opening, City Hall is closed to inclement weather or another unforeseeable event, the bid opening will be extended until 2:00 PM on the next normal business day. Bids will be accepted until that date and time.

21 FUNDS APPROPRIATION.

THE CONTRACT OBLIGATION ON BEHALF OF THE CITY IS SUBJECT TO PRIOR APPROPRIATION OF MONIES FROM THE GOVERNMENTAL BODY AND AUTHORIZATION BY THE MAYOR.

22 THE AWARDING AUTHORITY RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS, OR ANY PART OF ANY BID, WHICH IN THE OPINION OF THE AWARDING AUTHORITY, IS IN THE BEST INTERESTS OF THE CITY OF WALTHAM.

Section 006100

PERFORMANCE BOND

CONTRACTOR (name and address):

SURETY (name and address of principal place of business):

OWNER (name and address):

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description (name and location):

BOND

Bond Number:

Date (not earlier than the Effective Date of the Agreement of the Construction Contract):

Amount:

Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (seal)

Surety's Name and Corporate Seal (seal)

By: _____
Signature

By: _____
Signature (attach power of attorney)

Print Name

Print Name

Title

Title

Attest: _____

Attest: _____

Signature

Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the

Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the

amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall

be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

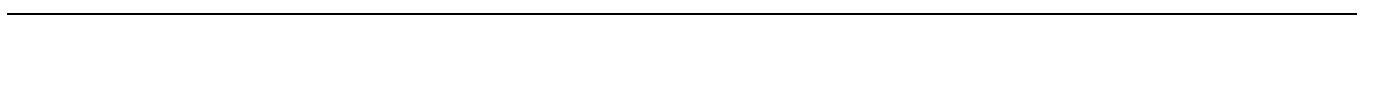
14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:



Section 006150

PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND

Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: None See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

_____ *(seal)*
Contractor's Name and Corporate Seal

_____ *(seal)*
Surety's Name and Corporate Seal

By: _____

Signature

By: _____

Signature *(attach power of attorney)*

Print Name

Print Name

Title

Title

Attest: _____

Signature

Attest: _____

Signature

Title

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

- 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
- 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and

the basis for challenging any amounts that are disputed; and

- 7.2 Pay or arrange for payment of any undisputed amounts.
 - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
 8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
 9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
 10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
 11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
 12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
 13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
 14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be
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deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the

agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

**SECTION 006160
FEDERAL FUNDING PROVISION**

Federal Funding Provision

The City has applied for and received funds from the United States Government under the provisions of Title I of the Housing and Community Development Act of 1974, as amended, Public Law 93-383; and Catalog of Federal Domestic Assistance Number 14.218; the City wishes to engage the Contractor to assist the City in utilizing such funds to carry out the purposes and responsibilities associated therewith in connection with the City's Community Development Program, and; Agreement sets forth the terms and conditions under which the Contractor will become the recipient of said grant;

Federal Objective

The activity funded with Community Development Block Grant (hereinafter referred to as CDBG) funds must meet the national objective of benefit to low-and moderate-income persons; as defined in 24 CFR 570.208.

Uniform Administrative Requirements

The Contractor shall comply with Federal Regulation 2 CFR 200. Upon request of the Contractor, the City will assist the Contractor in complying with applicable regulations and standards, and in establishing necessary administrative procedures and recordkeeping and financial control systems and procedures. This offer of assistance shall not in any way relieve the Contractor of the responsibility to ensure compliance with all relevant management requirements. Contractor agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls and maintain necessary source documentation for all costs incurred.

The Contractor agrees that the City of Waltham, The United States Department of Housing and Urban Development, the Comptroller General of the United States, or any of their duly authorized representatives shall have access to any records, Agreements, invoices, materials, payrolls, personnel records, books, documents, papers, financial records or computer data maintained, kept or used by which are related to this Agreement, for the purpose of making copies, audits, examinations, excerpts, and transcriptions. Such inspections may be made during normal business hours, and as often as the aforementioned governmental agencies deem necessary.

Massachusetts Unmarked Burial Law

It shall be the duty of a person who discovers unmarked human remains, or who knowingly causes human remains to be disturbed through construction, to immediately notify the office of the chief medical examiner.

The medical examiner shall make reasonable attempts to promptly identify unmarked human remains including, but not limited to, obtaining: (i) photographs of the human remains prior to an autopsy; (ii) dental or skeletal X-rays; (iii) photographs of items found with the human remains; (iv) fingerprints from the remains, if possible; and (v) a sample of bone, hair or tissue for DNA testing.

The office shall conduct an inquiry to determine whether the remains are suspected of being 100 years old or more and, if so determined, shall immediately notify the state archaeologist. The state archaeologist shall determine if the skeletal remains are Native American. If the remains are deemed likely to be Native American, the state archaeologist shall immediately notify the commission on Indian affairs which shall cause a site evaluation to be made to determine if the place where the remains were found is a Native American burial site.

Identification of Federal Funding (NOT APPLICABLE)

The following statement shall be placed permanently on the site once work has completed

“This project was partially financed through a City of Waltham Community Development Block Grant, administered by the United States Department of Housing and Urban Development.”

Women- and Minority-Owned Businesses (W/MBE)

The Contractor will use its best efforts to afford small businesses, minority business enterprises, and women’s business enterprises the maximum practicable opportunity to participate in the performance of this contract. As used in this contract, the terms “small business” means a business that meets the criteria set forth in section 3(a) of the Small Business Act, as amended (15 U.S.C. 632), and “minority and women’s business enterprise” means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, “minority group members” are Afro-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Contractor may rely on written representations by businesses regarding their status as minority and female business enterprises in lieu of an independent investigation.

“Section 3” Clause

Compliance with the provisions of Section 3 of the HUD Act of 1968, as amended, and as implemented by the regulations set forth in 24 CFR 135, and all applicable rules and orders issued hereunder prior to the execution of this contract, shall be a condition of the Federal financial assistance provided under this contract and binding upon the Grantee, the Contractor and any of the Contractor’s s and subcontractors. Failure to fulfill these requirements shall subject the Grantee, the Contractor and any of the Contractors and subcontractors, their successors and assigns, to those sanctions specified by the Agreement through which Federal assistance is provided. The Contractor certifies and agrees that no contractual or other disability exists that would prevent compliance with these requirements.

The Contractor further agrees to comply with these “Section 3” requirements and to include the following language in all subcontracts executed under this Agreement:

“The work to be performed under this Agreement is a project assisted under a program providing direct Federal financial assistance from HUD and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended (12 U.S.C. 1701). Section 3 requires that to the greatest extent feasible opportunities for training and employment be given to low- and very low-income residents of the project area, and that contracts for work in connection with the project be awarded to business concerns that provide economic opportunities for low- and very low-income persons residing in the metropolitan area in which the project is located.”

The Contractor further agrees to ensure that opportunities for training and employment arising in connection with a housing rehabilitation (including reduction and abatement of lead-based paint hazards), housing construction, or other public construction project are given to low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to low- and very low-income persons within the service area of the project or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs; and award contracts for work undertaken in connection with a housing

rehabilitation (including reduction and abatement of lead-based paint hazards), housing construction, or other public construction project to business concerns that provide economic opportunities for low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to business concerns that provide economic opportunities to low- and very low-income residents within the service area or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs.

The Contractor agrees to send to each labor organization or representative of workers with which it has a collective bargaining agreement or other contract or understanding, if any, a notice advising said labor organization or worker's representative of its commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.

The Contractor will include this Section 3 clause in every subcontract and will take appropriate action pursuant to the subcontract upon a finding that the subcontractor is in violation of regulations issued by the grantor agency. The Contractor will not subcontract with any entity where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR Part 135 and will not let any subcontract unless the entity has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section I(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been

communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who

is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be

awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds \$100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds \$100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

006160
Federal Funding Provisions

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)



Rev. Dec. 2008

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

NAME OF CONTRACTOR	OR SUBCONTRACTOR	ADDRESS	OMB No.: 1235-0008 Expires: 01/31/2015
PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION	PROJECT OR CONTRACT NO.

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT OR ST.	(4) DAY AND DATE							(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS					(9) NET WAGES PAID FOR WEEK
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

**SECTION 006160
FEDERAL FUNDING PROVISION**

Federal Funding Provision

The City has applied for and received funds from the United States Government under the provisions of Title I of the Housing and Community Development Act of 1974, as amended, Public Law 93-383; and Catalog of Federal Domestic Assistance Number 14.218; the City wishes to engage the Contractor to assist the City in utilizing such funds to carry out the purposes and responsibilities associated therewith in connection with the City's Community Development Program, and; Agreement sets forth the terms and conditions under which the Contractor will become the recipient of said grant;

Federal Objective

The activity funded with Community Development Block Grant (hereinafter referred to as CDBG) funds must meet the national objective of benefit to low-and moderate-income persons; as defined in 24 CFR 570.208.

Uniform Administrative Requirements

The Contractor shall comply with Federal Regulation 2 CFR 200. Upon request of the Contractor, the City will assist the Contractor in complying with applicable regulations and standards, and in establishing necessary administrative procedures and recordkeeping and financial control systems and procedures. This offer of assistance shall not in any way relieve the Contractor of the responsibility to ensure compliance with all relevant management requirements. Contractor agrees to adhere to the accounting principles and procedures required therein, utilize adequate internal controls and maintain necessary source documentation for all costs incurred.

The Contractor agrees that the City of Waltham, The United States Department of Housing and Urban Development, the Comptroller General of the United States, or any of their duly authorized representatives shall have access to any records, Agreements, invoices, materials, payrolls, personnel records, books, documents, papers, financial records or computer data maintained, kept or used by which are related to this Agreement, for the purpose of making copies, audits, examinations, excerpts, and transcriptions. Such inspections may be made during normal business hours, and as often as the aforementioned governmental agencies deem necessary.

Massachusetts Unmarked Burial Law

It shall be the duty of a person who discovers unmarked human remains, or who knowingly causes human remains to be disturbed through construction, to immediately notify the office of the chief medical examiner.

The medical examiner shall make reasonable attempts to promptly identify unmarked human remains including, but not limited to, obtaining: (i) photographs of the human remains prior to an autopsy; (ii) dental or skeletal X-rays; (iii) photographs of items found with the human remains; (iv) fingerprints from the remains, if possible; and (v) a sample of bone, hair or tissue for DNA testing.

The office shall conduct an inquiry to determine whether the remains are suspected of being 100 years old or more and, if so determined, shall immediately notify the state archaeologist. The state archaeologist shall determine if the skeletal remains are Native American. If the remains are deemed likely to be Native American, the state archaeologist shall immediately notify the commission on Indian affairs which shall cause a site evaluation to be made to determine if the place where the remains were found is a Native American burial site.

**SECTION 006160-1
FEDERAL FUNDING PROVISION**

Identification of Federal Funding (NOT APPLICABLE)

The following statement shall be placed permanently on the site once work has completed

“This project was partially financed through a City of Waltham Community Development Block Grant, administered by the United States Department of Housing and Urban Development.”

Women- and Minority-Owned Businesses (W/MBE)

The Contractor will use its best efforts to afford small businesses, minority business enterprises, and women’s business enterprises the maximum practicable opportunity to participate in the performance of this contract. As used in this contract, the terms “small business” means a business that meets the criteria set forth in section 3(a) of the Small Business Act, as amended (15 U.S.C. 632), and “minority and women’s business enterprise” means a business at least fifty-one (51) percent owned and controlled by minority group members or women. For the purpose of this definition, “minority group members” are Afro-Americans, Spanish-speaking, Spanish surnamed or Spanish-heritage Americans, Asian-Americans, and American Indians. The Contractor may rely on written representations by businesses regarding their status as minority and female business enterprises in lieu of an independent investigation. SEE SECT. 006170

“Section 3” Clause

Compliance with the provisions of Section 3 of the HUD Act of 1968, as amended, and as implemented by the regulations set forth in 24 CFR 135, and all applicable rules and orders issued hereunder prior to the execution of this contract, shall be a condition of the Federal financial assistance provided under this contract and binding upon the Grantee, the Contractor and any of the Contractor’s s and subcontractors. Failure to fulfill these requirements shall subject the Grantee, the Contractor and any of the Contractors and subcontractors, their successors and assigns, to those sanctions specified by the Agreement through which Federal assistance is provided. The Contractor certifies and agrees that no contractual or other disability exists that would prevent compliance with these requirements.

The Contractor further agrees to comply with these “Section 3” requirements and to include the following language in all subcontracts executed under this Agreement:

“The work to be performed under this Agreement is a project assisted under a program providing direct Federal financial assistance from HUD and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended (12 U.S.C. 1701). Section 3 requires that to the greatest extent feasible opportunities for training and employment be given to low- and very low-income residents of the project area, and that contracts for work in connection with the project be awarded to business concerns that provide economic opportunities for low- and very low-income persons residing in the metropolitan area in which the project is located.”

The Contractor further agrees to ensure that opportunities for training and employment arising in connection with a housing rehabilitation (including reduction and abatement of lead-based paint hazards), housing construction, or other public construction project are given to low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to low- and very low-income persons within the service area of the project or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs; and award contracts for work undertaken in connection with a housing

**SECTION 006160-2
FEDERAL FUNDING PROVISION**

rehabilitation (including reduction and abatement of lead-based paint hazards), housing construction, or other public construction project to business concerns that provide economic opportunities for low- and very low-income persons residing within the metropolitan area in which the CDBG-funded project is located; where feasible, priority should be given to business concerns that provide economic opportunities to low- and very low-income residents within the service area or the neighborhood in which the project is located, and to low- and very low-income participants in other HUD programs.

The Contractor agrees to send to each labor organization or representative of workers with which it has a collective bargaining agreement or other contract or understanding, if any, a notice advising said labor organization or worker's representative of its commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.

The Contractor will include this Section 3 clause in every subcontract and will take appropriate action pursuant to the subcontract upon a finding that the subcontractor is in violation of regulations issued by the grantor agency. The Contractor will not subcontract with any entity where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR Part 135 and will not let any subcontract unless the entity has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.

**SECTION 006160-3
FEDERAL FUNDING PROVISION**

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been

communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

**SECTION 006160-5
FEDERAL FUNDING PROVISION**

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who

is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be

awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds \$100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

**SECTION 006160-7
FEDERAL FUNDING PROVISION**

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds \$100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)



Rev. Dec. 2008

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

NAME OF CONTRACTOR	OR SUBCONTRACTOR	ADDRESS	OMB No.: 1235-0008 Expires: 01/31/2015
PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION	PROJECT OR CONTRACT NO.

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT. OR ST.	(4) DAY AND DATE							(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS					(9) NET WAGES PAID FOR WEEK	
				HOURS WORKED EACH DAY										FICA	WITH- HOLDING TAX		OTHER	TOTAL DEDUCTIONS		
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

Section 006170
MBE/WBE Participation

REVISED MBE/WBE GOALS FOR CERTAIN
STATE FUNDED BUILDING PROJECTS

Pursuant to M.G.L. c 7, §40N and M.G.L. c. 7, §61, the Supplier Diversity Office (“SDO”) (formerly SOMWBA) and the Division of Capital Asset Management (“DCAM”) have set revised participation goals for Minority Business Enterprise (“MBE”) and Women Business Enterprise (“WBE”) participation for affected state funded building projects and state assisted municipal building projects as defined in the above referenced laws and related Executive Orders, including Executive Orders 524 and 526.

Effective January 1, 2012, and until such time as the goals may be revised, the MBE and WBE participation goals for building construction and design awards and expenditures on new projects advertised on or after the effective date will be a combined MBE/WBE goal as follows:

10.4% combined MBE/WBE participation on construction contract awards; and,
17.9% combined MBE/WBE participation on design contract awards.

Overall annual designations by awarding authorities, as well as MBE/WBE participation on individual projects with a combined MBE/WBE participation goal, must include a reasonable representation of both MBE **and** WBE firms that meets or exceeds the combined goal. Proposed MBE/WBE participation plans that include solely MBE or solely WBE participation, or do not include a reasonable amount of participation by both MBE and WBE firms to meet the combined goal, will not be considered responsive. Where the prime contractor or designer is an SDO certified MBE or WBE, the prime must bring a reasonable amount of participation by a firm or firms that hold the certification which is not held by the prime contractor or designer on the project. Proposed participation on construction projects or design projects which consists solely of either an MBE or WBE representing 100% of the overall combined goal will not be considered reasonable participation.

The SDO and DCAM will determine whether there is reasonable participation by both MBE and WBE firms on individual projects under their respective oversight. Firms submitting MBE/WBE participation plans which do not provide reasonable participation by both MBE/WBE firms shall be provided an opportunity to revise and resubmit their plans within the time frame set by the awarding authority; however no price adjustments shall be permitted as a result of the revised plan. Firms failing to submit an MBE/WBE participation plan deemed reasonable and accepted by the awarding authority shall not be awarded the contract.

Participation by MBE and WBE firms must be documented, tracked and reported on separately as MBE participation and WBE participation by prime vendors, subcontractors and awarding authorities.

DIVISION 1
GENERAL REQUIREMENTS

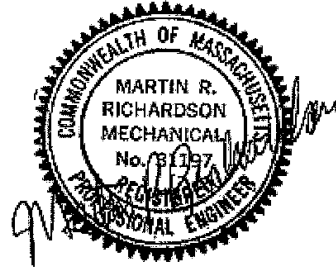
CITY OF WALTHAM

WALTHAM COMMUNITY CULTURAL CENTER
HVAC IMPROVEMENTS
510 Moody Street, Waltham MA

WALTHAM COMMUNITY AND CULTURAL CENTER
HVAC IMPROVEMENTS
510 MOODY STREET, WALTHAM, MA

LIVERMORE EDWARDS AND ASSOCIATES
Architect-of-Record

SED ASSOCIATES, INC.
HVAC Engineer & Plumbing



SED ASSOCIATES, INC.
Electrical Engineer

EVAN HANKIN
Structural Engineer



END OF SEALS

PROFESSIONAL SEALS
000005-1

August 15, 2017

SECTION 010100

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. The work of this Contract shall consist of the installation of a new HVAC system in the existing Waltham Community Cultural Center at 510 Moody Street, Waltham MA. The work shall include the installation of a new HVAC system and the supporting electrical and plumbing work. Installation of these elements will require penetration of existing walls and roofing, and the accommodation of new equipment in and on existing walls, floors, roofs and ceilings. Portions of existing ceilings will be removed and reinstalled and or replaced for the execution of the work.
- B. The existing building consists of two construction types: the earlier building is brick masonry with tile and some wood framing and plaster finishes (Type IIIB) and later portion is un-protected steel and block construction with composite concrete slabs and roof (Type IIB). (See Drawing G0-1 that indicates fire rating requirements of the building.)
- C. The construction will take place in an occupied building. The Contractor will conduct his operations so as not to interfere with the ongoing operations of other building tenants. Construction work areas will be protected from intrusion by building occupants. The Contractor will coordinate his work with the requirements of the building manager. The general occupancy hours of the building will be 7:30 AM to 3:00 PM on weekdays.
- D. The building has ongoing school activities and all construction personnel will be required to have CORI certifications to enter the building.
- E. It is the intent of that the work of this project will be activated for use by the Owner at the conclusion of the entire project.

1.2 WORK SEQUENCE

- A. The work shall commence on a timely basis and thereafter be carried out in a diligent and forthright manner, with a proper supply of labor, materials, plant, and equipment to assure the satisfactory completion of the work.
- B. For the work to be completed under this Contract the Contractor is notified that time is of the essence. The Contractor is expected to meet the completion dates set by the Owner for the various parts of the Project.

1.3 CONTRACTOR'S USE OF SITE AND SURROUNDING AREAS

- A. Prior to beginning work of the Contract, the Contractor shall meet with the Owner and the Architect to determine procedures regarding access to and use of existing buildings and site, exterior staging and storage areas, tree protection, special site conditions, and any other restrictions regarding the use of the site.
- B. Where work on public roads or walks, or other work on municipal property or easement is done, all such work shall conform to the rules, regulations, and specifications of the public agencies having jurisdiction. All permits and fees for such off-site work shall be obtained and paid for by the Contractor.
- C. The Contractor shall keep all public and private access roads and walks clear of debris caused by this work during the entire term of the Contract. He shall repair all public and private streets, drives, curbs, walks, and other improvements where disturbed by work of, or related to, building operations, leaving them in as good condition after completion of the work as before operations started, in accordance with rules, regulations, and specifications of the public agencies having jurisdiction.
- D. Parking of workmen's personal vehicles on the site shall be only as specifically permitted by the Owner and Architect.
- E. Access roads and fire-lanes on and about the site shall be kept open and free at all times, except moving traffic, for passage of emergency vehicles.
- F. A reasonable sum (cost of equivalent replacement) will be deducted from the Contract Sum for any permanent damage to existing trees or plantings which are outside the limit-of-work lines but on the Owner's property or which are within the limit-of-work lines and are designated to be protected. Contractor shall be fully responsible for damage to trees and plants off the Owner's property.
- G. The Contractor shall maintain as low a level of construction noise as practicable in order not to create a disturbance in the neighborhood and meeting the requirements of the local jurisdiction.
- H. No smoking will be allowed inside the building at the worksite.

1.4 OWNER'S OCCUPANCY

- A. Prior to the date of Substantial Completion, the Contractor agrees to the use of building systems provided under this contract by the Owner provided the Owner secures written consent of the Contractor, such consent not to be unreasonably withheld.
- B. If the Project has not been substantially completed by the specified date, the Owner may from time to time occupy the buildings or any portion of any building as the Work thereon is completed to such extent that they are usable for the purpose for which they are intended.

- C. The Owner will give notice to the Contractor prior to any such occupancy, subject to the following:
 - 1. In case of partial occupancy prior to the substantial completion date, the Owner shall secure endorsement from the insurance carrier and consent of the Surety permitting occupancy during the remaining period of construction.
 - 2. In case of partial occupancy after the substantial completion date, the Contractor shall extend all necessary insurance coverage until final acceptance of the Project. Owner's use and occupancy prior to final acceptance shall not relieve the Contractor of his responsibility to maintain the insurance coverage required by the Contract Documents.
- D. Occupancy of any building or any portion thereof by the Owner shall not constitute an acceptance of the Work or portion thereof nor relieve Contractor of responsibility to perform any of the required work not completed at the time of occupancy.
- E. Contractor shall not be required to furnish heat, light, or water used by the Owner in such occupancy, nor pay maintenance costs, nor shall be responsible for wear and tear or damage in the occupied buildings, or portion thereof resulting directly from such occupancy.

1.5 CONTRACT DOCUMENTS

- A. Intent: Drawings and specifications are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner; anything not expressly set forth but which is reasonably implied or necessary for the proper performance of the project shall be included.
- B. Writing style: Specifications are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, "Provide tile" means "Contractor shall provide tile."
- C. Existing Conditions: Notify Owner of existing conditions differing significantly from those indicated on the drawings. Do not remove or alter structural components without prior written approval.
- D. Definitions for terms used in the specifications:
 - 1. Provide: Furnish and install, complete with all necessary accessories, ready for intended use. Pay for all related costs.
 - 2. Approved: Acceptance of item submitted for approval. Not a limitation or release for compliance with the Contract Documents or regulatory requirements. Refer to limitations of "Approved" in General and Supplementary Conditions.

3. Match Existing: Match existing as acceptable to the Owner and Architect.

1.6 EXAMINATION OF SITE

- A. Prior to bidding the Contractor shall thoroughly examine the building site and the Contract Documents to ensure his knowledge of conditions and requirements affecting the work. No claim for extra compensation or extension of time will be allowed for Contractor's failure to comply with this requirement nor will any condition at the site, whether or not in agreement with conditions shown or called for on the Bid and Contract Documents, be allowed as a basis for such claims, except as may be otherwise specifically provided for.

1.7 DISCOVERY

- A. If during the work, articles of unusual value, or of historical or archaeological significance are encountered the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Architect. Resolution shall be handled as a change-in-the-work.

1.8 CONSTRUCTION WASTE MANAGEMENT

- A. The Project requires that construction waste be recycled so far as is practical. A construction waste management plan is required. The Architect will review and monitor the record the Contractor's efforts in this regard and will require that management reports are submitted before approval of payment requisitions.

1.9 PROJECT CONDITIONS

- A. Hazardous Materials: The existing building was remediated for roofing work that was accomplished under a previous contract. An inspection for hazardous materials was made of the existing conditions surrounding the areas that were expected to be involved in this work. A report of the sampling is appended to this Section.
 - 1. Lead paint was found on painted plaster surfaces. No asbestos containing materials were found in the plaster itself. For work requiring penetration of these elements methods of removal and disposal meeting Building Code and HUD guidelines must be used.
 - 2. Since remediation was done for roofing replacement work recently completed it is not expected that hazardous materials will be encountered in roofing penetrations.
 - 3. Samples were taken of attic insulation and wall board and found to be ACM free.
 - 4. Asbestos containing materials (ACM) was observed on existing piping in the building and samples were taken and analyzed confirming this observation. It is not expected

that any anticipated work will disturb any of this material and it is intended that it be left undisturbed in place.

5. If materials suspected of containing hazardous materials are encountered that are in the way of accomplishing the work of this contract, do not disturb; immediately notify Architect and Owner. Alternative methods of accomplishing the work will be used or the hazardous materials will be removed by Owner under a separate contract.

1.10 OWNER PURCHASED - OWNER INSTALLED ITEMS

A. The following items will be purchased and installed by the Owner. Provide access to the site as required. Provide coordination with the contractor(s) providing and installing this work. Prepare substrates to receive this work under this contract. The Contractor shall protect all Owner installed items until project completion.

1. The Owner will purchase and install the following items of equipment:

- NA

2. The Owner will purchase and install the following items of furniture:

- NA

1.11 OWNER PURCHASED - CONTRACTOR INSTALLED ITEMS

A. The following items will be purchased by the Owner and installed by the Contractor.

- NA

1.12 CONTRACTOR PURCHASED - OWNER INSTALLED ITEMS

A. The Contractor will purchase and deliver to the site the following items to be installed by the Owner or the Owner's representatives:

- NA

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

LIVERMORE EDWARDS AND ASSOCIATES

November 28, 2016

Mr. Joseph Pedulla
City of Waltham
Purchasing Department
610 Main Street
Waltham, MA 02452

RE: HazMat Investigation
Waltham Community Cultural Center – HVAC Design
510 Moody Street, Waltham MA 02451
LE 1499

We engaged FLI Environmental to provide testing for both ACM and lead in the paint relative to the proposed work for the HVAC Design for the Waltham Community Cultural Center. They were on site on 11/1/16 and we walked the building together to identify any potential problem materials and take samples for analysis.

Procedure and Results:

We inspected finishes and materials throughout the building where HVAC work was anticipated. We collected samples of paint and plaster, gypsum wall board, joint compound, pipe fittings and ceiling tile which were submitted to laboratories for analysis. The locations of the samples are indicated on the attached plan titled HAZMAT Sampling Plan, HM-1.

The sampling turned up ACM only on the pipe fittings in the basement area. All the remaining locations sampled were ACM free.

The paint samples that were taken from plaster walls were submitted for lead analysis. All the paint tested contained lead. The white wall paint sampled in the office and classroom had a low level of lead that is below 0.1% by weight that is slightly below the HUD minimum acceptable level of lead in paint. Another sample from the Auditorium had 2.59% by weight which significantly exceeds acceptable level of lead in paint.

We reviewed the attic insulation and the existing ductwork in the attic. We found no ACM at these locations.

Recommendations:

ACM (Asbestos Containing Materials):

Since we are not planning to disrupt any of the piping that contains covering that tested positive for ACM we believe that nothing has to be done regarding removing the pipe covering at this time. It should be noted that this material is plentiful on existing piping throughout the basement and may occur in other hidden areas, pipe chases, etc. in the building. A program for its elimination should be undertaken when the funds are available. If locations are found during construction where ACM prevents the contract work from proceeding then we recommend that it be removed on a spot by spot (glove bag) basis at that time.

Lead Paint Abatement:

We recommend that the project documents be developed in such a way that any pipe penetration of a paint and plaster surface be treated as if lead is present and appropriate construction techniques be used by the contractor to protect both workers and occupants from any airborne or surface lead particles. This will include the isolation of work areas and the use of tools that vacuum up and filter dust particles and a program of follow up, clean-up and testing that ensures safe environmental conditions.

Any painting that is done will use non-lead paint materials and will further encapsulate existing painted surfaces.

If you have any questions please don't hesitate to call.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Robert Livermore III". The signature is fluid and cursive, with a long horizontal stroke at the end.

Robert Livermore III, AIA
Livermore Edwards and Associates
14 Spring Street, Waltham, MA 02451
Tel 781-891-1260

cc. Jimmy LaCrosse, Waltham Planning Department

Enclosures: FLI Environmental Letter for Sampling on 11/1/16.
 Asbestos Identification Laboratory 11/9/16, Batch 17497
 SanAir Technologies Laboratory 11/15/16



69 BRIDGE STREET
DEDHAM, MA 02026
PHONE 781.251.0040
FAX 781.251.0901

Bob Livermore
14 Spring Street
Waltham, Massachusetts 02451

RE: Sampling for Asbestos Containing Materials at
Waltham Community Center
510 Moody Street
Waltham, MA FLI Project # 16-1996

Dear Mr. Livermore:

FLI provided a state licensed and EPA AHERA accredited asbestos inspector to collect a limited number of bulk samples of specific materials from the above referenced property as directed.

Inspection Summary:	Asbestos Inspector:	Jody Freitas
	License #:	AI900238
	Date of Sampling:	November 1, 2016
	Total Number of Samples:	16
	Samples Analyzed At:	Asbestos Identification Laboratory, Inc.
	NIST/NVLAP Certification#:	200919-0
	MassDLS Lab Certification#:	AA000208


Bulk samples were collected in a random manner and submitted via chain of custody to the analytical laboratory. The samples were analyzed by Polarized Light Microscopy per EPA Method 600/R-93-116, July 1993. The detection limit of the EPA recommended method is one percent asbestos by weight. Materials containing greater than one percent asbestos are treated as asbestos-containing as required by the EPA. Any homogeneous material having at least one (1) sample analyzed to contain greater than one percent (1%) asbestos is categorized as an asbestos containing material. Homogeneous materials where each sample analyzed was determined not to contain asbestos are categorized as non-asbestos. Laboratory Analytical Data Sheets are attached and provide details about each sample collected.

Remarks and Limitations:

1. Additional suspect materials may be present in other locations. Any additional suspect materials not identified in this report that become exposed during building renovation, maintenance or demolition should be sampled and analyzed for asbestos content prior to disturbing.
2. Each identified asbestos containing material must be removed by a licensed asbestos abatement contractor prior to being disturbed by building maintenance, renovation or demolition activities. This report is not meant to be used as an asbestos abatement plan or abatement specification.

Should you have any questions or need additional information, please contact our office at (781) 251-0040. Thank you for the opportunity to provide you with our services.

Sincerely,
FLI Environmental, Inc.



Jody Freitas
Senior Project Manager



Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com

Batch: 17497



Lab Code: 200919-0

November 09, 2016

Jody Freitas
FLI Environmental
69 Bridge Street
Dedham, MA 02026

Project Number: 16-1996

Project Name: Waltham Community Center- 510 Moc
St, Waltham, MA

Date Sampled: 2016-11-01

Work Received: 2016-11-08

Work Analyzed: 2016-11-09

Analysis Method: BULK PLM ANALYSIS EPA/600/R-93/116

Dear Jody Freitas,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced proje

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Jody Freitas for your business.

Michael Manning
Owner/Director

November 09, 2016

Jody Freitas
 FLI Environmental
 69 Bridge Street
 Dedham, MA 02026

Project Number: 16-1996

Project Name: Waltham Community Center- 510 Moody St, Waltham, MA

Date Sampled: 2016-11-01

Work Received: 2016-11-08

Work Analyzed: 2016-11-09

Analysis Method: BULK PLM ANALYSIS EPA/600/R-93/116

FieldID	Material	Location	Color	Non-Asbestos %	Asbestos %
LabID					
01A	2x4 Ceiling Tile	Office	multi	Mineral Wool 40	None Detected
193387				Cellulose 40	
01B	2x4 Ceiling Tile	Office	tan	Mineral Wool 45	None Detected
193388				Cellulose 45	
01C	2x4 Ceiling Tile	Office	tan	Mineral Wool 20	None Detected
193389				Cellulose 45	
02A	Pip Fitting Insulation	Hallway	white	Fiberglass 80	Detected Chrysotile
193390				Non-Fibrous 18	
02B	Pip Fitting Insulation	Hallway	white	Non-Fibrous 65	Detected Chrysotile
193391					
03A	Pipe Insulation	Hallway	white	Fiberglass 90	None Detected
193392				Non-Fibrous 10	
03B	Pipe Insulation	Hallway	multi	Fiberglass 25	Detected Chrysotile
193393				Cellulose 15	
04A	Gypsum	Bowling Alley	multi	Fiberglass < 1	None Detected
193394				Cellulose 25	
04B	Gypsum	Bowling Alley	multi	Fiberglass 2	None Detected
193395				Cellulose 20	
04C	Gypsum	Bowling Alley	multi	Fiberglass < 1	None Detected
193396				Cellulose 20	
05A	Joint Compound	Bowling Alley	white	Non-Fibrous 100	None Detected
193397					
05B	Joint Compound	Bowling Alley	white	Non-Fibrous 100	None Detected
193398					
05C	Joint Compound	Bowling Alley	white	Non-Fibrous 100	None Detected
193399					

FieldID	Material	Location	Color	Non-Asbestos %	Asbestos %
LabID					
06A	Plaster	Classroom	gray	Non-Fibrous 100	None Detected
193400					
06B	Plaster	Classroom	multi	Hair < 1 Non-Fibrous 100	None Detected
193401					
06C	Plaster	Classroom	white	Hair < 1 Non-Fibrous 100	None Detected
193402					

Wednesday 09

Analyzed by:



End of Report

Batch: 17497

Page 2 of 2

SanAir Technologies Laboratory

Analysis Report

prepared for

FLI Environmental, Inc.

Report Date: 11/15/2016
Project Name: Waltham Community
Center
Project #: 16-1996
SanAir ID#: 16040883



804.897.1177

www.sanair.com



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

FLI Environmental, Inc.
69 Bridge Street
Dedham, MA 02026

November 15, 2016

SanAir ID # 16040883
Project Name: Waltham Community Center
Project Number: 16-1996

Dear Jody Freitas,

We at SanAir would like to thank you for the work you recently submitted. The 2 sample(s) were received on Wednesday, November 09, 2016 via FedEx. The final report(s) is enclosed for the following sample(s): 1, 2.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

sample conditions:

2 sample(s) in Good condition



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

SanAir ID Number

16040883

FINAL REPORT

Name: FLI Environmental, Inc.
Address: 69 Bridge Street
Dedham, MA 02026

Project Number: 16-1996
P.O. Number:
Project Name: Waltham Community Center

Collected Date: 11/1/2016
Received Date: 11/9/2016 10:55:00 AM
Report Date: 11/15/2016 8:16:30 AM
Analyst: Thomas, Stacey

Lead Paint Analysis

Test Method: SW846/3050B/6010C

NOTE: $\mu\text{g/g}=\text{ppm}$

Sample	Description	$\mu\text{g Pb}$ in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
16040883-001	1 / White On Wall	76	0.1084	92.3	704 $\mu\text{g/g}$ (ppm)	0.0704 % By Weight

Test Method: SW846/3050B/6010C

NOTE: $\mu\text{g/g}=\text{ppm}$

Sample	Description	$\mu\text{g Pb}$ in Sample	Sample Size (grams)	Calculated RL	Sample Result	Sample Result
16040883-002	2 / Peach On Wall	2880	0.1111	90	25920.7 $\mu\text{g/g}$ (ppm)	2.5921 % By Weight

Method Reporting Limit < 1 $\mu\text{g}/0.1\text{ g}$ paint

SanAir Technologies Laboratory, Inc participates in the AIHA ELPAT for environmental Lead.
AIHA Lab Id: 162952

Certification

Signature: 
Date: 11/10/2016

Reviewed: 
Date: 11/15/2016



SanAir Technologies Laboratory, Inc.

1551 Oakbridge Drive, Suite B, Powhatan, VA 23139
804.897.1177 Toll Free: 888.895.1177 Fax: 804.897.0070
Web: <http://www.sanair.com> E-mail: iaq@sanair.com

SanAir ID Number

16040883

FINAL REPORT

Name: FLI Environmental, Inc.
Address: 69 Bridge Street
Dedham, MA 02026

Project Number: 16-1996
P.O. Number:
Project Name: Waltham Community Center

Collected Date: 11/1/2016
Received Date: 11/9/2016 10:55:00 AM
Report Date: 11/15/2016 8:16:30 AM
Peterson, Chelsea

ORGANISM DESCRIPTIONS

The descriptions of the organisms presented are derived from various reference materials. The laboratory report is based on the data derived from the samples submitted and no interpretation of the data, as to potential, or actual, health effects resulting from exposure to the numbers of organisms found, can be made by laboratory personnel. Any interpretation of the potential health effects of the presence of this organism must be made by qualified professional personnel with first hand knowledge of the sample site, and the problems associated with that site.

Disclaimer

- Results relate only to the items tested
- Results are not corrected for blanks
- All quality control results are acceptable unless otherwise noted
- SanAir Technologies Laboratory, Inc is not responsible for sample collection or interpretation made by others
- This report does not constitute endorsement by AIHA/NVLAP and/or any other U.S. governmental Agencies; and may not be certified by every local, state or federal regulatory agencies
- SanAir Technologies Laboratory, Inc only assures the precision and accuracy of the data it generates and assumes no responsibility for errors or biasing that occur during collection prior to SanAir's receipt of the the sample.
- SanAir's Method Detection Limits (MDL) and Reporting Limits (RL) have been derived using wipe materials meeting ASTM-E1792. The MDL and RL may not be relevant or applicable for other forms of wipe materials.

Lead Exposure Limits

Air

1.5 µg/m ³	EPA National Ambient Air Quality Standard (Quality Time – Weight Average)
30 µg/m ³	OSHA Action Level (8-hour time weighted average)
50 µg/m ³	OSHA Permissible Exposure Limit (General Industry)
50 µg/m ³	OSHA Permissible Exposure Limit (Construction)

Dust

40 µg/ft ²	HUD Clearance Level for Floors
250 µg/ft ²	HUD Clearance Level for Interior Window Sills
400 µg/ft ²	HUD Clearance Level for Window Troughs

Water

15 ppb (µg/liter)	EPA Maximum Containment Level
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Paint

0.5% by weight	HUD definition of lead based paint
1.0 mg/cm ²	
5000 ppm	

Soil

400 ppm	HUD-Play areas and high-contact areas for children
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Technologies Laboratory
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 www.sanair.com

**Metals & Lead
 Chain of Custody**

SanAir ID Number
 16040883

Company: FLI Environmental, Inc.	Project #: 16-1996	Phone #: 781-251-0040
Address: 69 Bridge Street	Project Name: Waltham Community Center	Phone #:
City, St., Zip: Dedham, MA 02026	Date Collected: 11/1/2016	Fax #: 781-251-0090
Samples Collected By: Jody Freitas	P.O. Number:	Email: jfreitas@flienv.com

Matrix Types

Metals Analysis Types

<input type="checkbox"/> Air	<input type="checkbox"/> Aqueous	<input type="checkbox"/> Bulk	<input type="checkbox"/> Total Concentration of Lead	<input checked="" type="checkbox"/> ICP-total concentration of metals (please list metals):
<input checked="" type="checkbox"/> Paint	<input type="checkbox"/> Sludge	<input type="checkbox"/> Soil	<input type="checkbox"/> Total Concentration of RCRA 8 Metals	
<input type="checkbox"/> Dust	<input type="checkbox"/> Wipe	<input type="checkbox"/> Potable Water	<input type="checkbox"/> TCLP for Lead	Lead
<input type="checkbox"/> Non-Potable Water	<input type="checkbox"/> Wastewater		<input type="checkbox"/> TCLP for RCRA 8 Metals	<input type="checkbox"/> Other:
<input type="checkbox"/> Other:			<input type="checkbox"/> TCLP Full (w/ Organics)	

*Turn Around Times	Same Day <input type="checkbox"/>	1 Day <input type="checkbox"/>	2 days <input type="checkbox"/>	3 Days <input type="checkbox"/>
	<input checked="" type="checkbox"/> Standard (5 day)	<input type="checkbox"/> Full TCLP (10d)		

*Courier charge for same day and 1 day TAT for offsite work.

Sample #	Sample Identification/Location	Flow Rate	Start Time	Stop Time	Volume (L) or Area (Sq ft)
1	White on Wall				
2	Peach on Wall				

Special Instructions	
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Relinquished by	Date	Time	Received by	Date	Time
<i>[Signature]</i>	11/8/16		<i>[Signature]</i>	NOV 19 2016	10:55AM

Unless scheduled, the turn around time for all samples received after 3 pm will begin at 8 am the next business morning.
 Weekend or Holiday work must be scheduled ahead of time and is charged for rush turn around time.
 Work with standard turn around time sent Priority Overnight and Billed To Recipient will be charged a \$10 shipping fee.

SECTION 010250

ALTERNATES

PART 1 - GENERAL

1.01 SUMMARY

- A. List price for each alternate in Bid Form. Include cost of modifications to other work to accommodate alternate. Include related costs such as overhead and profit.
- B. Owner will determine which alternates are selected for inclusion in the Contract.
- C. Alternates are described briefly in this section. The Contract Documents define the requirements for alternates.
- D. Coordinate alternates with related work to ensure that work affected by each selected alternate is properly accomplished.

PART 2 - PRODUCTS - Not Applicable To This Section

PART 3 - EXECUTION

3.01 SCHEDULE

- A. List of alternates:
 - 1. The following are ADD alternates:

Add Alternate #1 – 2nd Shift Work Inside the Building

In order to limit the conflicts between existing building occupants and construction activity this alternate consists of the additional cost to provide all work inside the building envelope after 3:00 PM each day.

END OF SECTION

SECTION 010300

FIELD ENGINEERING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and pay for field engineering services required for Project:
 - 1. Survey work required in execution of project.
 - 2. Civil, structural, and other professional engineering services specified, or required to execute Contractor's construction methods.
- B. Owner's Representative will identify existing control points and property line corner stakes indicated on the Drawings, at the start of construction.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: GENERAL CONDITIONS.
- B. Record documents: Section 01720, PROJECT RECORD DOCUMENTS.

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Qualified engineer or registered land surveyor, acceptable to Architect and Owner.
- B. Registered professional engineer of the discipline required for the specific service on the Project, licensed in the location of the project.

1.04 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are those designated on Drawings.
- B. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without prior written notice to Architect.
 - 2. Report to Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - 3. Require surveyor to replace Project control points which may be destroyed.

- a. Establish replacements based on original survey control.

1.05 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent bench marks on-site, referenced to data established by survey control points.
 - 1. Record locations, with horizontal and vertical data, on Project Record Documents.
- B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:
 - 1. Site improvements.
 - a. Stakes for grading, fill, and top soil placement.
 - b. Utility slopes and invert elevations.
 - 2. Batter boards for structures.
 - 3. Building foundation, column locations, and floor levels.
 - 4. Controlling lines and levels required for mechanical and electrical trades.
- C. From time to time, verify layouts by same methods.

1.06 RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.

1.07 SUBMITTALS

- A. Submit name and address of surveyor and professional engineer to Architect for approval.
- B. On request of Architect, submit documentation to verify accuracy of field engineering work.
- C. Submit certificate signed by registered engineer or surveyor certifying that elevation and locations of improvements are in conformance, or non-conformance, with Contract Documents.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 010700

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall be responsible for all cutting, fitting, and patching, including attendant excavation and backfill, required to complete the Work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the Work to provide for installations of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
 - 7. Provide patching in surfaces for items that have been removed as a result of demolition under this contract.

1.02 RELATED REQUIREMENTS

- A. Substitutions and product options: Section 016000, MATERIAL AND EQUIPMENT.
- B. Lead remediation in painted surfaces: Section 028300, LEAD REMEDIATION.

1.03 QUALITY ASSURANCE

- A. Permission to patch any items of work does not imply a waiver of the Architect's right to require complete removal and replacement in said areas and of said items if, in Architect's opinion, said patching does not satisfactorily restore the quality and appearance of the work.
- B. Requirements for Structural Work: Do not reduce load-carrying capacity or load/deflection ratio.
- C. Operational and Safety Limitations: Do not cut and patch operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in the

manner intended or resulting in decreased operational life, increased maintenance, or decreased safety.

- D. Visual Requirements: Do not cut and patch exposed work in exterior and occupied spaces so that visual qualities are reduced or cut and patch work is visible, as judged by the Architect. Remove and replace unsatisfactory work as directed by Architect.

1.04 SUBMITTALS

- A. Submit a written request to Architect well in advance of executing any cutting or alteration which affects:
 - 1. Work of the Owner or any separate contractor.
 - 2. Structural value or integrity of any element of the Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance, or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Request shall include:
 - 1. Identification of the Project.
 - 2. Description of affected work.
 - 3. The necessity for cutting, alteration, or excavation.
 - 4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of project.
 - 5. Description of proposed work:
 - a. Description of why cutting and patching cannot (reasonably) be avoided.
 - b. Scope of cutting, patching, alteration, or excavation.
 - c. Methods.
 - d. How structural elements (if any) will be reinforced.
 - e. Trades who will execute the work.

- f. Products proposed to be used.
 - g. Extent of refinishing to be done.
 - h. Approximate dates of the work, and anticipated results in terms of variations from the work as originally completed (structural, operational, visual, and other qualities of significance).
- 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. Written permission of any separate contractor whose work will be affected.
- C. Should conditions of work or the schedule indicate a change of products from original installation, submit request for substitution as specified in Section 01600, MATERIALS AND EQUIPMENT.
 - D. Submit written notice to Architect designating date and time the work will be uncovered.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Except as otherwise indicated or authorized by the Architect, provide materials for cutting and patching shall be selected to produce equal-or-better work than the work being cut and patched in terms of performance characteristics and visual effect. Use materials identical to original materials where feasible and satisfactory.
- B. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of Products, or performance of work.
- C. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with work until Architect has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of Project from damage.
- C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods which prevent damage to other work, and provide proper surfaces to receive installation of repairs.
 - 1. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
 - 2. Comply with the requirements of applicable Sections of Division 2 - SITE WORK where cutting-and-patching requires excavating and backfilling.
- B. Employ excavating and backfilling methods that prevent settlement or damage to other work.
- C. Employ original installer or fabricator to cut and patch for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- D. Execute fitting and adjustment of products to provide specified products, functions, tolerances, and finishes.
- E. Restore work which has been cut or removed; install new products to provide complete work in accordance with requirements of Contract Documents.
- F. Fit work airtight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.
- G. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
- H. Restore exposed finishes of patched areas; extend finish restoration to retained work to eliminate evidence of patching.
 - 1. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch.

- I. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

3.04 CLEANING

- A. In addition to cleaning specified in Section 01710, clean all areas affected by the work of this Section.
- B. Completely remove paint, mortar, oils, putty and similar items.
- C. Thoroughly clean piping, conduit, ductwork and similar elements before applying paint or other finishes. Restore all damaged pipe and ductwork coverings to its original condition.

END OF SECTION

SECTION 010900

REFERENCE STANDARDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes established stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.03 ABBREVIATIONS AND NAMES OF ORGANIZATIONS

- A. Obtain copies of referenced standards direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGC	Associated General Contractors of America
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AITC	American Institute of Timber Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPA	American Sod Producers Associates
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association

CRSI	Concrete Reinforcing Steel Institute
EJMA	Expansion Joint Manufacturer's Association
FGMA	Flat Glass Marketing Association
FM	Factory Mutual System
FS	Federal Specifications
GA	Gypsum Association
IEEE	Institute of Electrical and Electronics Engineers
IMIAC	International Masonry Industry-All Weather Council
ISA	International Society of Arboriculture
MFMA	Maple Flooring Manufacturers Association
MIL	Military Specifications
ML/SFA	Metal Lath/Steel Framing Association
NAAMM	National Association of Architectural Metal Manufacturers
NCMA	National Concrete Masonry Association
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
NRCA	National Roofing Contractors Association
NSWMA	National Solid Waste Management Association
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard
SCPI	Structural Clay Products Institute
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joint Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPRI	Single Ply Roofing Institute
SSPC	Steel Structures Painting Council
TAS	Technical Aid Series
TCA	Tile Council of America, Inc.
UL	Underwriters' Laboratories, Inc.
MCLIB	West Coast Lumber Inspection Bureau

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 012000

PROJECT MEETINGS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings throughout progress of the Work.
- B. The Contractor shall:
 - 1. Prepare agenda for meetings.
 - 2. Distribute written notice of each meeting four days in advance of meeting date.
 - 3. Make physical arrangements for meetings.
 - 4. Preside at the meetings.
 - 5. Record the minutes; include significant proceedings and decisions.
 - 6. Reproduce and distribute copies of minutes within three days after each meeting.
 - a. To participants in the meeting.
 - b. To parties affected by decisions made at the meeting.
 - c. Furnish one copy of minutes to Architect.
- C. Representatives of contractors, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- D. Architect may attend meetings to ascertain that Work is expedited consistent with Contract Documents and construction schedules.

1.02 RELATED REQUIREMENTS

- A. Shop Drawings: Section 013400, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Record documents: Section 017200, PROJECT RECORD DOCUMENTS.
- C. Operation and maintenance data: Section 017300, OPERATING AND MAINTENANCE DATA.

1.03 PRE-CONSTRUCTION MEETING

- A. Schedule within 15 days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties, designated by Contractor.
- C. Attendance:
 - 1. Owner's Representative.
 - 2. Architect and his Professional Consultants.
 - 3. Resident Project Representative.
 - 4. Contractor's Superintendent.
 - 5. Major Subcontractors.
 - 6. Major suppliers.
 - 7. Others as appropriate.
- D. Suggested Agenda:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers.
 - b. Projected Construction Progress Schedules.
 - 2. Critical work sequencing.
 - 3. Major equipment deliveries and priorities.
 - 4. Project Coordination.
 - a. Designation of responsible personnel.
 - 5. Procedures and processing of:
 - a. Field Decisions.
 - b. Proposal Requests.
 - c. Submittals.
 - d. Change Orders.

- e. Application for Payment.
- 6. Adequacy of distribution of Contract Documents.
- 7. Procedures for maintaining Record Documents.
- 8. Use of premises:
 - a. Office, work, and storage areas.
 - b. Owner's requirements.
- 9. Construction facilities, controls, and construction aids.
- 10. Temporary utilities.
- 11. Safety and first-aid procedures.
- 12. Security procedures.
- 13. Housekeeping procedures.

1.04 PROGRESS MEETINGS

- A. Schedule regular periodic meetings, as required.
- B. Hold called meetings as required by progress of the Work.
- C. Location of the meetings: Project site at location designated by the Contractor.
- D. Attendance:
 - 1. Owner
 - 2. Architect, and his professional consultants as needed.
 - 3. Subcontractors as appropriate to the agenda.
 - 4. Suppliers as appropriate to the agenda.
 - 5. Mechanical and electrical subcontractors.
 - 6. Others.
- E. Suggested Agenda:

1. Review and approval of minutes of previous meeting.
2. Review of Work progress since previous meeting.
3. Field observations, problems, conflicts.
4. Problems which impede Construction Progress Schedule.
5. Review of off-site fabrication, and delivery schedules.
6. Corrective measures and procedures to regain project schedule.
7. Revisions to Construction Progress Schedule.
8. Progress schedule during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:
 - a. Effect on Construction Progress Schedule and on completion date.
 - b. Effect on other contracts of the Project.
14. Other business.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 013000

SUBMITTALS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Progress Schedules.
- B. Schedule of Values.
- C. Manufacturer's Certificates.
- D. Composite Drawings.

1.02 RELATED DOCUMENTS

- A. Testing Laboratory Reports: Section 014100, TESTING LABORATORY SERVICES.
- B. Manufacturer's instructions: Section 016000, MATERIAL AND EQUIPMENT.
- C. Contractor's list of Products: Section 016000, MATERIAL AND EQUIPMENT.
- D. Shop drawings submittals: Section 013400, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- E. Closeout submittals: Section 017200, PROJECT RECORD DOCUMENTS; Section 017300, OPERATING AND MAINTENANCE DATA and Section 017400, WARRANTIES AND BONDS.

1.03 PROCEDURES

- A. General
 - 1. Deliver submittals to Architect at address listed on cover of Project Manual. Send 1 copy of a complete submittal to Owner concurrently.
 - 2. Provide each submittal in form and content acceptable to Architect.
 - 3. After Architect review of submittal, if not approved, revise and resubmit as required, identifying changes made since previous submittal.
 - 4. Distribute copies of approved submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

5. Resubmit periodically when conditions are changed so as to warrant resubmission or as directed by the Architect.
6. The Contractor shall keep a submittal log of all submittals in a format approved by the Architect and Owner that tracks each submittal including date of submittal, distribution, return date and action. This submittal log will be prepared and reviewed in advance of each project meeting.
6. Within 5 days of notice to proceed all submittals will be made on the following long lead time items.
 1. Rooftop HVAC Units
 2. Main Electrical Panel

B. Progress Schedules

1. Prepare schedule in bar chart form or alternate form as approved by Architect.
2. Show progress of job on weekly basis for each major element of construction.
3. Identify fixed milestones and critical path elements.
4. Revise schedule on a weekly basis and submit with application for payment. Submit initial schedule within 10 days after award of contract.
5. For subsequent submittals, provide written narrative explaining deviations from originally submitted schedule.
6. Submit schedule of delivery of major items that have long lead times or that are not readily available from local suppliers. Coordinate with submittal schedule to show adequate lead time from approvals for all items.

C. Schedule of values

1. Submit schedule of values for the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
2. The sum of all values listed in the schedule shall equal the total contract sum.
3. The application for payment shall use the same values and categories as the approved schedule of values.
4. Resubmit schedule of values until approval by Architect is obtained.
5. Submit schedule of values within 10 days of award of project. Final approval must be obtained before approval of first application for payment.

D. Manufacturer's Certificates

1. Submit certificates in duplicate, in accordance with the requirements of each specification section.
2. Provide proper identification of each submittal; project, contractor, subcontractor, supplier and specification section or drawing number.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 013400

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit Shop Drawings, Product Data, and Samples required by Contract Documents.

1.02 RELATED REQUIREMENTS

- A. Definitions and Additional Responsibilities of Parties: GENERAL CONDITIONS and MODIFICATIONS TO THE GENERAL CONDITIONS.
- B. Submittal of manufacturer's certificates: Section 013000, SUBMITTALS.
- C. Record documents: Section 017200, PROJECT RECORD DOCUMENTS.

1.03 SUBMITTAL SCHEDULE

- A. A Schedule of shop drawings, product data, and samples shall be submitted indicating by trade the date by which each such item is to be submitted and the date by which final approval of each item must be obtained. This schedule shall be revised as required by conditions of the Work, subject to Architect's approval. In each case, reasonable time must be permitted for Architect's review, Consultant's review, and for resubmittals if required.

1.04 SHOP DRAWINGS

- A. Drawings shall be presented in a clear and thorough manner.
 - 1. Details shall be identified by reference to Project name and number, Architect's name, sheet and detail number, schedule or room numbers shown on Contract Drawings.
- B. Minimum sheet size: 8-1/2 x 11 in.
- C. Each submittal shall be accompanied by appropriate transmittal form.
- D. With approval of the Architect submittals may be provided by internet in PDF format.

1.05 PRODUCT DATA

A. Preparation

1. Clearly mark each copy to identify pertinent products or models.
2. Show performance characteristics and capacities.
3. Show dimensions and clearances required.
4. Show wiring and piping diagrams and controls.

B. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information not applicable to the Work, and to identify clearly applicable products and work.
2. Supplement standard information to provide information specifically applicable to the Work.

1.06 SAMPLES

A. Office samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product, with integrally related parts and attachment devices.
2. Full range of color, texture, and pattern.

B. Field samples and mock-ups:

1. Contractor shall erect, at the Project site, at a location acceptable to the Architect.
2. Size or area: that specified in the respective specification section.
3. Fabricate each sample and mock-up complete and finished.
4. Remove mock-ups at conclusion of Work or when acceptable to the Architect, unless incorporated in the Work.

1.07 CONTRACTOR RESPONSIBILITIES

A. Review Shop Drawings, Product Data, and Samples prior to submission.

B. Determine and verify:

1. Field measurements.
 2. Field construction criteria.
 3. Catalog numbers and similar data.
 4. Conformance with specifications.
- C. Submit Shop Drawings, Product Data and Samples for individual items of work as single package.
- D. Submit interior finish samples as single package.
- E. Coordinate each submittal with requirements of the Work and of the Contract Documents.
- F. Notify the Architect in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.
- G. Do not begin work that requires Submittals until return of Submittals with Architect's approval.

1.08 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- B. Number of submittals required:
1. Shop Drawings:
 - a. Architectural Work: Submit one reproducible transparency and one opaque reproduction.
 - b. Engineering Consultant's Work: Submit one reproducible transparency and one opaque reproduction directly to the consultant; submit one opaque reproduction to the Architect with a copy of the transmittal sent to the consultant. The Consultant's review and comments will be made on the reproducible which will be forwarded to the Architect who will then return the reproducible to the Contractor.
 2. Product Data:

- a. Architectural Work: Submit the number of copies which the Contractor requires, plus two which will be retained by the Architect.
 - b. Engineering Consultant's Work: Submit the number of copies which the Contractor requires, plus three to the consultant and one to the Architect with a copy of the transmittal sent to the consultant. The Consultant's review and comments will be made on the Product Data which will be forwarded to the Architect who will then return the Product Data to the Contractor.
 3. Samples: Submit the number stated in each specification section.
- C. Submittals shall contain:
1. The date of submission and the dates of any previous submissions.
 2. The Project title and number.
 3. Contract identification.
 4. The names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
 5. Identification of the product, with the specification section number.
 6. Field dimensions, clearly identified as such.
 7. Relation to adjacent and critical features of the Work and materials.
 8. Reference to shop drawings to the work of other trade(s) shall designate such trade(s); the term "By Others" shall not be used.
 9. Applicable standards, such as ASTM, ANSI, or Federal Specification Numbers.
 10. Identification of deviations from Contract Documents.
 11. Identification of revisions on resubmittals.
 12. An 8 in. X 3 in. blank space for Contractor and Architect stamps.

13. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.

1.09 ARCHITECT'S REVIEW

- A. Architect's stamp shall contain the following data:

"Review/approval neither extends nor alters any contractual obligations of the Architect or Contractor.

APPROVED

APPROVED AS CORRECTED

REVISE AND RESUBMIT

REJECTED"

- B. The Architect will insert the date of action taken and an identification of the person taking the action.
- C. Explanation of the designated actions is as follows:

APPROVED: No corrections, no marks: Resubmission not required.

APPROVED AS CORRECTED: Minor amount of corrections; all items can be fabricated without further corrections to original submittal; checking is complete and all corrections are deemed obvious without ambiguity. Resubmission not required.

REVISE AND RESUBMIT: Amount of corrections requires that noted items must not be fabricated without further corrections of original submittal; checking is complete; details of items noted by checker are to be clarified further before full approval can be given for fabrication. Resubmission required.

REJECTED: Submittal is rejected as not in accord with the Contract Documents, too many corrections, or other justifiable reasons. When returning submittal, Architect will state reasons for rejection. Correct and resubmit. Do not fabricate.

1.09 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by the Architect and resubmit until approved.

- B. Shop Drawings and Product Data:
 - 1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
 - 2. Indicate any changes which have been made other than those requested by the Architect.
- C. Samples: Submit new samples as required for initial submittal.

1.10 DISTRIBUTION

- A. Distribute reproductions of Shop Drawings and copies of Product Data which carry the Architect's stamp of approval to:
 - 1. Job site file.
 - 2. Record Documents file.
 - 3. Other affected contractors.
 - 4. Subcontractors.
 - 5. Supplier or fabricator.
 - 6. Owner
- B. Distribute samples which carry the Architect stamp of approval as directed by the Architect.

1.11 ARCHITECT DUTIES

- A. Review submittals with reasonable promptness and in accord with the schedule and the requirements of the GENERAL CONDITIONS.
- B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or approval of submittal.
- C. Return submittals to Contractor for distribution, or for resubmission.

PART 2 PRODUCTS

Not applicable to this section.

END OF SECTION

SECTION 014100

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Owner reserves the right, at his sole discretion, to select and pay for the services of an Independent Testing Laboratory to perform specified services and testing as may be in the Owner's best interest.
 - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its services.
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

1.02 RELATED REQUIREMENTS.

- A. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Condition of the Contract.
- B. Respective sections of specifications: Certification of products.
- C. Laboratory tests required, standards for testing, and certification of products: Divisions 2 through 16.

1.03 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - E 329 Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction

1.04 QUALIFICATION OF LABORATORY

- A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
- B. Meet requirements of ASTM E 329.
- C. Authorized to operate in the state in which the project is located.

- D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- E. Testing Equipment:
 - 1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
 - a. National Bureau of Standards.
 - b. Accepted values of natural physical constants.

1.05 LABORATORY DUTIES

- A. Cooperate with Architect and Contractor; provide qualified personnel promptly on notice.
- B. Acquaint Owner's, Architect's and Contractor's superintendent with testing procedures and with all special conditions encountered at the site.
- C. Inspections, sampling, and testing of materials and construction methods shall be as specified in individual technical specification sections.
 - 1. Comply with specified standards, ASTM, ANSI, and other recognized authorities.
 - 2. Conduct and interpret the tests and state in each report whether the test specimens comply with the requirements, and specifically state any deviations therefrom.
 - 3. Obtain Contractor's written acknowledgment of each inspection, sampling, and test made.
- D. Promptly notify Architect and Contractor of irregularities or deficiencies of Work or Products which are observed during performance of services.
- E. Promptly submit written report of each test and inspection; one copy each to Architect, Owner, Contractor, and one copy to Project Record Documents File. Each report shall include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Testing laboratory name, address, and telephone number.
 - 4. Name and signature of laboratory inspector.
 - 5. Date and time of sampling or inspection.

6. Record of temperature and weather conditions.
 7. Date of test.
 8. Identification of Product and Specification section.
 9. Location of sample or test in the Project.
 10. Type of inspection or test.
 11. Results of tests and compliance with Contract Documents.
 12. Interpretation of test results, when requested by Architect.
 13. Observations regarding compliance with Contract Documents.
- F. Perform properly authorized additional services as required by the Owner.

1.06 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Approve or accept any portion of the Work, except as specifically authorized by the specifications.

1.07 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel, provide access to Work, and to Manufacturer's operations.
1. Monitor each inspection, sampling, and test.
 2. Provide Laboratory or Agency with written acknowledgment of each inspection, sampling, and test.
 3. Within 24 hours notify Architect and Owner in writing of reasons for not acknowledging Laboratory results.
- B. Secure and deliver to the Laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Provide to the Laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.

- D. Furnish copies of Product test reports as required.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the Project site or at the source of the Product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.
- F. Furnish verification of materials and equipment compliance with Contract Documents.
- G. Identify materials to be tested or inspected by Testing Laboratory or Agency.
- H. After determination of need for testing or inspecting by Owner, notify Laboratory sufficiently in advance, minimum five days, of operations to allow for its assignment of personnel and scheduling of tests.
 - 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- I. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling, and testing required:
 - 1. For the Contractor's convenience; and
 - 2. When initial tests indicate Work does not comply with Contract Documents.

1.08 CONDUCT OF INSPECTIONS AND TESTS

- A. The Contractor shall notify the Owner, Architect, and Testing Laboratory in sufficient time before the performance of work to permit the proper conduct of Owner-authorized inspections and tests.
- B. Representatives of Testing Laboratory shall inspect the manufacture, assembly, and placement of materials as required and as authorized by the Owner, and shall report their findings to the Architect, Owner, and Contractor.
- C. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection when such defect is discovered nor shall it obligate the Owner to accept such work.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 015100

TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install and maintain temporary utilities required for construction; remove temporary utilities when work is complete.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.

1.03 REFERENCED STANDARDS

- A. National Fire Protection Association (NFPA):

70 National Electrical Code

1.04 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with NFPA 70.
- B. Comply with Federal, State, and local codes and regulations and with utility company requirements.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, but shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY AND LIGHTING

- A. Provide metered connections to existing facilities, sized to provide service required for power and lighting. Owner will pay the costs of power used; metering is for Owner's accounting purposes only.
- B. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction from construction-type power cords.

- C. Provide adequate artificial lighting where natural light is not adequate for work, and for areas accessible to the public. Temporary lighting shall be based on one 200 watt lamp for each 1,000 sq. ft. of floor area. Work of this Section excludes power for hoisting, welding and operation of compressors.
- E. Ensure that no electricity is used outside of normal working hours beyond that reasonably necessary for security.
- F. Work shall meet applicable requirements of NFPA 70 and Section 164000, ELECTRICAL.

2.03 TEMPORARY HEAT AND VENTILATION

- A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage due to temperature and humidity.
- B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.
- C. Portable heaters shall be standard approved units with integral controls.
- D. Provide metered connections to existing fuel and power sources. Extend and supplement existing systems with temporary units as required to comply with requirements. Pay costs of installation, maintenance, operation, and removal. Owner will pay costs of fuel used from the existing system. Metering is for Owner's accounting purposes only.

2.04 TEMPORARY TELEPHONE SERVICE

- A. Arrange with local telephone service company to provide direct line telephone service to construction site for personnel and employees and for Architect and Owner's representative.
- B. Pay costs for installation, maintenance, and removal, and pay service charges for local calls. Toll charges shall be paid by party who places call.

2.05 TEMPORARY WATER

- A. Provide metered connections to existing facilities. Provide water for drinking and construction purposes; Owner will pay costs of water used. Metering is for Owner's accounting purposes only.
- B. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing.

2.06 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations exterior to the building at a location agreed on by the building manager.
- B. Service, clean, and maintain facilities and enclosures.

2.07 TEMPORARY FIRE PROTECTION

- A. Provide and maintain suitable fire protection equipment and services, and establish procedures for fire protection for welding and other potentially hazardous construction operations.
- B. Ascertain and comply with requirements of Project insurance carrier, local city/town Fire Department.
- C. Permanent fire protection system may be activated to meet these requirements. Replace fusible link heads and other expended or discharged components at time of Substantial Completion.

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with applicable requirements specified in Division 15-MECHANICAL, and in Division 16-ELECTRICAL.
- B. Maintain and operate systems to assure continuous service.
- C. Modify and extend systems as work progress requires.
- D. Provide notification to building manager one week in advance of all building utility shutdowns and coordinate attendance of all trade and supervisory personnel as required to complete shutdowns and restarts. A week-end shutdown must be scheduled if the shutdown is to last more than two hours.
- E. Fire alarm shutdowns will be scheduled through the City Fire Department.

3.02 REMOVAL

- A. Remove completely temporary materials and equipment when their use is no longer required.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.
- C. Restore permanent facilities used for temporary services to specified condition.

1. Prior to final inspection, remove temporary lamps and install new lamps.

END OF SECTION

SECTION 015300

BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install and maintain suitable barriers and enclosures as required to prevent public entry, and to protect the Work, and existing facilities from construction operations; remove when no longer needed, or at completion of Work.
- B. Barriers within the building are required to prevent building occupants from entering into a work area. Installation and removal of such barriers will be made according to the scheduled execution of the construction as coordinated with the building manger.

1.02 RELATED REQUIREMENTS

- A. Temporary heat: Section 015100, TEMPORARY UTILITIES

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, suitable for intended purpose, and shall meet requirements of applicable codes and standards.

2.02 FENCING

- A. Minimum fence height shall be 6 ft., or as indicated on Drawings.
- B. Chain Link Fence:
 - 1. No. 11 gauge, 2 in. mesh, 72 in. high galvanized chain link fabric, with extension arms and three strands of galvanized barbed wire.
 - 2. Galvanized steel posts; 1-1/2 in. line posts and 2 in. corner posts.

2.03 BARRIERS

- A. Materials to Contractor's option, as appropriate to serve required purpose.

2.04 ENCLOSURES

- A. Materials to Contractor's option, as appropriate for sufficient protection of work and materials.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.
- B. Maintain barriers and enclosures during entire construction period.
- C. Relocate barriers and enclosures as required by progress of construction.

3.02 FENCES

- A. Prior to start of work at the Project site, install enclosure fence with suitably locked entrance gates.
 - 1. Locate fence to enclose substantially entire Project site, or that portion the Contractor establishes as required to encompass entire Project construction operation, subject to the approval of the Owner.
 - 2. Locate vehicular entrance gates in suitable relation to construction facilities; and to avoid interference with traffic on public thoroughfares.
 - 3. Locate pedestrian entrance as required to provide controlled personnel entry, in suitable relation to construction parking facilities.
- B. Construct chain link fence in accordance with industry standards.

3.03 REMOVAL

- A. Completely remove barricades and enclosures, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by Architect.
- B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

END OF SECTION

SECTION 015600

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas under Contractor's control; remove physical evidence of temporary facilities at completion of Work.

1.02 RELATED REQUIREMENTS

- A. Temporary utilities: Section 015100, TEMPORARY UTILITIES.
- B. Cleaning: Section 017100, CLEANING.

1.03 NOISE CONTROL

- A. Noise levels shall not exceed those stipulated by Occupational Safety and Health Administration.

1.04 DUST CONTROL

- A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent air-borne dust from dispersing into the atmosphere.

1.05 WATER CONTROL

- A. Provide methods to control surface water to prevent damage to Project, site, and adjoining properties.
 - 1. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
- B. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and water.
- C. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and properties.

1.06 PEST AND RODENT CONTROL

- A. The Owner will provide pest and rodent control as necessary to prevent infestation of construction and storage areas.
- B. The Contractor will cooperate with the owner to coordinate and schedule rodent and pest control activities during construction. The Contractor shall notify the owner of specific areas requiring attention as soon as it is evident.

1.07 DEBRIS CONTROL

- A. Maintain all areas under Contractor's control free of extraneous debris.
- B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.
 - 1. Provide containers for deposit of debris as specified in Section 017100, CLEANING.
 - 2. Prohibit overloading of trucks to prevent spillages on access and haul routes.
 - a. Provide periodic inspection of traffic areas to enforce requirements.
- C. Schedule periodic collection and disposal of debris as specified in Section 017100, CLEANING.
 - 1. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

1.08 POLLUTION CONTROL

- A. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of noxious substances from construction operations.
- B. Provide equipment and personnel, perform emergency measures required to contain any spillages and to remove contaminated soils or liquids.
 - 1. Excavate and dispose of any contaminated earth off-site, and replace with suitable compacted fill and topsoil.
- C. Take special measures to prevent harmful substances from entering public waters.
 - 1. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.
- D. Provide systems for control of atmospheric pollutants.
 - 1. Prevent toxic concentrations of chemicals.

2. Prevent harmful dispersal of pollutants to atmosphere.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 016000

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Products.
- B. Workmanship.
- C. Manufacturer's Instructions.
- D. Transportation and Handling.
- E. Storage and Protection.
- F. Substitutions and Product Options.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract: GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.
- B. Submittal of manufacturer's certificates: Section 013000, SUBMITTALS.
- C. Shop Drawings, Product Data submittals: Section 013400, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- D. Maintenance of approved Submittals on site: Section 017200, PROJECT RECORD DOCUMENTS.
- E. Operation and maintenance data: Section 017300, OPERATING AND MAINTENANCE DATA.
- F. Warranties and Bonds: Section 017400, WARRANTIES AND BONDS.

1.03 PRODUCTS

- A. Products include material, equipment, and systems.
- B. Comply with Specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

- D. Do not use materials and equipment removed from existing structure, except as specifically required, or allowed, by Contract Documents.

1.04 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 MANUFACTURERS' INSTRUCTIONS

- A. When work is specified to comply with manufacturers' instructions, submit copies of published instructions as part of product data required in Section 013000, SUBMITTALS. Distribute copies as specified and maintain one set in field office as required in Section 017200, PROJECT RECORD DOCUMENTS.
- B. Perform work in accordance with details of instructions and specified requirements. Should a conflict exist between Specifications and manufacturer's instructions, consult with Architect.

1.06 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accordance with construction schedules. Coordinate to avoid conflict with work and conditions at site.
- B. Prevent damage to and soiling of materials and equipment in transit and in handling, deliver in dry, undamaged condition in manufacturer's unopened containers or packaging.
- C. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and products are undamaged.
- D. Coordinate for cranes and lifting with the City Authorities when materials are to be unloaded and/or lifted from the street onto or into the building.

1.07 STORAGE AND PROTECTION

- A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weathertight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

- B. For exterior storage of fabricated Products, place on sloped supports above ground. Cover Products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to ensure that Products are undamaged and are maintained under required conditions.
- E. After installation, provide coverings to protect Products from damage from traffic and construction operations, remove when no longer needed.

1.08 PRODUCT OPTIONS

- A. Within 30 days after date of Contract, submit complete list of materials and equipment proposed, with names of manufacturers, trade names, and model designations.
- B. Options:
 - 1. Products specified only by reference standard: Any Product meeting that standard.
 - 2. Products specified by naming several manufacturers: Products of any named manufacturer meeting Specifications.
 - 3. Products specified by naming one or more manufacturers and "or approved equal": Submit a request for substitution for any manufacturer not specifically named.
 - 4. Products specified by naming only one manufacturer: No option.

1.09 MATERIAL SUBSTITUTIONS

- A. Where products or materials are specified by manufacturer's name, trade name or catalog reference, the words "or approved equal" shall be understood to follow unless there is a statement specifically indicating that no substitution will be allowed. An item shall be considered equal to the item so named or described if in the opinion of the Architect:
 - 1. It is at least equal in quality, durability, appearance, strength and design; including compliance with applicable specifications and compatibility with physical space allocations provided for the item;
 - 2. It performs at least equally the function imposed by the general design for the work;
 - 3. It conforms substantially, even with deviations, to the detailed requirements for the item as indicated by the Specifications.

- B. Where two or more products or materials are specified, the choice of these shall be optional with the Contractor.
- C. Should the Contractor, after the award of the Contract, wish to use any products or materials other than those specified, he shall request written permission of the Architect. His request shall name and adequately describe (including shop drawings) the proposed substitutions, furnish any information requested by the Architect, and state what difference, if any, will be made in the Contract price, including the cost of changes in the Work, for such substitutions should they be accepted. Upon receipt of complete information from the Contractor, the Architect will consider all aspects of the proposed substitution and advise the Contractor in writing approving or disapproving the substitution. The principal reasons for approval or disapproval of the substitution will be enumerated by the Architect. Disapproval of the substitution shall not cause for an increase in contract price or a delay in schedule.
- D. Request constitutes a representation that Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds, in all respects, specified Product.
 - 2. Will provide the same warranty for substitution as for specified Product.
 - 3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.
 - 4. Waives claims for additional costs which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.
- F. Architect will determine acceptability of proposed substitution, and will accept or reject substitutions in writing within a reasonable time.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 017000

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SUMMARY

- A. The following are prerequisites to substantial completion. Provide the following:
 - 1. Punch list.
 - 2. Supporting documentation.
 - 3. Warranties.
 - 4. Certifications.
 - 5. Occupancy permit.
 - 6. Start-up and testing of building systems.
 - 7. Change over of locks.
 - 8. Start up and testing of all food service equipment.

- B. Provide the following requisites to final acceptance:
 - 1. Final payment request with supporting affidavits.
 - 2. Completed punch list.

- C. Provide a hard copy set of drawings (full & half size) and one electronic version which include changes which occurred during construction. (Record Documents)

- D. Provide the following closeout procedures:
 - 1. Submission of record documents.
 - 2. Submission of maintenance manuals.
 - 3. Training and turnover to Owner's personnel.
 - 4. Final cleaning and touch-up.
 - 5. Removal of temporary facilities, including all restoration and repair work required.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 017100

CLEANING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Conditions of the Contract and Special Conditions Relative to Cleaning Requested by the Owner: GENERAL CONDITIONS and MODIFICATIONS TO THE GENERAL CONDITIONS.
- B. Cleaning for specific Products or Work: Division 2 through 16.

1.2 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and antipollution laws.

1.3 QUALITY ASSURANCE

- A. Do not allow accumulation of waste materials or rubbish. At the completion of Work remove all waste materials and rubbish from the Project as well as all tools, equipment, machinery, and surplus materials. Restore all areas used for storage of debris or rubbish to rough grade condition. Where storage of trash is designated, such storage shall be in an orderly manner as directed by the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Use cleaning materials that pose no hazards to health or property, and will not damage surfaces.
- B. Use those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.1 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the Work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris resulting from construction operations.

- B. Provide on-site containers for collection of waste materials, debris, and rubbish.
- C. Remove waste materials, debris, and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.2 DUST CONTROL

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

3.3 FINAL CLEANING

- A. Employ skilled workers for final cleaning.
- B. Clean and restore adjoining surfaces and other work which was soiled or damaged superficially during the installation; replace other work damaged beyond successful restoration. Where the performance of subsequent work could possibly result in damage to the complete unit or element, provide protective covering or other provisions to minimize possible damage.
- C. Remove, grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
- D. Wash and shine glazing and mirrors.
- E. Polish glossy surfaces to clear shine.
- F. Heating, Ventilating and Air Conditioning Equipment:
 - 1. Clean permanent filters and replace disposable filters units in units that are operated during construction.
 - 2. Do not operate equipment without filters during construction and testing.
- G. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- H. Before final completion (**270 days**) and Owner-occupancy, inspect sight-exposed interior and exterior surfaces and work areas to verify that work is clean.

END OF SECTION

SECTION 017200

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Maintain at the site for the Owner one record copy of:
 - 1. Project Manual and Specifications, including discrete sets of Contract Documents for:
 - a. Site work and architectural and structural work,
 - b. Plumbing work,
 - c. Fire protection work,
 - d. HVAC work, and
 - e. Electrical work.
 - 2. Drawings.
 - 3. Addenda and Bulletins.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Architect's Supplemental Instructions or other written instructions.
 - 6. Approved Shop Drawings, Product Data, and Samples.
 - 7. Field test records.
 - 8. Construction photographs.
 - 9. Copies of building, electric, plumbing, and public safety codes.

1.02 RELATED REQUIREMENTS

- A. Manufacturer's certificates: Section 013000, SUBMITTALS.
- B. Shop Drawings, etc.: Section 013400, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of record documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with Construction Specifications Institute Master format.
- C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by Architect.

1.04 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in color code designated by Architect.

1.05 RECORDING

- A. Maintain current, discrete sets of Record Documents for general construction (site work and architectural and structural work) and for Plumbing, Fire Protection, HVAC, and Electrical Work.
- B. Label each document "PROJECT RECORD" in neat large printed letters.
- C. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
- D. Drawings: Legibly mark to record actual construction:
 - 1. Depths of various elements of foundations in relation to finish first floor datum.
 - 2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 - 4. Field changes of dimensions and detail.
 - 5. Changes made by Architect's Supplemental Instructions or Change Order.

6. Details not on original Contract Drawings.
- E. Specifications and Addenda; Legibly mark each Section to record:
1. Manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.
 2. Changes made by Architect's Supplemental Instructions or by Change Order.

1.06 SUBMITTAL

- A. At Contract closeout, deliver complete electronic CAD drawing files for each trade compatible with Owner's requirements and reproducible mylar copies of each set of Record Documents to Architect for Owner. Revisions shall be neat, legible, accurate and consistent with original Drawings in quality of drafting.
- B. Accompanying submittal with transmittal letter in duplicate, containing:
1. Date.
 2. Project title and number.
 3. Contractor's name and address.
 4. Title and number of each Record Document.
 5. Signature of Contractor or his authorized representative.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 017300

OPERATING AND MAINTENANCE DATA

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.
 - 1. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent Sections of the Specifications.
- B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

1.02 RELATED REQUIREMENTS

- A. Submittals: Section 013400, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Record Specifications and Drawings: SECTION 017200, PROJECT RECORD DOCUMENTS.
- C. Warranties and bonds: Section 017400, WARRANTIES AND BONDS.

1.03 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel:
 - 1. Trained and experienced in maintenance and operation of described products.
 - 2. Familiar with requirements of this Section.
 - 3. Skilled as technical writer to the extent required to communicate essential data.
 - 4. Skilled as draftsman competent to prepare required drawings.

1.04 FORM OF SUBMITTALS

- A. Prepare data in form of an instructional operating and maintenance manual for use by Owner's personnel.
- B. Format:
 - 1. Size: 8-1/2 in. X 11 in.

2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
 - a. Provide reinforced punched binder tab, bind in with text.
 - b. Fold larger drawings to size of text pages.
5. Provide fly-leaf for each separate product or each piece of operating equipment.
 - a. Provide typed description of product and major component parts of equipment.
 - b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality three-ring binders with durable and cleanable plastic covers.
2. Maximum ring size: 1 inch.
3. When multiple binders are used, correlate the data into related consistent groupings.

1.05 CONTENT OF MANUAL

- A. Neatly typewritten table of contents for each volume, arranged in systematic order.
1. Contractor, name of responsible principal including address, and telephone number.
 2. A list of each product required to be included, indexed to content of the volume.
 3. List, with each product, name, address, and telephone number of:
 - a. Subcontractor or installer.
 - b. Maintenance contractor, as appropriate.

- c. Identify area of responsibility of each.
 - d. Local source of supply for parts and replacement.
 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- B. Product Data:
 1. Include only those sheets which are pertinent to the specific product.
 2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.
 - c. Delete references to inapplicable information.
- C. Drawings:
 1. Supplement Product Data with drawings as necessary to clearly illustrate:
 - a. Relations of component parts of equipment and systems.
 - b. Control and flow diagrams.
 2. Include reduced photocopies or microfiche aperture cards of Project Record Drawings for Plumbing, Fire Protection, HVAC and Electrical work. Provide additional maintenance and operations drawings keyed to Record Drawings.
- D. Written text, as required to supplement product data for the particular installation:
 1. Organize in consistent format under separate headings for different procedures.
 2. Provide logical sequence of instructions for each procedure.
- E. Copy of each warranty, bond, and service contract issued.
 1. Provide information sheet for owner's personnel, give:
 - a. Proper procedures in event of failure.
 - b. Instances which might affect validity of warranties or bonds.

1.06 MANUAL FOR MATERIALS AND FINISHES

- A. Submit four copies of complete manual in final form.
- B. Content; for architectural products, applied materials and finishes:
 - 1. Manufacturer's data, giving full information on products.
 - a. Catalog number, size, composition.
 - b. Color and texture designations.
 - c. Information required for re-ordering special manufactured products.
 - 2. Instructions for care and maintenance.
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods which are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.
- C. Content, for moisture-protection and weather-exposed products:
 - 1. Manufacturer's data, giving full information on products.
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
 - 2. Instructions for inspection, maintenance, and repair.
- D. Additional requirements for maintenance data: Respective sections of Specifications.

1.07 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit four copies of complete manual in final form.
- B. Content, for each unit of equipment and system, as appropriate:
 - 1. Description of unit and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.

- b. Performance curves, engineering data, and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
2. Operating procedures:
 - a. Start-up, break-in, routine and normal operating instructions.
 - b. Regulation, control, stopping, shut-down and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
3. Maintenance Procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair, and reassembly.
 - d. Alignment, adjusting, and checking.
4. Servicing and lubrication schedule.
 - a. List of lubricants required.
5. Manufacturer's printed operating and maintenance instructions.
6. Description of sequence of operation by control manufacturer.
7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance, including:
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
8. As-installed control diagrams by controls manufacturer.
9. Each contractor's coordination drawings.
 - a. As-installed color code piping diagrams.
10. Charts of valve tag numbers, with location and function of each valve.

11. List of original manufacturer's spare parts recommendations, manufacturer's current prices, and recommended quantities to be maintained in storage.
 12. Other data as required under pertinent sections of specifications.
- C. Contents, for each electric and electronic system, as appropriate:
1. Description of system and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data, and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Circuit directories of panelboards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
 3. As-installed color coded wiring diagrams.
 4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
 5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Adjustment and checking.
 6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 8. Other data as required under pertinent sections of specifications.
- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
 - E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.08 SUBMITTAL SCHEDULE

- A. Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of Work.
 1. Architect will review draft and return one copy with comments.
- B. Submit one copy of complete data in final form 15 days prior to final inspection or acceptance.
 1. Copy will be returned after final inspection or acceptance, with comments.
- C. Submit four copies of approved data in final form within ten days after final inspection or acceptance.

1.09 INSTRUCTION OF OWNER'S PERSONNEL

- A. Before final inspection or acceptance, instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment, and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction. Review contents of manual with personnel in full detail to explain all aspects of operating and maintenance.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 017400

WARRANTIES AND BONDS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals to verify compliance with Contract Documents.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to Architect for review and transmittal to Owner.

1.2 RELATED REQUIREMENTS

- A. General warranty of construction: GENERAL CONDITIONS.
- B. Operating and maintenance data: Section 017300, OPERATING AND MAINTENANCE DATA.
- C. Warranties and Bonds required by Specific Products: Divisions 2 through 16.

1.3 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item including:
 - 1. Product or work item.
 - 2. Firm, with name of principal, address, and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond, or service and maintenance contract.
 - 5. Duration of warranty, bond, or service and maintenance contract.

6. Provide information for Owner's personnel:
 - a. Proper procedures in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
7. Contractor, name of responsible principal, address, and telephone number.

1.4 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 1. Size 8-1/2 in. X 11 in., punched sheets for standard three-ring binder.
 - a. Fold larger sheets to fit into binders.
 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS".
List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.5 TIME OF SUBMITTALS

- A. For equipment or components parts of equipment put into service during progress of construction: Submit documents within ten days after inspection and acceptance.
- B. Otherwise make submittals within ten days after Date of Substantial Completion, prior to final request for payment.
- C. For items of work where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.6 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, service, and maintenance contracts as specified in respective section of Specifications.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Not applicable to this section.

END OF SECTION

SECTION 021120

SELECTIVE DEMOLITION AND CLEANING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Scope: Include all selective demolition and cleaning work as required to complete the work of the Contract as indicated. Include, but do not limit to:
1. All selective demolition work within, on, or relative to, the existing building as specifically called for on the Drawings and as required to accommodate the additions and renovation work, except specific demolition and removal work specified to be done as work of other Sections.
 2. Cutting of all grooves, chases, openings, holes, etc., required for all trades through or into existing construction, except cutting and drilling specified to be done as work of other Sections.
 3. Removal from site and legal disposal of all removed materials, trash, debris, etc., removed by selective demolition operations, except any items indicated to be reused on the project or to be stored by Owner's future use.
 4. Careful removal of items indicated to be reused on the project, and safe storage until time for reinstallation.
 5. Careful removal of items indicated to be salvaged for Owner's future use, including safe storage within the existing building.
 6. General cleaning of all interior and exterior work areas of the building followed by thorough cleaning and surface preparation of all interior surfaces to be exposed in the finished work, and all interior and exterior surfaces to receive subsequent new finishes, in the finished work.
 7. Full cleaning of affected streets and roadways with sweepers and by any means necessary to remove debris, dust, earth, rocks, etc. caused by the construction of this contract on a regular basis in order to maintain a clean roadway at all times. Work shall be accomplished to the satisfaction of the Owner's designated representative.
- B. NOTE: It is the intent of this specification that demolition work be done by the demolition contractor. It will be the responsibility of each trade to mark and coordinate with the demolition contractor for all items in his trade that are to remain in place, be salvaged or to be removed. The individual trades shall disconnect, cap, or deactivate all

items that are to be removed by the demolition contractor. The completion of any work not covered under the separate contracts of the subcontractors will be the responsibility of the General Contractor.

- C. Hazardous Materials: It is expected that hazardous materials will be encountered in the Work.
 - 1. Some existing paint surfaces have been identified as having lead content. See Section 010100, SUMMARY OF WORK, Paragraph 1.9. While asbestos containing materials have been identified in the building they are not expected to interfere with the execution of work expected under this Contract.
 - 2. If materials suspected of containing hazardous materials are encountered that are in the way of the work of this Contract, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.

1.02 RELATED REQUIREMENTS

- A. Weather protection enclosures, dust barriers and curtaining and miscellaneous protective barriers.
- B. Disconnecting, plugging, capping, etc., of existing mechanical and electrical work to be removed and demolition and removal of portions of existing mechanical and electrical work to be removed which are indicated and/or specified to be removed by Mechanical and Electrical trades.
- C. Pest and rodent control.
- D. Management of construction waste.
- E. Demolition of existing ceilings and removal and replacement of existing tiles and ceiling grid as required for the installation of new mechanical systems: Section 095113, ACOUSTICAL PANEL CEILINGS.

1.03 REFERENCES

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this section.
- B. Examine all drawings and all other sections of the specifications for requirements therein affecting the work of this section.

PART 2 - PRODUCTS

Not applicable to this section.

PART 3 - EXECUTION

3.01 EXECUTION

- A. Phasing and Commencement of Work: It is intended that by the date of execution of the Contract agreement the work areas for work of this contract will be fully evacuated by Owner and ready for demolition work to begin. However, no work shall be started in or on the existing building for any of the phases until prior written approval has been issued to the Contractor by the Owner, such approval not to be unreasonably withheld.
- B. Selective Demolition:
 - 1. Do all work to conform to the governing laws and building codes. All permits required for the selective demolition work shall be procured by the Contractor.
 - a. Provide unobstructed legal exits at all times.
 - b. Meet Requirements of Clean Air Act.
 - c. Provide demolition so as not to release hazardous materials into the environment.
 - 2. Carry out selective demolition work with utmost care, using appropriate and safe tools and methods to assure that the building structures or finishes are not damaged or are not subjected to damaging shock or vibration. Do not endanger building structure by cutting, removal, overloading, or other cause. Contractor will coordinate with owner to ensure noise control methods and the timing of the work meets with his satisfaction.
 - 3. Cut or remove work causing openings in exterior walls, roofs, or other elements providing weather protection, only after temporary weatherproof enclosures have been provided.
 - 4. Repair damage done to elements of building to remain, except repairs specified to be provided under other Sections. Provide neat cutting and trimming of elements to remain wherever cutting is required, to provide straight, true, and sharp, cut-lines and edges. Do not overcut or overdrill, nor break, puncture, tear down, or otherwise damage existing construction beyond the limits needed for proper preparation of openings or for proper passage of penetrating elements. Where existing finishes, except paint or varnish, are indicated to be removed, remove down to bare subsurfaces without causing damage to the subsurfaces.

5. Do not allow debris to accumulate. Sprinkle during handling and loading to reduce dust. Either store debris outside of building temporarily in dumpster type container(s) or remove from premises daily. Carry debris out in containers or drop in fully enclosed chutes, in no case passing through, throwing from, or dropping free from windows, wall openings, etc.
6. Block or effectively filter return air systems in a safe manner to prevent intrusion of dust into remaining air handling systems.
7. Items to be Reused: Carefully remove all existing items specified or designated on Drawings to be reused on the work in manner to assure least possible damage. After removal, store in protected storage areas for later refurbishing and/or reinstallation, as specified. Replace with equivalent new items all items designated to be reused which, in the opinion of the Architect, have become too damaged to be satisfactorily reused, without additional cost to the Owner.
8. The Owner will remove all items that he requires for salvage before the building or portion of the building to be demolished is turned over to the Contractor for Construction with the exception of items specifically tagged or indicated on the drawings to be turned over to the owner at the location designated by the owner.
9. Disposal: Remove and legally dispose of off-the-site all materials removed which are not designated on Drawings to be reused on the project or salvaged for Owner's use. Contractor shall, upon removal from the site, have rights of salvage of the materials.

C. Cleaning:

1. Upon completion of selective demolition work in any exterior or interior work area; remove all loose and crumbling finish materials, paint, etc., and all loose dust and debris, brush down all exposed surfaces, and leave the area broom clean, ready for subsequent work on the Contract.
2. Following broom cleaning, thoroughly clean all exposed interior surfaces throughout which are to be left exposed in the finished work and all exterior and interior surfaces to receive new finishes, including painting, in the finished work. Clean in a manner suitable for each of the materials, such as to cause no damage to same or to surrounding materials to remain. Except for items subject to water damage, provide wet cleaning with bristle brush, clean water, and caustic detergent followed by careful, controlled, thorough, rinsing with fresh, clean water. Clean items subject to water damage by effective dry method(s). Exercise extreme care to control wash water and rinse water run-off, splashing, etc., to prevent damage to the building surfaces or finishes to remain.

END OF SECTION

SECTION 028300

LEAD REMEDIATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Scope: Include all lead remediation work as required to complete the work of the Contract as indicated. Include, but do not limit to:
 - 1. All work regarding attaching to, drilling through and removal of painted plaster surfaces that contain lead paint contaminants.
 - 2. Use of approved equipment intended for lead remediation work.
 - 3. Use of personnel and technicians that approved for the work of remediation.
 - 4. Barriers and enclosures necessary for the safe execution of the remediation work.
 - 5. Removal from site and legal disposal of all removed materials, trash, debris, etc., removed by lead remediation operations.
 - 6. General cleaning of all interior and exterior work areas involved in the execution of the lead remediation work.
 - 7. Testing for lead for areas, air and surfaces to ascertain readiness for occupancy or the work of other contractors.
- B. NOTE: It is the intent of this specification that lead remediation work be done by the lead remediation personnel licensed in this work. It will be the responsibility of each trade to mark and coordinate with the lead remediation contractor for all locations in his trade that where penetrations are to be made. The general contractor will coordinate this work.
- C. Asbestos Containing Materials (ACM): It is not expected that ACM will be encountered that will need to be removed for the work of this Contract.
 - 1. ACM that exists in this building is intended to remain and not disturbed by the work of this contract.
 - 2. If materials suspected of containing hazardous materials are encountered and can not be worked around, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.02 RELATED REQUIREMENTS

1. Protection enclosures, dust barriers and curtaining and miscellaneous protective barriers required for other contractors.
2. Disconnecting, plugging, capping, etc., of existing mechanical and electrical work to be removed and demolition and removal of portions of existing mechanical and electrical work to be removed which are indicated and/or specified to be removed by Mechanical and Electrical trades.

1.03 REFERENCES

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this section.
- B. Examine all drawings and all other sections of the specifications for requirements therein affecting the work of this section.

1.04 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes established stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.
- C. Safety Regulations.
 1. *Occupational Safety and Health Administration*
29 CFR 1910 General Industry Standards
29 CFR 1910.1025 Lead Standard for General Industry
29 CFR 1910.134 Respiratory Protection
29 CFR 1910.1200 Hazard Communication
29 CFR 1910.245 Specifications for Accident Prevention (Sign and Tags)
29 CFR 1926 Construction Industry Standards
29 CFR 1926.62 Construction Industry Lead Standard
 2. *Environmental Protection Agency*
40 CFR Part 261 United States Environmental Protection Agency Regulations
 3. *Department of Housing and Urban Development*
24 CFR Parts 35, 36, 37 HUD Lead- Based Paint Regulations
HUD Guidelines for the Evaluation and Control of Lead- Based Paint Hazards in Housing
 4. Codes and Standards.

- a. ASTM - American Society for Testing Materials.
 - b. ANSI - American National Standards Institute.
 - 1. ANSI Z288.2- 8 Practices for Respiratory Protection
 - 2. ANSI Z9.2 1979 Fundamentals Governing the Design and Operation of Local Exhaust Systems.
 - c. U. L. - Underwriters Laboratories, Inc.
5. 1.3.3 Abatement Regulations and Guidelines. In addition to any detailed requirements of these Specifications, the Abatement Subcontractor shall, at his own cost and expense, comply with all laws, ordinances, rules, and regulations of federal, state, regional and local authorities regarding handling and storing of lead waste material.

PART 2 - PRODUCTS

Not applicable to this section.

PART 3 - EXECUTION

3.01 EXECUTION

- A. Phasing and Commencement of Work: It is intended that by the date of execution of the Contract agreement the work areas for work of this contract will be fully evacuated by Owner and ready for remediation work to begin. However, no work shall be started in or on the existing building for any of the phases until prior written approval has been issued to the Contractor by the Owner, such approval not to be unreasonably withheld.
- B. Lead Remediation Work:
 - 1. Do all work to conform to the governing laws and building codes. All permits required for the lead remediation work shall be procured by the Contractor.
 - 2. Provide demolition so as not to release hazardous materials into the environment.
 - 3. Carry out selective remediation work with utmost care, using appropriate and safe tools and methods to assure that remediation safety requirements are met and that the building structures or finishes are not damaged or are not subjected to damaging shock or vibration. Do not endanger building structure by cutting, removal, overloading, or other cause. Contractor will coordinate with owner to ensure noise control methods and the timing of the work meets with his satisfaction.
 - 4. Cut or remove work causing openings in exterior walls, roofs, or other elements providing weather protection, only after temporary weatherproof enclosures have been provided.

5. Repair damage done to elements of building to remain, except repairs specified to be provided under other Sections. Provide neat cutting and trimming of elements to remain wherever cutting is required, to provide straight, true, and sharp, cut-lines and edges. Do not overcut or overdrill, nor break, puncture, tear down, or otherwise damage existing construction beyond the limits needed for proper preparation of openings or for proper passage of penetrating elements. Where existing finishes, except paint or varnish, are indicated to be removed, remove down to bare subsurfaces without causing damage to the subsurfaces.
6. Block or effectively filter return air systems in a safe manner to prevent intrusion of dust or contaminates into remaining air handling systems.
7. Disposal: Remove and legally dispose of off-the-site all materials removed.

C. Cleaning:

1. Upon completion of lead remediation work in any exterior or interior work are; remove all loose and crumbling finish materials, paint, etc., and all loose dust and debris, brush down all exposed surfaces, and leave the area broom clean, ready for subsequent work on the Contract.
2. Clean in a manner suitable for each of the materials, such as to cause no damage to same or to surrounding materials to remain. Except for items subject to water damage, provide wet cleaning with bristle brush, clean water, and caustic detergent followed by careful, controlled, thorough, rinsing with fresh, clean water. Clean items subject to water damage by effective dry method(s). Exercise extreme care to control wash water and rinse water run-off, splashing, etc., to prevent damage to the building surfaces or finishes to remain.

END OF SECTION

SECTION 042000

UNIT MASONRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Brick masonry units for repair of openings in shafts and walls for piping and ductwork.
 - 2. Mortar and grout.
 - 3. Hoisting equipment for the Work of this Section.
 - 4. Coordination with General Contractor for use of staging, planking and scaffolding, interior and exterior, which is the responsibility of the General Contractor as specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
 - 1. Section 055000 - METAL FABRICATIONS:
 - a. Lintels to be built into masonry walls.
 - 2. Section 061000 - ROUGH CARPENTRY:
 - a. Wood nailers and blocking built into masonry.
 - 3. Section 076200 - SHEET METAL FLASHING AND TRIM:
 - a. Through-wall flashings and built-in flashings.
- D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:
 - 1. NA
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 014100 - TESTING AGENCY SERVICES.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type and color of the following:
 - 1. Brick masonry units for repairing existing brick walls and shafts.
- C. Qualification Data: For testing agency.
- D. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
 - 1. Masonry units:
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
 - 2. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.
- F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- E. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
 - 2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 - 3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS," or other wording.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from

specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 MASONRY UNITS

- A. Brick Masonry Units: ASTM C 90, normal weight unless indicated otherwise manufactured to dimensions 3/8 inch less than nominal dimensions.
- B. Shapes: Provide standard shapes indicated and as required for building configuration. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Available Products:
 - a. LanXess; Bayferrox Iron Oxide Pigments.
 - b. Davis Colors; True Tone Mortar Colors.
 - c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- D. Aggregate for Mortar: ASTM C 144. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- E. Aggregate for Grout: ASTM C 404.
- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
 - 1. Available Products:
 - a. Addiment Incorporated; Mortar Tite.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
 - c. BASF Construction Chemicals, Admixture Systems; Rheopel Plus Mortar Admixture.

G. Water: Potable.

2.4 EMBEDDED FLASHING MATERIALS

A. Metal Flashings: Furnished under Section 076200 - SHEET METAL FLASHING AND TRIM.

2.5 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Manufacturers:

- a. Diedrich Technologies, Inc.
- b. EaCo Chem, Inc.
- c. ProSoCo, Inc.

B. Proprietary Non-Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Available Product:

- a. EaCo Chem, Inc.; SOS 50.

2.6 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement [, mortar cement,] and lime.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated [or needed to provide required compressive strength of masonry].

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.

3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

2.7 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

- A. Identification Labels: Vinyl adhesive signs, to comply with applicable local Code.
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:
 - a. Fire Wall Signs, Inc.
 - b. Safety Supply Warehouse.
 2. Text: "FIRE AND SMOKE BARRIER – PROTECT ALL OPENINGS"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed. Do not use units cut to less than one-half size.
- E. Do not install concrete masonry units with more than 5 percent damage to the face. Do not install brick units which will show defects after installation.
- F. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- G. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
 - 6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs. Prior to installation review bond pattern with Designer and the City of Boston Project Manager.
- C. Stopping and Resuming Work: When practical, stop work by racking back units in each course from those in course below; tothing is acceptable if necessary for the progress of the work. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 – FIRE-RESISTIVE JOINT SYSTEMS.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and concrete masonry units as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 2. Allow cleaned surfaces to dry before setting.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated, except as follows:
1. Cut joints flush for masonry walls to receive air barrier membrane, plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.6 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of 4 inches at each jamb, unless otherwise indicated.

3.7 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

- A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.8 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by DCAMM for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.
- B. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
- C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.
- D. Inspections: Level 1 special inspections according to the Massachusetts State Building Code.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- E. Testing Prior to Construction: One set of tests.
- F. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof. Test types as determined by the independent testing and inspection agency.
- G. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- H. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- I. Mortar Aggregate Ratio Test (Proportion Specification): As indicated in the Statement of Special Inspections prepared by the Design Engineer of Record. .
- J. Mortar Test (Property Specification): As indicated in the Statement of Special Inspections prepared by the Design Engineer of Record. .
- K. Grout Test (Compressive Strength): As indicated in the Statement of Special Inspections prepared by the Design Engineer of Record. .
- L. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7.

3.9 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, around penetrations and where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Designer's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
 - 7. Clean stone trim to comply with stone supplier's written instructions.

3.10 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off the Site.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following. Requirements for materials, hot-dip galvanizing, and shop-applied primers are included with each item as applicable.
 - 1. Galvanized steel framing and supports for mechanical and electrical equipment.
 - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections; galvanized at exterior locations and in exterior walls.
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections
 - 1. Section 042000 - UNIT MASONRY:
 - a. Lintels, miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. NA

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

- B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

- 1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

1.4 SUBMITTALS

- A. Product Data: For the following:

- 1. Paint products.
 - 2. Grout.

- B. Shop Drawings: Show fabrication and installation details for metal fabrications.

- 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the Commonwealth of Massachusetts responsible for their preparation. All costs for professional engineering shall be included in the bid price for the Work of this Section.
 - 4. Where fabrications are to receive sprayed-on fireproofing, include statement that primer is compatible with fireproofing proposed for use.

- C. Welding certificates.

- D. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the Commonwealth of Massachusetts and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated for this Project in material, design, and extent.

- C. 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 D1.6, "Structural Welding Code--Stainless Steel."
- D. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at

exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

- B. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- C. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Acceptable Manufacturers: Kwik-Bolt 3 by Hilti, Inc., TruBolt Wedge Anchor by ITW Red Head or Power-Stud by Powers Fasteners.

2.3 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
 - 1. Available Products: Dupont Universal Primer, Keeler and Long Universal Primer, or Tnemec Series 394 PerimePrime.
- C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Available Products: Dupont Ganicin, Keeler and Long Urethane Zinc Rich Primer, or Tnemec Series 394 PerimePrime.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 1. Provide interior, field-applied paint with a VOC content of 250 g/L or less, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive

adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
 2. Furnish inserts if units are installed after concrete is placed.
- C. Fabricate supports for folding-panel partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; coordinate location of holes.

2.6 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
1. Provide mitered and welded units at corners.
 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.7 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.10 STEEL PRIMERS AND FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Urethane Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush Off Blast Cleaning."
 - 3. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, embedded in concrete or masonry, unless otherwise indicated. Extend priming of partially embedded members to a depth of 2 inches.
 - 4. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 5. Comply with SSPC-PA 2, "Measurement of Dry Coating Thickness with magnetic Gages."
- B. Zinc-Rich Primer: Urethane zinc rich primer compatible with topcoat Specified in Section 099000 - PAINTS AND COATINGS. Provide primer with a VOC content of 250 g/L (2.8 lb/gal.) or less per OTC and HAPS COMPLIANT STANDARDS PER 2010 standards when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Provide Tnemec Series 394 Perimerprime at 3.0 mils DFT or approved equal by DuPont, Keeler and Long, or PPG PMC Amercoat 68 MCZ Zinc Rich Primer.
- C. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthly materials. Fill vent holes and grind smooth after galvanizing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation;

with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

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

END OF SECTION

SECTION 061000

ROUGH CARPENTRY

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Include all rough carpentry work as required to complete the Work of the Contract, as indicated. Include, but do not limit to:
 - 1. All rough hardware, inserts, related metal components, etc., for work of this Section, except those items specifically specified to be provided by other trades.
 - 2. All dimensioned rough carpentry framing (beams, joists, rafters, headers, studs, cripples, sills, plates, ledgers, ridge boards, etc.) blockings, edgings, curbs, grounds, screeds, nailing strips, nailing inserts, furring, strapping, sheathing, subflooring, etc., required for all trades, including preservative treatments and applications.
 - 3. Building felts for work of this Section, and protective papers and boards for finished floors and walls. Protection for installed items as required.
 - 4. Other usual items of normal rough carpentry work indicated on the Drawings or necessary for the proper completion of the project, even though not specifically mentioned herein.

1.2 RELATED REQUIREMENTS

- A. Finish carpentry and millwork: Section 062000, FINISH CARPENTRY
- B. Gypsum drywall: Section 092500, GYPSUM DRYWALL
- C. Metal fabrications: Section 055000, METAL FABRICATIONS
- D. Wood blocking for roofing: Section 075350, FULL ADHERED PVC ROOFING

1.3 REFERENCE STANDARDS

- A. Testing and Grading Agencies
 - AITC American Institute of Timber Construction (www.aitc-glulam.org)
 - ALSC American Lumber Standards Committee (www.alsc.org)
 - ANSE American National Standards Institute (www.ansi.org)

APA The Engineered Wood Association (www.apawood.org)

AWPA American Wood Preservers Association (www.awpa.com)

CSA Canadian Standards Association (www.csa.ca)

1.4 QUALITY ASSURANCE

- A. All lumber products to comply with the most current American Softwood Lumber standards: grade stamped.
- B. Pressure treated lumber must be CSA or ALSC labeled for type of use. Arsenic containing wood preservative is not acceptable. Alkaline Copper Quaternary (ACQ) and Copper Azole (CBA) are for wet, below grade and exterior building components. Acid Copper Chromate (ACC) and Copper HDO (CX-A) shall not be used for ground contact, wet or below ground use.
- C. Plywood sheathing must be grade stamped (APA) by the Engineered Wood Association, Teco or Pittsburgh Labs and shall meet the requirements of the latest edition of Voluntary Product Standards PS-1 or PS-2. Exterior sheathing must be Exposure 1 performance rated.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials when delivered to site shall be stacked and stored above the ground under protective coverings or indoors in such manner as to insure proper drainage, ventilation, and protection. No kiln dried materials shall be placed in the building until concrete, and masonry work have been completed and are sufficiently dry.
- B. Lumber shall be of sound stock, new, straight, of consistent size, free of stains and mildew, and kiln dried to a moisture content of not more than 19%. Where exposed or semi-exposed, wood members shall be selected for best possible appearance from the grade of stock specified.
- C. Lumber shall be surfaced four sides and shall bear the grade and trademark of the association under whose rules it was produced, and a mark of mill identification.
- D. Lumber shall be furnished in longest practical lengths with respect to each intended use, and single length pieces shall be used wherever possible.
- E. General Carpentry Material Schedule:

<u>Item</u>	<u>Grade</u>	<u>Species</u>
Lumber 2 in. nominal thickness or greater for beams, rafters, and joists. Built up headers.	Stress Rated Structural Framing, Fb 1500 psi	Douglas Fir or Larch
Lumber 2 in. nominal thickness for non-structural studs and cripples.	Stud Grade	Hem-Fir
Lumber 2 in. nominal thickness or greater for other uses.	No. 2 Structural or Better	Hem-Fir
Lumber less than 2 in. nominal thickness:	No. 2 Common	Hem-Fir
Plywood Roof Sheathing:	U.S. Product Standard PS-1-74, Standard Sheathing, Exterior Grade, S2S CDX	Group 1 Species
Wall Sheathing Gypsum - G-P Dens-Glass	5/8" Firestop type X One Hour Rated - Mfg. by Georgia Pacific	Exterior
Plywood Interior Subflooring:	U.S. Product Standard PS-1-74, STURD-I-FLOOR Interior Grade, Exterior Glue, T & G Edges	Group 1 Species

F. Wood Preservative Treatment

1. Pressure Type: All lumber for use as sill plates, plates, furring strips, etc., in contact with face brick masonry, foundation walls, roofing or slabs-on-grade shall be pressure treated with a toxic salt wood preservative conforming to Fed. Spec. TT-W-535, Type B, applied in a closed cylinder by vacuum process, full cell method in strict accordance with the recommended practices of the American Wood Preservers Association and Fed. Spec. TT-W- 571g. Retention shall be at least 0.35 lbs. of dry salts per cu. ft. of wood. Supply certificate of treatment to Architect. All treated wood shall be redried before installation and all field cuts shall be brush treated with the preservative material.

2. Pressure treatment shall be .25 lbs/ft³ for above ground use, .40 lbs/ft³ for ground contact and .60 lbs/ft³ for wood foundation and marine use. Lumber is to contain AWPA certification stamp for the level of preservation retention. Surface brushing is not acceptable.
3. Wood preservative treatment for roofing elements shall be compatible with EDPM roofing materials and with the guidelines of Factory Mutual.

G. Fire Retardant Treated Wood

1. Where required all fire retardant treated wood shall meet the requirements of the Building Code and shall have the necessary approvals from the governing authorities in the use and assembly for which it is intended. All fire retardant treated wood shall be in conformance with the guidelines of Factory Mutual.
2. The following wood elements require fire retardant treatment:
 - a. Structural wood elements
 - b. Wood blocking
 - c. Wood framing
 - d. Wood sheathing

H. Sill Sealer shall be 1 in. by 6 in. fiberglass "Sill Sealer" by Owens-Corning Fiberglas Corp.

2.2 ROUGH HARDWARE

- A. Provide all rough hardware required to complete this work and to attach this work in a secure and rigid manner to work of this and other trades, including all inserts, anchors, anchor bolts, "L" bolts, lag bolts, screws, washers, nuts, nails, joist hangers, post anchors, and other rough hardware. Assist other trades as necessary in the placement of inserts and anchor bolts in concrete and masonry and furnish full instructions regarding locations, sizes, and other requirements of the items in order that they may properly prepare their work to receive same. All rough hardware shall comply in all respects with the governing laws and codes.
- B. All rough hardware to be exposed in the finished exterior and interior work shall be hot-dip galvanized steel (conforming to applicable ASTM-A653 standard) or non-ferrous, except that cadmium plating may be substituted for galvanized at interior locations only. Concealed rough hardware may be unplated. Exposed exterior nails shall be hot-dip galvanized steel, or non-ferrous. Fully concealed exterior nails and interior nails shall be bright steel. Rough hardware items shall be of appropriate type and of proper capacity and size as required for each specific project condition. For fasteners in contact with the ground or concrete stainless steel fasteners (Type 304) shall be used.
- C. Beam hangers shall be proprietary steel assemblies, with top flanges, equal to "Series LB and B", by Simpson Co., equivalent by Cleveland Steel Specialties or Heckman Building Products

Co., or equal approved by Architect. Joist hangers shall be proprietary steel assemblies, as manufactured by Simpson Co., Cleveland Steel Specialties or Heckman Building Products Co., or equal approved by Architect. Types, capacities, and size of all steel framing accessories shall conform to building code and job requirements. Where exposed to exterior weather, metal framing accessories shall be hot-dip galvanized.

- D. Unless otherwise specifically indicated, wood sill plates, ledgers, etc., of 2 in. nominal thickness or greater shall be bolted to backup concrete or masonry materials by use of 1/2 in. "L" bolts located 4 in. from ends and splices and spaced not greater than 32 in. on center along lengths of the members, to develop positive and secure anchorage to the back-up material.
- E. Unless otherwise specifically indicated, wood nailers, furrings, etc., less than 2 in. nominal thickness shall be secured to back-up concrete or masonry materials by use of appropriate fasteners located 4 in. from ends and spaced not greater than 16 in. on center along lengths of the members. Type and length of fastening devices shall be such as to develop positive and secure anchorage to the back-up material.

2.3 BUILDING FELTS AND PROTECTIVE PAPERS

- A. Building felts for general use shall be Type K.
- B. Kraft paper for protective purposes shall conform to Fed. Spec. UU-P-246a, Type 1, and shall be positively non-staining.

PART 3 EXECUTION

3.1 ROUGH CARPENTRY WORK

- A. No attempt is made in this Specification to list the various elements of rough carpentry work, as the major part of the work to be done is clearly shown on or reasonably inferred from the Drawings. The rough carpentry work required shall include all such work required throughout the project to complete the entire intent of the work, regardless of whether or not each and every item is specifically called for. Refer to Drawings to determine the major extent of the rough carpentry work required.
- B. The Contractor shall be responsible for structural integrity, connections, and anchorage of all rough carpentry work.
- C. Construct all rough carpentry work plumb, level, and true with tight, close fitting joints, securely attached and braced to surrounding construction, all in a first class workmanlike manner. Counterbore for bolt heads, nuts, and washers where required to avoid interference with other materials.
- D. Install continuous strips of fiberglass sill sealer under all sill plates bearing on perimeter foundation walls.

- E. Install wood framing members in one-piece, full length members for maximum strength, laid out and spaced in accordance with the structural framing drawings.
- F. Install wood blockings, nailers, ledgers, etc., as indicated, specified or required, furnished in not less than 12 ft. lengths, except where shorter lengths are required.
- G. Install all wood grounds required at gypsum drywall, and all grounds and screeds required at stucco soffit work, including those required by other trades to properly attach their work, such as grounds for attachment of fixtures, louvers, grilles, registers, diffusers, etc. At gypsum drywall include all blockings for attachment and anchorage of all fixtures, accessories, cabinets, shelves, rail brackets, door stops, and other items required to be attached to finished walls and ceilings, all of adequate strength to carry with a factor of safety of at least 2 to 1 the various loads to be applied.
- H. Nailing of rough carpentry work shall conform to requirements of the governing laws and codes.
- I. Where nailing or power-driving into concrete or masonry is done, take care to avoid puncturing conduits, pipes, ducts, etc., embedded in such work, and repair any damage so caused.
- J. Install all plywood sheathing and subflooring throughout, as indicated. Where one side is to be exposed, install with best veneer to exposed side. Provide solid framing or blocking under all ends and edges. Allow approximately 1/16 in. gap between panel edges at square edged plywood panels and 3/32 in. gap at tongue-and-groove edged plywood panels. Installation and nailing of plywood board shall be in strict accordance with the printed specifications and recommendations of the American Plywood Association.

3.2 BUILDING FELTS AND PROTECTIVE PAPERS

- A. Provide (1) all building felts required for installation of work of this Section and (2) protective papers required for protection of finished floors, previously installed equipment and existing equipment, except where specified to be provided by a different trade.

3.3 CLEANING

- A. Upon completion of rough carpentry work in any given area, remove all rubbish and debris from the work area and leave in broom clean condition.

END OF SECTION

SECTION 072710

FIRE PENETRATION SEALANTS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Provide all equipment and materials, and do all work necessary to complete the firestop sealant work for the entire project. The general contractor shall be responsible for the actual field locations of penetrations through fire rated partitions and or floors as required.

1.2 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.3 RELATED REQUIREMENTS

- A. Section 079000, SEALANTS
- B. Section 230000, MECHANICAL INSULATION
- C. Section 210000, FIRE PROTECTION
- D. Section 260000, BASIC ELECTRICAL MATERIALS AND METHODS

1.4 REFERENCES

- A. ASTM E 814: Test Method of Fire Tests of Through-Penetration Firestops.
- B. UL 1479: Fire Tests of Through-Penetration Firestops.
- C. UL Fire Resistance Directory: Through-Penetration Firestops Systems (XHEZ).
- D. NFPA 70: National Electrical Code.
- E. NFPA 101: Life Safety Code.

1.5 DEFINITION

- A. Firestopping: A material, or combination of materials, used to retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame (and to

impede passage of smoke, gases and water) through penetrations in fire-rated wall and floor assemblies.

1.6 SUBMITTALS

- A. Submit under provision of Section 01300.
- B. Product Data: Provide data on product characteristics, product performance, limitation criteria and documentation of proposed through-penetration firestop systems which reflect actual job conditions.
- C. Manufacturer's installation instructions: Indicate preparation and installation instructions.

1.7 QUALITY ASSURANCE

- A. Qualifications: Applicator shall receive training on installation of through-penetration firestop materials from manufacturer's representative.

1.8 REGULATORY REQUIREMENTS

- A. Conform to applicable code requirements.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original unopened containers identified with manufacturer's brand designation and UL label where applicable.
- B. Store materials under cover and protect from damage in accordance with manufacturer's instructions.
- C. Do not use damaged or expired materials.
- D. Before handling, read product and material safety data sheets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory. This specification is written based on Hilti Construction Chemicals, Inc. but "or equal" is acceptable. Provide products of the following manufacturers as identified below:

Hilti Construction Chemicals, Inc.
Tremco Construction Products
United States Gypsum

2.2 MATERIALS

- A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for the specific fire-rated construction conditions being firestopped, conforming to construction assembly type, penetrating item size and type, annular space requirements, and fire-rating involved for each distinct application.
 - 1. For penetrations by non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following materials are acceptable: Hilti FS 601 Elastomeric Firestop Sealant; Hilti FS 605 High Performance Firestop Sealant or equal.
 - 2. For fire-rated construction joints or other gaps, the following material is acceptable: Hilti FS 610 Elastomeric Firestop Sealant or equal.
 - 3. For penetrations by plastic pipe, the following materials are acceptable: Hilti CP 642 Firestop Collars; Hilti FS 611A Intumescent Firestop Sealant or equal.
 - 4. For penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles the following material is acceptable: Hilti FS 611A Intumescent Firestop Sealant or equal.
 - 5. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways and raceways, the following material is acceptable: Hilti FS 635 Trowelable Firestop Compound or equal.
- B. Provide a firestop system with an "F" rating as determined by UL 1479 or ASTM E 814 which is equal or higher than the time rating of construction being penetrated.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean surfaces to receive firestopping materials of dirt, dust, grease, oil, loose material, and other matter which may affect bond of firestopping material or the fire resistance.
- B. Insure that surface to be firestopped is prepared in accordance with manufacturer's instructions.

3.2 INSTALLATION

- A. Refer to Underwriter's Laboratories, Inc. (UL) Fire Resistance Directory; "Through-Penetration Firestop Systems (XHEZ)" for system details.
- B. Install firestopping materials in accordance with manufacturer's instructions.

END OF SECTION

SECTION 075419

POLYVINYL-CHLORIDE ROOFING

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Provide roofing work as required to accommodate new HVAC equipment on the existing roof. All work is to be done with materials provided by the original manufacturer as listed below and installed by an approved installer to maintain the existing roofing warrantee:

Sika Sarnafil, a Division of Sika Corporation
100 Dan Road, Canton, MA 02021
Tel (781) 828 – 5400 Fax (781) 828 – 5365
Email: webmaster.sarnafil@us.sika.com

- B. Provide temporary walkway over roofing for use of contractors of other trades in performing work at the roof. Provide protection of roofing at work sites on the roof as required.
- C. Remove and dispose of existing roofing materials in such a way as to prevent excursion of water into the building. Dispose of these materials meeting all codes and regulations.
- D. Special Requirements: Provide roofing system listed in most recent Factory Mutual Research Corp. Approval Guide for Class I-60 roofing system and complying with installation specifications outlined in Factory Mutual Research Corp. Data Sheet 1-28.
- E. Provide walking pads to be installed on top of roofing membrane to all roof top equipment from roof access.

1.2 RELATED REQUIREMENTS

- A. Sheet metal flashing: SHEET METAL FLASHING, Section 076200.

1.3 REFERENCES

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.4 REFERENCED STANDARDS

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

C728 Perlite Thermal Insulation Board
D4434 Standard for Polyvinyl Chloride Sheet Roofing

B. Federal Specifications (Fed. Spec.):

HH-I-1972 Insulation Board, Thermal, Polyurethane and
Polyisocyanurate Faced

1.5 QUALITY ASSURANCE

- A. The roofing shall be applied only by a roofing contractor (Applicator) that has been pre-authorized by the roofing product manufacturer.
- B. Upon completion of the installation and the delivery to the Manufacturer by the Applicator of a certification that all the work has been done in strict accordance with the contract specifications and the Manufacturer's requirements, an inspection shall be made by a Technical Representative of the Manufacturer to review the installed roof system.
- C. There shall be no deviation made from the Project Specification or the approved shop drawings without prior written approval by the Owner, the Architect and the Manufacturer.
- D. All work pertaining to the installation of the roofing and flashings shall only be completed by the Applicator's personnel trained and authorized by the Manufacturer in those procedures.

1.6 SUBMITTALS

- A. Samples: Submit samples of each material under this Section requested by Architect, for approval. Samples shall be in size and form requested by Architect, and reasonable to show characteristics, color and finishes of the materials.
 - 1. Submit a 1 ft. x 1 ft. sample of roof leveler board.
 - 2. Submit a 6" x 6" sample of the membrane
 - 3. Submit a 6" x 6" sample of the insulation
- B. Product Data: Submit complete manufacturer's product data of all materials and systems to Architect for approval, consisting of complete product description, test data, specifications and warranty form sufficient to fully describe the proposed work and the warranty to be provided.
- C. Do not order materials or begin installation until Architects approval of submittals has been obtained.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Manufactured materials shall be delivered in original, factory-sealed packages, cans and rolls, all bearing the name and description of the product and the name of the manufacturer.
- B. Protect all materials from the weather, under cover, and on raised platforms.
- C. Adhesives, cements, mastics and sealers shall be stored between 60°F and 80°F. Should they be exposed to lower temperatures, restore to room temperature for three to five days prior to use. Do not use materials damaged in handling or storage.
- D. Store leveler board with full protection against dampness prior to laying. Leveler boards shall be dry when applied, and shall be protected from the weather during installation. Any materials damaged by exposure to the elements or other cause shall be rejected and promptly removed from the site.

1.8 GUARANTEE

- A. Furnish and deliver written manufacturer's guarantee in Owner's name covering all materials and workmanship under this Section, in addition to, and not in lieu of, guarantee requirements set forth under GENERAL CONDITIONS and MODIFICATIONS TO GENERAL CONDITIONS, and other liabilities which the Contractor may have by law or other provision of the Contract Documents.
- B. Furnish manufacturer's warranty stating that manufacturer shall maintain roofing and membrane flashings in water-tight condition at his own expense for fifteen (15) years from the date of Substantial Completion, provided that Owner gives the manufacturer written notice of any leak within thirty days from the discovery of such leak. Warranty is solely intended to cover any condition caused by defective materials, installation, and ordinary wear and tear. Warranty shall not cover damage from lightning, full gales, hurricanes, or similar unusual natural occurrences or any condition caused by any deliberate act or by negligence in maintenance.

PART 2 PRODUCTS

2.1 ROOF SYSTEM

- A. Roofing system shall be a mechanically fastened fully adhered PVC membrane roof system. Materials and installation shall conform to the manufacturer's standard specifications, and work of this Section shall be executed by Roofing Subcontractor licensed by the manufacturer.
- B. The thermoplastic membrane roofing system shall consist of single-ply fully heat welded sheet adhered or mechanically attached over insulation layer or leveler board.

- C. Roofing system shall be listed in most recent Factory Mutual Research Corporation (FMRC) Approval Guide for Class I-60 Roofing systems. Installation shall be in accordance with FMRC Data Sheets 1-28, 1-29 and 1-49. Roofing shall meet the Class A rating set by the Underwriters Laboratories (UL).
- D. Manufacturers approved walkway pads to all equipment from roof access.

2.2 INSULATION

- A. Rigid insulation beneath membrane:
 - 1. Rigid isocyanurate component shall have minimum density of 2 lb. cu. ft., minimum compressive strength (ASTM D 1621) of 25 psi, maximum moisture vapor transmission (ASTM E96) of 2.0 perm, "C" factor of 0.16 in. and "R" factor of 6.67 (1 in.) or in thickness as indicated on the drawings which ever is greater as manufactured by Celotex Corp, NRG Barriers, Sarnofil or Firestone.
 - 2. Tapered isocyanurate insulation shall have an average R-value of R-20 and a slope of 1/8" per foot to drains. Crickets shall slope at 1/4" per foot.
 - 3. Insulation shall be approved by Factory Mutual (FM) for Class 1 Insulated Steel Deck Construction and shall be UL listed Class A.
 - 4. Provide 4' x 4' square of tapered insulation at each roof drain sloped to drain to prevent ponding.

2.3 MEMBRANE ROOFING MATERIAL

- A. Fully Adhered Thermoplastic Membrane Roofing System:
 - 1. Elastomeric Sheet Material: Manufacturer's standard thickness but not less than 60 mils, 200 Mpa psi minimum tensile strength (ASTM D 751), 15% elongation (ASTM D 751), vapor permeable, ultraviolet and ozone resistant, low temperature brittleness of -40°F (-40°C) (ASTM D 746) grey.
 - 2. Flashings - 60 mil. fully compatible with roofing system.
 - 3. Available Products: subject to compliance with requirements, products which may be incorporated in the work, include, but are not limited to, the following manufacturers:
 - SikaSarnafil, Inc.
 - Carlisle Sure Flex Systems, Inc.
 - Versico Incorporated

2.4 ROOFING BOARD

- A. For installation of membrane over steel decking use manufacturer's approved recovery board.

2.5 RELATED MATERIALS

- A. Bonding adhesive shall be as recommended by manufacturer. Adhesive shall be compatible with all materials to which the roofing membrane is to be bonded.
- B. Splicing cement and splice cleaner shall be as recommended by membrane manufacturer.
- C. Lap sealant for sealing the exposed edge of the splices shall be trowel or gun consistence, as recommended by membrane manufacturer.
- D. Water cutoff mastic shall be as recommended by membrane manufacturer.
- E. Night seal shall be as recommended by membrane manufacturer.
- F. Pourable sealer shall be as recommended by membrane manufacturer.
- G. Prefabricated accessories (pipe seal, inside and outside corners, etc.) shall be as manufactured and recommended by membrane manufacturer.
- H. Nailing Strips and Fasteners: Nailing strips shall be extruded rubber and fasteners shall be non-corrodible.
- I. Roofing Nails: 11 gauge hot-dip galvanized, length to penetrate wood members at least 7/8 in., with 5/8 in. diameter heads, as recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 INSPECTION OF SURFACES

- A. Carefully check roof deck areas for conditions affecting application and performance. Ensure pull-out resistance of deck to be 360 lb. minimum. Report defects in writing to Architect. Do not proceed with roofing work until defects have been corrected.
- B. Beginning work shall constitute acceptance of its conditions and any defects in roofing work resulting from such accepted surfaces shall be corrected without further expense to the Owner.

3.2 GENERAL REQUIREMENTS

- A. Surfaces to receive roofing materials shall be rigid, tight, clean, dry, smooth, free of scale, dust, oil, or other foreign matter, and also free of frost or the effects of freezing. Thoroughly clean surfaces to remove loose particles immediately before application of subsequent materials. Do not apply roofing materials over wet sub-surfaces.
- B. Where surfaces joints at roof and wall substrates exceed 1/4 in. width, fill flush with surface with pourable sealer before proceeding with the installation.
- C. Do not leave unfinished roof areas uncovered overnight or during inclement weather.
- D. Work shall conform to manufacturer's published specifications. Roof shall be made permanently weatherproof in continuous operation, including connection to flashing and roof edge provided under Section 076200, SHEET METAL FLASHING AND TRIM.
- E. Provide manufacturer's recommended weatherproofing method at all special conditions, such as at projections, at connections to sheet metal roof edge, flashings, etc.
- F. Special Cautions:
 - 1. Do not use oil-based or plastic roof cement.
 - 2. Do not subject elastomeric materials to contact with petroleum, grease, oil, solvents, vegetable or mineral oil, nor animal fat. Prevent contact with hot pipes, and ducts.
 - 3. Cements and bonding adhesive contain petroleum distillates and are extremely volatile and flammable. Avoid breathing vapors and do not use near fire or flame.
 - 4. Ensure that splicing and bonding surfaces are dry during installation.
- G. Do not damage or stain surrounding work. Remove stains and repair damage immediately, as work progresses, as part of work of this Section.

3.3 ROOF INSULATION

- A. Follow sequence coding. Install only as much insulation and daily as can be covered with roofing by close of work. Do not expose materials to rain or snow, nor overnight. Replace material that becomes wet.
- B. Lay insulation over roof deck with spots of cold adhesive to facilitate handling during placement and securing of mechanical fasteners. Neatly cut board to fit around roof penetration and projections. Trim edges of boards so that no edge is left unsupported.

Stagger transverse joints in board underlayment and insulation layers 2 ft. in adjacent rows and butt edges tightly. Joints between boards shall be less than 1/4 in. wide.

- C. Insulation shall be fastened mechanically to roof deck by installation of proprietary anchor plates for sheet roofing at rates indicated by manufacturer.
- D. Install tapered cants and crickets as indicated on approved shop drawings to provide required roof slope and pitch to drains.
- E. Feather or taper board around drains for smooth transition between roof surface and drain clamp ring.
- F. Install continuous treated wood nailers at perimeter of roof and other locations as required to ensure smooth transitions between surfaces. Wood to resist minimum pull-out force of 300 lbs/ft.

3.4 THERMOPLASTIC MEMBRANE ROOFING

A. PVC Roofing Membrane Installation:

1. General: Start installation only in presence of manufacturer's technical representative.
2. Cut sheets to maximum size possible, in order to minimize seams and to accommodate contours of roof deck and proper drainage across shingled laps of sheets.
3. Adhesive Adhered Thermoplastic Membrane Roofing: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer. Apply adhesive to surfaces to be bonded and roll Sheet Roofing into place when adhesive has properly cured. Install mechanical fasteners, flashings and counter-flashings, and accessories at location and as recommended by manufacturer.
4. Hot Air Welding of Seam Overlaps: All seams shall be hot air welded using manufacturer's approved heat welding equipment. Seam overlaps shall be 3 inches wide when automatic machine welding and 4" wide when hand welding. All sheets to be welded shall be completely dry. All welded seams shall be checked with a rounded screwdriver and by test samples of welding taken at least 3 times daily.
5. Walkway Protection Mats: Install mats at locations shown and where required for access to roof-mounted equipment. Place protection boards carefully to avoid damage to membrane, laying over an additional layer of roof membrane material, loosely applied, for additional protection.
6. Membrane Flashings. Provide membrane sheet flashings at membrane sheet roofing work, as indicated.

- a. Use longest practical lengths and widths of membrane sheet flashing material to eliminate or minimize joints. Complete splices between flashings and main roof sheet before bonding flashings to vertical surfaces. Splices shall be sealed 3 in. beyond fasteners that attach membrane to horizontal nailer in same manner as splices within roofing membrane. Flashings shall be bonded 100% to subsurfaces, except at coves where movement is anticipated, where flexible tube shall be installed.
 - b. Apply bonding adhesive to flashing and surface to which it is being bonded. When bonding adhesive has dried to the point where it does not string or stick to a dry finger touch, roll flashing into adhesive. Do not bridge flashing at changes of direction.
 - c. Nail top of flashing 12 in. on center under sheet metal copes, counter flashing, and other sheet metal work.
 - d. Pipe Flashing: Flash penetrating pipe, conduit and duct penetrations with prefabricated pipe seals where possible and field fabricated sealants where necessary.
 - e. Expansion Joints: Treat expansion joints as indicated in expansion joint manufacturer's standard details and published instructions for specific conditions.
 - f. Unusual Penetrations: Seal clusters of pipes and unusually shaped penetrations with pourable sealer, 2 in. deep in pitch pocket seal, as indicated in manufacturer's standard details and published instructions for specific conditions.
7. Provide daily night seal at loose edges to prevent water flow beneath finished roofing.
- a. Mix sealer components as instructed by manufacturer. Apply at rate of 1 gal./100 linear ft., 12 in. back from sheet edges on exposed substrate.
 - b. Embed membrane in sealer and apply continuous pressure with 2-1/2 in. tubing filled with sand. Pull sheet free, cut off and discard contaminated portion of the membrane before continuing permanent installation.

3.5 CLEANING

- A. Keep surrounding surfaces clean as work progresses.
- B. Remove cartons, debris, emptied containers, and other rubbish as work progresses, and at completion of work of this Section. Legally dispose of rubbish off site.

3.6 CLOSE OUT

- A. Arrange for final inspection of completed roofing assembly with Manufacturer's Rep, the Architect and the Owner present.
- B. Repair and correct any deficiencies noted.
- C. Obtain all roofing guarantees and warranties and provide to Owner for record.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Provide all sheet metal flashing and trim as required to complete the work of the Contract, as indicated on the Drawings and as specified herein. Include, but do not limit to:
 - 1. Sheet metal flashings and counterflashings at exterior walls where new penetrations in existing copper siding is required for new utility penetrations.
 - 2. Sheet metal work at all other locations where the use of sheet metal may reasonably be inferred as necessary to make the work complete in the intent of providing thoroughly weathertight conditions at roofs, throughout.
- B. All flashing work shall be according to requirements of Factory Mutual, see section 075350, Fully Adhered PVC Sheet Roofing.

1.2 RELATED REQUIREMENTS

- A. Wood blocking, nailers, etc.: Section 061000, ROUGH CARPENTRY.
- B. Masonry work: Section 042000, UNIT MASONRY.

1.3 REFERENCES

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.4 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - B 101 Lead Coated Copper Sheets
 - B 209 Sheet and Plate Aluminum and Aluminum Alloy
- B. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1.5 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of all work of this Section to Architect for approval, indicating large scale details of all typical and special conditions, showing sizes, materials, profiles and gauges of all materials, joining and splicing, attaching and anchoring sheet metal components, methods of relieving thermal stresses, and other pertinent information.
- B. Samples: Furnish 8 in. long samples of roof edge, gravel stop, and other sheet metal items as directed by the Architect to illustrate type, thickness, weight and gauge, and color and finish.
- C. Obtain approval of submittals prior to proceeding with fabrication or ordering of materials.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials in manufacturer's sealed containers and rolls.
- B. Store indoors or under cover, on raised platforms, fully protected from damage.

1.7 GUARANTEE

- A. In addition to roofing manufacturer's guarantee, furnish to the Owner a written guarantee of roofing (and sheet metal) subcontractor against all defects of materials and workmanship in work of this Section for a period of one year, commencing on the date of Substantial Completion of the building.

PART 2 PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Sheet metal for other uses throughout, except as otherwise specified shall be cold-rolled, cornice-temper sheet copper conforming to ASTM B 370 in gauges as indicated below:
 - 1. Roofing shall be 16 ounces per square foot.
 - 2. Nailing cleats shall be of 20 ounces per square foot.
 - 3. Where required lead coated copper shall conform to ASTM B101, Type 1, Class A – Standard Coating.
 - 4. Roof edge coping shall be 20 ounces per square foot.
- B. Nails shall be "Stronghold" type, with large flat heads, annular rings, and needle points. Nails shall not be smaller than No. 12 Stubs gauge and of sufficient length to penetrate wood substrates not less than 7/8 in. Nails shall be of same materials and finish as sheet metal with which used.

- C. Screws, bolts, and other accessories shall be of same materials and finish as sheet metal with which used.
- D. Solder shall be 40% lead, 60% tin.
- E. Flux shall be non-acid proprietary flux manufactured specifically for use with copper, lead coated or terne coated materials, as applicable.
- F. Sealant shall be low-modulus sealant, silicone or urethane based, compatible and recommended by manufacturer for use with sheet metal types specified, equal to products manufactured by General Electric, Dow Chemical Co., or Pecora Co., as approved by Architect.

PART 3 EXECUTION

3.1 INSPECTION OF SURFACES

- A. Carefully inspect surfaces to receive sheet metal for all conditions affecting sheet metal application and performance. Carefully check wood blockings, inserts, nailers, etc., for adequate anchorage. Defects shall be reported in writing to the Architect and sheet metal work shall not proceed until defects have been corrected.
- B. Beginning of work shall constitute acceptance of the conditions of the surfaces to which this work is to be applied as satisfactory to properly receive the work.

3.2 SHEET METAL WORKMANSHIP

- A. Furnish and install sheet metal flashing and trim, and other work as required for the various conditions as specified hereinabove and as shown on the Drawings, in addition to other locations where the use of sheet metal may be inferred as necessary to make the work of this Section complete in its intent of providing thoroughly weather-tight conditions at roofing membranes, and control of moisture where used in masonry walls.
- B. Accessories and other items essential to the completeness of each of the sheet metal installations, though not specifically shown or specified, shall nevertheless be provided, and shall be of matching material.
- C. Surfaces to be covered with sheet metal shall be free from defects of every description and shall be clean of dirt and other foreign matter before sheet metal work is started. Portions of sheet metal in contact with dissimilar metal, concrete, or masonry shall be given a coat of bituminous paint. Extreme care shall be taken to prevent direct contact of dissimilar metals.
- D. Roof Edge: Furnish and install custom copper roof edge and accessories, as indicated to match existing, in strict accordance with SMACNA standards.

- E. Except as otherwise shown on the approved shop drawings or specified herein, the workmanship of sheet metal work, method of forming joints, anchoring, cleating, provisions for thermal movement, etc., shall conform to the standard details and recommendations of the sheet metal producer and those of producer organizations and research institutions and associations governing the sheet metal used, in addition to the standards and details set forth in the SMACNA Manual.
1. To greatest extent applicable, fabricate sheet metal components in shop, and thoroughly clean joints on both sides of the sheet metal work as specified here-in-below.
 2. Seams, except where expansion provisions are required or where otherwise specified or detailed, shall be flat-locked and shall finish at least 1/2 in. in width.
 3. Exposed edges shall be doubled back 1/2 in. in such a manner as to conceal them and to provide stiffness, and shall generally be bent out at a 45 degree angle.
 4. All flat-locked seams at sheet metal work shall be soldered. Soldering shall be done slowly with well heated coppers, and ample solder shall be used so that the seam will show at least 1 in. of evenly flowed solder.
 5. As a general sheet metal fabrication procedure, remove all flux from faces of sheet metal and then neutralize the flux residue by swabbing with washing soda or ammonia. Pre-tin and clean all soldered joints before final assembly wherever possible.
 6. Seal all working-joints in sheet metal work with low-modulus sealant to assure positively weather-tight conditions throughout, using materials as specified hereinbefore and workmanship as specified under Section 079000, SEALANTS.
 7. All sheet metal remaining exposed in the finished work shall be cleaned and left free from stains and blemishes.

END OF SECTION

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Joint sealants and fillers.
- B. This Section includes joint sealants for the applications specified with the products in this Section and as indicated on the Drawings.
- C. Alternates: Not Applicable.
- D. Items To Be Installed Only: Not Applicable.
- E. Items To Be Furnished Only: Not Applicable.
- F. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 042000 - UNIT MASONRY for masonry control and expansion joint fillers and gaskets.
 - 2. Section 072710 – FIRE PENETRATION SEALANTS for penetrations of rated walls.
 - 3. Section 075350 – POLYVINYL-CHLORIDE ROOFING for penetrations of roofing systems.
 - 4. Section 092116 - GYPSUM BOARD ASSEMBLIES for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
 - 5. Section 095113 - ACOUSTICAL PANEL CEILINGS for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

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

- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Qualification Data: For Installer.
- D. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Field Test Report Log: For each elastomeric sealant application.
- G. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

3. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
4. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer[or are below 40 deg F
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. **VOC Content of Interior Sealants:** Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. **Colors of Exposed Joint Sealants:** As indicated by manufacturer's designations.

2.2 JOINT SEALANTS

- A. **Elastomeric Sealants:** Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. **Stain-Test-Response Characteristics:** Elastomeric sealants shall be nonstaining to porous substrates. Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. **Suitability for Contact with Food:** Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. **Single-Component Neutral-Curing Silicone Sealant:**
 - 1. **Available Products:** Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.
 - c. May National Bondaflex Sil 290
 - d. Pecora Corporation; 864.
 - e. Tremco Inc.; Spectrem 1.
 - 2. **Extent of Use:** Joints in exterior vertical and soffit surfaces.
- E. **Single- or Multi-component Pourable Urethane Sealant:**

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik Findley; Chem-Calk 550.
 - b. May National Bondaflex PUR 2 SL
 - c. Meadows, W. R., Inc.; POURTHANE.
 - d. Pecora Corporation; Urexpan NR-200.
 - e. Tremco Inc.; THC-901, multi-component.
 - f. Tremco Inc.; Vulkem 45SSL, single component.
 2. Extent of Use: Joints in exterior horizontal surfaces.
- F. Single-Component Mildew-Resistant Acid-Curing Silicone Sealant:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 786 Mildew Resistant.
 - b. GE Silicones; Sanitary SCS1700.
 - c. May National Bondaflex Sil 100 WF
 - d. Tremco Inc.; Tremsil 200.
 2. Extent of Use: Sanitary joints at interior toilet rooms and other wet areas.
- G. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik Findley; Chem-Calk 600
 - c. May National Bondaflex Sil-A 700
 - d. Pecora Corporation; AC-20+.
 - e. Tremco Inc.; Tremflex 834.
 2. Extent of Use: Joints at non-moving interior surfaces, except where indicated to be sanitary joints.

2.3 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at

temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate

capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry and unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following metal, glass, porcelain enamel and glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

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

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

- A. Cooperate with field quality control personnel. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
- B. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 083050

ACCESS DOORS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, deliver to Project site, unload in designated storage area, and where specifically called out, install access doors as indicated on the Drawings and as specified herein.
- B. Where metal access doors and Panels are called for on the Drawings, and/or are required on the project for access to valves, damper controls, pipes, conduits, switches, regulators, etc., they shall be furnished under this Section to the proper trades for building into the work, except that any access panels specifically specified under the Mechanical or Electrical Sections of the Specifications to be provided as work of those trades are excluded from the work of this Section. Doors provided under the mechanical or electrical sections shall meet the product requirements of this section.

1.02 RELATED REQUIREMENTS

- A. Gypsum Wallboard: Section 092500, GYPSUM DRYWALL.
- B. Access panels for mechanical and electrical systems: Section 210000, FIRE PROTECTION; Section 220000, PLUMBING; Section 230000, MECHANICAL and Section 260000, ELECTRICAL.

1.03 REFERENCES

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.04 SUBMITTALS

- A. Shop Drawings: Submit complete shop drawings of all work of this Section to Architect for approval, showing all pertinent details of construction, finish and installation.
- B. Product Data: Submit complete manufacturer's product data of all work of this Section to Architect for approval, consisting of complete product description and specifications, catalog cuts, and other descriptive data required for complete product and product use information.

- C. Do not order materials or begin fabrication or installation work until Architect's approval of submittals has been obtained.

1.05 GUARANTEE

- A. In addition to the specific guarantee requirements of GENERAL CONDITIONS and MODIFICATIONS TO GENERAL CONDITIONS, the Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

PART 2 PRODUCTS

2.01 METAL ACCESS DOORS

- A. Access doors shall be flush-type, 16 g. minimum thickness for frame and 14 gauge for panel, 22 in. X 22 in. and 24 in. X 36 in., sizes as indicated specially designed for each type of wall and ceiling finish and construction with which used, with factory-applied prime finish, as manufactured by Inryco/Milcor Inc., Karp Associates Inc., C.E. Sparrow Company, Inc., or equal approved by Architect. Refer to Architectural, Mechanical, and Electrical Drawings for locations, sizes, and materials with which used.
 - 1. Where installed at fire-rated walls or ceilings, access doors shall be of fire-resistive construction and shall bear the proper U.L. label.
 - 2. Where installed in gypsum wallboard walls or ceilings, access doors shall be of the type which will accept adhesive-mounted gypsum board flush with surrounding surfaces. Gypsum board will be provided under Section 092500, GYPSUM DRYWALL.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Metal access doors shall be installed in strict accordance with the approved shop drawings and the manufacturer's printed instructions and recommendations.
- B. It shall be the responsibility of the access panel installer to verify the required fire rating of the panel before installation.

END OF SECTION

SECTION 092100

PLASTERING WORK

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Scope: Furnish all materials and install all lathing and plastering work and related items, to complete the work, as indicated. Include:
 - 1. Patching of gypsum plaster surfaces as indicated on the drawings or which are caused by work of this Construction Contract.
 - 2. Plaster surfaces as indicated on the drawings.

1.2 RELATED REQUIREMENTS

- A. Demolition work: Section 021120, SELECTIVE DEMOLITION AND CLEANING
- B. Remediation of lead painted plaster walls: Section 028300, LEAD REMEDIATION.
- C. Penetration of plaster walls: Section 230000, HEATING VENTILATING AND AIR CONDITIONING.
- D. Penetration of plaster walls: Section 260000, ELECTRICAL WORK

1.3 REFERENCES

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.
- B. Examine all drawings and all other sections of the Specifications for requirements therein affecting the work of this section.

1.4 REFERENCED STANDARDS

- A. Association Standards and Quality: Specification Standards ANSI A42.1 and A42.2 shall apply to the work of this Section.
- B. American Society for Testing and Materials (ASTM):
 - 1. A 641, Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 2. C 28, Specification for Gypsum Plasters.

3. C 35, Specification for Inorganic Aggregates for Use in Gypsum Plaster.
4. C 37, Specification for Gypsum Lath.
5. C 59, Specification for Gypsum Casting and Molding Plaster.
6. C 841, Specification for Installation of Interior Lathing and Lathing.
7. C 842, Specification for Application of Interior Gypsum Plaster.
8. C 847, Specification for Metal Lath.
9. C 954, Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.33 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
10. C 1002, Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's specifications and installation instructions for each product specified.
- B. Shop Drawings: Show layout of control joints.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements: Comply with ASTM C 842.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials shall be by U.S. Gypsum Co., National Gypsum Co., or equal approved by the Architect.
- B. Gypsum Plastering Materials:
 1. Base Plaster: Gypsum neat plaster complying with ASTM C28.
 2. Finish plaster: Gypsum gauging plaster complying with ASTM C28.
- C. Metal Lath:

1. Diamond Mesh Lath: Expanded metal lath with 5/16 in. wide diamonds, weighing 2.5 lbs. and 3.4 lbs. per sq. yd., galvanized or painted steel, and complying with ASTM C 847.
- D. Sand: ASTM C35.
- E. Water: Potable.
- F. Delivery and Storage of Materials: Manufactured materials shall be delivered to the site in original packages or containers bearing the manufacturer's names and brand names and stored to protect from damage.
- G. Patching of small or limited areas "trenched" or damaged for the installation of utilities: Use "blue board" as backing board and USG "Durabond 90" for patching and finishing materials.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. In Accordance with the following ASTM Standards and manufacturer's recommendations:
 1. Metal Lath, Gypsum Lath, and Accessories: C841.
 2. Gypsum Plaster: C 842.
- B. Gypsum Plaster Work
 1. Plaster Type: Shall be smooth-trowelled gypsum-lime plaster finish applied over a single double-back gypsum-sand base coat applied to back-up material to which a continuous application of bonding agent or metal lath, as appropriate, has been applied. 3.4 lb. diamond mesh metal lath shall be used where insufficient back-up surface is available.
 2. Patching of existing plaster to remain shall be done with best workmanship and with careful attention given to matching appearance of new work to the existing work and to make transitions between new and existing work as imperceptible as possible in the finished work.
- C. Tolerances: For flatness of surface, do not exceed 1/4 in. in 8 ft. for bow or warp of surface and for plumb and level.

3.2 CLEANING

- A. Remove plaster and protective materials from accessories and from adjacent surfaces.

END OF SECTION

SECTION 092500

GYPSON DRYWALL

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Furnish and install gypsum drywall work, as indicated on the Drawings and as specified herein. Include, but do not limit to:
 - 1. New drywall surfaces and the repair and refinishing of drywall surfaces where disturbed by the work of this contract.

1.2 RELATED REQUIREMENTS

- A. Wood blocking, furring, grounds, etc., except plumbing fixture support blocking: Section 061000, ROUGH CARPENTRY.
- B. Painting: Section 099000, PAINTING.
- C. Wood trim: Section 062000, FINISH CARPENTRY.

1.3 REFERENCES

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS AND CONDITIONS OF THE CONTRACT and applicable parts of DIVISION 1 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.4 REFERENCED STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - C 36 Specification for Gypsum Wallboard
 - C 79 Test Method for Gypsum Sheathing Board
 - C 442 Specification for Gypsum Backing Board and Coreboard
 - C 475 Joint Treatment Materials for Gypsum Wallboard Construction
 - C 514 Specification for Nails for the Application of Gypsum Wallboard

- C 630 Specification for Water-Resistant Gypsum Backing Board
 - C 645 Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board
 - C 646 Specification for Steel Drill Screws for the Application of Gypsum Board to Light-Gauge Steel Studs
 - C 754 Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board
 - C 840 Specifications for Application and Finishing of Gypsum Board
 - C 893 Type G Steel Screws for the Application of Gypsum Board to Gypsum Board
 - C 894 Type W Screws for the Application of Gypsum Board to Wood Framing
 - C 919 Sealants in Acoustical Applications
 - C 931 Specification for Exterior Gypsum Soffit Board
 - C 954 Specification for Steel Drill Screws for the Application of Gypsum Board to Steel Studs from 0.033 in. (0.84-mm) to 0.112 in. (2.84-mm) in Thickness
 - C 1002 Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases
 - C 1047 Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
- B. Level of finish of gypsum wallboard products:
- GA-214 Level of Finish Consensus Document - Gypsum Association

All products used in the Project shall be manufactured by the same manufacturer.

1.5 SUBMITTALS

- A. Shop Drawings: Furnish complete shop drawings and product cuts of all work of this Section to Architect for approval, showing all pertinent details of construction and installation, and sizes, gauges, configurations, and connections of all components. Confirm on shop drawings that deflection will not exceed $L/360$ of length.

- B. Samples: Furnish samples of materials to be furnished under this Section to Architect for approval.

1.6 QUALITY ASSURANCE

- A. Reference Standards: Conform to governing laws, building code and manufacturer's printed standards.

1.7 COORDINATION

- A. Work of this Section shall be coordinated with the work of other Sections to assure the steady progress of all the work of the Contract. Obtain complete information regarding wall and ceiling mounted fixtures, grilles, registers, access panels, equipment, accessories, etc. to be used on the work from other trades. In no case shall work of other Sections be concealed until it has been inspected.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver all manufactured materials to site in original packages, containers, or bundles bearing the manufacturer's name and brand names, type of material, and contents.
- B. Store materials in interior spaces, above floors, under cover, away from sweating walls and other damp surfaces, and with good ventilation.
- C. Handle gypsum boards to prevent damage to edges, ends, or surfaces. Protect metal corner beads, casing beads, and trim from being bent or damaged.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Materials shall be manufactured by Gold Bond Building Products, United States Gypsum Co., Georgia-Pacific Co.

2.2 MATERIALS

- A. Ceiling Suspension System: Shall be a complete, mechanical suspension system, conforming to ASTM C 645, consisting of cold-rolled steel channel main runners, screwable steel furring channels, hangers, and anchors, and all required clips and other components, required for complete installation.
 - 1. Hanger anchors shall be of type suitable for each of project conditions, and of sufficient capacity (not less than 150 lb. live load each) for purpose intended.
 - 2. Hangers shall be 12 gauge, minimum, galvanized and annealed steel wire.

3. Steel runner channels shall be 1-1/2 in. cold-rolled 16 gauge steel channels, weighing 475 lb. per 1,000 lin. ft., shop painted black.
 4. Screwable steel ceiling furring channels shall be 25 gauge hot-dip galvanized, screwable, pressed steel furring channels, 7/8 in. thick, hat section.
 5. Clips for attachment of steel furring channels to steel carrying channels shall be proprietary clips as recommended by manufacturer.
 6. Tie Wire: Not less than 16 gauge annealed and galvanized.
- B. Screwable Steel Stud Framing System: Unless otherwise indicated, shall be a complete proprietary framing system consisting of prefabricated, non-load bearing, screwable 20 gauge (heavy gauge) and 25 gauge (light gauge) hot-dip galvanized steel studs, and all required steel track, anchors, and related items, conforming to ASTM C 645, all hot-dip galvanized.
1. Steel studs at jambs of door and fixed glass frames, at open partition ends, where the partition is to receive wall-mounted shelves, heavy fixtures, etc., and where use of light gauge studs is limited by manufacturer's structural design tables shall be 20 gauge. At other locations studs shall be 25 gauge.
 2. Wood blockings for support of fixtures, accessories, etc., shall be Construction and/or Standard Grade Hem-fir.
- C. Screwable Steel Wall Furring Channels: 25 gauge hot-dip galvanized, screwable, pressed steel furring channels, 7/8 in. thick, hat section, Z furring channels, lin., 1-1/2 in. and 2 in. Z shaped channels.
- D. Gypsum Wallboard: Indicated thickness(es) by 48 in. width by lengths as required, tapered edge, paper finish, conforming to ASTM C36. Where used in fire-rated assemblies, Type X fire resistant type shall be used. Moisture resistant gypsum wall board shall be used at toilet rooms and kitchen areas and as indicated on the drawings. Acoustical board shall be used where indicated on the drawings.
- E. Joint Treatment Materials: Joint treatment materials shall conform to ASTM C 475.
1. Laminating Adhesive and Joint Finishing compound: As recommended by gypsum wallboard manufacturer, interior type for interior general use, exterior type for use at water-resistant gypsum backer board.
 2. Joint Tape: 2 in. to 2-1/2 in. wide paper tape, as recommended by gypsum wallboard manufacturer.
- F. Screws:

1. Screws for Attachment of Gypsum Wallboard to Steel Framing and Furring Members: Self-drilling, Type S, bugle head screws, conforming to ASTM C 646, with bugle-type Phillips-head, appropriate size and length in each case as recommended by manufacturer.
 2. Screws for Attachment of Gypsum Wallboard to Wood Blocking: Self-drilling Type W screws conforming to ASTM C 894, with bugle-type Phillips-head. Screw length and size in each case shall be as recommended by gypsum wallboard manufacturer.
 3. Screws for Attachment of Steel Framing and Furring Members to Other Steel Members: Self-drilling, Type S, pan head screws, conforming to ASTM C 646, appropriate size and length in each case as recommended by manufacturer.
- G. Accessories shall conform to ASTM C 840 and the following:
1. Corner Bead: 1 in. by 1 in. perforated flange, standard type, 26 gauge, galvanized steel, with paper facing bead for compound finishing equal to B1XW EL B1 (Super Wide) as manufactured by USG.
 2. Metal Trim: 24 gauge, galvanized steel, with paper facing bead for compound finishing.
 3. Control Joint: 26 gauge, galvanized steel, "Vee" type, with perforated flanges, for compound finishing.

PART 3 EXECUTION

3.1 INSPECTION AND COORDINATION

- A. Inspect job conditions and related work and report to Architect in writing, all conditions interfering with the proper installation of work of this Section. Commencement of work in any given area shall constitute acceptance of conditions in that area as acceptable to receive work of this Section.
- B. Make all changes and adjustments in work of this Section as needed to accommodate the work of other trades, providing all cutting and patching until it has been inspected.

3.2 GENERAL REQUIREMENTS

- A. Work shall conform to published specifications and installation instructions of each manufacturer, the approved shop drawings, above-referenced quality assurance standards, the governing laws and code. Refer to Drawings to determine location of fire-resistive, fire-protective, and acoustically-rated work, and construct this work to conform to the specifications and installation instructions of UL or other testing agency(ies). Also refer to the Drawings to determine the number of layers of gypsum board, thickness of board, etc., for each of the installations.

- B. Erect gypsum drywall work, rigidly support, and securely fasten in place, in such manner that plumb, level, and true finished lines and surfaces will result in the finished work in accordance with the requirements of ASTM C 754 and ASTM C 840.
- C. Do gypsum drywall work only after all windows and door openings are enclosed and a temperature of not less than 55°F. is maintained during and up to completion of the drywall work.
- D. Gypsum drywall work only after permanent heat is installed.

3.3 STEEL FRAMING AND FURRING

- A. Suspended Ceilings: Install complete suspended steel ceiling framing system in accordance with ASTM C 754, and the following:
 - 1. Install hangers at ends of, and 48 in. on center along lengths of main runners, securing to ceiling structure above with the appropriate anchors. Provide all additional secondary framing as required to provide support by primary framing members or deck above. Do not anchor hangers to pipes, ducts, or other overhead non-structural elements.
 - 2. Install steel runner channels 48 in. on center maximum and within 6 ft. of walls.
 - 3. Install screwable steel furring channels perpendicular to main runners and spaced 24 in. on center along length of, and within 6 in. of walls without wall angles, and within 8 in. of ends of panels and clipped to, the main runners.
 - 4. Entire installation shall be level and true, with maximum variation from level 1/8 in. when measured with a 10 ft. straight-edge, and with accumulation of variation of level not to exceed 1/2 in. per room or area.
- B. Screwable Steel Stud Partition construction shall conform to ASTM C754, and the following:
 - 1. Installation of Partition Track: Align standard steel track at floors and ceiling construction according to partition layouts and secure with suitable fasteners to the floor and ceiling construction at a spacing not to exceed 24 in. o.c. Carry all walls and partitions full height as noted on the Drawings above ceiling to underside of floor and roof decks. Fill all voids above track, such as steel deck flutes, solidly with packing wool or fiberglass insulation at non-fire rated partitions, and with mineral wool fire-safing insulation at fire rated partitions for smoke and fire-stopping purposed in flutes of steel deck directly above top track where partitions run perpendicular to flutes, to achieve effective closure and to assure the rated performance at fire-rated assemblies. Where partitions run parallel to trusses provide 2 X 6 bridging 2'0" o.c. Where acoustical partitions (those to receive acoustical insulation) and fire-rated partitions run parallel to trusses, install all the track in continuous bed of acoustical or

thermal sealant formed by applying a 1/4 in. minimum bead of sealant to the rear of the track and pressing into place. At fire-rated partitions also install tightly backed fire-safing insulation in the voids for smoke and fire-stopping purposes to achieve effective closure and to assure the rated performance of the fire-rated assemblies.

2. Installation of Steel Studs: Steel studs shall be one piece, without splices installed at spacing not to exceed 16 in. o.c. (or other spacing indicated) and located at abutting construction and at the internal apex of corners. Provide additional studs at corner conditions, frame jambs, etc., as called for on the Drawings and specified herein.
 3. Position steel studs vertically engaging both floor and runners. Anchor studs located adjacent to door and floor glass frames, partition intersections, corners, and over partition ends, to the floor and ceiling runner flanges with positive screw engagement with 3/8 in. Type S partition screws or by locking the studs with metal lock fasteners and to the ceiling runner flanges by screw engagement. Allow for relief of 1/2 in. roof or ceiling deflection at tops of all partitions by screwing through slotted holes.
 4. Install double stud at door and fixed glass frame jambs and securely attach to the frame anchors by at least two screws per anchor. Over steel door and fixed glass frames, install steel track header and install studs above, with back-to-back pair, centered over the door to secure control joints. Run continuous length of cold-rolled steel channel through the stud cores, overlapping at least one stud beyond jamb studs at each end. Frame out for recessed cabinets, accessories, grilles, etc., as recommended by the manufacturer for each of the project conditions.
- C. Steel Stud Chase Walls: Construct partitions on both sides of non-fire rated chase walls in same manner as other partitions, with studs in direct alignment across the chase. Brace with three gypsum wallboard gussets, per pair of studs, across the chase, located at quarter points, and screwed to the studs. Comply with manufacturer's published details.
- D. Steel Furring: Install screwable steel furring channels over faces of concrete or masonry walls to receive gypsum wallboard finishes, continuously along tops and bottoms of walls and in continuous vertical rows space 16 in. o.c. along full length of each furring member, through alternate flanges.
- E. Metal Access Panels: Install all metal access panels at partitions, furrings, and suspended ceilings. Access panels will be furnished to this trade loose under other Section(s).
- F. Fixture Attachments: Before any wallboard is installed, a complete survey of all fixtures, accessories, cabinet work, shelves, rail brackets, door stops, or other items to be attached to the finished work of this Section shall be made and wood blocking or other attachments shall be installed within the steel framing and furring work to receive the loads. Blockings or other attachments for the various loads shall be as recommended by the manufacturer and shall be described on the shop drawings. All such fixture attachments shall be observed by the Contractor before commencing installation of wallboard. All such blockings and attachments shall be provided as work of this Section.

- G. Miscellaneous Framing and Furring: Construct all special miscellaneous screwable steel stud framing and furring, such as at ceiling edgings, soffits, column and beam enclosures, skylight wells, etc., as detailed and as required to achieve the shapes and profiles indicated and other miscellaneous framing indicated and/or reasonably required for the thorough completion of the Project.
 - 1. Thoroughly fasten together, anchor, and brace to provide absolutely rigid structural conditions fully capable of supporting the loads to be applied with factor of safety not less than 2-1/2 to 1. Carry out the work generally as detailed, strictly following instructions of the manufacturer for steel and stud structural framing use. Screw all connections with self-tapping metal screws or other appropriate fasteners and provide all additional reinforcement required to assure the required performance.

3.4 GYPSUM WALLBOARD APPLICATION

- A. Unless otherwise indicated, application of gypsum wallboard shall conform to ASTM C840.
- B. Apply thickness and layers of gypsum wallboard at ceilings, walls, partitions, column and beam enclosures as indicated. Stagger joints in each layer. Locate joints in first layer on opposite sides of partitions to occur on different studs. Apply wallboard at ceilings with long dimension perpendicular to furring channels, with each end occurring over a framing member. Install wallboard at walls and partitions with long dimension vertical, and with each end and edge lying over a framing member.
 - 1. At double layer installations apply second layer by combination of laminating adhesive and mechanical fastenings (through first layer into the steel framing and/or furring member behind), in strict accordance with manufacturer's printed recommendations for each project condition.
- C. Carry gypsum wallboard, each side, continuously from floor to underside of deck construction above, including above suspended ceilings, for acoustical and fire-resistive performances.
- D. To minimize end joints, use maximum practical lengths. Bring gypsum wallboard panels into contact, but do not force into place. Fit abutting ends and edges neatly. Provide slots for sealant at top, bottom, ends, and corners of wallboard at all walls and partitions indicated to receive acoustical insulation, as indicated. Also provide slots for sealant where wallboard abuts other finish materials, as specified hereinbelow.
- E. Spacing and installation of drywall screws for the various applications and fire-rating requirements shall conform to the printed standards of the manufacturer.
- F. Set heads of fasteners flush with surface of the paper, but not breaking the paper. Where attached loosely to a framing or furring member, a second fastener shall be installed within 1-1/2 in.

- G. Cut gypsum wallboard neatly at corners, edges, etc., and for pipes, electrical outlets, electrical conduit and raceway, recessed cabinets, and other projections.

3.5 INSTALLATION OF WALLBOARD ACCESSORIES

- A. Install accessories at gypsum wallboard installations, as follows, in strict accordance with manufacturer's instructions.
 - 1. Install joint reinforcement tape at all joints, and at all internal corners where abutting surfaces are both gypsum wallboard construction.
 - 2. Install corner beads at all external wallboard corners.
 - 3. Install casing bead wherever finish wallboard abuts dissimilar materials and other places where specifically called for on the Drawings.
 - 4. Install control joints generally over (and under) centers of all major wall openings (those greater than 40% of wall height, measured floor to ceiling), over all door frames, over control joints in back-up materials, and at maximum distance of 30 ft. in walls, 60 ft. or to limit areas to not more than 2400 sq. ft., at ceilings (except where lesser distance is indicated), and other places specifically called for on the Drawings. Interrupt furring and/or framing behind the control joints. In all cases, specific locations of control joints shall be as indicated or as directed by the Architect, and this information must be in hand before control joint installation is begun.
 - 5. Install access panels supplied by others as required. Before installation, verify correct rating of panel to be installed.

3.6 JOINT FINISHING

- A. The level of finish shall be equal to "Level 4" as indicated by the Gypsum Association document GA-214 unless otherwise indicated on the documents. Level 0 may be suitable for temporary construction. Level 1 is often called "fire-taping" and may be suitable for locations above ceilings that are not exposed to view or required for finishing. Level 2 finish can be used for areas where finish appearance is not a concern or where used as a substrate for another solid finish material such as tile. Level 3 finish is suitable for areas that will be covered with a heavy textured spray or heavy wall covering finish is specified. Level 5 is used for areas requiring a high degree of smoothness and durability in the final finish that may have a gloss or semi-gloss finish applied. This finish is often called "veneer plaster."
- B. Finish all corners, joints, and edges of gypsum wallboard and gypsum soffit board work, and all corner beads, casing beads, control joints and other trim to provide complete finishing of all exposed wallboard surfaces, in strict accordance with manufacturer's printed instructions

and ASTM C 840. Finish to absolutely flush, true surface showing no irregularity when tested by light source parallel to the plane of the nominal wallboard face.

- C. Finish all concealed joints in wallboard above ceiling finishes flush with tape and a minimum of two coats of compound to provide a continuous, uninterrupted plane for acoustical and fire-resistive performance. Concealed joints may be left in rough condition without finish sanding.

3.9 PROTECTION AND CLEANING

- A. Protect the work of other trades and work of this Section already installed against soiling and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged or soiled.

- A. Protect the work of other trades and work of this Section already installed against soiling and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged or soiled.

END OF SECTION

SECTION 095113

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Removal of existing acoustical ceiling tiles and panels for reinstallation after work of HVAC contractor.
 - 2. Removal of existing suspension systems, grid systems and ceiling hangers as required for work of HVAC contractor.
 - 3. Reinstallation of suspension systems and tile.
 - 4. Installation of new replacement tile and suspension systems to match existing.
 - 5. Acoustical sealant at edge moldings at acoustical ceilings.
- B. Alternates: Not Applicable.
- C. Items To Be Furnished Only: Not Applicable.
- D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 099000 – PAINTING AND COATING for existing ceiling needing black touchup paint work.
 - 2. Section 230000 - HEATING, VENTILATING AND AIR CONDITIONING for air handling and distribution components located in ceilings.
 - 3. Section 260000 - ELECTRICAL WORK for light fixture and alarm system components located in ceilings.

1.3 SUBMITTALS

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

- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.
- C. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.
- D. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
 - 2. Suspension Systems: Obtain each type through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

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

1.8 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. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Products: Subject to compliance with specified requirements, provide one of the following products for each type indicated.
- B. ACT- 1: General building use and as indicated to match existing installed tile.
 - 1. Manufacturer and Model Number:
 - a. Armstrong, Cortega No. 769
 - b. USG, to match Armstrong
 - c. CertainTeed, to match Armstrong
 - 2. Panel Size: 24 inches by 48 inches by 5/8 inch.
 - 3. Panel Mounting: Square Edge.

4. Noise Reduction Coefficient (NRC): Not less than 0.80.
5. Ceiling Attenuation Class (CAC): Not less than 35.
6. Color: White.
7. Grid Material: Painted steel, baked polyester (white)
8. Grid Face Width: 15/16 inch

C. ACT- 2: Black Ceiling Tile (for Bowling Alley).

1. Manufacturer and Model Number:
 - a. Armstrong, Cortega No.769
 - b. USG, to match Armstrong
 - c. CertainTeed, to match Armstrong
2. Panel Size: 24 inches by 48 inches by 5/8 inch.
3. Panel Mounting: Square Edge.
4. Noise Reduction Coefficient (NRC): Not less than 0.80.
5. Ceiling Attenuation Class (CAC): Not less than 35.
6. Color: Black.
7. Grid Material: Painted steel, baked polyester (black)
8. Grid Face Width: 15/16 inch

2.2 METAL SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

1. Manufacturer: USG, Armstrong, CertainTeed, or Chicago Metallic.
2. Structural Classification: Intermediate-duty system.
3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
4. Cap Material: Steel or aluminum cold-rolled sheet.
5. Color: White, or Black as indicated prefinished.
6. Grid Face Width: As specified with ACT type.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.
2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory

devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 diameter wire.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. The layout and installation of acoustical panel ceilings and suspension systems shall be coordinated with other work penetrating the ceiling. This includes, but is not limited to, light fixtures, HVAC diffusers and equipment, and fire suppression system components.
 - 2. Acoustical panels shall be cut and fit around light fixtures, HVAC diffusers and equipment and fire suppression system components to set flush or recessed as recommended by manufacturer.
- B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 6. Do not attach hangers to steel deck tabs.
 7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 099000

PAINTING AND COATING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Field painting of exposed interior items and surfaces disturbed by the work of this contract.
 - 2. Field painting of exposed electrical conduit and metal piping that does not have a factory applied final finish.
 - 3. Surface preparation for painting.
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 055000 - METAL FABRICATIONS for shop priming ferrous metal.
 - 2. Section 092100 – PLASTERING WORK for repair of plaster surfaces.
 - 3. Section 092116 - GYPSUM BOARD ASSEMBLIES for surface preparation of gypsum board.

1.3 DEFINITIONS AND EXTENT

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.

3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Designer will select from standard colors and finishes available.
1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
 - a. Finished mechanical and electrical equipment.
 - b. Light fixtures.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:

- a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
 3. Submit two eight inch by 12 inch Samples for each type of finish coating for Designer's review of color and texture only.
- C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
1. Designer will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.

- a. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - b. Small Areas and Items: Designer will designate items or areas required.
2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Designer will use the room or surface to evaluate coating systems of a similar nature.
 3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: Furnish four unopened gallons of each type of paint and coating work, in color and gloss as used for the Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Designer about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 9. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.

2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
 2. Uninsulated plastic piping.
 3. Pipe hangers and supports.
 4. Tanks that do not have factory-applied final finishes.
 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
 2. Panelboards.
 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- 3.4 CLEANING
- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.
- 3.5 PROTECTION
- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Designer.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.
- 3.6 PAINT SCHEDULE
- A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.
- B. Interior Paint Schedule:
1. Interior Gypsum Wallboard and Plaster Walls for Latex Eggshell Finish:

One Coat	<ol style="list-style-type: none"> 1. Moore Eco Spec WB Interior Latex Primer (372) 2. Duron Genesis Latex Primer 3. S-W Harmony Latex Wall Primer 4. PPG Pure Performance Latex Primer 5. Glidden Professional Lifemaster No VOC Latex Primer (9116)
And Two Coats	<ol style="list-style-type: none"> 1. Moore Eco Spec WB Interior Latex Eggshell (374) 2. Duron Genesis Latex Eggshell 3. S-W ProMar 200 Zero VOC Latex Eggshell

4. PPG Pure Performance Latex Eggshell
 5. Glidden Professional Lifemaster No VOC Latex Eggshell (9300)
2. Interior Gypsum Wallboard and Plaster Ceilings for Latex Flat Finish:
- One Coat
1. Moore Eco Spec WB Interior Latex Primer (372)
 2. Duron Genesis Latex Primer
 3. S-W Harmony Latex Wall Primer
 4. PPG Pure Performance Latex Primer
 5. Glidden Professional Lifemaster No VOC Latex Primer (9116)
- And Two Coats
1. Moore Eco Spec WB Interior Latex Flat (373)
 2. Duron Genesis Latex Flat
 3. S-W ProMar 200 Zero VOC Latex Flat
 4. PPG Pure Performance Latex Flat
 5. Glidden Professional Lifemaster No VOC Latex Flat (9100)
3. Interior Concrete Masonry Units for Latex Semi-Gloss Finish in Dry Areas:
- One Coat
1. Moore Super Spec Latex Block Filler (160)
 2. Glidden Professional Latex Block Filler (3010)
 3. PPG Speedhide Int/Ext Latex Block Filler (28g/l VOC formulation.)
 4. S-W Loxon Block Surfacer
- And Two Coats
1. Moore Super Spec Latex Block Filler (160)
 2. Glidden Professional Lifemaster No VOC Latex Semi-Gloss (9200)
 3. PPG Pure Performance Latex Semi-Gloss
 2. S-W ProMar 200 Zero VOC Latex Semi-Gloss
4. Interior Exposed Steel, Joists, Ductwork, Conduit and Similar Items (where indicated):
- One Coat
1. Tnemec 115 WB Unibond or 15 Unibond at 2.5 to 3.0 mils DFT
 2. PPG PMC Amercoat 220 Acrylic at 3.0 mils DFT
 3. RD Muracryl at 2.5 to 3.0 mils DFT
 4. International Intercryl 530 at 2.5 to 3.0 mils DFT
 5. S-W Waterborne Dry Fall at 3.0 to 4.5 mils DFT
5. Mechanical and Electrical Work (Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork: Same as specified for other interior metals, hereinabove.

END OF SECTION

SECTION 220001

PLUMBING

(Filed Sub-Bid Required)

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SECTION 220001

PLUMBING

(Filed Sub-Bid Required)

PART 1 – GENERAL

1.1 FIELD SUB-BID

- A. Plumbing work is stipulated as a Filed Sub-Bid under Part D, Item 2 of the Form for General Bid.
- B. All sub-bids shall be submitted on the Form for Sub-Bid furnished by the Awarding Authority, as required by section 44F of Chapter 149 of the Massachusetts General Laws, as amended.
- C. Sub-Bids must be filed with the Awarding Authority in a sealed envelope, before twelve o'clock (noon), Boston time, on the date stipulated in the Advertisement.
- D. Specific information relating to the sub-bidders is set forth in the Contract Documents, under the heading "Notice to All Bidders, Including Sub-Bidders" and the attention of sub-bidders is directed thereto.
- E. Sub Sub-Bid Requirements: None under this Section.
 - F. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings: P0.01, P1.11,P1.12,P1.13,P1.14.
- G. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section. The listing of Contract Drawings above does not limit Filed Subcontractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing Title Sheet, as modified by Addenda.

1.2 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.3 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Gas, natural throughout the entire project area connecting to each and every piece of equipment requiring gas.
 - 2. Alterations, additions and/or removal of existing plumbing systems and fixtures within the renovated area in order to conform to new space requirements.
 - 3. Valves.
 - 4. Hangers, supports and attachments.
 - 5. Core drilling for the Work of this Section.
 - 6. Coordination drawings and record drawings and similar requirements.

7. Hoisting Equipment: The Plumbing subcontractor shall furnish, install and maintain in safe and adequate condition all mechanical hoisting equipment, operating personnel and rigging that is necessary for the proper execution of the Work of this Section. The requirements of Section 015000 - Temporary Facilities and Controls, in relation to hoisting and rigging being the responsibility of the General Contractor, do not apply to the work of this Section.
 8. Staging, Planking and Scaffolding: The Plumbing subcontractor shall furnish, install and maintain in safe and adequate condition, all staging, planking and scaffolding up to eight feet in height that is necessary for the proper execution of the Work in this Section. The General Contractor shall furnish, install and maintain in safe and adequate condition all staging, planking and scaffolding above eight feet in height.
- B. Alternates: Not Applicable.
- C. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections: Not Applicable.
- D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 078413 – PENETRATION FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.
 2. Section 230001 – HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC piping and ductwork and for condensate drains.
- E. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
- F. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- G. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

1.02 SUBMITTALS

- A. Comply with requirements specified in Section 013300 – SUBMITTAL REQUIREMENTS.
- B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
1. Piping.

2. Fittings, unions, flanges, and couplings.

1.03 DEFINITIONS

- A. As used in this Section, "provide" means "furnish and install" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."

1.04 CONTRACT DOCUMENTS

- A. Listing of Drawings does not limit responsibility of determining full extent of work required by Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.
- B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.
- D. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.
- E. Information and components shown on riser diagrams but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.
- F. Data that may be furnished electronically by the Designer (on computer tape, diskette, or otherwise) is diagrammatic. Such electronically furnished information is subject to the same limitation of precision as heretofore described. If furnished, such data is for convenience and generalized reference, and shall not substitute for Designer's sealed or stamped construction documents.

1.05 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents

shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.

- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by Paragraph (D) above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.06 MODIFICATIONS IN LAYOUT

- A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.
- B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.
- C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.
- D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.

- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.07 SITE VISIT

- A. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

1.08 EXISTING CONDITIONS AND PREPARATORY WORK

- A. Before starting work in a particular area of the project, visit site and examine conditions under which work must be performed including preparatory work done under other Sections or Contracts or by User Agency. Report conditions that might affect work adversely in writing through Contractor to Designer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.09 CODES, STANDARDS, AUTHORITIES AND PERMITS

- A. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site. Materials and equipment shall be manufactured, installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:
 - 1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
 - 2. American Gas Association (AGA).
 - 3. National Fire Protection Association (NFPA).
 - 4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
 - 5. Occupational Safety and Health Act (OSHA).
 - 6.
 - 7. Underwriters' Laboratories (UL).
 - 8. American National Standards Institute (ANSI).
 - 9. Compressed Gas Association (CGA).
 - 10. Canadian Standards Association (CSA).
 - 11. United States Pharmacopeia (USP).
- B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.
- C. When requirements cited in this Specification conflict with each other or with Contract Documents, most stringent shall govern work. Designer may relax this requirement

when such relaxation does not violate ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.

- D. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents:
1. American National Standards Institute (ANSI).
 2. American Society of Mechanical Engineers (ASME).
 3. National Electric Manufacturers Association (NEMA).
 4. American Society for Testing and Materials (ASTM).
 5. American Water Works Association (AWWA).
 6. Thermal Insulation Manufacturers Association (TIMA).
 7. Institute of Electrical and Electronics Engineers (IEEE).
 8. Insulated Cable Engineers Association (ICEA).
 9. National Fire Protection Association (NFPA).

1.10 GUARANTEE AND 24 HOUR SERVICE

- A. Guarantee Work of this Section in writing for one year following the date of beneficial occupancy by the User Agency. If the equipment is used for ventilation, temporary heat, etc. prior to initial beneficial occupancy by the User Agency, the bid price shall include an extended period of warranty covering the one-year of occupancy, starting from the initial date of beneficial occupancy by the User Agency. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.
- B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.
- C. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.
- D. Provide 24 hour service beginning on the date the project is first beneficially occupied by the User Agency, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to QCC. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and Owners Project Manager approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
- E. Submit copies of equipment and material warranties to Designer before final payment.
- F. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.

- G. This Paragraph shall not be interpreted to limit Owners Project Manager's rights under applicable codes and laws and under this Contract.
- H. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph.
- I. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work nor beneficial use by User Agency, and shall not institute guarantee period.
- J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owners Project Manager's satisfaction, advise Designer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will suggest course of action.

1.11 RECORD DRAWINGS

- A. Comply with requirements specified in Section 017700 – CONTRACT CLOSEOUT.
- B. All "main air" pneumatic control piping routing locations must be shown on the record drawings.
- C. Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.12 BULLETINS, MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

- A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as-built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:
 - 1. Directions for and sequence of operation of each item of Plumbing systems. Sequence shall list valves, switches, and other devices used to start, stop and control system. Include approved valve directory showing each valve number, location of each valve, and equipment or fixture controlled by valve.
 - 2. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
 - 3. Lubrication instructions detailing type of lubricant, amount, and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.

- B. Furnish three copies of manuals to Designer for approval and distribution to Owners Project Manager. Deliver manuals no less than 30 days prior to acceptance of equipment to permit User Agency's personnel to become familiar with equipment and operation prior to acceptance.
- C. Provide framed and glazed charts as follows: mount as directed by Designer.
 - 1. Flow diagrams from first part of manual as described above.
 - 2. Valve directory.
 - 3. Lubrication chart from third part of manual.
- D. Operating instructions: Upon completion of installation or when Owners Project Manager accepts portions of building and equipment for operational use, instruct User Agency's operating personnel in any or all parts of various systems. Instructions shall be performed by factory trained personnel. User Agency shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.
- E. Each contractor shall be responsible for his work and equipment until finally inspected, tested, and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug during construction to prevent entry of obstructing material.
- F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.

1.13 COORDINATION DRAWINGS

- A. Refer to Section 013100 – PROJECT MANAGEMENT AND COORDINATION for coordination drawing requirements.
- B. Coordination Drawings include but are not necessarily limited to:
 - 1. Structure.
 - 2. Partition/room layout.
 - 3. Ceiling tile and grid.
 - 4. Light fixtures.
 - 5. Access panels.
 - 6. Sheet metal, heating coils, boxes, grilles, diffusers, etc.
 - 7. All heating piping and valves.
 - 8. Smoke and fire dampers.
 - 9. Soil, waste and vent piping.
 - 10. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
 - 11. Above ceiling miscellaneous metal.

1.14 STARTERS AND CONTROLLERS

- A. Motor driven equipment supplied under this Section shall be operated by starters furnished and installed under Section 260001 – ELECTRICAL WORK, except for starters integral with Plumbing equipment which shall be provided by the Plumbing Contractor. Starters provided by the Plumbing Contractor shall meet all requirements of the Electrical Sections of the Specifications.
- B. The Plumbing Contractor shall provide nameplates on all starters furnished under Section 260001 – ELECTRICAL WORK and this Section for use on equipment provided under this Section.
- C. All motor controls shall conform to NEMA Standards and be the product of a single manufacturer; Arrow-Hart and Hageman, Allen-Brady, or Square D; or equal.
- D. Auxiliary contacts shall be included in all starters provided under Section 260001, ELECTRICAL WORK, for integrally mounted starters. Auxiliary contacts shall be provided for all interlocking wiring.
- E. Starters shall normally be provided with two sets of contactors; one set normally open and one set normally closed. Interface shall be provided for all starters and other devices as noted herein.
- F. Starters and contactors factory-built into the control panel of packaged equipment will be considered as an integral part of the package.
- G. All starters, disconnects and control devices shall be clearly labeled with black lamacoid plates with engraved white letters, to indicate User Agency's identification number, function and the equipment which they control. Submit list of labels for review.
- H. Enclosures for starters included with packaged equipment shall be NEMA Class 1 where installed indoors, NEMA Class IV, where installed outdoors, mechanical rooms or where indicated as weatherproof.

1.15 ELECTRICAL MOTOR CHARACTERISTICS

- A. Electrical motors shall conform to the requirements of IEEE, NEMA, U.L., K.E.C., F.M. and NFPA suitable for load conditions, squirrel cage, 1.15 service factor, drip proof, 1750 rpm unless otherwise noted, with inherent overload protection and pressure lubricated bearings with grease fittings. Provide totally enclosed fan cooled motors as noted within the specifications. Refer to ELECTRICAL CHARACTERISTICS REQUIREMENTS of the Electrical Section of the Specifications.
- B. Motors below 2 HP shall be 120V - 1 phase. Motors that are 1/2 HP and greater shall be in accordance with the electrical requirements. (Verify with Elec.) Motors that are 40 HP and larger shall have part wound motors that are compatible with starters. All other motors shall be designed for use with across-the-line starters. Motors to be provided with overload protection. Provide two speed motors where noted on the drawings. Phase protection shall be provided on motors 1/2 HP and larger.

- C. Motor leads shall be permanently identified and supplied with connectors.
- D. The minimum requirement for three phase motors shall be NEMA Design B, Class B, insulated for a maximum 40 degree C (104 degrees F.) ambient.
- E. Select motors for quiet, continuous operation to suit loads which may be imposed by equipment. Recognize that motor horsepower specified and scheduled are minimum sizes. If larger motors, starters, power wiring and additional control wiring are included in bid.
- F. Submit an accurate schedule of all motors. Include for each motor, the HP, RPM, nameplate, voltage current, equipment served, location, electrical characteristics and identification number.

PART 2 - PRODUCTS

2.01 PIPE FITTINGS AND JOINTS

- A. General
 - 1. Pipe and fittings shall conform to the latest ANSI, ASTM, NFPA and AWWA Standards including latest amendments.
 - 2. Each length of pipe, each pipe fitting, trap, material and/or device used in the respective system shall have cast, stamped or indelibly marked on it, the maker's name or mark, weight and quality of the product when such marking is required by the approved standard that applies.
 - 3. Piping and fittings shall be factory coated.
- B. Gas Piping
 - 1. General
 - a. 2 inches and smaller shall be scheduled 40 steel, threaded with wrought or cast fittings.
 - b. 2-1/2 inches and larger shall be scheduled 40 steel, flanged.
 - c. Provide galvanized malleable iron unions, with bronze facings conforming to ANSI B16.39 for sizes 2 inch and smaller.
 - d. Provide steel flanges conforming to ANSI B16.5, standard or welding neck pattern.
- C. Unions and Flanges
 - 1. Unless otherwise specified herein, unions for copper and brass piping two inches and smaller in diameter shall be 125 SWP, bronze body brass ground joint type. Those larger than two inches in diameter shall be 150 SWP flat faced cast brass flanges conforming to ANSI Standard B16.24.
 - 2. Where brass flanges and ferrous flanges are to be joined, ferrous flanges shall be full faced.

3. Mating of ferrous and non-ferrous flanges shall be separated with rubber gaskets (1/16 inch minimum thickness) and teflon liners installed in the bolt holes. Bolt holes shall be drilled to receive the teflon lines. Physical contact between the ferrous and non-ferrous flanges including the bolts, nuts and washers will not be permitted.
4. Unions for ferrous piping shall be of the same material as the piping to which they connect.

2.02 VALVES

A. General

1. Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed.
2. Valve Design: Rising stem or rising outside screw and yoke stems.
3. Non-rising stem valves may be used where headroom prevents full extension of rising stems.
4. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.
5. Sizes: Same size as upstream pipe, unless otherwise indicated.
6. Operators: Provide the following special operator features:
 - a. Handwheels, fastened to valve stem, for valves other than quarter turn.
 - b. Lever handles, on quarter turn valves 6 inch and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.
 - c. Chain-wheel operators, for valves 2-1/2 inch and larger, install 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
 - d. Gear drive operators, on quarter turn valves 8 inch and larger.
7. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
8. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
9. End Connections: As indicated in the valve specifications.
 - a. Threads: Comply with ANSI B1.20.1.
 - b. Flanges: Comply with ANSI B15.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
 - c. Solder-Joint: Comply with ANSI B16.18.
 - 1) Caution: Where soldered end connections are used, use solder having a melting point below 840 deg. F for gate, globe, and check valves; below 421 deg F for ball valves.

B. Valves in the interior domestic water piping systems (cold water, hot water) system:

1. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, Nibco, Watts, Apollo, or equal.
2. Ball Valves
 - a. Ball Valves, 1 Inch and Smaller: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; two piece construction; with bronze

- body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service.
- b. Ball Valves, 1-1/4 Inch to 2 Inch: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; 3 piece construction; with bronze body conforming to ASTM B 62, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl covered steel handle. Provide solder ends for domestic hot and cold water service.
3. Butterfly Valves
 - a. Butterfly Valves, 2-1/2 Inch and Larger: MSS SP-67; rated at 200 psi; cast iron body conforming to ASTM A 126, Class B. Provide valves with field replaceable EPDM sleeve, nickel-plated ductile iron disc (except aluminum bronze disc for valves installed in condenser water piping), stainless steel stem, and EPDM O ring stem seals. Provide lever operators with locks for sizes 2 through 6 inches and gear operators with position indicator for sizes 8 through 24 inches. Provide lug or wafer type as indicated. Drill and tap valves on dead end service or requiring additional body strength.
 4. Check Valves
 - a. Swing Check Valves, 2 Inch and Smaller: MSS SP-80; Class 125, cast bronze body and cap conforming to ASTM B 62; with horizontal swing, Y pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line. Provide Class 150 valves meeting the above specifications, with threaded end connections, where system pressure requires or where Class 125 valves are not available.
 - b. Swing Check Valves, 2-1/2 Inch and Larger: MSS SP-71; Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, and bronze disc or cast iron disc with bronze disc ring; and flanged ends. Provide valves capable of being refitted while the valve remains in the line.
 - c. Gauge Cocks: Gauge cocks shall be T-head or lever-handle ground key type with washer and screw, constructed of polished ASTM B 62 bronze, 125 psi. End connections shall suit the service, with or without union and nipple.

2.03 HANGERS AND ACCESSORIES

A. General

1. Provide pipe stands, supports, hangers and other supporting appliances as necessary to support work required by Contract Documents. All components of the hanger support system shall comply with the standards set forth in MSS-SP58 and MSS-SP69 (Manufacturers Standardization Society) latest publication.

2. Manufacturers: Subject to compliance with requirements, provide hangers and supports of Carpenter and Patterson, Inc, ITT Grinnel Corp., Elecon Metal Products or equal.

B. Secure vertical piping to building construction to prevent sagging or swinging.

C. Space hangers for horizontal piping as follows:

Pipe Size	Rod Diameter	Maximum Spacing
2 and 3/4 A	3/8"	6 ft.-0"
1" and 1-1/4"	3/8"	8 ft.-0"
1-1/2 and 2"	3/8"	10 ft.-0"
2-1/2 and 3"	2"	10 ft.-0"
4 and 5"	5/8"	12 ft.-0"
6"	3/4"	12 ft.-0"
8" and over	7/8"	12 ft.-0"

D. Friction clamps shall be equal to Figures 126 and copper plated when in direct contact with copper or brass piping.

E. Hangers for uncovered (uninsulated) copper or brass piping 2" and smaller shall be Carpenter & Patterson Figure 1ACT steel, copper plated band type.

F. Hangers for uncovered (uninsulated) steel or cast iron piping 2" and smaller shall be Carpenter & Patterson Figure 1A steel band type.

G. Hangers for uncovered (uninsulated) steel or cast iron piping 2-1/2" and larger shall be Carpenter & Patterson Figure 100 steel clevis type.

H. Hangers for all insulated piping shall be Carpenter & Patterson Figure 100 steel clevis type with insulation shield specified below.

I. Hangers for uncovered (uninsulated) copper or brass piping 2-1/2" and larger shall be factory applied copper plated steel clevis hangers, Carpenter & Patterson Fig. 100 CT. Rods and nuts used with these hangers shall also be factory applied copper plated.

J. Where three or more pipes are running parallel to each other, factory fabricated gang type hangers with pipe saddle clips, or rollers may be used in lieu of the hereinbefore specified Clevis hangers. These hangers shall be sized to provide for insulation protectors as hereinafter specified. Pipe saddle clips shall be not less than 16 gauge metal and shall be copper when installed with uninsulated copper piping. Where pipe rollers are provided for uninsulated copper or brass piping, insulation protectors shall be

provided at each set of rollers and filled with a section of heavy density fiberglass pipe covering specified hereinafter. (Refer to insulation of this specification.) Fig. 342 sized to suit loading with hanger rods and nuts.

- K. Extension type split ring hangers with wall plates shall be equal to Carpenter & Patterson Figures 81, 81-CT, 90-CT and 85, 85-CT plates for iron, steel and copper.
- L. Hanger rods for other installations shall be sized in accordance with the recommended load capacities of ASTM Specifications Designation A-107, latest amendment.
- M. Insulation protectors (shields) for horizontal piping shall be constructed of galvanized steel formed to a 180 degree arc and 12 inches long, equal to Carpenter & Patterson Figure 265P, 18 gauge type H for hangers 5 inches in size and smaller, 16 gauge for hangers larger than 5 inches in size.
- N. Exposed rods, clamps and hangers shall be electro-galvanized coated.
- O. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.
- P. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.
- Q. All no-hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as required by code and recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310-78.

2.04 INSERTS AND ESCUTCHEONS

- A. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.
- B. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

2.05 ACCESS PANELS

- A. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches .
- B. 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:
 - 1. J. L. Industries, Inc, Inc.

2. Karp Associates, Inc.
 3. Larsen's Manufacturing Company.
 4. Milcor Inc.
 5. Nystrom, Inc.
- C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces as applicable.
 2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
 3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
 4. Hinges: Continuous piano.
 5. Lock: Cylinder, keyed alike.
- D. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces as applicable.
 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch .
 5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
 6. Hinges: Continuous piano.
 7. Automatic Closer: Spring type.
 8. Lock: Self-latching device with cylinder lock, keyed alike.

2.06 FIRE STOPPING

- A. Work of Section 078413 – PENETRATION FIRESTOPPING.

2.07 SLEEVES AND PENETRATIONS

- A. Piping penetrations through fire rated construction shall comply with a listed fire rated assembly as detailed in the UL Fire Resistance Directory. Pipe sleeves through floors, exterior walls and fire-rated construction shall be galvanized Schedule 40 steel pipe. Pipe sleeves through non-fire-rated partitions shall be 26 gauge-galvanized steel.
1. Sleeves Through Exterior Below Grade Foundation Walls and Floor Slabs on Grade: Provide galvanized Schedule 40 steel with continuous weld slop on welding flange water stop. Provide waterproof caulking assembly by Link-Seal or Sure-Seal.
 2. In areas where pipe is exposed, install sleeves flush with the finish floor, except in mechanical rooms, and janitor's closets extend sleeves at least 4 inches above finish floor.
 3. Annular Space Requirements: Sleeves shall be sized to provide a total clearance of approximately 1 inch around pipe including insulation cover. Annular space around fire rated through penetrations assemblies shall be in compliance with the Listed Assembly.
 4. Packing between the pipe and sleeve in fire rated construction shall be a combination of listed insulation and fireproof caulk.

- B. Where piping passes below grade beams and footings, provide a ductile iron sleeve three sizes larger than the pipe being served. Sleeve shall be a minimum of six feet in length.

2.08 VALVE TAGS

- A. Upon completion of piping installation work provide valve tags on all valves installed under the work of the mechanical sections. Valve tags shall be at least 1-1/2 inch diameter brass or engraved plastic with 1/4 inch high lettering for service designation over 2 inch high consecutively numbered valve identification. Engraved valve tags shall be color coded as specified for piping identification. Coordinate valve tag numbers with the User Agency's facility management program. Provide service designation prefix as scheduled:

1.	Plumbing Systems:	Prefix:
a.	Domestic Cold Water	CW
b.	Domestic Hot Water	HW
c.	Normally Closed	NC

- B. Valve tags on plumbing systems may be engraved laminated plastic tags color-coded to match the pipe identification marks.
- C. Identify Non-Potable water outlets with permanently attached yellow color-coded marker or 4-inch high triangle tag reading: Water Unsafe.

2.09 PIPING IDENTIFICATION

- A. Piping: Provide clip-on color-coded piping identification markers on mechanical piping systems specified in Section 230001 – HEATING, VENTILATING AND AIR CONDITIONING. Provide matching flow arrows to indicate direction of flow. Markers shall be equal to Seton Setmark. Pipe marking for outside diameters of 6 inches or greater may be springs or metal bands secured to the corners at each end of the semi-rigid plastic marker to hold each end of the marker firmly against the pipe.

- 1. Color coding and size of legend letters shall comply with the standards of ANSI A13.1.
- 2. Provide markers with legend letters sized in compliance with the following schedule:

Outside Diameter (Over Insulation)	Size of Letters:	Length of Color Code:
1-1/4 inch and smaller	2 inch	8 inches
1-1/2 inch to 2 inch inches	3/4 inch	8

- | | | | |
|--|--------------------------|------------|-----------|
| | 2-1/2 inches to 6 inches | 1-1/4 inch | 12 inches |
| | 8 inch | 2-1/2 inch | 24 inches |
| | 10 inch and larger | 3-1/2 inch | 32 inches |
3. Plumbing Systems: Provide color-coded identification markers in compliance with the following schedule with contrasting legend letters.

Service	Identification	Color Code
Gas	GAS	Yellow with Black

2.10 IDENTIFICATION OF EQUIPMENT

- A. Equipment: Stencil equipment such as pumps, water heaters, and tanks with the name of the equipment and equipment number. Coordinate equipment numbers with the User Agency's maintenance personnel. Stencils shall be at least 6 inches high and of a color to provide a contrast with the equipment finish.
- B. Equipment markings shall be prominently displayed on each normally visible side of equipment. Equipment intended for installation in finished area shall have markings located behind normally used access panels mounted so as to be readily found. Equipment identification designations shall be taken from equipment schedules as indicated on the Drawings.

PART 3 – EXECUTION

3.01 IDENTIFICATION

- A. All equipment and each length of pipe fitting, trap, fixture, control panel, starter and device used in the systems shall have a permanently attached nameplate or be cast, stamped or indelibly marked with the manufacturer's mark or name, the weight, type and class. The nameplates shall be kept clean and readable at all times.
- B. Painting
1. Finished field painting of designated plumbing works shall be performed under Section 099000 – PAINTING AND COATING.
 2. All unpainted, non-insulated, non-galvanized, ferrous metal surfaces only of conduits, pipes, equipment, hangers, supports, accessories, and so forth, furnished and installed by this Subcontractor, shall be painted as follows by this Subcontractor. Concealed and Exposed - one prime coat of metal primer. Underground - two coats of black asphaltum paint.
 3. Surfaces which will be inaccessible for painting after installation shall be painted before installation.
 4. Surfaces to be painted shall be thoroughly cleaned of all scale, rust, dirt, oil and other foreign matter and shall be completely dry before applying paint.
 5. After installation, equipment and accessories with factory primed or finished surfaces shall be cleaned, and bare or marred spots refinished and/or touched

up by each Subcontractor with the same type paint and process as applied at the factory.

6. Nameplates on all equipment shall be cleaned and left free of paint.
7. Materials and workmanship shall be equal to the requirements specified under Section 099000 – PAINTING AND COATING.

3.02 SYSTEMS

A. Cold and Hot Water Piping (Including Non-Potable Cold Water)

1. Vacuum breakers shall be installed on supplies to each piece of equipment to prevent back-siphonage.
2. Branch lines from water service or main lines shall be taken off the top or bottom of main, using such crossover fittings as may be required by structural or installation conditions. All water service pipes, fittings, and valves shall be kept a sufficient distance from other work to permit finished covering to be not less than 1.5 inches from other work and not less than 1.5 inches between coverings on the different services.
3. Provide shock absorbers at special equipment, tops of the risers, at each individual or each group of fixtures.
4. Water piping shall be run parallel and graded evenly to the drainage points. There shall be a 2 inch drain valve provided for each low point in the piping so that all parts of each water system can be drawn off.
5. Provide suitable means of thermal expansion for the hot water piping using swing joints, expansion loops and long-turn offsets as required to suit building conditions.
6. Piping connections to equipment shall be provided with unions or flanges to permit convenient disassembly for alterations and repairs.
7. No piping shall be installed in a manner to permit back-siphonage or any flow of water from sanitary or drainage systems into the water systems or their distribution piping under any conditions.
8. Air gaps, open end of funnel drains, and approved vacuum breaking devices shall be provided as specified or as indicated on the Drawings. Piping to hose-end faucets or hose-end fittings, or any fixtures where water supply outlet is below the fixture overflow rim shall have vacuum breakers.
9. Where flanges are installed in the water systems, red rubber gaskets shall be installed between each pair of flanges.
10. Heating or bending of copper tubing to eliminate the installation of fittings will not be permitted.
11. Piping systems shall be kept clean during all phases of work. Open ends of incomplete piping shall be protected to prevent the entrance of foreign materials.
12. Pipe shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing.
13. Provide copper-plated friction clamps on the old water supplies to each water closet and urinal flushometer. Friction clamp shall be firmly clamped to the pipe and shall be firmly attached to the adjacent wall structure.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation

1. Install piping approximately as shown on the drawings and as directed during installation by the Designer's representative.
2. Piping shall be installed as straight and direct as possible, forming right angles or parallel lines with building walls, other piping and be neatly spaced. Installed tight to the building structure and in alignment with other exposed piping.
3. The horizontal runs of piping, except where concealed in partitions, shall be installed as high as possible.
4. Piping or other apparatus shall not be installed in such a manner as to interfere with the full swing of the doors and access to other equipment.
5. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the Drawings shall be followed as closely as possible.
6. It shall be possible to drain the water from all sections of each cold and hot water piping system. Pitch piping back to drain valves.
7. Screwed piping of brass or chrome-plated brass shall be made up with special care to avoid marring or damaging pipe and fitting exterior and interior surfaces.
8. Small fittings shall be taper thread. Lampwick, cord, wool or any other similar material shall not be used to make up thread joints.
9. Screwed pipe and copper tubing shall be reamed smooth before installation.
10. All exposed piping in connection with fixtures shall be chrome plated. Where chrome-plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when work is completed.
11. Reducing fittings, unless otherwise approved in special cases, shall be provided in making reduction in size of pipe. Bushings will not be allowed unless specifically approved.
12. Remove and replace with new materials, any copper or brass piping (chrome-plated or unplated) showing visible tool marks.
13. Vertical risers shall be firmly supported by riser clamps, properly installed to relieve all weight from the fittings.
14. Any piece of pipe six inches or less in length shall be considered as a nipple.
15. All water service piping shall be kept a sufficient distance from other work to permit finished covering to be not less than 1.5 inches from other work and not less than 1.5 inches between the coverings (insulation) on the different services.

B. Hanger Installation

1. All piping shall be supported from the building structure by means of approved hangers and supports, to maintain proper grading and pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
 - a. Maximum spacing of hangers on soil pipe shall be five feet and hangers shall be provided at all changes in direction. Vertical hanger rods to

support piping from the structure or supplementary steel shall not exceed four feet in total length. Where pipe support assemblies exceed four feet in total length vertically, this Contractor shall provide factory fabricated channels and all associated accessories.

- b. Friction clamps shall be installed at the base of the plumbing risers and at each floor (above or below floor slabs). Friction clamps installed above floor slabs shall not be supported from or rest on floor sleeves.
- c. Provide hangers at a maximum distance of two feet from all changes in direction (horizontal and vertical) and on both sides of concentrated loads independent of the piping.
- d. Hangers, in general, for all horizontal piping shall be Clevis type hangers. These hangers shall be sized to fit the outside diameter of the pipe insulation and insulation protectors (sheet metal shields) specified herein. For sprinkler/stand-pipe systems, hanger shall be approved black malleable iron, heavy duty pattern having two (2) parts bolted together.
- e. All vertical drops and runouts including insulated pipes shall be supported by split ring hangers with extension rods and wall plates. These hangers shall be copper-plated when used on uncovered copper tubing. Supports on insulated vertical piping shall be sized to fit the outside diameter of the pipe insulation with 360 degrees insulation protector.
- f. Provide on each horizontal insulated lines, pipe covering protectors (shields) at each hanger. Each protector shall be sized to fit the outside diameter of the pipe insulation.
- g. Retaining straps shall be provided with all beam clamps.
- h. All supplementary steel, including factory fabricated channels, associated accessories, and 12 inch long sheet metal shields, throughout the project for this Section of the Specifications, both suspended and floor mounted, shall be provided by this Contractor and shall be subject to the approval of the Engineer.
- i. Hangers shall not pierce the insulation on any insulated pipe.
- j. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.
- k. Remove all rust from the ferrous hanger equipment (hangers, rods, and bolts) and apply one coat of red lead immediately after erection.
- l. Piping at all equipment and each control valve shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping at equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.
- m. All piping shall be independently supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.
- n. Installation of hangers which permit wide lateral motions of any pipe will not be acceptable.
- o. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.

- p. All no-hub cast iron pipe 6 inches or larger in diameter shall be braced to prevent horizontal movement as recommended by the Cast Iron Soil Pipe Institute by using braces, blocking or rodding as illustrated in the CISPI Handbook, Vol. II, Specification Section 310.

C. Installation of Sleeves, Inserts and Escutcheons

1. Sleeves in floors shall be set one (1) inch above the finished floor surface or as indicated on the Architectural Drawings.
2. Sleeves through interior masonry or non-masonry walls or partitions shall be set flush with the finished surfaces of the wall or partition.
3. Field drilling for inserts required for work under this Section of the Specifications shall be provided by this Contractor.
4. Each interior wall or partition sleeve shall be packed with foam or glass wool to within one inch of each face of wall, and the remaining portion of each end of sleeve to be sealed with U.L. listed fire proof caulking compound equal to the rating of the partition.
5. Escutcheons shall be installed around all exposed insulated or bare pipe, except water closet starts or bends passing through a finished floor, wall or ceiling. Escutcheons shall fit snugly around the bare pipe or insulated pipe.

D. Valve Installation

1. Location of Valves: There shall be valves where indicated on the drawings and where specified as follows:
 - a. At building service entrances, foot of all supply risers, branches to groups of fixtures, branches to separate fixtures, equipment, wall hydrants, hose bibbs, connections to other systems and sectionalizing points in each system.
 - b. Each fixture supply shall have a separate angle stop or straight stop finished like the pipe it services.
 - c. Each piece of equipment shall have isolation valves for each service connected.
 - d. At the foot of each riser, on the inlet and outlet side of control valves.
 - e. At the low points of each water system including trapped sections, provide a tee with 2 inch branch and valve with 3/4 inch hose end adapter and attached chain with cap.
 - f. Valves shall be located to permit easy operation, replacement or repair.

3.04 INSPECTION AND TESTS

A. General

1. All labor, materials, instruments, devices and power required for testing shall be provided by the Plumbing Subcontractor. The tests shall be performed in the presence and to the satisfaction of the Designer and Owners Project Manager and such other parties as may have legal jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing and approval by the Local Plumbing Inspector and Owners Project Manager.

2. Where portions of piping systems are to be covered or concealed before completion of the project, those portions shall be tested separately in the manner specified herein for the respective entire system.
3. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of Owners Project Manager shall be retested in part or in whole as directed.
4. The Authority retains the right to request a recheck or resetting of any pump or instrument by the Plumbing Subcontractor during the guarantee period at no additional cost to the Contract or QCC.
5. Repair, or if directed by Designer or Owners Project Manager, replace any defective work with new work without extra cost to QCC. Repeat tests as directed, until the work is proven to meet the requirements specified herein.
6. Restore to its finished condition any work, provided by other Contractors, damaged or disturbed by tests. The Plumbing Subcontractor shall engage the original Contractor to do the work of restoration to the damaged or disturbed work.
7. The fixtures shall be tested for stability of support and satisfactory operation. The piping shall be tested when directed by the Designer, Local Plumbing Inspector Owners Project Manager for stability of support.
8. After the fixtures are set and connected, and the piping systems to same have been tested, the Plumbing Subcontractor shall turn water on to the fixtures, equipment, fill the traps, etc., and the proper operation of all items shall be demonstrated by him in the presence of and to the satisfaction of the Designer, Owners Project Manager, Plumbing Inspector, or their designated representative.
9. Caulking of screwed joints or holes in piping will not be acceptable.
10. The Plumbing Subcontractor shall notify the Designer, Owners Project Manager and all inspectors having jurisdiction, a minimum of 48 hours in advance of making any required tests so that arrangements may be made for their presence to witness scheduled tests.

B. Specific

1. Gas Piping Systems:
 - a. Before the installation of fixtures, equipment and insulation, each system including vents shall have all necessary openings plugged to permit the entire system to be tested in accordance with the State Plumbing Code. Each system shall hold this water without a drop in water level. Test to be witnessed by Local Plumbing Inspector and Owners Project Manager.
 - b. Where a portion of the system is to be tested, the test shall be accomplished with a vertical stack ten feet above the highest horizontal line to be tested may be installed, and filled with water to maintain sufficient pressure. A pump may be used to supply the required pressure. The pressure shall be maintained for a minimum of four hours for sufficient time to permit inspection of all joints.

3.05 COMMISSIONING OF EQUIPMENT AND SYSTEMS

- A. The Designer will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Designer.
- B. Prior to the Designer's checking a part of the installation or the entire installation, this contractor shall submit a letter signed by an officer of this contracting company or an officer of the general contractor stating that:
 - 1. he is a an officer of the company,
 - 2. he has personally inspected the installation to be checked,
 - 3. the date of his inspection,
 - 4. the installation is complete and tested and ready to be inspected by the Designer, and that all required test reports have been submitted.
- C. This contractor shall arrange that an officer of this contracting company or of the general contractor, as well as Owners Project Manager, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this contractor shall submit a letter signed by the officer stating that:
 - 1. he is an officer of the company,
 - 2. he has personally witnessed the test (give the name of the test),
 - 3. the date of testing,
 - 4. the results of testing, as compared to specified performance,
 - 5. listing the name, title, and company affiliation of all those witnessing the test.

3.06 SPECIAL RESPONSIBILITIES

- A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.
 - 1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
 - 2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
 - 3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
 - 4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections or by User Agency.
 - 5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Designer.
 - 6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor-mounted vibrating and rotating equipment provided under this Section.

7. Notify Designer of location and extent of existing piping, ductwork and equipment that interferes with new construction. In coordination with and with approval of Designer, relocate piping, ductwork and equipment to permit new work to be provided as required by Contract Documents. Remove non-functioning and abandoned piping, ductwork and equipment as directed by Designer. Dispose of or store items as requested by Designer.

B. Installation Only Items

1. Where this contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for their unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
 - a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
 - b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.
2. This Contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this contractor will be considered only if presented in writing within one week of their date of delivery. Unless such claims have been submitted this contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.

- C. Maintenance of equipment and systems: Maintain HVAC, Plumbing and Fire Protection equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.

- D. Use of premises: Use of premises shall be restricted as directed by Designer and as required below.

1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Designer and as specified under CLEANING paragraph.
2. It shall be this trade's responsibility to store his materials in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.

3. Do not interfere with function of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Designer as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Designer to provide minimal interference with normal operation. Obtain Designer's approval of the method proposed for minimizing service interruption.

E. Surveys and measurements:

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Designer in writing and do not proceed with work until written instructions have been issued by Designer.

3.07 MATERIALS AND WORKMANSHIP

- A. Work shall be neat and rectilinear. Piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage before completion.
- B. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.
- C. References to manufacturers and to catalog designation, are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.
- D. Finish of materials, components and equipment shall be as approved by Designer and shall be resistant to corrosion and weather as necessary.
- E. QCC will not be responsible for material and equipment before testing and acceptance.

3.08 CONTINUITY OF SERVICES

- A. Do not interrupt existing services without Owners Project Manager's approval.
- B. Schedule interruptions in advance, according to Owners Project Manager's instructions. Submit, in writing, with request for interruption, methods proposed to minimize length of interruption.
- C. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on User Agency's operations.

3.09 ANCHORS AND INSERTS

- A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.
- B. Provide anchors as necessary for attachment of equipment supports and hangars.

3.10 INSTALLATION OF EQUIPMENT

- A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Designer and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.
- B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof-mounted equipment shall be installed and supported on structural steel provided under other Sections.
- C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.
- D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.
- E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.
- F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.
- G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warranty. Report in writing to Designer, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.

3.11 PAINTING

- A. Equipment shall have shop coat of non-lead gray paint. Hangers and supports shall have one coat of non-lead red primer. Machinery such as pumps, fans, etc., shall be stenciled with equipment name. Stencil shall be at least 6" high for large equipment, 2" high for small equipment. Finish painting, including painting of various piping and duct systems, shall be done under other Sections.

- B. Note requirement for Designer's approval invoked under Part 3 article, MATERIALS AND WORKMANSHIP regarding finish of material and equipment which are visible or subject to corrosive or atmospheric conditions.

3.12 CLEANING

- A. Piping
 - 1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
- B. Equipment
 - 1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.13 SYSTEM SHUTDOWNS

- A. Coordination shutdowns of existing systems with the QCC are Project Manager and submit a written request at least ten working days in advance. Minimize system shut downs as much as possible. Submit a list of all effected areas, the proposed work to be performed, and the expected length of the shut-down including time for retesting.
- B. Provide temporary services to maintain active system during extended shut-downs as required for demolition and construction phasing.

3.14 CORE DRILLING

- A. Do not core new concrete structure without written approval from the Structural Engineer.
- B. Perform all core drilling required for the proper installation of this Section. Locate all required openings and prior to coring. Coordinate the opening with the other Trades and obtain approval from the Structural Engineer.
- C. Thoroughly investigate the existing conditions in the vicinity of the required opening prior to cutting. Take care so as not to disturb the existing building systems. Damage to existing conditions incurred during core drilling shall be corrected to Owners Project Manager's satisfaction with no additional expense to the QCC.

END OF SECTION

SECTION 230000 - HVAC (FILED

SUB-BID REQUIRED)

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PART 1 – GENERAL

1.1 FILED SUB-BID

- A. HVAC work is stipulated as a Filed Sub-Bid under Part D, Item 2 of the Form for General Bid.
- B. All sub-bids shall be submitted on the Form for Sub-Bid furnished by the Awarding Authority, as required by section 44F of Chapter 149 of the Massachusetts General Laws, as amended.
- C. Sub-Bids must be filed with the Awarding Authority in a sealed envelope, before twelve o'clock (noon), Boston time, on the date stipulated in the Advertisement.
- D. Specific information relating to the sub-bidders is set forth in the Contract Documents, under the heading "Notice to All Bidders, Including Sub-Bidders" and the attention of sub-bidders is directed thereto.
- E. Sub Sub-Bid Requirements: None under this Section.
 - 1. TESTING ADJUSTING AND BALANCING
 - 2. SHEETMETAL
 - 3. INSULATION
 - 4. AUTOMATIC TEMPERATURE CONTROLS
- F. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:
 - 1.. H0.01,H1.01,H1.01,H1.03,H1.04,H1.05,H2.11,H2.12,H2.13,H2.14,H2.15,H2.11,H3,12 ,H3.13,H3.14,H3.15,H4.11,H4.12,H4.13,H4.14,H4.15,H5.01,H5.02,H6.01,H7.01, H7.02.
 - 2. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section. The listing of Contract Drawings above does not limit Filed Subcontractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing Title Sheet, as modified by Addenda.

1.2 GENERLA PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.3 WORK INCLUDED

- A. The work included in the Heating, Ventilating and Air Conditioning specifications consists of furnishing all materials, labor, equipment and appurtenances to perform, and leave in satisfactory operating condition the new systems.
- B. It is the intention of these specifications to call for finished work, fully tested and ready for continuous operation. Any apparatus, equipment, material or work not mentioned in the specifications or incidental accessories to make the work completely balanced, perfect in all respects and ready for operation, even if not specifically mentioned, shall be furnished, tested, adjusted or balanced at no additional expense to the Owner. Should there appear to be discrepancies or questions of intent, the Sub-Contractors shall refer the matter to the Architect for decision before start of any related work.
- C. The drawings, where applicable, show equipment and device locations, required flows at those devices and locations of new thermostats and controls. In addition, the drawings identify routing for new ducting and new piping as well as their respective sizes. The HVAC Sub-Contractor shall field verify that the routing is free of obstacles and other

trades work.

- D. The Contractor shall confer and cooperate with all other building trades so that all work will be installed in the proper relationship to all other work.
- E. The Contractor shall provide and maintain all staging, scaffolding, ladders and hoisting equipment required for the execution of the work by his personnel. Remove same from premises when no longer required.
- F. The work under this section shall include furnishing all motor starters and components for installation by the electrical sub-contractor.
- G. The work under this section shall include all labor, materials, accessories, services, and equipment necessary to furnish and install:
 - 1. All pipe guides, supports, hangers and anchors.
 - 2. All vibration isolation equipment, bases and devices.
 - a. Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflection. Deflections shall be as noted on the equipment schedule or those required to provide 98% isolation efficiency.
 - 3. All insulation of all parts of the condensate system including all pipe, fittings, pipe flanges, valves, expansion joints, vents, drains, etc. which may be subject to thermal losses adverse to the operation of the various systems, or which may sweat.
 - 4. All insulation of all parts of the supply and outdoor air intake duct systems including all duct, fittings, flanges, dampers, etc. which may be subject to thermal losses adverse to the operation of the various systems, or which may sweat.
 - 5. All refrigeration piping and insulation.
 - 6. All filters and air cleaning equipment.
 - 7. All ductwork.
 - 8. All duct fittings.
 - 9. All ductwork accessories.
 - 10. All motorized dampers.
 - 11. All air inlet and outlet equipment.
 - 12. All louvers.
 - 13. All fan coil units.
 - 14. All ductless split system air conditioning systems.
 - 15. All variable refrigerant volume heat pump systems.
 - 16. All energy recovery units.
 - 17. All package HVAC units.
 - 18. All fans.
 - 19. All electric heating devices.
 - 20. All control system components to provide a fully operational automatic temperature control system.
 - 21. All Testing, Adjusting and Balancing of all components of the HVAC systems.
- H. The following work is not included in this section and will be provided under other sections, except as specified herein:
 - 1. Electrical wiring for all equipment
 - 2. Structural supports necessary to distribute loading equipment to roof or floor
 - 3. Temporary light, power, water, heat, gas and sanitary facilities for use during

- construction and testing. Refer to Division I, General Conditions.
4. Excavation and backfill
 5. Concrete work including concrete housekeeping pads and blocks for vibrating and rotating equipment, and cast-in-place manholes
 6. Flashing roof and wall penetrations
 7. Painting
- I. The Contractor shall coordinate their scope of work with requirements as noted on architectural drawings.

1.4 DEFINITIONS

- A. Where used in this specification, the following definitions shall apply:
1. "Test" means to determine quantitative performance of HVAC equipment.
 2. "Adjust" means to produce the specified fluid at the terminal equipment.
 3. "Balance" means to establish the specified air flows within the distribution systems.
 4. "Procedure" is the standardized approach and execution of sequence of work operations to yield reproducible results.
 5. Report forms shall be test data sheets arranged for collection of test data in logical order for submission and review. These data shall form the permanent record which shall be used as the basis for any future testing, adjusting, and balancing required.
 6. The testing, adjusting, and balancing Sub-Contractor shall hereinafter be referred to as "The TAB Sub-Contractor", who shall be a subcontractor to the HVAC sub-contractor.
 7. Where specifications refer to SMACNA standards, the SMACNA standards shall be considered as the minimum acceptable. If local codes require other standards than the local codes shall govern.
 8. "Work" shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.
 9. "Concealed" shall mean hidden from sight in chases, furred in spaces, shafts, embedded in construction, in a crawl space, and above hung ceilings.
 10. "Exposed" shall mean not installed underground or concealed as defined above.
 11. "Furnish" shall mean purchase and deliver to the project site, complete with every necessary appearance and support.
 12. "Install" shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting, proper location and operation in the project.
 13. "Provide" shall mean furnish and install.
 14. "Piping" shall mean, in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.
 15. "Furnished by others" shall mean materials or equipment purchased and set in place under other sections of the general contract and connected to the systems covered by this section of the specifications by the HVAC Sub-Contractor.
 16. "Coordinate" shall mean all work provided under this section of the specification shall be in compliance with work of other trades.
 17. "HVAC Subcontractor," "Subcontractor," or "Installing Contractor" shall be the Subcontractor responsible for the work of this section of the specifications, and shall be responsible for coordination of the work of this section.
 18. "ATC" shall mean Automatic Temperature Controls, and shall be interchangeable with Building Automation System.

19. "Owner's Representative" shall be the party responsible to make decisions regarding all contractual obligations in reference to the Scope of Work for the Owner.
20. The "Sheetmetal Sub-Contractor" shall herein after be responsible for the sheetmetal work of this section.
21. The "TAB Sub-Contractor" shall herein after be responsible for the balancing work of this section.
22. The "ATC Sub-Contractor" shall herein after be responsible for the ATC work of this section.

1.5 GENERAL REQUIREMENTS FOR SHEETMETAL DUCTWORK

- A. Where specifications refer to SMACNA standards, the SMACNA standards shall be considered as the minimum acceptable. If local codes require other standards, then the local codes shall govern.
- B. All ductwork indicated on the drawings is to be considered as shown in schematic. Changes in duct size to clear obstructions or to accommodate field conditions caused by the work of other trades, not shown on the drawings, shall be made, where necessary to conform to the actual space conditions and shall be provided at no additional cost to the owner. No duct changes shall be fabricated until after written approval of the modified or original shop drawings by the Engineer.
- C. It shall be the Sub-Contractor's responsibility to field verify all dimensions and to coordinate his work with the work of other trades. Locations and placement of ducts shall be coordinated with the work of the other trades before any ductwork is fabricated or installed.
- D. Each duct system shall be constructed for the specific duct pressures and/or pressure classifications shown on or required by the contract drawings. Where no specific duct pressure or class designation is shown the SMACNA 2" W.G. pressure class is the basis for compliance with these standards.

1.6 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

1.7 RELATED WORK IN OTHER SECTIONS

- A. The following is a list of related work to be performed or furnished by other trades under other sections of the specifications:
 1. Electrical power wiring.
 2. Grillage and miscellaneous structural elements to fully support and/or suspend the HVAC equipment.
 3. Access Panels (other than duct access panels) – filed sub-bid contractor to purchase and provide to General Contractor. General Contractor to install.

4. Firestopping by General Contractor.

1.8 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

- A. Furnish line voltage fan speed control switches for installation by the Electrical Subcontractor.
- B. All motors for HVAC equipment shall be furnished and set under this section. All motor starters shall be provided by the HVAC Sub-Contractor for installation by the Electrical Contractor. All controls shall be provided and installed by the ATC Sub-Contractor. All control wiring shall be provided and installed by the ATC Sub-Contractor in accordance with the applicable provisions of the electrical specifications.

1.9 INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

- A. Section 260000 – Duct mounted smoke detectors.

1.10 CODES AND STANDARDS

- A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, and any 'other Codes-and Regulations having jurisdiction including but not limited to:
 - 1. All applicable NFPA Standards
 - 2. State and Local Building, Mechanical, Electrical and Energy Codes
 - 3. American Society of Mechanical Engineers (ASME)
 - 4. American Society of Testing and Materials (ASTM)
 - 5. American National Standards Institute (ANSI)
 - 6. Underwriters Laboratories, Inc. (UL)
 - 7. Occupational Safety and Health Administration (OSHA)
 - 8. Any other 'local codes' or authorities having jurisdiction
- B. Heating, pumping, sheetmetal and refrigeration systems shall be installed by contractors and personnel appropriately licensed in the State (Installing Contractor). Electrical and automatic temperature control wiring shall be done in accordance with applicable codes by licensed electricians.
- C. All equipment shall meet the more efficient requirements:
 - 1. As shown on bid documents, or
 - 2. Minimum efficiencies stated in the governing Energy Code.
- E. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:
 - 1. Air Conditioning and Refrigeration Institute (ARI)
 - 2. Air Diffusion Council (ADC)
 - 3. Air Movement and Control Association (AMCA)
 - 4. American Boiler Manufacturers Association (ABMA)
 - 5. American National Standards Institute (ANSI)
 - 6. American Petroleum Institute (API)
 - 7. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE)
 - 8. American Society of Mechanical Engineers (ASME)

9. American Society of Testing and Materials (ASTM)
 10. American Welding Society, Inc. (AWS)
 11. Associated Air Balance Council (AABC)
 12. Copper Development Association (CDA)
 13. Expansion Joint Manufacturers Association, Inc. (EJMA)
 14. Factory Mutual System (FM)
 15. Institute of Electrical and Electronics Engineers (IEEE)
 16. Manufacturer's Standardization Society of the Valve & Fitting Industry (MSS)
 17. National Electric Manufacturers-Association (NEMA)
 18. National Environmental Balancing Bureau (NEBS)
 19. The Hydronics Institute (HI)
- F. The date of the code or standard is that in effect at the Bid Date.
 - G. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by the Owner's Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner's Representative, and without extra cost to the owner. If work is covered before inspection and approval, the HVAC Sub-Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.11 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

- A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by the HVAC Sub- Contractor or his/her Sub-subcontractors, without additional expense to the Owner.
- B. The drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the site and shall have the approval of the Architect-before being installed. The HVAC Sub-Contractor and related Sub-Contractors shall follow Drawings, including shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Architect before proceeding with the installation. The HVAC Sub-Contractor and related Sub-Contractors shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
- C. Sizes of ducts and pipes and routing are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge.

1.12 SURVEY AND MEASUREMENTS

- A. Base all required measurements, horizontal and vertical, from referenced points established with the Owner's Representative and be responsible for correctly laying out the Work required under this Section of the Specification.

- B. In the event of discrepancy between actual measurements and those indicated, notify the Owner's Representative in writing and do not proceed with the related work until instructions have been issued.

1.13 COORDINATION WITH OTHER BUILDING TRADES

- A. Structural members and building openings for HVAC equipment, ducts, piping, fans, etc., for use by the HVAC Sub-Contractor shown on the architectural or structural plans are the coordination responsibility of the HVAC Sub-Contractor.
- B. The work shall be so performed that the progress of the entire building construction, including all other trades, shall not be delayed or interfered with. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.
- C. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other sections. Any conflicts shall be referred immediately to the Owner's Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner's Representative's satisfaction at no expense to the Owner.
- D. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section may interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.
- E. Keep fully informed as to the shape, size and position of all openings required for all apparatus, piping, ductwork, etc., and give information in advance to build openings into the work. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the Owner's Representative for the proper setting of same.
- F. All distribution systems which require pitch or slope such as condensate drains and water piping shall have the right of way over those which do not.
- G. The HVAC Sub-Contractor shall, with the approval of the Architect and without extra charge, make reasonable modifications in his work as required by normal structural interferences, or by interference with work of other trades, or for proper execution of the work.
- H. Keep fully informed as to the size, shape and location of all openings required for the work of this Section and give full information to all Contractors and Sub-Contractors and the Owner's Representative.

1.14 GENERAL REQUIREMENTS

- A. Nameplates
 - 1. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, type or style, model number, catalog number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.
- B. Maintenance Information

1. Systems and equipment which require periodic maintenance to maintain efficient operation shall be furnished with complete necessary maintenance information. Required routine maintenance actions, as specified by the manufacturer, shall be stated clearly and incorporated on a readily accessible label on the equipment. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product.
- C. Equipment Guards
1. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts so located that any person may come in close proximity thereto shall be completely enclosed or guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service.

1.15 MATERIAL AND EQUIPMENT STANDARDS

- A. Where equipment or materials are specified with the name of a manufacturer, such specifications shall be deemed to be used for the purpose of establishing a standard for that particular item. No equipment or material shall be used unless previously approved by the Owner's Representative.
- B. Substitutions (approved equals) may be offered for review provided the material, equipment or process offered for consideration, is equal in every respect to that indicated or specified. In order for requests for substitution to be considered, all must be submitted for pre-approval of manufacturer within 30 days of award of contract. All requests must be accompanied by a list of minimum 5-year-old successful installations of similar scope (with owner contact and phone number), complete specifications together with drawings or samples to properly appraise the materials, equipment or process. Allow 30 days for Owner's Representative's review.
- C. If a substitution of materials or equipment in whole or in part is made, this HVAC Sub-Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.
- D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.16 SHOP DRAWINGS AND SUBMITTALS

- A. Conform to the requirements of Division I, General Conditions, for schedule and form of all submittals unless specifically noted otherwise in this section. Coordinate this submittal with submittals for all other finishes. Shop drawings and design layouts shall be prepared by licensed installing contractors and shall note the name(s), license number(s) and license expiration date(s) of the contractor(s) installing the heating, piping, and refrigeration systems.
- B. Provide any additional submittals not noted below that may be required by NStar and Massachusetts Clean Energy Center Commercial Scale Air Source Heat Pump Program for confirmation of conformance with the requirements of the Advanced Buildings program.
- C. Definitions:
 1. Shop drawings are information prepared by the HVAC Sub-Contractor to illustrate portions of the work in more detail than indicated in the Contract Documents.
 2. Acceptable Manufacturers: The mechanical design for each product is based on the

single manufacturer listed in the schedule or shown on the drawings. In Part 2 of the specifications certain Alternate Manufacturers are listed as being acceptable. In addition, the MATERIAL AND EQUIPMENT STANDARDS paragraph potentially allows for substitutions as being acceptable. These are acceptable only if, as a minimum, they:

- a. Meet all performance criteria listed in the schedules and outlined in the specifications. For example, to be acceptable, a fan coil unit must deliver equal CFM against equal external static pressure (with the allowed pressure drop of dirty filters) using equal or less horsepower as the fan coil unit listed in the schedules.
 - b. Fit within the available space it was designed for, including space for maintenance and component removal, with no modification to either the space or the product. Clearances to walls, ceilings, and other equipment will be at least equal to those shown on the design drawings. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Engineer has determined that the manufacturer's products will fit within the available space this determination is solely the responsibility of the HVAC Sub-Contractor.
 - c. For rooftop mounted equipment and equipment mounted in areas where structural matters are a concern, the products must have a weight no greater than the product listed in the schedules or specifications.
 - d. Products must adhere to all architectural considerations including, but not limited to: being of the same color as the product scheduled or specified, fitting within the architectural enclosures and details, and for diffusers – being the same size and of the same physical appearance as scheduled or specified products.
- D. Submittal Procedures, Format and Requirements
1. Shop drawings showing manufacturer's product data shall contain detailed dimensional drawings (minimum 1/4" scale) including plans and sections (where physical clearance could be an issue). Provide larger scale details as necessary. Sheet metal drawings shall show elements of Architect's reflected ceiling plan, exposed ductwork, walls and partitions (highlighting fire walls and smoke partitions), diffusers, registers, grilles, fire and smoke dampers, sleeves and other aspects of construction as necessary for coordination.
 2. Submit accurate and complete description of materials of construction, manufacturer's published performance characteristics, sizes, weights, capacity ratings (performance data, alone, is not acceptable), electrical requirements, starting characteristics, wiring diagrams, and acoustical performance for complete assemblies. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.
 3. If shop drawings showing connection details are not submitted and connections are found to be installed incorrectly, the HVAC Sub-Contractor shall reinstall them within the original contract price.
 4. Provide complete data for all auxiliary services and utilities required by submitted equipment. This shall include power, condenser or cooling water, condensate and compressed air requirements and points of connection.
 5. Provide a complete description of all controls and instrumentation required, including

- electrical power connection drawing for all components and interconnection wiring to starters, detailed information on starters, control diagrams, termination diagrams, and all control interfaces with a central control system.
6. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment.
 7. The Owner's Representative shall approve all materials before commitment for materials is made.
- E. Product Data: Submit complete manufacturer's product description and technical information including:
1. Piping and Fittings (all systems, types and joining methods)
 2. Pipe Hangers and Supports
 3. Fan Coil units
 4. Variable refrigerant volume heat pump systems
 5. Ductless split system air conditioners
 6. Energy recovery units
 7. Gas fired make up air units
 8. Identification
 9. Sleeves
 10. Valves and Accessories (all types)
 11. Pipe Insulation
 12. Electric Motors and Starters
 13. Refrigerant and Oil
 14. Equipment Nameplates
 15. Vibration Isolation equipment
 16. Complete ductwork, equipment layout, and shop drawings, construction details and construction standards
 17. Motorized dampers
 18. Duct Insulation
 19. Diffusers, Registers and Grilles
 20. Air Filters
 21. Fans
 22. Electric heating devices
 23. Operating and maintenance instructions and manuals
 24. HVAC Control Systems
 25. Color selection charts and samples for equipment and systems in finished areas.
- F. Submit shop drawings and product data grouped to include complete submittals of related systems, products and accessories in an individual (combined) submittal with a screwed together post binding system. Three-ring binders shall not be accepted.
- G. Deviations
1. Proposed deviations from the Contract Documents, other than substitutions, shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Architect.
 2. Without letters flagging the deviation, it is possible that the Architect may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Owner's Representative, the Seller shall hold the Architect, his consultants and the Owner harmless for any and all adverse consequences resulting

- from the deviations being implemented. This shall apply regardless of whether the Architect has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.
3. Approval of proposed deviations, if any, will be made at discretion of Architect.
- H. Schedule: Incorporate shop drawing review period into construction schedule so that work is not delayed. The HVAC Sub-Contractor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project schedule: Allow at least 10 working days, exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted with the exception that 20 working days, exclusive of transmittal time are required for the following:
1. HVAC temperature control submittals
 2. HVAC balancing report
 3. Coordination drawings
 4. If more than five shop drawings of a single trade are received in one calendar week.
- I. Responsibility
1. Intent of submittal review is to check for capacity, rating and certain construction features. HVAC Sub-Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes' or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other sections. Work shall comply with approved submittals to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer's noting of some errors while overlooking others will not excuse the HVAC Sub-Contractor from proceeding in error. Contract Documents requirements are not limited, waived nor superseded in any way by review.
 2. Inform sub-contractors, manufacturer's suppliers, etc. Of scope and limited nature of review process and enforce compliance with contract documents.
- J. In the event that the HVAC Sub-Contractor fails to provide Shop Drawings for any of the products specified herein:
1. The HVAC Sub-Contractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.
 2. If the HVAC Sub-Contractor furnishes and installs material and/or equipment that are not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment. He shall also be responsible for the replacement of this material and/or equipment with material and/or equipment that is in complete accordance with these Specifications, at the direction of the Owner's Representative.
 3. Removal and replacement of materials and/or equipment that are not in complete compliance with these Specifications shall be done at no extra cost to the Owner.
 4. Removal and replacement of materials and/or equipment that are not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.
- J. Mark dimensions and values in units to match those specified.
- K. Submit Material Safety Data Sheets (MSD) on each applicable product with submittal.

1.17 APPROVAL OF SUBMITTALS

- A. The Architect will return signed and approved or disapproved submittals to the Contractor within the time allowed by other sections of the specifications. Any submittals, which have been disapproved, shall be resubmitted by the Contractor within the time allowed by other sections of the specifications.

1.18 RESPONSIBILITY FOR ACCURACY OF SUBMITTALS

- A. The HVAC Sub-Contractor is solely responsible for the accuracy and completeness of all submittals, regardless of corrections made in, or approval given to, such submittals. When the Architect makes comments and returns the submittals, it is incumbent upon the HVAC Sub-Contractor to thoroughly review the comments and notations made by the Architect. When, in the HVAC Sub-Contractor's opinion, the notes made by the Architect are in error or in conflict with other elements of the system, it is incumbent upon the HVAC Sub-Contractor to promptly notify the Architect of his findings or opinion along with substantiating data, in writing to preclude misunderstanding or expensive alterations caused by a review error or oversight. The submittals are intended to provide detailed documentation of the system design and its components. The responsibility for their correctness rests completely, totally and solely with the HVAC Sub-Contractor.

1.19 SUBSTITUTION OF MATERIALS OR EQUIPMENT

- A. Named manufacturers for any equipment specified herein or identified on the drawings are identified for the purpose of identifying quality standards, performance information or type. Any substitution as "or equal" shall be considered. The Architect shall determine whether or not the offered equipment is equal to the specified. Where dimensional constraints exist the HVAC Sub-Contractor shall be responsible for any extra costs associated with extra work required to make the "or equal" equipment fit.
- B. After approval of the submittals, substitution of materials or equipment of makes other than those specifically named in the submittals will be approved by the Architect only if the material or equipment proposed for substitution is equal to and/or superior to material or equipment named in construction, efficiency, utility and accuracy; and further that the material or equipment named in the submittals cannot be delivered to the job in proper sequence due to conditions beyond the control of the HVAC Sub-Contractor.
- C. To receive consideration, requests for substitution shall be accompanied by documentary proof of equality or difference of both proposed equipment to be substituted and equipment named in the approved submittals. Substitution by the HVAC Sub-Contractor of other materials or processes than those named in the approved submittals shall be done only upon written authorization from the Architect.
- D. Substitutions of fans shall have noise ratings that are equal to or better than the specified units. The substituted equipment shall be provided with the sound power data for both the substituted and specified equipment graphed on an NC curve chart for review with the submittal.

1.20 FEES AND PERMITS

- A. The HVAC Sub-Contractor and related Sub-Contractors shall apply for, obtain and pay for all required permits, inspections, certificates, and incidental charges required for proper performance of the work, and shall furnish the Architect with copies of applications and

all correspondence.

1.21 OPERATION AND MAINTENANCE INSTRUCTIONS

- A. Commence preparation of the Operating and Maintenance manuals immediately upon receipt of “Approved” or “Approved as Noted” shop drawings and submit each section within one month. The last submission shall be no later than two months prior to the date of Substantial Completion of the project.
- B. The manual shall consist of (3) sets of manuals and include (3) CDs, which shall contain the scanned content of the entire manual. The manual shall be submitted for review prior to creation of the CDs.
- C. The manual shall contain the following:
 - 1. Operations Manual
 - a. Systems description including all-relevant information needed for day-to-day operations and management including start-up and shut-down instructions.
 - b. Wiring diagrams, schematics, logic diagrams and sequence of operations that accurately depict the controls system.
 - c. Depiction of each interface screen where programmable logic and visual displays are provided. Descriptors shall be provided to define displayed data; alarms, etc.
 - d. A single sheet (for ease of removal) of all access codes and passwords necessary to access all levels of control and programming.
 - e. Trouble shooting guide defining common alarms/problems with possible cause and effect.
 - 2. Maintenance Manual
 - a. Define all maintenance activities required to ensure system operation within manufacturers’ specified parameters. Provide table of all required activities plotted vs. interval with adequate fill-in-space for “activity completion date” and “comments”. Where multiple instrument readings are required, provide data sheet formatted to accommodate activity.
 - b. Provide as part of each package, lubricating charts indicating equipment tag number, location, equipment service, greasing and lubricating requirements, lubricants, and intervals.
 - c. Provide as part of each package, a valve and system chart that corresponds to the valve tags. Provide directions for normal positions and positions for equipment failure modes.
 - d. The HVAC Sub-Contractor shall furnish spare-parts data for each different item of equipment furnished. The data shall include a complete list of: parts and supplies, with current unit prices, lead time, and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified herein after to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 360 days at the particular installation. The foregoing shall not relieve the HVAC Sub-Contractor of any responsibilities under the guarantees specified herein.
 - e. Provide copy of all warranty information with associated date of substantial completion (commencement of warranty) and end date of coverage. Define all components/subsystems specifically included and excluded.

- D. Provide O&M manuals for each of the following as a minimum:
 - 1. Electric Motors and Starters
 - 2. Energy recovery units
 - 3. Gas fired make up air units
 - 4. Fan coil units
 - 5. Variable refrigerant volume systems
 - 6. Vibration Isolation
 - 7. Air Filters
 - 8. Fans
 - 9. Electric heating devices
 - 10. ATC Systems

1.22 COORDINATION DRAWINGS

- A. Before materials are purchased or work is begun, prepare coordination drawings showing the size and location of equipment, piping, etc., in the manner described under SUPPLEMENTARY CONDITIONS.
- B. Coordination drawings are for the General Contractor's and the Architect's use during construction and shall not be construed as replacing any shop, "as-built" or record drawings required elsewhere in these contract documents.
- C. The HVAC Sub-Contractor shall be responsible for initiating the preparation of the coordination drawings and passing the drawings to other trades through the General Contractor for addition of the other trade's work.
- D. Before work progresses, and in addition to the shop drawings listed herein, submit coordination drawings at a suitable scale of not less than 3/8 inches equals one foot.
- E. Provide one reproducible and one blueprint of the drawings.
- F. Provide composite systems coordination drawings showing HVAC duct, piping and equipment, plumbing pipe and equipment and electrical conduit, cable, lights and other equipment.
- G. All trades are required to coordinate with the other trades and revise the composite systems coordination drawings to eliminate interferences.

1.23 RECORD DRAWINGS

- A. The Architect will furnish the HVAC Sub-Contractor electronic files of the mechanical drawings as issued for this contract in AutoCAD 2015 format. The HVAC Sub-Contractor shall change these drawings to indicate accurately and neatly the actual duct routing and duct sizes. At the end of the project the HVAC Sub-Contractor shall deliver to the Architect one set of reproducible As-built drawings and a Compact Disk with As-Built drawing files in AutoCAD 2015 format for the owner's permanent record.
- B. The "As-Built" drawings shall show the actual location of all air volume dampers and actuators.

1.24 WARRANTIES

- A. Submit manufacturers standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the HVAC Sub-Contractor and related Sub-Contractors may have by law or by provisions of the Contract Documents.
- B. Guarantee that all elements of each system meet the specified performance

requirements as set forth herein or as indicated on the Drawings.

- C. Upon receipt of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.25 SYSTEM TRAINING

- A. The HVAC Sub-Contractor shall provide on-site training on the mechanical systems for the building. The amount of time provided shall be as indicated below. Training times and dates shall be coordinated with the Owner. The training shall be videotaped by the HVAC Sub-Contractor with a copy provided to the Owner with the O&M Manuals.
- B. Training shall include but not be limited to:
 - 1. A general overview of the operation of each system (provide 8 hours)
 - 2. The Variable refrigerant volume heat pump system and controls (provide 2 hours)
 - 3. The energy recovery ventilators and fresh air system (provide 4 hours)
 - 4. The kitchen exhaust and make up air system (provide 2 hours)
 - 5. The ATC system. (provide 4 hours)
 - 6. Any other topics related to the mechanical system as requested by the Owner.
- C. The variable refrigerant volume heat pump system shall include training by a manufacturer approved representative, a minimum of four hours and 16 hours of standard structured off-site training at the manufacturer's or manufacturer's representative's facility. The training shall be as is typically provided for Contractor certification in maintenance of the systems and shall include any information requested by the Owner.
- D. Training time is exclusive of travel time, breaks, lunch, etc.

1.26 TESTING AND CHECKOUT

- A. After completion of any work installed under this section, field tests shall be performed and checkout of the system accomplished. The tests shall include functional and operational tests where applicable on all equipment under all conditions that exist at the time. All defects of new equipment disclosed by tests shall be rectified without additional cost to the Owner. The installing Sub-Contractor shall be required to make all adjustments to equipment and accessory material to provide a thoroughly functional installation. All new equipment shall be installed, tested and checked before the HVAC Sub-Contractor tests, adjusts or balances the system as a whole.
- B. The TAB Sub-Contractor shall perform the services of testing, adjusting, and balancing of the heating, ventilating, and air conditioning systems. The TAB Sub-Contractor shall check and adjust all HVAC systems to produce the performance specified by the construction documents and to achieve total system balance. The Tab Sub-Contractor shall be certified by an appropriate air balance council, such as the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or other approved agency, or shall employ technicians certified by an appropriate air balance council, such as the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or other approved agency to perform the air balancing procedures. All work done by the TAB Sub-Contractor shall be by qualified technicians under the direct supervision of a certified test and balance engineer. The TAB Sub-Contractor shall furnish all certified engineers, instruments, and provide personnel, trained and experienced, to test, adjust and balance all airside systems and related

- automatic temperature control systems, and shall submit system performance reports.
- C. The work to be performed by the TAB Sub-Contractor shall include, but not be limited to:
 - 1. Adjustment of the airside performance of the HVAC systems to provide design air quantities and temperatures.
 - 2. Electrical measurement.
 - 3. The balance of all air and water distribution systems.
 - 4. Verification of performance of all equipment, thermostats and controls.
 - D. The TAB Sub-Contractor shall accomplish these objectives by:
 - 1. Checking installations for conformity to design.
 - 2. Measurement and establishment of the air distribution quantities of the systems as required to meet the design specifications.
 - 3. Adjusting and balancing all HVAC systems to meet the design specifications.
 - 4. Recording and reporting all results in a format approved by the Architect.
 - E. All work shall be completed in accordance with the standards set by AABC, NEBB, or other approved testing and balancing organizations. In general, all equipment, materials, and balancing procedures shall comply with all applicable standards.
 - F. The qualifications of the TAB Sub-Contractor shall include current membership in AABC, or certification by NEBB, or the TAB Sub-Contractor shall submit proof to the satisfaction of the Architect that the TAB Sub-Contractor meets the certification requirements of the AABC or NEBB.
 - G. Submit for approval samples, shop drawings, certificates, literature and data with information sufficient to evaluate the submission in compliance with the requirements of a completely adjusted and balanced system. Testing, adjusting and balancing procedures shall equal those of approved submittals and shall not be completed or incorporated in the work until approved. Approval or acceptance of submittal items will not preclude rejection of these items upon discovery of defects in them prior to final acceptance of completed work.
 - H. All work shall be performed in compliance with the approved submittals. The work schedule shall include the proposed procedures, proposed forms, diagrams, and reports for documenting the work. The TAB Sub-Contractor shall establish an approved systematic and uniform set of procedures in compliance with the AABC or NEBB.
 - I. All test instruments shall be accurately calibrated and maintained in good working order. If requested, calibration tests of equipment to be used shall be performed in the presence of the Owner.
 - J. The equipment and systems shall be tested, adjusted and balanced in accordance with the approved submittals. Wherever the TAB Sub-Contractor deviates from the original procedures, he shall be responsible for the new procedures being a better method. Any changes made necessary by the above shall be brought to the attention of the Architect and shall be subject to his approval prior to making such change. The procedural changes shall not be made a basis for additional compensation by the Owner, but shall be made at the TAB Sub-Contractor's own expense.

1.27 DUCT CLEANLINESS

- A. The Sheetmetal Sub-Contractor shall be responsible for the requirements of this section.
- B. All ductwork shall be protected from dust and debris with plastic wrap on each end until installation. After installation, unfinished ends or grilles shall be covered until the system is in operation.

- C. Any equipment connected to ductwork shall not be operated until construction progress has reached a point where minimal dust is being created as determined by the Architect.
- D. If any equipment is to be used prior to the point of minimal dust creation, all return or exhaust intakes shall be covered with filter material and all filters in the equipment shall be changed on a daily basis.

1.28 IDENTIFICATION OF MECHANICAL SERVICES

- A. Identify all ductwork with plastic adhesive labels identifying the system, supply or return, and flow arrows.
- B. Identify all piping with plastic adhesive labels identifying the system, supply or return, and flow arrows.
- C. Labels shall be located at all changes of direction, every 20 feet on long pipe runs, at valves and close to points of branch takeoffs.
- D. Identify all energy recovery units, make up air units, controls, starters and similar equipment with white lamacoid engraved nameplates with black letters. Firmly secure with self tapping screws.
- E. Energy Recovery Unit identification shall be 6"x4" and shall indicate the following information:
 - 1. Tag number
 - 2. Design exhaust and supply airflow
 - 3. Design exhaust and supply external static pressure
 - 4. Gas furnace input and output
 - 5. Motor horsepower
 - 6. Power (volts/phase/hz)
- F. Fan coil unit identification shall be 3"x2" and shall include the following information:
 - 1. Tag number
 - 2. Nominal cooling capacity (Btu/h)
 - 3. Nominal heating capacity (Btu/)
 - 4. Rooms Served (ducted units only)
 - 5. Power (volts/phase/hz)
- G. Variable refrigerant volume heat pump system identification shall be 3"x2" and shall include the following information:
 - 1. Tag number
 - 2. Nominal cooling capacity (Btu/h)
 - 3. Nominal heating capacity (Btu/h)
 - 4. Power (volts/phase/hz)
- H. Package HVAC units identification shall be 6"x4" and shall include the following information:
 - 1. Tag number
 - 2. Nominal heating capacity (input and output)
 - 3. Design airflow (CFM)
 - 4. Design airside external static pressure (IN WC)
 - 5. Power (volts/phase/hz)
- i. Fan identification shall be 3"x2" and shall include the following information:
 - 1. Design airflow (CFM)
 - 2. Design external static pressure (IN WC)
 - 3. Motor horsepower

4. Power (volts/phase/hz)

1.29 DELIVERY, STORAGE AND HANDLING

- A. No materials shall be delivered or stored on site until Shop Drawings have been approved.
- B. All manufactured material shall be delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.
- C. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.
- D. Inspect all equipment and materials, upon receipt at the job site, for damage and conformance to approved shop drawings.

1.30 PROTECTION OF WORK AND PROPERTY

- A. The HVAC Sub-Contractor shall be responsible for the care and protection of all work included under this section until the completion and final acceptance of this Contract.
- B. Protect all equipment and materials from damage from all causes; including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.
- C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this section and make good damage thus caused.
- D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.31 SAFETY PRECAUTIONS

- A. Life safety and accident prevention shall be a primary consideration. Comply with all of the safety requirements of the owner and OSHA throughout the entire construction period of the project.

1.32 SCHEDULE

- A. Construct work in sequence under provisions of Division I and as coordinated with the Owner's Representative.

1.33 ACCESSIBILITY

- A. All work provided under this section of the specification shall be installed so that parts requiring periodic inspection, maintenance and repair are readily accessible. Work of this trade shall not infringe upon clearances required by equipment of other trades, especially code required clearances to electrical gear. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Owner's Representative.

1.34 ELECTRICAL WORK

- A. All electrical apparatus and controls furnished, and the installation thereof, as a part of the HVAC work, equipment and controls shall conform to applicable requirements under specification 260000 – Electrical.

1.35 PROJECT CLOSEOUT

- A. Certificates of Approval
 - 1. Upon completion of all work, provide certificates of inspections from the following equipment manufacturers stating that the authorized factory representatives have inspected and tested the operation of their respective equipment and found the equipment to be in satisfactory operating condition and installed per the manufacturers installation instructions and requirements.
 - a. Automatic Temperature Controls
 - b. Variable Refrigerant Volume Heat Pump System
- B. Construction Observations by the Engineer
 - 1. The engineer is contracted to make progress site visits during construction, one substantial completion (punch list) site visit for determining substantial completion and one Final inspection visit to determine if all work is complete.
 - 2. The HVAC Sub-Contractor and the General Contractor are required to inspect their own work and make any corrections to the work to comply with the specifications and the contract documents. It is not the responsibility of the engineer to develop lists of incomplete work items.
 - 3. Progress Site Visits
 - a. The purpose of the progress site visit by the engineer is to observe if the work is proceeding in accordance with the contract documents.
 - b. The engineer will prepare a field report which will note in general the work completed since the last observation visit, work found not to be in accordance with the contract documents and work not corrected since the previous observation visit.
- C. Substantial Completion
 - 1. When the HVAC Sub-Contractor considers the work under this Section is substantially complete, the HVAC Sub-Contractor shall submit written notice, through the General Contractor, with a detailed list of items remaining to be completed or corrected and a schedule of when each remaining work item will be completed. Should the engineer determine the list of remaining work does not constitute substantial completion, the engineer will notify the Architect and/or Owner and he will not make a substantial completion site visit.
 - 2. The following items shall be submitted and approved by the Engineer prior to the written request for substantial completion inspection:
 - a. Certification of successful operation of all systems
 - b. Training of the Owner's personnel in the operation of the systems.
 - c. Record Drawings in accordance with the contract specifications.
 - d. Operation and Maintenance Manuals
 - e. Testing reports
 - f. Balancing reports
 - g. Manufacturers certificates of approvals
 - h. Emergency contact list for reporting of malfunctioning equipment during the warrantee period
 - i. Contractors project completion certificate in accordance with the building code requirements.
 - 3. Should the engineer, during the substantial completion visit, observe that the work is

- substantially complete, s/he will provide a written listing of the observed deficiencies referred herein as the Punch List. The Punch List will provide for a place for the HVAC Sub-Contractor and general contractor to sign off and date each item and individually indicating that the observed deficiency item has been corrected.
4. Should the Engineer, during the substantial completion site visit, observe that the work is not substantially complete, s/he will provide a written list of the major deficiencies and a reason for the work not being considered substantially complete.
 5. If the work is found not to be substantially complete, then the engineer shall be reimbursed for his time to re-observe the work. A re-observation fee shall be charged to the Subcontractor through the Contractual Agreement for any further observations by the engineer.
 6. The HVAC Sub-Contractor shall remedy all deficiencies listed in the punch list within the time frame required by the contract.
- D. Engineers Construction Completion Certificate
1. Where required by the applicable code, the Engineers Construction Completion Certification will be issued by the Engineer when all life safety and health related issues are complete, all required functional tests are complete and all reports are complete. The following is a minimum listing of the required systems to be tested with reports generated indicating they are complete and ready for use:
 - a. Air Balancing
 - b. Variable Refrigerant Volume Heat Pump System Start up
 - c. Pipe Pressure Test
 - d. Ductwork
 - e. Kitchen Exhaust Duct
 2. There shall be NO outstanding items identified on the punch list for scope within any of these categories.
- E. Final Completion - is **270 days from the date of the Notice-to-Proceed**
1. The following items shall be submitted prior to the written request for Final completion:
 - a. Revised substantial completion items to be resubmitted in accordance with the review process comments
 - b. Warranties commencing the date of substantial completion
 - c. Individual signed and dated punch list acknowledging completion of all punch list items
 2. When the HVAC Sub-Contractor considers all of the punch list work items complete, the HVAC Sub-Contractor shall submit written notice through the General Contractor that all punch list items are complete and resolved and the work is ready for final inspection. The signature lines for completion of each punch list item shall be signed by the HVAC Sub-Contractor indicating the work is complete and signed by the General contractor indicating site has inspected the work and found it to be complete. Should the Engineer find the work to be finally complete and all Punch list items are complete, the engineer will make a recommendation to the Architect or Owner. If the Engineer has found the punch list work to be incomplete during the final inspection, a written listing of the observed deficiencies will be prepared by the Engineer.
 3. If the work is not fully complete then the engineer shall be reimbursed for his time to re-observe the work. A re-observation fee shall be charged to the HVAC Sub-Contractor through the contractual agreement for any re-observations by the

engineer.

- F. Re-Observation Fees
 - 1. The re-observation fee shall be \$1,800 per visit.
- G. HVAC Sub-Contractor's Project Completion Certificate
 - 1. Upon completion of work and prior to request for Certificate of Occupancy, the HVAC Sub-Contractor shall issue a certificate stating that work has been installed generally consistent with construction documents and all applicable codes. The certificate shall certify:
 - a. Execution of all work has been installed in accordance with the approved construction documents.
 - b. Execution and control of all methods of construction was in a safe and satisfactory manner in accordance with all applicable local, state and federal statutes and regulations.
 - 2. The certificate shall include the following information:
 - a. Project
 - b. Permit Number
 - c. Location
 - d. Construction Documents
 - e. Date on Plans and Specifications submitted for approval and issuance of the Building Permit
 - f. Addendum(a) and Revision Dates
 - 3. The certificate shall be signed by the HVAC Sub-Contractor and include the following:
 - a. Signature
 - b. Date
 - c. Company
 - d. License Number
 - e. License Expiration Date

1.36 SEQUENCING

- A. Phasing: Refer to Section 01 10 00 - Summary, and Drawings for phasing and milestone completion requirements which affect the Construction Manager's Work and the Work of the HVAC Sub-Contractor and related Sub-Contractors.
- B. Coordinate work of this Filed Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- C. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.
- D. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

2 PART 2 – PRODUCTS

2.1 MATERIALS

- A. All materials, except as otherwise specified, shall be new, of current production, first quality and the best of each class specified.
- B. Required materials not covered by detailed specifications shall be of a suitable class, grade, quality and type and shall be subject to the approval of the Architect. Where two or more units of the same class of equipment are required, these units shall be the products of a single manufacturer.
- C. All equipment shall be installed and constructed to operate safely, as designed, without leakage, undue wear, noise, vibration or corrosion.

2.2 ELECTRIC MOTORS AND RELAYS

- A. Design, type and ratings of electric motors shall comply with the National Electrical Code, NEMA and Underwriter's Laboratory.
- B. Unless otherwise noted or required for special applications, motors shall be open drip-proof with sealed ball bearings.
- C. All electric motors shall be of the voltage, type and frame as specified in the electrical portion of the specifications.

2.3 ACROSS-THE-LINE STARTERS

- A. All motor starters shall be across-the-line start with magnetic contactors and thermal overloads properly sized for the motor nameplate data.
- B. All motor starters shall be furnished with a Hand-Off-Auto (HOA) switch mounted on the cover of the enclosure.
- C. All motor starters shall be furnished with a fused 120 volt control power transformer rated at a minimum of 2 amps.
- D. All motor starters shall be furnished mounted in a NEMA 1 enclosure suitable for the mounting location.
- E. All motor starters shall be provided with magnetic contactors having one normally open and one normally closed auxiliary contactor.

2.4 HANGERS AND SUPPORTS

- A. Pipe hanger or stanchion support assemblies shall include turnbuckles or other means of vertical adjustment.
- B. Trapeze hangers may be used in lieu of separate hangers for closely spaced, parallel lines. Pipe hanger components shall be as per MSS SP-58.
- C. Hangers shall have steel rods with two nuts and shall be suspended from suitable beam clamps or concrete inserts. Rod sizes shall be as recommended by the hanger manufacturer and at least the following:
 - Pipe to 2"3/8" diameter
 - 2½" - 3"1/2" diameter
 - 4- 5"5/8" diameter
- D. Maximum hanger or stanchion support spacing for copper or steel pipe shall be as follows:

PIPE SIZE	MAX SPACING	PIPE SIZE	MAX SPACING	PIPE SIZE	MAX SPACING
3/4" or less	5 feet	2 ½"	9 feet	6"	14 feet

1"	6 feet	3"	10 feet	8"	16 feet
1¼"	7 feet	3 ½"	11 feet	10"	18 feet
1½"	8 feet	4"	12 feet	12"	19 feet
2"	8 feet	5"	13 feet	14"	25 feet

- E. Hangers or stanchion supports for copper tubing shall be copper plated where they contact the copper tubing.
- F. Hangers or stanchion supports for insulated pipe shall have insulation shields.
- G. All rigid piping attached to the building and serving equipment subject to vibration shall be hung or supported on vibration isolators for the first 20 feet.
- H. Vertical rises shall be supported from stands at the bottom of the rise or hangers at the top of the rise as shown on the drawings per the HVAC Sub-Contractor's option.

2.5 ANCHORS

- A. Anchor points as shown on the drawings or as required shall be located and constructed to permit the piping system to take up its expansion and contraction freely in opposite directions away from the anchored points.

2.6 VIBRATION ISOLATORS

- A. Double deflection neoprene mountings shall have a minimum static deflection of 0.35". All metal surfaces shall be neoprene covered to avoid corrosion and have friction pads both top and bottom so they need not be bolted to the floor. Bolt holes shall be provided for these areas where bolting is required.
- B. Spring type isolators shall be free standing and laterally stable without any housing and complete with ½" neoprene acoustical friction pads between the baseboard and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 80% of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflections, compressed spring height and solid spring height.
- C. Vibration hangers for piping and mechanical equipment shall contain a steel spring and 0.3" deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bussing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through an arc of 30° before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include a scale drawing showing the 30° swing capability. For locations requiring precise elevation during installation the hanger shall be precompressed to the rated deflection and the released after completion of the installation.
- D. Vibration hangers for duct systems shall contain a steel spring located in a neoprene cup manufactured with a grommet to prevent short circuiting of the hanger rod. The cup shall contain a steel washer designed to properly distribute the load on the neoprene and prevent its extrusion. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through an arc of 30° before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include a scale drawing showing the 30° swing capability.
- E. Horizontal thrust restraints shall be provided on equipment subject to excessive

displacement. The horizontal thrust restraint shall consist of a spring element in series with a neoprene pad. The spring element shall be contained within a steel frame and designed so that it can be preset for thrust and adjusted to allow for a maximum of ¼" movement when the equipment starts or stops. The assembly shall be furnished with one rod and angle brackets for attachment to the equipment and the ductwork. Horizontal thrust restraints shall be attached at the centerline of the thrust and symmetrically on each side of the unit.

2.7 CONDENSATE PIPING

- A. Condensate piping shall be type-L copper with soldered joints or PVC schedule 40. All 90deg. changes in direction shall be made with 45deg. elbows and tee-wyes with cleanouts, not with straight tees.

2.8 REFRIGERANT PIPING

- A. All refrigeration system piping shall be as follows:

Construction	Hard brazed joints
Piping	Copper tubing type ACR, hard drawn, cleaned, dehydrated and capped for refrigeration service, ANSI B70.1 ASTM A-280
Fittings	Wrought copper, Brazed joint type, ANSI B16.22
Coupling	Same as above
Brazing Alloy	Easy Flo, Silfos, Phos Co., Minimum 1100 °F melting temperature, ASTM 280

- B. Soft drawn copper tubing may be used in sizes acceptable to the refrigeration equipment manufacturer.

2.9 PIPING INSULATION MATERIALS

- A. Insulation for pipe shall be glass fiber with a K factor of .24 at 100° F mean temperature with a factory applied kraft reinforced foil all service vapor barrier jacket with a factory applied double pressure sensitive adhesive sealing system.
- B. Insulation for concealed fittings and valves shall be glass fiber blanket with a K factor of .24 at 75° F mean temperature with a factory applied kraft reinforced foil all service vapor barrier jacket.
- C. Exposed fittings, valves and flanges shall be insulated with molded fitting covers or fabricated segments of pipe insulation.
- D. Insulation, jacket, covers and sealant shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less per UL 723.
- E. Insulation shall be Owens-Corning Fiberglass ASJ/SSL-II or approved equal.
- F. All refrigerant piping (suction and liquid lines) shall be insulated with flexible foamed plastic, minimum 5.0 lb. per cubic foot density, thermal conductivity not greater than 0.27 Btu-in/sq ft/°F/hour at mean temperature difference of 75°F.
- G. Multiple layers of refrigerant piping insulation shall be provided to achieve the overall required thickness.
- H. All outdoor exposed refrigerant piping shall be painted with two coats of protective finish to prevent degradation due to exposure to sunlight. Prior to applying the finish,

the insulation shall be wiped clean with denatured alcohol. The finish shall not be tinted. All seams shall be located on the lower half of the pipe.

- I. Insulation thickness shall be as follows:

SYSTEM	PIPE SIZE	THICKNESS
Refrigerant Piping	All	1½"
Condensate	All	1"

2.10 VALVES

- A. All valves shall be first quality of an approved manufacturer, shall be installed with the proper clearances and shall be tight at the specified pressures.
- B. Valves shall be of minimum working pressure and materials as fittings specified for the service, however, in no case shall valves be designed for less than 125 PSI working pressure.
- C. Where a specific manufacturer, brand and/or figure number is specified, an equivalent figure from an approved manufacturer shall be acceptable.
- D. For shut off service the HVAC Sub-Contractor shall use ball valves with full open ID.
- E. For throttling or modulating service the HVAC Sub-Contractor shall use a butterfly valve or another type of valve if a specific valve is specified on the drawings.
- F. Butterfly Valves
 - 1. Butterfly valves shall be of the flangeless type and may be lug or wafer style if not specified on the drawings.
 - 2. Butterfly valves shall be rated 200 PSI bi-directional, differential pressure with a 200 PSI dead end service rating.
 - 3. Butterfly valves shall have bodies of shock resistant ductile iron and shall have extended necks for 2" of insulation.
 - 4. Butterfly valves shall have no exposed fasteners in the waterway to pin the disc to the stem.
 - 5. Liners shall be molded in and supported by the valve body at the flange seals.
 - 6. Top and bottom stem bushings of dissimilar material are required with a positive retention mechanism
 - 7. Butterfly valves shall be NIBCO figure W/LD 2000.
 - 8. Butterfly valves larger than 4" shall be provided with gear operators.
- G. Check Valves
 - 1. Check valves shall be bronze 2." and smaller; Cast iron or cast steel with bronze trim for 3" and larger.
 - 2. All check valves shall have removable caps and regrindable disc and seat ring.
 - 3. Bronze check valves shall be rated 125 PSI SWP, 200 PSI WOG as NIBCO figure T- 413 or S-413.
 - 4. Iron Check valves shall be 125 PSI SWP, 200 PSI WOG as NIBCO figure F-918.
- H. Globe Valves
 - 1. Globe valves shall be bronze 2½" and smaller; Iron with iron trim for 3" and larger as NIBCO figure T-211 or S-211.
 - 2. Bronze globe valves shall be rated 125 PSI SWP, 200 PSI WOG
 - 3. Iron globe valves shall be OS&Y 125 PSI SWP, 200 PSI WOG as NIBCO figure F- 718-

- N.
- 4. All globe valves shall be suitable for repacking under pressure.
- I. Ball Valves.
 - 1. Ball valves shall be bronze 2½" and smaller equal to Apollo Ball Valves 70 series.
 - 2. Ball valves shall be rated for 200 PSI @ 250°F.
- J. Combination Isolation/Balancing Valves
 - 1. Combination Isolation/Balancing Valves ½" to 4" shall be Flowset or approved equal.
 - 2. Valves shall be rated to 300 PSI.
 - 3. A Flowset Meter Kit shall be supplied to the owner before completion of installation.
 - a. Meter kit shall include a carrying case containing readout instrumentation, differential pressure meter, transparent direct reading flow faces, 10' hoses with pressure taps, dial indicating thermometer and a pressure gauge.
- K. Valve Handles and Operators.
 - 1. Butterfly valves shall be provided with locking lever type hand operators notched to allow incremental positioning and with a positional lock to function as a memory stop. The lock shall be lockable via a padlock.
 - 2. Gate valves shall be provided with hand wheels.

2.11 PIPE LABELS

- A. All refrigerant piping shall be labeled with plastic adhesive labels. Labels shall indicate the piping system (refrigerant suction, refrigerant liquid, etc.), and shall indicate the direction of flow. Piping shall be labeled every 20 feet minimum on straight runs, within 2 feet of access panels and shall be labeled within five feet of changes of direction. Labels shall be applied to the insulation jacket.

2.12 SLEEVES

- A. Provide Schedule 40 galvanized steel pipe sleeves for each pipe passing through a wall, floor, partition or roof.

2.13 FILTERS

- A. Unless otherwise noted panel filters shall be shall be 1" 30-30 filters.

2.14 RECTANGULAR DUCTS

- A. All ductwork shall be fabricated of G-60 coated galvanized steel of lockforming grade and conforming to ASTM standards A-525 and A-527, unless otherwise noted, and shall be constructed in accordance with the latest SMACNA standards.
- B. Duct sizes shown on the drawings are the clear inside dimensions, after any lining has been applied.

2.15 RECTANGULAR DUCT FITTINGS

- A. All ductwork shall be fabricated of G-60 coated galvanized steel of lockforming grade and conforming to ASTM standards A-525 and A-527, unless otherwise noted, and shall be constructed in accordance with the latest SMACNA standards.

ROUND DUCTS

- A. All ductwork shall be fabricated of G-60 coated galvanized steel of lockforming grade and conforming to ASTM standards A-525 and A-527, unless otherwise noted, and shall be

constructed in accordance with the latest SMACNA standards.

2.16 FLEXIBLE DUCTS

- A. All flexible ducts shall be constructed of a trilaminate of aluminum foil, fiberglass and aluminized polyester mechanically locked to a galvanized steel helix. No adhesives shall be used to lock the fabric to the helix.
- B. All flexible ducts must conform to NFPA 90A and 90B requirements and be tested in accordance with UL-181 and bear a UL label and be installed in accordance with their listing by UL. Flexible ducts shall have a flame spread rating or 25 or less and a smoke developed rating or 50 or less per UL 723.
- C. Insulated flexible duct shall have a block fire retardant polyethylene outer jacket with a ½ lb density 1-1/2" thick fiberglass insulation jacket.
- D. Flexible ducts 12" diameter and smaller shall be rated at 12" positive pressure and 10" negative pressure. Flexible ducts 14" and 16" diameter shall be rated at 5" positive and negative pressure and flexible ducts 18" diameter and larger shall be rated at 1" positive and negative pressure.
- E. Flexible ducts shall not exceed 5 feet in length.

2.17 FLEXIBLE CONNECTORS

- A. All connections between vibrating or rotating equipment and ductwork shall be made with a flexible connection consisting of a heavy fiberglass fabric, double coated with neoprene and shall be fireproof conforming to NFPA 90A, waterproof and airtight. The flexible connection shall be a minimum of 6" long and held in place with heavy metal bands.

2.18 DUCT INSULATION MATERIALS - DUCT WRAP

- A. Insulation for ducts and fittings shall be glass fiber with a K factor of .25 at 75° F mean temperature with a factory applied kraft reinforced foil all service vapor barrier jacket with a 2" stapling flange.
- B. Insulation, jacket and sealant shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less per UL 723.
- C. Insulation shall be Owens-Corning Fiberglass Type 150 or approved equal.
- D. Exposed exterior ductwork insulation shall be protected with a waterproof EPDM membrane with all seams sealed water tight and all longitudinal seams located on the bottom of the duct.
- E. The following ducts shall be insulated:
 - 1. All unlined fan coil unit supply and return ducts shall have 1½" of insulation.
 - 2. Roof mounted supply and exhaust and kitchen make up air supply ducts shall be insulated with 3" of insulation or more as required to achieve an R8 value.

2.19 ACOUSTICAL DUCT LINING

- A. Acoustical duct lining shall be constructed of a semi-rigid board of glass fiber with a black-pigmented, fire resistant coating on the side toward the airstream. The duct lining shall comply with the requirements of NFPA 90 and ASTM C 1071.
- B. Duct lining shall have a thermal conductivity of 0.25 Btu*in/hr*ft²*°F.
- C. The following ducts shall be lined:

1. All ERV supply and return ducts shall have 1" lining for the first 10 feet or past the second elbow, whichever is further.
 2. All kitchen make up air supply duct shall have 1" lining for the first 10 feet or past the elbow down to the first floor, whichever is further.
 3. All VRV system fan coil unit supply and return ducts shall have 1" lining for the first 5 feet or past the first elbow, whichever is further.
- D. Duct dimensions shown on the drawings are the clear inside dimensions, after the lining has been applied.

2.20 VOLUME DAMPERS

- A. Furnish and install, where indicated on the drawings or where required for balancing, air splitter dampers, butterfly dampers, or opposed blade dampers with indicating and locking quadrants or push rods and pillow blocks.
- B. Opposed blade dampers shall be manually operated multi-blade type with sleeve bearings, galvanized steel interlocking blades and a galvanized steel frame. In ducts over 19" in depth and 12" in height, use multiple opposed blade type, gang operated dampers with a maximum blade width of 8". Fabricate the damper blades of 10-gauge steel with hemmed edges, and a maximum length of 48". Damper operating rods shall be the full blade length and shall extend through the duct to externally mounted bearing plates. On insulated ductwork, bearing plates shall be flush with insulation finish and fastened to the duct. The operating lever shall be of the indicating type with locking quadrant. Splitter dampers shall be sufficiently long to extend the full width of the branch duct to which they are attached. Where necessary they shall curve to scoop branch duct air out of the main duct air stream. The dampers shall be constructed in accordance with the latest SMACNA standards and shall be at least two gauges heavier than the ducts in which they are installed.

2.21 DRIP PANS

- A. Examine the drawings and in cooperation with the Electrical Contractor confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric motors and controllers, switchboards, or similar equipment. Piping is not permitted in electric equipment, transformer, switch gear and telephone gear rooms.
- B. Where the installation of piping does not comply with the requirements of foregoing paragraph, where feasible the piping shall be relocated.
- C. Where relocation of piping is not feasible, furnish gutters as follows:
 1. Provide and erect a gutter of 16 ounce cold rolled copper or 18 gauge galvanized steel, under every pipe which is within 2 feet from a vertical line to any motor, electrical controllers, switchboards, panelboards or the like.
 2. Each gutter shall be reinforced, rimmed, soldered and made watertight, properly suspended and pitched to a point outside of the electrical room.

2.22 ACCESS PANELS

- A. Hinged access panels shall be provided at locations of volume dampers, control dampers, and elsewhere as required to service the duct systems. Access doors shall be fully gasketed for airtight seal at the rated working pressures of the systems in which they are installed. Access doors shall be adequately sized for their intended purpose and equipped

with a minimum of two sash locks. Access doors in insulated ducts shall be double wall and insulated.

- B. Access panels shall be provided at locations of the variable refrigerant volume systems if located above hard ceilings.

2.23 FIRE DAMPERS

- A. Fire dampers shall be suitable for applications in HVAC systems with velocities up to 4,000 feet per minute (1,219 m/min).
- B. Product Data: Submit manufacturer's product data.
 - 1. Include maximum pressure data.
 - 2. Indicate materials, construction, dimensions, and installation details.
 - 3. Verify conformance to NFPA 90A, UL 555, CSFM, and applicable building code.
- C. Manufacturer shall test and qualify with UL a complete range of damper sizes covering dampers specified. Testing 1 size only is not acceptable.
- D. Damper Capacity: Demonstrate damper capacity to close under HVAC system operating conditions in accordance with UL 555.
 - 1. Maximum Pressure: 4 inches w.g. (1 kPa).
 - 2. Maximum Air Velocity: 4,000 feet per minute (1,219 m/min).
- E. Materials shall be delivered to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- F. Materials shall be stored in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.
- G. Dampers shall be handled and lifted in accordance with manufacturer's instructions. Materials and finishes shall be protected during handling and installation to prevent damage.
- H. Dampers shall be Ruskin model FDR25.
- I. Fire Rating: UL 555 classified and labeled as a 1-1/2 hour fire damper.
- J. Air Flow Rating: UL approved for dual directional air flow.
- K. Blade:
 - 1. Style: Single piece, spring closure upon fusible link release.
 - 2. Material: Minimum 14 gage (2.0 mm) galvanized steel with angle stiffeners for added strength.
- L. Bearings: Self-lubricating stainless steel sleeve, turning in hole in frame.
- M. Axle: Minimum 1/2 inch (13 mm) diameter plated steel, mechanically attached to blade.
- N. Cinch Plates:
 - 1. One-piece, minimum 20 gage (1.0 mm) galvanized steel. Adjustable bolt-type. Factory matched and shipped with individual damper.
- O. Mounting: Vertical, unless shown as horizontal on drawings.
- P. Temperature Release Device:
 - 1. Fusible link, 165 degrees F (74 degrees C).
- Q. Finish: Mill galvanized.
- R. Assembly: Damper and accessories shall be factory assembled and furnished as a single unit conforming to UL 555.
- S. Performance Data:
 - 1. Temperature Qualified: Damper shall be qualified in accordance with UL 555 as a 1-1/2 hour fire damper.
 - 2. Capacity: Damper shall close in HVAC system operating conditions of 4 inches w.g.

(1 kPa) and air velocity of 4,000 feet per minute (1,219 m/min.)

- T. Factory Tests: Damper shall be factory cycled to assure proper operation.
- U. Areas to receive dampers shall be inspected, and the Engineer shall be notified of conditions that would adversely affect the installation or subsequent utilization of the dampers. Installation shall not proceed until unsatisfactory conditions are corrected.
- V. Dampers shall be installed at locations indicated on the drawings and where required by the building code in accordance with manufacturer's UL approved installation instructions.
- W. Dampers shall be installed round and free from racking.
- X. Damper sleeves shall not be compressed or stretched into duct or opening.
- Y. Damper shall be handled using sleeve or frame. Damper shall not be lifted using blade or jackshaft.

2.24 REGISTERS, GRILLES AND DIFFUSERS

- A. The types, sizes and airflow patterns of the registers, grilles and diffusers as specified and as shown on the plans have been selected to accomplish the intent and purpose of the system. Any substitutions proposed for items scheduled, shown or specified must provide the same air flow patterns, at the same air volumes and must have the same acoustical characteristics as the specified elements.
- B. All interiors of all ducts in back of all registers, grilles and diffusers shall be painted with one coat of flat black nonflammable paint.
- C. Duct connections to supply devices shall be made inside the collars, if any, and, duct connections to return or exhaust devices shall be made outside the collars, if any.
- D. All registers, grilles and diffusers shall have a baked enamel, white, semi-gloss finish.
- E. Square and rectangular diffusers shall have removable cores with opposed blade dampers, gasketed borders and concealed fastenings.
- F. Frame types of diffusers shall be as appropriate for the type of ceiling in which they are to be installed.
- G. Supply, return and exhaust air registers shall have opposed blade dampers and gasketed borders.

2.25 VARIABLE REFRIGERANT VOLUME HEAT PUMP SYSTEM

- A. General
 - 1. System shall have the capacities and electrical characteristics indicated on the schedule.
- B. System Description
 - 1. The variable refrigerant volume heat pump system shall be by Mitsubishi, Daikin or Carrier. The design is based on Mitsubishi City Multi R2-series.
The system shall be capable of non-simultaneous heating and cooling.
 - 2. The R2-Series system shall consist of a PUHY outdoor unit, multiple indoor units and M-NET DDC (Direct Digital Controls).
 - 3. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups.
 - 4. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation.
 - 5. Each indoor unit or group of indoor units shall be independently controlled. The sum

of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

C. System Start-Up

1. The manufacturer or manufacturer's representative shall provide start-up services for the system and shall provide a report on the start-up procedure and provide documentation that the system is installed and functioning per the manufacturer's specifications.
2. The manufacturer or manufacturer's representative shall provide integration system assistance as required to assist the ATC sub-contractor in integrating the VRV system with the DDC system.

D. System Training

1. The manufacturer or manufacturer's representative shall provide training for the Owner or Owner's representative. Training shall be a minimum of 4 hours and shall be conducted at the same time as the training for the other hvac systems.
2. The manufacturer shall also provide 16 hours of structured off-site training for the Owner's personnel.

E. Warranty

1. The units shall be covered by a manufacturer's extended warranty for a period of five (5) years from the date of system acceptance.
2. The compressors shall have a manufacturer's limited warranty for a period of seven (7) years from the date of system acceptance.
3. All manufacturer's requirements to obtain the limited warranty shall be met, including but not limited to: designed by a certified City Multi Diamond Designer, installation by a contractor that has completed the Mitsubishi service course, and submission of a completed commissioning report that is approved by Mitsubishi.

F. System Efficiency

1. The systems shall have the following minimum efficiencies in order to comply with the NStar Advanced Buildings program requirements.
2. Units shall be ASHRAE 90.1 rated in accordance with AHRI 1230.
3. Minimum efficiencies for Units =>135,000<240,000 Btuh:
 - a. EER – 10.6
 - b. IEER – 11.8
 - c. COP - 3.2
4. Minimum efficiencies for Units =>240,000 Btuh:
 - a. EER – 9.5
 - b. IEER – 10.6
 - c. COP – 3.2

G. Outdoor Unit

1. General
 - a. The R2-Series PUHY outdoor unit shall be used specifically with CITY MULTI VRFZ components. The PURY outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
 - b. The building design is intended to comply with the NStar Advanced Building Core Performance Standards. The efficiencies used to evaluate compliance are listed below. If alternate systems are proposed by the HVAC Sub-Contractor, the

efficiencies shall meet or exceed these efficiencies. If the proposed system does not, approval of the NStar Advanced Buildings review will be required for the system to be accepted as an alternate. The efficiencies below were determined using the DOE alternative testing procedures for variable refrigerant volume systems.

- 1 PUHY-P192TSJMU-A – Cooling EER 11.4, Heating 47°F 3.54, Heating 17°F COP 2.44, IEER 14.7.
 - 2 PUHY-P240TSJMU-A – Cooling EER 10.9, Heating 47°F 3.49, Heating 17°F COP 2.3, IEER 14.8.
- c. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the HVAC Sub-Contractor.
 - d. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 63 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the HVAC Sub-Contractor.
 - e. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated.
 - f. There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
 - g. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
 - h. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
 - i. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
 - j. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
 - k. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature or cooling mode down to 23°F ambient temperature, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the HVAC Sub-Contractor.
 - l. The outdoor unit shall not cease operation in any mode based solely on outdoor ambient temperature.
 - m. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
2. Unit Cabinet
 - a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished.
 3. Fan
 - a. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of

- 0.24 in. WG external static pressure via dipswitch.
 - b. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
 - c. All fan motors shall be mounted for quiet operation.
 - d. All fans shall be provided with a raised guard to prevent contact with moving parts.
 - e. The outdoor unit shall have vertical discharge airflow.
 - 4. Refrigerant
 - a. Refrigerant shall be R410A.
 - 5. Coil
 - a. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
 - b. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
 - c. The coil shall be protected with an integral metal guard.
 - d. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
 - e. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.
 - 6. Compressor
 - a. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors shall not be allowed.
 - b. A crankcase heater(s) shall be factory mounted on the compressor(s).
 - c. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-8% of rated capacity, depending upon unit size.
 - d. The compressor will be equipped with an internal thermal overload.
 - e. The compressor shall be mounted to avoid the transmission of vibration.
 - 7. Electrical
 - a. The outdoor unit electrical power shall be 208/230 or 460 volts, 3-phase, 60 hertz.
 - b. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz), 207-253V (230V/60Hz) or 414-506V (460V/60Hz).
 - c. The outdoor unit shall be controlled by integral microprocessors.
 - d. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
- H. Branch Circuit Controllers
 - 1. General
 - a. The BC (Branch Circuit) Controllers shall be specifically used with R410A R2-Series systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.

2. BC Unit Cabinet:
 - a. The casing shall be fabricated of galvanized steel.
 - b. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
 - c. The unit shall house two tube-in-tube heat exchangers.
3. Refrigerant
 - a. R410A refrigerant shall be required.
4. Refrigerant valves:
 - a. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
 - b. Each branch shall have multiple two-position valves to control refrigerant flow.
 - c. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
 - d. Linear electronic expansion valves shall be used to control the variable refrigerant flow.
5. Integral Drain Pan:
 - a. An integral condensate pan and drain shall be provided.
6. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
 - b. The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).
 - c. The BC Controller shall be controlled by integral microprocessors.
 - d. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
- I. Indoor Unit – 4-Way Cassette Type (Large)
 1. General:
 - a. The PLFY-P**NBMU-E shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
 2. Unit Cabinet:
 - a. The cabinet shall be space-saving ceiling-recessed cassette.
 - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
 - c. Branch ducting shall be allowed from cabinet.
 - d. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
 - e. The grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space

3. Fan:
 - a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
 - b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - c. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto.
 - d. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
 - e. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
 - f. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.
 - g. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
 - h. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.
 - i. If specified, the grille shall have an optional i-see sensor that will measure room temperature variations and adjust the airflow accordingly to evenly condition the space.
4. Filter:
 - a. Return air shall be filtered by means of a long-life washable filter
5. Coil:
 - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 - b. The tubing shall have inner grooves for high efficiency heat exchange.
 - c. All tube joints shall be brazed with phos-copper or silver alloy.
 - d. The coils shall be pressure tested at the factory.
 - e. A condensate pan and drain shall be provided under the coil.
 - f. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.
 - g. Both refrigerant lines to the PLFY indoor units shall be insulated.
6. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
7. Controls:
 - a. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
- J. Indoor Unit – 4-Way Cassette Type (Small)
 1. General:
 - a. The PLFY-P**NCMU-E shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute

time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

2. Unit Cabinet:
 - a. The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.
 - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
 - c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
 3. Fan:
 - a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
 - b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - c. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
 - d. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
 - e. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.
 4. Filter:
 - a. Return air shall be filtered by means of a long-life washable filter.
 5. Coil:
 - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 - b. The tubing shall have inner grooves for high efficiency heat exchange.
 - c. All tube joints shall be brazed with phos-copper or silver alloy.
 - d. The coils shall be pressure tested at the factory.
 - e. A condensate pan and drain shall be provided under the coil.
 - f. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
 - g. Both refrigerant lines to the PLFY indoor units shall be insulated.
 6. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
 7. Controls:
 - a. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
- K. Indoor Unit - Ceiling Concealed Ducted
1. General:
 - a. The PDFY shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating linear expansion device. The PDFY shall be used with the R2-Series outdoor unit and BC Controller, Y- Series outdoor unit, or S-Series outdoor unit. The PDFY shall support individual control using M-NET DDC controllers.

2. Indoor Unit.
 - a. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
 3. Unit Cabinet:
 - a. The unit shall be, ceiling-concealed, ducted.
 - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
 4. Fan:
 - a. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
 - b. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
 - c. The indoor unit shall have a ducted air outlet system and ducted return air system.
 5. Filter:
 - a. Return air shall be filtered by means of a standard factory installed return air filter.
 - b. Optional return filter box (rear or bottom placement) with high-efficiency filter shall be available for all PDFY indoor units.
 6. Coil:
 - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 - b. The tubing shall have inner grooves for high efficiency heat exchange.
 - c. All tube joints shall be brazed with phos-copper or silver alloy.
 - d. The coils shall be pressure tested at the factory.
 - e. A condensate pan and drain shall be provided under the coil.
 - f. The condensate shall be gravity drained from the fan coil.
 - g. Both refrigerant lines to the PDFY indoor units shall be insulated.
 7. Electrical:
 - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
 - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
 8. Controls:
 - a. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
- L. Controls
1. Controls shall consist of remote controllers, schedule timers, system controllers, centralized controllers and an integrated web based interface communicating over a high-speed communication bus.
 2. The controls network shall support operation monitoring, scheduling, error email distribution, personal browsers, tenant billing and online maintenance support.
 3. The controls network shall be capable of supporting integration with Building Management Systems (BMS) via a Mitsubishi LonWorks® interface.

- a. The Mitsubishi Electric HVAC LonWorks® interface shall support up to fifty indoor units with a variety of network variables on a per indoor unit basis. Input variables include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, and filter sign reset. Output variables include, but are not limited to, model size, alarm state, error code, and error address.
4. AG-150A Centralized Controller
- a. The AG-150A Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple CITY MULTI outdoor units. The AG-150A Centralized Controller shall be approximately 7-1/2"x12" in size and shall be powered from a Power Supply Unit (PAC-SC51KUA). The AG-150A Centralized Controller shall support operation superseding that of the remote controllers, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring. The AG-150A Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic control set of operation controls for the AG-150A Centralized Controller shall include on/off, operation mode selection (cool, heat, auto (R2-Series only), dry, and fan), temperature setting, fan speed setting, and airflow direction setting. Since the AG-150A provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the AG-150A Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, vane direction, fan speed, and permit/prohibit of remote controllers.

AG-150A (Centralized Controller)			
Item	Description	Operation	Display
ON/OFF	Run and stop operation for a single group	Each Group or Collective	Each Group or Collective
Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat. (Group of Lossnay unit: automatic ventilation/vent- heat/interchange/normal ventilation) Operation modes vary depending on the air	Each Group or Collective	Each Group

AG-150A (Centralized Controller)			
Item	Description	Operation	Display
Temperature Setting	Sets the temperature for a single group. Range of temperature setting: Cool/Dry: 67°F-87°F (57°F-87°F for PEFY/PDFY/PFFY-E) Heat: 63°F-83°F (63°F-83°F for PEFY/PDFY/PFFY-E) Auto: 67°F-83°F (63°F-83°F for PEFY/PDFY/PFFY-E) * Range of temperature setting varies depending on	Each Group or Collective	Each Group
Fan Speed Setting	Models with 4 air flow speed settings: Hi/Mid-2/Mid-1/Low Models with 3 air flow speed settings: Hi/Mid/Low Models with 2 air flow speed settings: Hi/Low	Each Group or Collective	Each Group

Air Flow Direction	Air flow direction angles 100%-80%-60%-40%, Swing, *1. Louver cannot be set. Air flow direction settings vary depending on the model.	*1 Each Group or Collective	Each Group
Timer Operation	Start/Stop and Enable/Disable can be set 3 times in one day. For a week's schedule, store three start/stop patterns and one enable/disable pattern. *2 When the timer is set, "Timer Enabled" is shown on	Each Group or Collective	*2 Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *3: Centrally Controlled is displayed on the	Each Group or Collective	*3 Each Group
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4 When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log	N/A	*4 Each Unit or Collective
Test Run	Operates air conditioner units in test run mode.	Each Group	Each Group
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop". When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation",	Each Group	Each Group

AG-150A (Centralized Controller)			
Item	Description	Operation	Display
External Input / Output	By using accessory cables you can set and monitor the following. Input By level: "Batch start/stop", "Batch emergency stop" By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" *5: Requires the external I/O cables (PAC-YG10HA-E)	*5 Collective	*5 Collective

- b. All AG-150A Centralized Controllers shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN).
- c. The AG-150A Centralized Controller shall be capable of performing initial settings

via the 9" high-resolution, backlit, color touch panel on the controller or via a PC using the AG-150A Centralized Controller's initial setting browser.

- d. Software shall be provided so that the building manager can securely log into each AG-150A via the PC's web browser to support operation monitoring, scheduling, error email, personal browser for PCs and MACs, and online maintenance diagnostics.
5. Indoor Unit Controllers
 - a. Each space shall be provided with a PAR-YT51CRB Simple MA controller that will allow occupant adjustment of the temperature, operation mode, fan speed and overriding of the scheduled setpoint temperature.
 - b. The controller shall be provided with an integral space temperature sensor to allow sensing of the space temperature at the controller or at the unit.
 - c.

2.26 ROOF MOUNTED ENERGY RECOVERY VENTILATOR WITH GAS HEAT

- A. General
 1. Acceptable Manufacturers: Greenheck, Cook, Munters.
 2. Units shall be listed per ANSI/UL 1995, Heating and Cooling Equipment. Energy transfer ratings of the energy recovery wheel shall be ARI Certified. Ventilators shall bear the AMCA Certified Rating Seals for Air Performance.
 3. Performance shall be as scheduled on plans.
- B. Unit Casing and Frames
 1. Unit shall be of internal frame type construction of galvanized steel. Frame and panels shall be G90 galvanized steel. All panels exposed to the weather shall be a minimum of 18 gauge galvanized steel.
 2. Unit shall be internally lined with galvanized sheet metal creating a double wall. Where top panels are joined there shall be an overlapping, standing seam to insure positive weather protection. All metal- to-metal seams shall be factory sealed, requiring no caulking at job site.
 3. Unit base to be designed for curb mounting. Unit base shall overhang the curb for a positive seal against water run-off.
- C. Insulation
 1. Unit casing to be insulated with fiberglass to provide an R8 insulating value. Insulation shall meet requirements of NFPA 90A and tested to meet UL 181 erosion requirements. Insulation to be enclosed in double wall construction.
- D. Energy Recovery Wheel
 1. Wheel shall be of the enthalpy type for both sensible and latent heat.
 2. Energy transfer ratings shall be ARI Certified to Standard 1060 and bear the ARI certification symbol for ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program based on ARI 1060.
 3. The energy recovery effectiveness shall be 75% or greater.
 4. Wheel shall be constructed of lightweight polymer media.
 5. Polymer media shall be mounted in a stainless steel rotor.
 6. Wheel design shall consist of removable segments for ease of service and/or cleaning. Silica gel desiccant shall be permanently bonded to wheel media to retain latent heat capability after cleaning. Energy recovery device shall transfer moisture entirely in the vapor phase.
 7. Energy recovery drive belt material shall be high strength urethane and shall be

factory installed in a prestretched state, eliminating the need for field belt tension adjustment. Link style belts are not acceptable.

- E. Access Doors
 - 1. All components shall be easily accessible through removable doors for exhaust, supply, filter, and damper compartments.
 - 2. Energy recovery wheels (smaller than 54 inches) shall be mounted in a slide-out track for ease of inspection, removal, and cleaning.
 - 3. Access doors shall be operable without the use of tools.
- F. Fan Sections
 - 1. Centrifugal fans to be double width, double inlet, forward curved type. All blower wheels shall be statically and dynamically balanced. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds.
 - 2. Separate motors for exhaust and supply blowers shall be provided.
 - 3. Adjustable sheaves on belt-driven fans with motors less than 10 hp shall allow independent balancing of exhaust and supply airflows.
 - 4. Fan and motor assemblies are mounted to unit base with spring-type vibration isolators.
 - 5. Fans shall be located in draw-through position in reference to the energy recovery wheel.
- G. Motors and Drives
 - 1. Motors shall be energy efficient, complying with EPACT standards, for single speed ODP and TE enclosures.
 - 2. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage, phase, and enclosure.
 - 3. Drives shall be sized for a minimum of 150% of driven horsepower.
 - 4. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts; 10 horsepower and less shall be supplied with an adjustable drive pulley.
 - 5. Energy wheel motors shall have integral overload protection.
- H. Filters
 - 1. Supply and exhaust air filters shall be 2-inch thick pleated fiberglass, 30% efficient and tested to meet UL Class 2, minimum MERV 8. Filter racks shall be die-formed galvanized steel.
- I. Electrical
 - 1. All internal electrical components shall be factory wired for single point power connection.
 - 2. All electrical components shall be UL Listed, Approved, or Classified where applicable and wired in compliance with the National Electrical Code.
 - 3. Weatherproof, integral door interlocking disconnect switch, motor starters, control circuit fusing, control transformer for 24 VAC circuit, and terminal strip shall be supplied in the control center. Motor starters shall consist of a contactor and Class 20 electronic adjustable overload protection and shall be provided for all motors in the unit.
- J. Indirect Gas Heater
 - 1. Indirect fired gas furnace shall be minimum 80% efficient, ETL Listed for Indoor and

Outdoor installation to ANSI Standard Z83.8 – 2002 and CGA approved per 2.6 – 2002.

2. Furnace shall be capable of operation with natural gas and have a power venting system.
 3. The burner and heat exchanger shall be constructed of stainless steel.
 4. Furnace shall include main gas pressure regulator, main gas valve, direct spark ignition system and high limit and a 24-volt control transformer.
 5. Furnace control shall be 8-stage.
- K. Controls
1. The unit shall have a control center that includes a magnetic motor starter with solid state overload protection, control transformer with fusing, disconnect switch, separately fused motor and distribution terminal strip.
 2. The unit shall be provided with a Lonworks based DDC interface which will allow connection to the building DDC system. The interface shall allow the discharge temperature setpoint and start/stop to be adjusted from the DDC system. The interface shall provide feedback about discharge temperature, fan status, and wheel rotation status.
- L. Accessories
1. Provide contact to allow stopping of the wheel for economizer mode.
 2. Provide timed exhaust frost control.
 3. Provide motorized fresh air and exhaust dampers.
 4. Provide insulated roof curb.
 5. Provide louvered weatherhood for the fresh air inlet.
- M. Warranty
1. The energy recovery ventilator shall be warranted to be free from defects in material and workmanship for a period of one year from the acceptance date.
 2. The energy recovery wheel shall be warranted to be free from defects in material and workmanship for a period of five years from the acceptance date.
 3. Motors shall be warranted by the motor manufacturer for a period of one year from the acceptance date.
 4. The gas furnace shall be warranted to be free from defects in material and workmanship for a period of 10 years from the purchase date.

2.27 ENERGY RECOVERY VENTILATORS

- A. The unit shall be a packaged static plate energy recovery ventilator.
- B. The energy recovery ventilator shall be certified by the Home Ventilating Institute (HVI) under CSA 439.
- C. The energy recovery core shall meet NFPA 90A and 90B requirements for flame spread, not to exceed 25, and smoke generation, not to exceed 50, through an on going testing and verification program using UL Standard 723.
- D. The energy recovery core shall be capable of transferring both sensible and latent energy between air streams. Latent energy transfer shall be accomplished by direct water vapor transfer using molecular transport by hygroscopic resin.
- E. The energy recovery core shall perform without the occurrence of condensation or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional extreme conditions shall not affect the usual function or performance of the energy recovery core.
- F. The unit shall accomplish energy recovery in both heating and cooling seasons and shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters or other defrost cycles under normal operating conditions.

- G. Exhaust and fresh airstreams shall at all times travel in separate passages, and airstreams shall not mix.
- H. Airflow through the energy recovery core shall be laminar, avoiding deposition of particulates on the interior of the exchange plate material.
- I. The energy recovery core shall be of static plate, cross-flow construction, with no moving parts.
- J. The unit shall be supplied with an internal 24 VAC transformer and relay.
- K. The unit shall have line cord for easy plug-in operation.
- L. A latched and hinged door shall provide access to blowers, energy recovery core, and filters.
- M. Cabinet walls and doors shall be insulated with 1" FSK high-density board insulation, with additional ¼" foam insulation on access door for thermal and sound insulation.
- N. The energy exchange element and blowers shall be protected by a polyester filter in both exhaust air and fresh air streams.
- O. The core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten (10) years from the date of acceptance. The balance of the unit shall be warranted for a period of two (2) years from the date of acceptance.

2.28 DUCTLESS SPLIT SYSTEM AIR CONDITIONER

- A. The ductless split system air conditioners shall be by Mitsubishi, Sanyo or Samsung.
- B. Unit shall provide cooling down to 0°F outdoor air temperature.
- C. Unit shall be run tested at the factory prior to shipment.
- D. Unit shall use refrigerant 410a.
- E. The unit shall be microprocessor controlled.
- F. Unit shall be controlled by a programmable hardwired controller.
- G. The unit shall have a minimum efficiency of 14.0 SEER and 12.0 EER as required to comply with the NStar Advanced Buildings program. Unit shall be tested in accordance with ARI standards.
- H. Outdoor unit
 - 1. Units shall be completely factory assembled, piped and wired.
 - 2. Casing shall be fabricated of galvanized steel, finished with an electrostatically applied coating.
 - 3. Cabinet shall have four slotted mounting holes.
 - 4. Fan shall be direct drive propeller type.
 - 5. Coil shall be non-ferrous construction with plate fins on copper tubing. Coil shall be protected with a guard.
 - 6. Refrigerant flow shall be controlled by linear expansion valves.
 - 7. Compressor shall be hermetic, inverter driven type, with variable capacity operation down to 50% of maximum.
- I. Indoor Unit
 - 1. Indoor unit shall be wall mount type.
 - 2. Fan shall be multispeed, with automatic fan speed control.

2.29 CONDENSATE PUMPS

- A. Condensate pumps shall be fully automatic.
- B. Basin shall be constructed of ABS plastic.
- C. Volute and propeller shall be polypropylene.
- D. Shaft shall be stainless steel.
- E. Cover shall be ABS with 3 drain holes.
- F. Unit shall be provided with a discharge check valve.

- G. Thermal overload protection shall be provided.
- H. Unit shall have a six foot power cord with plug.

2.30 ELECTRIC WALL HEATER

- A. The electric fan powered wall heater shall be designed for recessed mounting.
- B. The heater shall be designed for surface or recessed wall mounting in any position. For surface mounting, a surface mounting box shall be used. For semi-recessed installation a semi-recessed sleeve shall be used.
- C. The back box shall be designed for duty as a recessed rough-in box in either masonry or frame. The back box shall be 20-gauge cold rolled steel and shall contain knock outs through which field wiring leads are brought and connected to pigtails of the preinstalled female disconnect receptacle. Connecting of the male plug of the inner frame completes the wiring of the heater.
- D. The inner frame assembly shall consist of a 20-gauge steel chassis on which are mounted the heating element, fan motor and blade, thermostat, fan control and thermal cut out. The inner frame assembly shall be completely prewired with the leads terminating in a male plug, thus facilitating positive disconnect and easy removal for service without disturbing the back box or field wiring.
- E. The heating element be of nonglowing design consisting of a special resistance wire enclosed in a steel sheath to which steel plate fins are brazed. The element shall cover the entire air discharge area to ensure uniform heating of all discharge air.
- F. The fan motor shall be impedance protected, permanently lubricated and with totally enclosed rotor.
 - G. Fan control shall be bimetallic, snap-action type and shall activate fan after heating element reaches operating temperature, and continue to operate the fan after the thermostat is satisfied and until all heated air has been discharged. The thermostat shall be of bimetallic, snap-action, two-pole type with enclosed contacts and with positive "off" on all models. Thermal cutout shall be bimetallic, snap-action type designed to automatically shut off heater in the event of over heating and reactivate the heater when temperatures return to normal.
- H. The louvered front cover shall be of 20-gauge cold rolled steel finished in desert tan baked enamel or chrome finish, with four mounting holes, mounting screws, and plug button to match finish.
- I. Unit shall be supplied with front covers without the hole for the thermostat knob to provide full tamper-proof installation.
- J. All sheet metal parts, except chrome finished front covers, shall be phosphatized, then completely painted as determined by the architect by an electrostatic, baked enamel, painting process.

2.31 AUTOMATIC TEMPERATURE CONTROLS

- A. Qualifications of Bidder
 - 1. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 3 years.
 - 2. Bidder must have an office within 50 miles of the job site staffed with factory-trained engineers capable of trouble shooting and maintaining all systems for the project.
 - 3. All bidders must be authorized distributors or branch offices of the manufacturers

specified.

4. All bidders must have a trained staff of application engineers, who have been certified by the manufacturer in the configuration, programming and service of the automation system. The Installer shall have successfully completed the Control Systems

B. SCOPE OF WORK

1. Except as otherwise noted, the control system shall consist of all Building Network Controllers, Custom Application Controllers, Application Specific Controllers, workstations, routers, software, sensors, transducers, relays, control valves, control dampers, valve and damper operators, control panels, and other accessory equipment to fully provide all required control functions. Provide a complete system of electrical interlock wiring to fill the intent of the specification and provide for a complete and operable system. Except as otherwise specified, provide operators for equipment such as dampers if the equipment manufacturer does not provide these. Coordinate requirements with the various Contractors.
2. The ATC Sub-Contractor shall review and study all HVAC drawings and all mechanical and electrical specifications to familiarize him with all equipment and sequences. ATC Sub-Contractor shall provide all the required quantities and types of devices necessary to completely perform all sequences, whether or not such devices are explicitly shown on the drawings or specified. If any devices are not specified they shall be of the same high quality of specified components.
3. All interlocking, wiring and installation of control devices associated with the equipment to be controlled shall be provided under this Contract. When the BAS system is fully installed and operational, the ATC Sub-Contractor and representatives of the Owner will review and check out the system and train the Owner's personnel. At that time, the ATC Sub-Contractor shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications. The ATC Sub-Contractor shall carry 40 hours of additional on-site programming to allow for field modifications that may be needed to optimize the various systems to fully conform to the requirements of these specifications and work with the actual operating conditions as installed.
4. At the completion of the project a network client shall be set up for the Engineer to view the system.
5. The ATC Sub-Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in the contract documents. At a minimum, provide controls for the following:
 - a. Graphics, reports, trending, alarms and occupancy (occupied, unoccupied and warm-up/cool-down) schedules as appropriate for all equipment.
 - b. Interface with controls provided by equipment manufacturers. Equipment controls shall be Lonworks protocol.
 - c. Gas fired energy recovery units.
 - d. Energy recovery units.
 - e. Electric duct heaters.
 - f. Fresh air (ERV) system control dampers.
 - g. Variable refrigerant volume heat pump systems.
 - h. Gas fired kitchen make up air units.
 - i. Space temperature monitoring for spaces served by ductless split system air

- conditioning units.
 - j. Monitoring points for building services such as electric usage and demand, gas meter, etc.
 - k. Power and control wiring to all DDC devices, dampers, BAS panels, etc.
 - l. All other equipment scheduled or shown on drawings
 - 6. Provide services and manpower necessary for testing of system in coordination with the HVAC Sub-Contractor, TAB Contractor and Owner's representative and in accordance with the acceptance testing plan and functional performance test narratives.
 - 7. All work required in the Commissioning section of the specifications. See Specification Section 019100.
 - 8. All work performed under this section of the specifications shall comply with all codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the ATC Sub-Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern. The ATC Sub-Contractor shall obtain and pay for all necessary construction permits and licenses.
- C. SYSTEM DESCRIPTION
1. The Building Automation System (BAS) shall consist of PC-based workstations and Lon-based microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions. The intent is for the BAS to seamlessly connect devices throughout the building, regardless of sub-system type. Gateways shall not be used.
 2. The system for this building shall be integrated with the Town-wide BAS system.
 3. For this project the system shall consist of the following components:
 - a. Operator Workstation(s): The ATC Sub-Contractor shall furnish Operator Workstation Computers and printers as described in the specification. System monitoring and supervisory control shall be through the installation of graphical user interface (GUI) software applications through a fast interface/graphics sub-system. GUI workstations shall provide complete access to any point in the system at any time. Remote operator interfaces and configuration tools shall be supported in a client server fashion.
 - 1 The operator workstation for this building shall be located in the basement mechanical room.
 - b. Ethernet-based Building Network Control Units (BNCU): The ATC Sub-Contractor shall furnish Ethernet-based Building Network Controllers as described in Part 2 of the specifications. These controllers shall connect directly to the Operator Workstation over the Town HVAC network, provide communication to all Custom Application Controllers, Application Specific Controllers, Input/Output Modules, and serve as a communication link to equipment furnished by others (if applicable).
 - c. Custom Application Controllers (CAC):
 - 1 Provide the necessary quantity and types of Custom Application Controllers to meet the requirements of the project for control of the designated mechanical equipment. All controllers shall be seamlessly integrated utilizing the same network and the same programming language.

- 2 Each controller shall be completely programmable and provide functionality based on I/O configuration rather than application. For example, the Custom Application Controllers shall have the ability to provide local lighting control.
 - 3 Each CAC shall operate completely standalone, containing all of the I/O (including 15% spare points of each type) and programs to control its associated equipment.
- d. Application Specific Controllers (ASC):
- 1 Provide the necessary quantity and types of Application Specific Controllers to meet the requirements of the project for control of the designated equipment. All controllers shall be seamlessly integrated utilizing the same network and the same programming language.
 - 2 Each ASC shall be capable of executing the required sequences of operation and provide the I/O point capacity and types as indicated on the drawings.
 - 3 Each ASC shall operate completely standalone, containing all of the I/O and programs to control its associated equipment.
- e. WEB Server: The BAS shall function as a WEB server to allow an operator to view and/or modify any point in the system via the Control Suite software located on the Town HVAC network. Systems requiring any version of the workstation software loaded on the accessing computer shall not be acceptable.
- D. WORK BY OTHERS
1. The ATC Sub-Contractor shall cooperate with other contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work.
 2. The ATC Sub-Contractor shall furnish all control dampers (not furnished by equipment manufacturers) and other similar equipment for installation by the HVAC Sub-Contractor.
 3. The ATC Sub-Contractor shall provide field supervision to the designated contractor for the installation of the following:
 - a. Control dampers.
 - b. Location of all sensor wells and tapings in all duct systems.
 4. The Electrical Contractor shall provide:
 - a. All power wiring to motors and to junction boxes in mechanical rooms. All power wiring from the boxes to all BAS panels and devices, regardless of location, shall be by the ATC Sub-Contractor.
 - b. Furnish smoke detectors and wire to the building fire alarm system. HVAC Sub-Contractor to mount devices. ATC Sub-Contractor to hardwire to fan shut down and BAS alarm.
 - c. Contact(s) from fire alarm system for opening of elevator shaft vent damper(s) for wiring by ATC Sub-Contractor.
- E. CODE COMPLIANCE
1. All equipment or wiring used in conditioned air streams, spaces or return air plenums shall comply with NFPA 90A Flame/Smoke/Fuel contribution rating of 25/50/0 and all applicable building codes or requirements.
 2. All wiring shall conform to the National Electrical Code and the Division 26 specifications – whichever is more stringent.

3. All smoke dampers shall be rated in accordance with UL 555S.
 4. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.
 5. Comply with FCC, Part 68 rules for telephone modems and data sets.
- F. SUBMITTALS
1. Submittals shall be in accordance with Section 013300-Submittals.
 2. Shop drawings shall include a riser diagram and floor plans depicting locations of all controllers, routers, hubs, workstations, etc. with associated network architecture and wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. Wiring diagrams detailing interconnecting devices such as fan starters, freezestats, smoke detectors, relays, etc., shall be provided for each system. Written narratives for all sequences shall be included. A "Bill of Materials" list shall be provided for each system indicating part numbers, descriptions, manufacturer, and quantities of each component utilized.
 3. Submittal data shall contain manufacturer's data sheets on all hardware and software products required by the specification and sequences. Damper, and airflow station schedules shall indicate size, type, configuration, capacity, maximum pressure rating, pressure drop, maximum differential pressure shut-off capabilities, and name and location of all equipment served.
 4. Submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, trends, alarms and configuration to be furnished with the workstation software. Provide complete information on user programming (commands, sequences, etc.). Information shall be bound or in a three ring binder with an index and tabs.
 5. No work may begin on any segment of the project until submittals have been reviewed for conformity with the design intent of the project and approved.
- G. SYSTEM STARTUP AND ACCEPTANCE TESTING
1. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS shall be tested against the appropriate sequence of operation. The system shall be functionally tested as part of the Commissioning process. The warranty period shall begin after successful completion of the system test and commissioning functional testing.
 2. The ATC Sub-Contractor shall submit their acceptance testing plan, pre-functional performance test forms and narratives, and functional performance test forms and narratives. Unless a commissioning agent has been contracted the responsibility to facilitate the commissioning process, the ATC Sub-Contractor shall be responsible for coordinating the attendees needed to demonstrate the sequence of operation performance to the Owner. The controls system will not be accepted without the prior acceptance of the submitted documents noted herein.
 3. The ATC Sub-Contractor shall test and set in operating condition all equipment and systems. For major equipment such as chillers, boilers, and air handling units, this shall be done in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives. Coordinate with all required attendees.
 4. The ATC Sub-Contractor shall provide all manpower and engineering services

required to assist the HVAC Sub-Contractor and TAB Sub-Contractor in testing, adjusting, and balancing all systems in the building. The ATC Sub-Contractor shall have a trained technician available on request during the balancing of the systems. The ATC Sub-Contractor shall coordinate all requirements to provide a complete air balance with the TAB Sub-Contractor and shall include all labor and materials in his contract.

H. TRAINING

1. On-site training shall also include a minimum of 8 hours of hands-on instruction geared toward the operation and maintenance of the systems. Two weeks prior to training, the necessary lesson plans, training documents, handouts, etc. shall be provided with the curriculum outline, which shall include as a minimum:
 - a. System Overview.
 - b. System Software and Operation.
 - c. System Access.
 - d. Software features overview.
 - e. Changing set points and other attributes.
 - f. Scheduling.
 - g. Editing programmed variables.
 - h. Displaying and editing color graphics.
 - i. Running reports and trending.
 - j. Workstation maintenance.
 - k. Application programming.
 - l. Operational sequences including start-up, shutdown, adjusting and balancing.
 - m. Equipment maintenance.

I. OPERATION AND MAINTENANCE MANUALS

1. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire BAS. This documentation shall include specific part numbers and software versions and dates. A complete list of recommended spare parts shall be included with the lead time and expected frequency of use of each part clearly identified. These manuals shall be delivered to the Owner's representative within 2 months of the final approved submittals before substantial completion.
2. The preventative maintenance shall include all tasking, frequency, and special instructions required for a proactive preventative maintenance action plan.
3. Following project completion and testing, the ATC Sub-Contractor shall submit "as-built" record drawings reflecting the exact installation of the system. The as-built documentation shall also include a copy of all application software both in written form and on CD/DVD.

J. WARRANTY

1. The ATC Sub-Contractor shall warrant the entire system (parts and labor) for 12 months after successful system acceptance testing is accepted by Owner's Representative. Beneficial use by the owner may be an alternative method to begin the warrantee period (providing there is a minimum of 12 months left after successful system acceptance testing and system acceptance by Owner's Representative). During the warranty period, the ATC Sub-Contractor shall be responsible for all software and hardware upgrades and revisions during normal workday schedule, and within 48 hours of notification if solution cannot be resolved via the remote or web-

site connection, to provide and maintain complete and workable building control systems.

K. CONTROL DAMPERS AND ACTUATORS

1. Automatic dampers, furnished by the ATC Sub-Contractor shall be low leakage and include all required linkages, supports, actuators, switches, etc. Dampers are to be installed by the HVAC or Sheet Metal Sub-Contractor under the supervision of the ATC Contractor. All blank-off plates and conversions necessary to install smaller than duct size dampers are the responsibility of the Sheet Metal Contractor. Control dampers shall be designed for operation in a temperature range of -25oF and 180oF.
2. Damper blade width shall not exceed six inches (eight inches for high pressure dampers), unless otherwise noted on drawings. Blade and frame seals shall be replaceable extruded silicone, EDPM, or PVC coated polyester (for low velocity dampers only) on blade edges, TPE or stainless steel compression at jambs. Seals and linkages shall provide tight closing, low leakage dampers.
3. Dampers installed on fan discharges shall be oriented such the blades are perpendicular to the fan shaft, this will minimize pressure drop due to uneven airflow from the fan. Unless otherwise noted, provide opposed blade dampers for modulating applications and parallel blade for two-position control. Dampers, providing they meet the requirements of these specifications, shall be as manufactured by Ruskin, Arrow, TAMCO (T. A. Morrison), American Warming and Ventilating, Vent Products, Greenheck, Honeywell, or Johnson Controls. Note that not all manufacturers may make all types of dampers. Ruskin model numbers are used to indicate the minimum acceptable quality for each type of damper.
4. Dampers for use in galvanized steel duct systems shall be either galvanized steel, stainless steel or aluminum. Dampers for use in aluminum duct systems shall be either aluminum or stainless steel. Dampers for use in stainless steel duct systems shall be either stainless steel or baked herisite coated aluminum (with no steel or galvanized steel parts).
5. Low pressure control dampers (on up to 2" pressure class ductwork) with velocities up to 1,500 fpm shall be flat blade type designed for a minimum of 2.5" differential pressure (all sizes) and up to 2,000 fpm face velocity. These are designated as low pressure dampers. Maximum size of modules for large dampers shall be 4' x 4' (could be pressure limited) with an AMCA certified leakage rate not exceeding 3.7 cfm/sf at 1" w.g. static pressure differential. Where larger dampers are needed (either dimension), incorporate mullion supports (same material as damper frame) Designed to prevent failure or deformation of the damper assembly up to a differential pressure of 4" w.g. Maximum pressure drop of a fully open 2' x 2' damper at 1,500 fpm shall not exceed 0.08".
6. Aluminum Dampers:
 - a. Low Pressure Dampers: Frames and single thickness blades shall be constructed of not less than 0.080" thick extruded aluminum, type 6063-T5 with minimum 4" deep frame. Linkage hardware shall be installed in frame side and be constructed of aluminum and corrosion resistant, zinc & nickel-plated steel (stainless steel for use in stainless steel duct systems). Coordinate with manufacturers for inclusion of thrust collars and other special requirements where vertical blades are required (such as fan discharges). Aluminum low pressure control dampers shall be equal to Ruskin Type CD51.

7. Damper actuators shall be electronic direct coupled over the shaft, enabling it to be mounted directly to the damper shaft with a "V" shaped toothed cradle (to minimize slippage) without the need for connecting linkage. Actuators shall have electronic overload circuitry to prevent damage. Actuators shall have position indicator. For powerfailure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Spring shall be capable of easy field change from normally open to normally closed. Actuators shall have an external manual gear release (above 60 in-lb torque, provide manual crank) to allow manual positioning of the damper when the actuator is not powered. Modulating actuators shall accept a 0 to 10 VDC or 0 to 20 mA control input and provide a 2 to 10 VDC or 4 to 20 mA operating range. All actuators on dampers larger than 2 square feet shall provide a position feedback signal (such as 2 to 10 VDC) indicating damper position, wired to the BAS and indicated on the graphics.
8. Actuators for dampers mounted in up to 2" pressure class shall be sized for a minimum 2,500 fpm velocity and 2" differential pressure with a minimum 15% safety factor. Actuator for dampers mounted in higher pressure class ductwork shall be sized for 4,000 fpm velocity and a differential pressure equal to the duct design pressure with a minimum 15% safety factor. Show actuator sizing calculations on submittals. Actuators shall be as manufactured by Belimo, Siemens, or approved equal.

L. **HARDWARE INSTALLATION**

1. Installation Practices for Wiring
 - a. All controllers are to be mounted vertically and per the manufacturer's installation documentation.
 - b. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run, with a separate breaker. Each run shall include a separate hot, neutral and ground wire. The ground wire shall terminate at the breaker panel ground. This circuit shall not feed any other circuit or device.
 - c. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.
 - d. Wires shall be attached to the building proper at regular intervals such that wiring does not droop. Wires shall not to be affixed to or supported by pipes, conduit, ducts, etc.
 - e. Conduit in finished areas, shall be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.
 - f. Conduit, in non-finished areas where possible, shall be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure. Wires shall be kept a minimum of three (3) inches from all piping.
 - g. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.
 - h. Wire shall not be allowed to run across telephone equipment areas.
2. Installation Practices for Field Devices
 - a. Well-mounted sensors shall include thermal conducting compound within the well

- to insure good heat transfer to the sensor.
 - b. Actuators shall be firmly mounted to give positive movement and linkage shall be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
 - c. Relay outputs shall include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.
 - d. Water line mounted sensors shall be removable without shutting down the system in which they are installed.
 - e. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.
 - f. For building static pressure sensors, the high pressure port shall be inserted into the space via a metal tube. Pipe the low pressure port to the outside of the building with a shield to prevent distortion of reading due to wind.
3. Enclosures
- a. For all I/O requiring field interface devices, these devices where practical shall be mounted in field interface panels (FIP). The ATC Sub-Contractor shall provide an enclosure, which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
 - b. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
 - c. FIP enclosures shall be of steel construction with baked enamel finish, NEMA 1 rated with hinged doors and keyed locks. The enclosures shall be sized for twenty percent spare mounting space. All locks will be keyed identically.
 - d. All wiring to and from the FIP shall be to labeled screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
 - e. All outside mounted enclosures shall meet the NEMA-4 rating.
 - f. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.
4. Identification
- a. Identify all control wires with labeling tape or sleeves using words, letters, and/or numbers that can be exactly cross-referenced with as-built drawings.
 - b. All I/O field devices inside FIP's shall be clearly labeled.
 - c. All enclosures (including controllers), all I/O field devices (except space sensors), all control valves and actuators, all routers and other field devices that are not mounted within FIP's shall be identified as follows:
 - 1 Identification shall be with bakelite nameplates. The lettering shall be in white against a black or blue background, be keyed to the as built drawings, and indicate that the device is a control device.
5. Location
- a. The location of sensors shall be per mechanical and architectural drawings or as required for proper operation. Coordinate with installing contractor to provide appropriate straight upstream and/or downstream runs for accurate readings of mixed temperatures or flows.
 - b. Space humidity, carbon dioxide or temperature sensors shall be mounted away

from machinery generating heat, direct light and diffuser air streams.

- c. Outdoor air temperature sensors shall be mounted on the north building face directly in the outside air. Install outdoor temperature and humidity sensors with solar radiation/precipitation shields to minimize the effects of heat radiated from the building or sunlight and from rain.
- d. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

M. WIRING, CONDUIT AND CABLE

- 1. All wire will be copper and meet the minimum wire size and insulation class listed below:

Wire Class	Wire Size	Isolation Class
Power	12 Gauge	600 Volt
Class One	14 Gauge Std.	600 Volt
Class Two	18 Gauge Std.	300 Volt
Class Three	18 Gauge Std.	300 Volt
Communications	Per Mfr.	Per Mfr.

- 2. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.
- 3. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.
- 4. Where wiring is required to be installed in conduit, EMT shall be used unless indicated otherwise on the Drawings or as required by Division 26 specifications. Conduit shall be minimum 1/2 inch galvanized EMT. Set screw fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit seal-off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.
- 5. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.
- 6. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JHboxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.
- 7. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management or smoke control systems shall be in conduit.
- 8. Coaxial cable shall conform to RG62 or RG59 rating. Provide plenum rated coaxial

cable when running in return air plenums.

9. Ethernet 10/100 Base –T network wiring shall be equivalent to Owner’s premise wiring or, as a minimum, Category 5 cabling.
10. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140.
11. Only glass fiber is acceptable, no plastic.
12. Fiber optic cable shall only be installed and terminated by an experienced sub-contractor. The ATC contractor shall submit to the Engineer the name of the intended sub-contractor of the fiber optic cable with his submittal documents.

N. SEQUENCE OF OPERATION

1. Refer to HVAC floor plans and Piping Schematics located on the drawings for equipment designations and locations.
2. All of the systems setpoints and controls shall be tied into the DDC system and shall be adjustable through the system unless otherwise noted.
3. Energy Recovery Unit and Fresh Air Control Dampers
 - a. ERV-1 shall be provided with a Lonworks communication card to allow interface with the DDC system.
 - b. ERV-1 shall be energized and run continuously during occupied hours as determined by a schedule in the DDC system.
 - c. When ERV-1 is energized:
 - 1 The supply and exhaust dampers shall be open.
 - 2 The supply and exhaust fans shall be energized and run continuously.
 - 3 If the ERV supply discharge air temperature is below the supply air temperature setpoint of 70°F (adjustable) and the enthalpy when is energized, the gas furnace shall modulate to maintain 70°F the supply air temperature setpoint.
 - 4 If the ERV supply discharge air temperature is greater than the supply air temperature setpoint, the gas furnace shall be de-energized.
 - d. Enthalpy Wheel
 - 1 When the outdoor air temperature is between 55 °F and 75 °F (adjustable), the wheel shall be de-energized.
 - e. When ERV-1 is de-energized:
 - 1 The supply and exhaust fans shall be de-energized.
 - 2 The supply and exhaust dampers shall be closed.
 - f. The fresh air control dampers shall be controlled by carbon dioxide sensors located in each of the two Multi Purpose Rooms.
 - 1 When the CO2 concentration as sensed by either sensor rises above 800 parts per million (ppm), the dampers controlling the air to other parts of the building shall close and the fresh air damper for the Multi Purpose Room shall open for a minimum of 30 minutes (adjustable).
 - 2 When the CO2 concentration drops below 800 ppm and the dampers has been open for a minimum of 30 minutes (adjustable), the fresh air damper for the Multi Purpose Room shall close and the fresh air dampers for the other parts of the building shall open.
4. Energy Recovery Unit
 - a. ERV-2 shall be energized and run continuously during occupied hours as determined by a schedule in the DDC system.
 - b. When ERV-2 is energized:

- 1 The supply and exhaust dampers shall be open.
 - 2 The electric duct heater shall be energized by a duct mounted airflow switch and shall stage to maintain 70°F (adjustable) discharge temperature.
 - 3 When the ERV-2 discharge air temperature is above the discharge temperature setpoint the electric duct heater shall be de-energized.
 - 4 The discharge air temperature setpoint shall be adjustable in the DDC system.
- c. When ERV-2 is de-energized:
- 1 The supply and exhaust dampers shall be closed.
5. Variable Refrigerant Volume Heat Pump (VRV) System
- a. The variable refrigerant volume heat pump system will have a manufacturer provided control system.
 - 1 The ATC sub-contractor shall provide all required control wiring between air handlers, condensing units, control panels, etc, per the manufacturer's recommendations and requirements.
 - 2 The HVAC sub-contractor shall provide the set-up of the VRV system manufacturer provided control system. The ATC sub-contractor shall assist the HVAC sub-contractor in identifying any requirements of the system for integration with the DDC system.
 - 3 The VRV system shall be provided with a LonWorks interface by the HVAC sub-contractor. The ATC sub-contractor shall be responsible for all programming required to configure the LonWorks interface to integrate with the DDC system.
 - b. The DDC system shall be integrated with the VRV control system such that all temperature setpoints and scheduled for the VRV system can be changed from the DDC system front-end.
 - c. The DDC system shall receive and log all alarms from the VRV system.
 - d. The DDC system shall monitor all points available from the VRV control system, with the following being the minimum:
 - 1 Space temperatures
 - 2 Unit operating mode (indoor and outdoor units)
 - 3 Fan command
 - 4 Fan status
 - 5 Fan speed
 - e. The variable refrigerant volume heat pump system shall operate on internal controls to modulate the compressors to provide heating or cooling as required.
 - f. Indoor Units (FCUs)
 - 1 The indoor units shall be controlled by PAR-30MAAU controllers.
 - a) During occupied periods, the indoor units shall operate to maintain the space controller setpoint.
 - (a) The space controller setpoint shall be determined by the central control system unless overridden by the occupant at the space controller.
 - (b) When a single ducted unit serves multiple spaces, the space temperature sensor in the unit shall control the operation of the unit. When a unit serves a single space, the space, the space temperature sensor in the space controller shall control the unit

- b) During unoccupied periods, the indoor units shall operate to maintain the unoccupied setpoint temperature.
 - 2 Rooms with multiple indoor units shall have all units controlled from a single controller unless multiple controllers are indicated on the drawings.
- 6. Ductless Split System Air Conditioners
 - a. Ductless split system air conditioners shall be controlled by the packaged controls.
 - b. The ATC sub-contractor shall provide all control wiring between the indoor and outdoor units and between the thermostat/controller and the system.
 - c.

2.32 SCAFFOLDS AND STAGING

- A. General: Filed subcontractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - Temporary Facilities and Controls and herein.
 - 1. Scaffolding and staging required for use by this Filed subcontractor pursuant to requirements of Section 01 50 00 - Temporary Facilities and Controls shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Subcontract requiring such scaffolding.
 - 2. Each Filed subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - Temporary Facilities and Controls and as additionally required for dust control).
 - a. General Contractor is responsible to provide enclosures required for temporary heat from November 1 to March 31; refer to Section 01 50 00 - Temporary Facilities and Controls.
 - 3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Filed subcontractor.

2.33 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Filed subcontractor shall be furnished, installed, operated and maintained in safe conditions by this Filed subcontractor, as referenced under Section 01 50 00 - Temporary Facilities and Controls.

3 PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. All work shall be coordinated with the work to be installed by other sections of these specifications.
- B. All work shall be executed in a workmanlike manner by workmen skilled in this type of work and shall present a neat appearance when completed.
- C. All duct supports, structural members, hangers and other apparatus necessary to support firmly and substantially the various components of the systems shall be provided under this section.

- D. Nameplates, catalog numbers, and rating identifications shall be securely attached to equipment.
- E. The work shall be performed in a timely manner so as to cause no delay in the overall job progress. The HVAC Sub-Contractor shall cooperate with the other trades so that the work is installed in the most beneficial sequence for expeditious project completion.

3.2 CLEANING OF SYSTEMS AND PREMISES

- A. Before the systems are tested and balanced, all ducts serving the area under construction shall be cleaned so that no dirt, dust or other foreign matter will be carried through or deposited in the systems or the space served by the duct systems.
- B. At all times keep the premises clear of rubbish.
- C. Upon completion of the work in an area, remove all debris and rubbish resulting from the execution of this contract, and dispose of same. At anytime should the General Contractor be dissatisfied with the performance of the HVAC Sub-Contractor's clean up responsibilities, he may elect after notifying the HVAC Sub-Contractor to undertake this operation and to backcharge the HVAC Sub-Contractor accordingly.

3.3 HVAC SUB-CONTRACTOR'S WARRANTY

- A. The HVAC Sub-Contractor shall provide a one year warranty against failure of the installed materials for any reason. The warranty shall cover the full costs of parts and labor required to remedy the defect, including, if necessary, replacement at the site, and shall run from the date of the Architect's acceptance of the system. The warranty shall also include provision for field inspection at no charge to the Owner, to verify failure, establish probable cause, and determine corrective action required. The HVAC Sub-Contractor shall furnish all service during the first year of operation. Any material, that in the opinion of the architect, requires excessive service during the first year of operation shall be considered defective and will be replaced by the HVAC Sub-Contractor at no charge to the Owner.
- B. The HVAC Sub-Contractor shall provide a listing of all manufacturers' commercial warranties provided by those manufacturers on their Materials. The list of these warranties must include the time period of each warranty. One copy each of those warranties shall be submitted with the listing.
- C. The HVAC Sub-Contractor shall be responsible for warranting the testing, adjusting and balancing work for a period of one year after final date of completion. The HVAC Sub-Contractor shall also be responsible for all damage to existing systems as a result of the work performed. All damaged systems shall be repaired or replaced at the option of the Owner at no additional cost to the Owner. All such repair or replacement work shall be done immediately upon finding.
- D. Warranty response to any malfunction shall be on a next day, normal working hour basis.
- E. Work under warranty shall be performed by fully qualified workmen and/or technicians.
- F. All guarantees and warranties required to be provided for the work in this Section shall begin their term on the date of final written acceptance of the entire system by the Owner.

3.4 SUBMITTALS

- A. The capacity of each HVAC unit shall be substantiated by computer generated selection data or other detailed selection data provided by the manufacturer, for the specific

conditions defined on the drawings.

1. The selection data shall clearly show the entering and leaving fluid conditions, the fluid flow volume and the fluid pressure drop through the unit, the ambient conditions, the heat rejection media entering and leaving conditions, the available external static pressure, the unit total static pressure, the airside pressure drops, the refrigerant and the saturated suction temperature, the required RPM of the unit, the motor horsepower, the motor voltage, the motor efficiency, the motor RPM, the motor type, the fuel efficiency, the fuel consumption rate, the maximum capacity, the part load performance data of the anticipated operation of the system, and the radiated sound ratings at design conditions as may be appropriate for any specific piece of equipment.
- B. HVAC Sub-Contractor shall submit shop drawings indicating the method of supporting all units.

3.5 PERFORMANCE

- A. The drawings are diagrammatic and the final arrangement of the work shall suit the existing and field conditions, the characteristics of the materials used and the instructions of the Engineer and/or the Architect.
- B. The HVAC Sub-Contractor shall be responsible for repair of damaged or disturbed existing work or the work of other trades caused by his work, testing of his work or repair to his work.
- C. All devices shall be installed in accordance with the manufacturer's recommendations, the Engineer's instructions and so as to provide all required access for cleaning, operation, repair and maintenance.

3.6 START UP

- A. All equipment, systems, controls and units shall be started as part of a heating, ventilating and air conditioning system, in accordance with all manufacturers' recommendations.
- B. Copies of start up sheets shall be included in Operations & Maintenance Manuals.

3.7 VIBRATION ISOLATION

- A. All equipment, piping, etc. shall be mounted on or suspended from approved foundations and supports, as specified herein or as shown on the drawings.
- B. Mounting sizes shall be determined by the mounting manufacturer and the mountings shall be installed in accordance with the manufacturer's recommendations. The HVAC Sub-Contractor shall be responsible for the adequacy of the mountings to provide the minimum isolation efficiency required by these specifications or as specifically noted on the drawings.
- C. Suspended centrifugal fans shall be installed on vibration isolation hangers.

3.8 RECTANGULAR DUCTS

- A. General
1. All ductwork shall be installed in accordance with the best trade practices and SMACNA standards shall be the minimum requirements.
 2. The Sheet Metal Sub-Contractor shall follow the application recommendations of the manufacturer of all hardware and accessory items and make selections of such

consistent with the duct classification and services.

B. Sealing

1. All ductwork shall be sealed in accordance with the following table:

SMACNA SEAL CLASS	SEALING REQUIRED	SMACNA STATIC PRESSURE CONSTRUCTION CLASS
A	All transverse joints All longitudinal seams All duct wall penetrations	4" W.G. and up
B	All transverse joints All longitudinal seams	3" W.G.
C	All transverse joints	2" W.G. and down

2. For the purposes of these specifications sealing shall mean the following:
 - a. The use of adhesives, gaskets, liquids, mastics, hot melt sealant, pressure sensitive tape or combinations thereof to close openings in the surface of the ductwork and field erected plenums and casings through which air leakage would occur.
 - b. The requirements to seal apply to both positive and negative pressure modes.
3. Pressure sensitive tape shall only be acceptable for sealing ductwork which operates at a static pressure of ½" or less.
4. Liquid sealant shall only be acceptable for slip joints where metal clearances do not exceed 1/16".
5. Gaskets shall be used for all flanged connections and shall have an adhesive backing to adhere to the flange during assembly of the joint.

C. Reinforcement

1. Unless specified otherwise on the drawings rectangular ductwork shall be constructed and reinforced per the following "Rectangular Duct Reinforcement" tables, where the duct wall thickness, the reinforcement spacing and the rigidity class are specified by duct size and pressure classification. Rigidity class designations are based on the SMACNA standards for "Intermediate Reinforcement" and "Transverse Joint Reinforcement" as published in the SMACNA "HVAC DUCT CONSTRUCTION STANDARDS - Metal and Flexible".
2. Duct sides that are 19" and over and are 20 gauge or less with more than 10 square feet of unbraced panel shall be cross braced or beaded unless they are lined or externally insulated.
3. Fittings shall be reinforced similarly to sections of straight duct. On size change fittings the greater fitting dimension determines the duct gauge. Where fitting curvature or internal members provide equivalent rigidity, such features may be credited as reinforcement.
4. The duct side with the largest dimension shall determine the duct gauge.
5. Holes made in the duct walls for the passage of tie rods shall be of minimum size and shall be sealed in accordance with the required duct seal classification.
6. Where used tie rods shall be evenly spaced in the width of the duct dimension.

D. Transverse Joints

1. Transverse joints shall be selected and used consistent with the static pressure

- class, sealing requirements and duct support intervals for proper assembly.
- 2. Where bar or angle stock is incorporated in a joint it shall be secured.
- 3. Fasteners shall be steel and may be zinc or cadmium coated. They shall not project into duct more than ½".
- 4. Where bolts or welds are specified other types of fasteners shall not be used.
- E. Seams
 - 1. Seams shall be suitably selected for the material and pressure classification of the duct.
 - 2. Seams shall be formed and assembled with proper dimension and proportion for tight and secure fit.

3.9 RECTANGULAR DUCT FITTINGS

- A. General
 - 1. All ductwork shall be installed in accordance with the best trade practices and SMACNA standards shall be the minimum requirements.
 - 2. The Sheet Metal Sub-Contractor shall follow the application recommendations of the manufacturer of all hardware and accessory items and make selections of such consistent with the duct classification and services.

3.10 ROUND DUCTS

- A. General
 - 1. All ductwork shall be installed in accordance with the best trade practices and SMACNA standards shall be the minimum requirements.
 - 2. The Sheet Metal Sub-Contractor shall follow the application recommendations of the manufacturer of all hardware and accessory items and make selections of such consistent with the duct classification and services.
- B. Duct Gauge
 - 1. Round ducts shall be constructed of the galvanized steel with duct walls in accordance with "SMACNA" standards.

3.11 ROUND DUCT FITTINGS

- A. Elbows larger than 8" shall be five piece welded construction.
- B. Branch and take-off fittings shall be conical tee or conical reducing tee fittings.
- C. Final connections to the individual terminal supply units shall be by means of flexible duct.

3.12 BALANCING DAMPERS

- A. Balancing dampers shall be located as shown on the drawings and in the following locations as a minimum:
 - 1. All supply and return air branches from the trunks and all sub-branches from the mains shall have balancing dampers.
 - 2. Branch duct connections from low pressure ducts to diffusers shall be made with dampered spin collars.
- B. Locate dampers as far as possible from air outlets.

3.13 FLEXIBLE DUCTS

- A. Use
 - 1. Flexible ducts shall not exceed 5 feet in length.
 - 2. All flexible duct used on the supply air system shall be insulated with 1½" thick vinyl jacketed fiberglass insulation.
- B. Length
 - 1. The minimum length of flexible duct shall be used.
 - 2. The maximum length of flexible duct in any single duct run shall be four feet.
 - 3. Flexible duct shall not be used on supply air systems.
- C. Bends
 - 1. Bends shall be made with not less than one and one half duct diameter centerline radius.
 - 2. Maximum bend shall be 90°.
- D. Fastening
 - 1. Secure flexible duct to collar or sleeve by peeling back jacket and insulation at end of flexible duct. Fit duct over collar or sleeve and clamp with ½" wide galvanized steel or stainless steel bands or clamps and matching seals. Pull jacket and insulation back in place and secure with two wraps of pressure sensitive sealing tape. Clamping device shall be two inches back from end of flexible duct. Seal with two wraps of duct tape.
- E. Installation
 - 1. Flexible duct is to be installed as straight as possible and as tight as possible.
 - 2. Submittals shall include product data sheets as well as the manufacturer's recommended installation practices.

3.14 SUSPENSION OF DUCTWORK

- A. Rigid round and rectangular ducts shall be installed with support systems as required to maintain alignment. Horizontal ducts shall have a support within two feet of each elbow and within four feet of each branch intersection.
- B. Strap hangers on rectangular ducts may be used on ducts less than 60" wide if they are secured to the bottom of the duct with an approved fastener and with a minimum 1" tab below the duct, or with no fasteners if the strap is a single continuous loop.
- C. Multiple trapeze hangers may be suspended from rod hangers to support ducts directly above and below each other if the rods are sized to support the combined load.
- D. Round ducts less than 10" in diameter may be suspended by wire.
- E. All hangers and trapezes shall be sized, spaced and selected in accordance with Section IV of SMACNA "HVAC DUCT CONSTRUCTION STANDARDS".

3.15 MISCELLANEOUS DUCT WORK REQUIREMENTS

- A. Ductwork connected to intake or discharge louvers shall be painted inside for the first ten feet with bitumastic and pitched to a low point. The low point is to be provided with a 1½" copper drain piped by this trade to a building drain.
- B. A gasket type joint shall be used where dissimilar metals are joined.

3.16 DUCT INSULATION - DUCT WRAP

- A. All work shall be in strict accordance with applicable codes and ordinances and the manufacturers recommendations.
- B. All completed work shall be smooth in appearance.

- C. Seams shall be stapled 6" on center with outward clinching staples and sealed with pressure sensitive aluminum foil tape.
- D. All seams, joints punctures and tears shall be sealed with pressure sensitive aluminum, foil tape.
- E. All air conditioning supply and return ductwork shall be insulated. All exterior insulated ductwork shall be weather proofed per Section 2.18.

3.17 PIPE HANGERS, SUPPORTS, ANCHORS AND GUIDES

- A. The HVAC Sub-Contractor shall submit shop drawings indicating the method of supporting all piping furnished by this trade.
- B. The Structural Engineer or Architect must approve the method of hanging before work is commenced.
- C. Shop drawings of anchors shall be submitted before work is commenced.
- D. Shop drawings of guides shall be submitted before work is commenced.
- E. Sleeves of the specified type shall be installed wherever pipe lines penetrate walls, roofs, floors or partitions.
- F. Sleeves shall be installed in accordance with the requirements of NFPA and the Massachusetts State Building Code.

3.18 PIPING SYSTEM INSTALLATION AND ASSEMBLY

- A. All piping shall be installed at right angles to building surfaces, supports and structures.
- B. Pipe welding shall performed by a certified welder with oxy-acetylene or electric arc in accordance with the latest revision of the applicable code, ASME Boiler Construction Code, ASA Code for Pressure Piping, or state and/or local codes which may supersede codes mentioned.
- C. Threaded joints shall be made with Teflon tape only applied to male threads and care being taken to insure that the tape does not reach the interior of the pipe. All burrs and/or cuttings shall be removed and the pipe shall be reamed or filed out to not less than the original diameter. Piping shall be kept free from scale and dirt.
- D. All pipes shall be straight, true and round without obstructions and with sharp, full cut threads or with ends beveled for welding.
- E. Provide drain valves with hose connections at all low points and at the bottoms of all risers to allow for complete drainage of the system.
- F. All openings shall be capped or plugged during construction to prevent dirt and/or rubbish from entering the piping.
- G. Unions or flanged connections shall be placed wherever necessary to permit easy dismantling of the piping and equipment.
- H. Where possible, piping shall be grouped together and supported in a neat and orderly manner.
- I. Insulating bushings or dielectric nipples shall be provided between steel piping and copper piping on equipment.
- J. Air vents shall be provided where indicated on the drawings and at all high points in the water systems.
- K. Pipe must be supported before and after expansion compensation devices.
- L. Mount all pressure gauges to be read from the floor.
- M. Install pressure gauges on the suction and discharge of pumps.
- N. Provide two spare pressure gauges of each pressure range and type.

- O. Mount all thermometers to be read from the floor.
- P. Install thermometers on the supply and return of the chill water system.
- Q. Provide two spare thermometers of each range and type.

3.19 SEISMIC RESTRAINTS

- A. Seismic restraints shall be provided in accordance with 780 CMR 1612.0 EARTHQUAKE LOADS. This specification does not require any additional seismic restraints beyond those of 780 CMR.
- B. Seismic restraints are required for:
 - 1. The energy recovery ventilator.
 - 2. Make Up Air Unit
- C. The HVAC Sub-Contractor shall be responsible for the design of the seismic restraints. The HVAC Sub-Contractor shall have the seismic restraint shop drawings stamped by a registered structural engineer.

3.20 FINAL ACCEPTANCE

- A. The HVAC Sub-Contractor shall leave all system components in proper working order, such as belt guards in place, access doors closed, doors to electrical switch boxes closed, thermostats restored to specified setting. All recorded data shall represent a true, actually measured, or observed condition. Any abnormal conditions in the mechanical systems or conditions that prevent total system balance shall be reported to the Architect immediately upon finding. The HVAC Sub-Contractor shall permanently mark all dampers and other adjustment devices in a manner that will allow the settings to be restored.
- B. The HVAC Sub-Contractor shall verify control system operation as specified, and shall report all system problems and malfunctions. The verification and checkout of the control system shall be accomplished during the heating and cooling cycles of operation for an appropriate period of time to assure control response and overall stability.
- C. The HVAC Sub-Contractor shall verify that all air systems are in compliance with all standards, such as ASHRAE minimum outside air, and all other applicable codes and requirements.
- D. All filters shall be replaced by the HVAC Sub-Contractor before commencing.
- E. The HVAC Sub-Contractor shall make any necessary changes in fan speed, and shall realign all belts when necessary.

3.21 AIR BALANCING

- A. The HVAC Subcontractor shall employ an independent TAB Sub-Contractor, acceptable to and approved by the Architect/Engineer, to balance and adjust the air systems.
- B. Balancing and adjusting shall not begin until all HVAC systems have been installed and are in full working order. Prior to the start of balancing, the following shall be checked:
 - 1. Rotation of all fans.
 - 2. Dampers are free to open and close
 - 3. Clean filters are in place.
- C. Upon completion of balancing and adjusting of the systems hereinafter specified, submit six (6) copies of the data for review and approval by the Architect/Engineer.
- D. The TAB Sub-Contractor shall be procured early enough in the project to allow for him/her to review the project documents and determine if sufficient components are in place to balance and adjust the systems. The TAB Sub-Contract shall provide a list of

- any deficient are he/she identifies.
- E. TAB Sub-Contractor shall provide all testing instruments, manpower, temporarily connections and materials needed for balancing and adjusting of the air systems. All test instruments should have been calibrated within the last six (6) months. The TAB Sub-Contractor shall provide verification of calibration upon request.
 - F. Architect/Engineer and Owner shall be notified a minimum of five (5) days prior to balancing commencing so that a representative can be available to witness the balancing work. In addition, the TAB Sub-Contractor shall (upon completion of the balancing work and report submittal), at the request of the Architect/Engineer or Owner's representative, verify the balancing readings at four (4) locations. The locations shall be chosen by the Architect/Engineer or Owner's representative.
 - G. All balancing and adjusting of air systems shall be done in accordance with the latest edition of the NEBB procedural Standards for Testing, Adjusting and Balancing of Environmental systems or the latest edition of SMACNA's HVAC Systems Testing, Adjusting and Balancing.
 - H. Balancing of the cooling systems shall be performed in the air conditioning season, heating systems in the heating season.
 - I. Prior to balancing of the air systems, and as part of the balancing report, the TAB Sub-Contractor shall prepare ductwork schematics of the systems to be balanced. Schematics shall be similar to those indicated in the NEBB and SMACNA publications previously identified.
 - J. Air Balancing Report forms shall be similar to the standard NEBB and SMACNA forms found in the previously identified manuals. The following information shall be provided at minimum (reports for equipment and systems not indicated shall be obtained from the NEBB/SMACNA manuals or prepared by the TAB Sub-Contractor. Reports prepared by the TAB Sub-Contractor shall be submitted for review and approval prior to final Balancing Report submittal):
 - 1. Air Apparatus Test Report
 - a. Location.
 - b. System Number.
 - c. Manufacturer.
 - d. Airflow - design and actual.
 - e. Total CFM.
 - f. Total Static pressure.
 - g. Discharge Static Pressure.
 - h. Suction Static Pressure.
 - i. Coil pressure drops (static pressure).
 - j. Filter pressure drops.
 - k. Motor volts and amps.
 - l. Outside Air and Return Air CFM.
 - m. Drive data.
 - 2. Fan Test Report
 - a. System Number.
 - b. Location.
 - c. Manufacturer.
 - d. Airflow - design and actual.
 - e. Total static pressure - design and actual.

- f. Inlet static pressure.
 - g. Discharge static pressure.
 - h. Motor and Drive data.
 - i. Fan RPM.
 - j. Voltage and Amperage.
3. Duct Traverse
- a. System zone/branch.
 - b. Duct Size.
 - c. Area.
 - d. Design Velocity.
 - e. Design Airflow.
 - f. Test Velocity.
 - g. Test Airflow.
 - h. Duct Static Pressure.
 - i. Air temperature.
4. Air Outlet Report
- a. Area Served.
 - b. Outlet Number.
 - c. Type.
 - d. Size.
 - e. AK factor.
 - f. Velocity - design and actual.
 - g. Airflow - design and actual.
- K. The TAB Sub-Contractor shall balance and adjust air systems to meet design requirements. $\pm 5\%$. Balancing shall be accomplished by adjusting dampers, drives, etc. to obtain design requirements.
- L. The HVAC Sub-Contractor shall cooperate and make provisions for the TAB Sub-Contractor as needed to accommodate the air balancing. As part of this Contract, the HVAC Sub-Contractor shall provide and/or change pulleys, belts and sheaves, and dampers, at no additional cost, in order to properly balance the systems to design requirements.

3.22 START UP AND TESTING OF COOLING AND HEATING EQUIPMENT

- A. All cooling equipment shall be tested to verify that the equipment operates mechanically and electrically as specified.
- B. All heating equipment shall be tested to verify that the equipment operates mechanically and electrically as specified.
- C. The HVAC Sub-Contractor shall verify that all operating and safety controls are correctly adjusted.
- D. The HVAC Sub-Contractor shall verify that the cooling equipment controls are operating properly.
- E. Tests shall be made to verify that the capacity control is fully modulating according to the required load. Tests shall be made at minimum load, 50% load, 100% load and various other loads throughout the modulating cycle.
- F. The HVAC Sub-Contractor shall record the following non-test data:
 - 1. Equipment designation number.
 - 2. Equipment manufacturer.

3. Model number.
 4. Serial number.
 5. Rated input.
 6. Rated output.
 7. All other pertinent data.
- G. The HVAC Sub-Contractor shall perform and record the following to meet minimum requirements:
1. Verify proper system operation.
 2. Verify that the cooling system controls are operating according to design specifications.
 3. All other measurements required for complete system testing.
- H. The HVAC Sub-Contractor shall calculate the system coefficient of performance as measured. All calculations made using the measured data shall be included in the report. In general, the HVAC Sub-Contractor shall complete all tests necessary for complete cooling and heating systems analysis.

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[SECTION 260001

ELECTRICAL WORK

(Filed Sub-Bid Required)

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SECTION 260001

ELECTRICAL WORK

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.01 FILED SUB-BID

- A. Electrical work is stipulated as a Filed Sub-Bid under Part D, Item 2 of the Form for General Bid.
- B. All sub-bids shall be submitted on the Form for Sub-Bid furnished by the Awarding Authority, as required by section 44F of Chapter 149 of the Massachusetts General Laws, as amended.
- C. Sub-Bids must be filed with the Awarding Authority in a sealed envelope, before twelve o'clock (noon), Boston time, on the date stipulated in the Advertisement.
- D. Specific information relating to the sub-bidders is set forth in the Contract Documents, under the heading "Notice to All Bidders, Including Sub-Bidders" and the attention of sub-bidders is directed thereto.
- E. Sub Sub-Bid Requirements: None under this Section.
- F. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:
 - E0.01 Electrical General Notes, Symbols & Abbreviations
 - E1.01 Electrical Demolition Plan First Floor
 - E1.11 Electrical Proposed Plan Ground Floor
 - E1.12 Electrical Proposed Plan First Floor
 - E1.13 Electrical Proposed Plan Second Floor
 - E1.14 Electrical Proposed Plan Roof
 - E2.01 Electrical One Line Diagram & Schedules "I"
 - E2.02 Electrical One Line Diagram & Schedules "II"
 - E2.03 Electrical One Line Diagram & Schedules "III"
 - E3.01 Electrical Details
 - FA1.11 Fire Alarm Proposed Plan Roof
 - FA2.01 Fire Alarm Riser, Details and Notes

1.02 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.03 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Interior secondary distribution systems including overcurrent and switching devices, panelboards, raceways, cables, wiring, junction and pull boxes, wireways, and all other components required for complete electrical distribution system.
 2. Grounding and bonding of all electrical systems and equipment.
 3. Fire alarm system complete with all devices and wiring.
 4. Wiring devices (switches and receptacles) complete with associated wall plates.
 5. Power wiring to new HVAC equipment.
 6. Testing of all new electrical systems.
 7. Coordination between electrical and other trades.
 8. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.
 9. Core drilling for the Work of this Section.
 10. Coordination drawings and record drawings and similar requirements.
 11. Hoisting Equipment: The Electrical Work subcontractor shall furnish, install and maintain in safe and adequate condition all mechanical hoisting equipment, operating personnel and rigging that is necessary for the proper execution of the Work of this Section.
 12. Staging, Planking and Scaffolding: The Electrical Work subcontractor shall furnish, install and maintain in safe and adequate condition, all staging, planking and scaffolding necessary for the proper execution of the Work in this Section.
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
1. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING:
 - a. Power connections for new Rooftop units, Remote condensing units, Energy recovery units, fan coil units, DDC control panels, fans.
- D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections:
1. Section 092100 – PLASTERING WORK:
 - a. Access doors in plaster assemblies.
 2. Section 092500 - GYPSUM DRYWALL:
 - a. Access doors in gypsum board assemblies.
 3. Section 230001 - HEATING, VENTILATING AND AIR CONDITIONING:
 - a. Duct smoke detectors and sampling tubes.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 055000 – METAL FRABRICATIONS for structural supports necessary to distribute loading from equipment to roof or floor.
 2. Section 061000 - ROUGH CARPENTRY for plywood packing panels.
 3. Section 072710 – FIRE PENETRATION SEALANTS for coordination of floor and wall penetrations with firestopping contractor.
 4. Section 092500 – GYPSUM DRYWALL for coordination with gypsum ceilings.
 5. Section 095113 – ACOUSTICAL PANEL CEILINGS for coordination with acoustical ceilings.
 6. Section 230001 – HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC piping and ductwork, motors, and DDC wiring except 120 VAC power to control panel as indicated on the Drawings
 7. Section 260001- ELECTRICAL WORK for fire alarm devices.
- F. The Electrical Sub-Contractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the electrical work.

1.04 SUBMITTALS

- A. Comply with requirements specified in Section 013000 – SUBMITTALS.
- B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
1. Panelboards.
 2. Overcurrent and switching devices.
 3. Wiring devices and wall plates.
 4. Fire alarm system with wiring diagram and schedule.
 5. Wiring and cables.
 6. Conduit.
 7. Boxes and fittings.
 8. Safety switches.

1.05 REFERENCES

- A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the drawings or specifications for electrical work carries with it the instruction to furnish, install and connect the item as part of the electrical work, regardless of whether or not this instruction is explicitly stated.
- B. It shall be understood that the specifications and drawings for electrical work are complimentary and are to be taken together for a complete interpretation of the electrical work except that indications on the drawings, which refer to an individual element of work, take precedence over the specifications where they conflict with same.

1.06 REGULATORY REQUIREMENTS

- A. Comply with all applicable federal and state laws, and all local codes, by-laws and ordinances.
- B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Designer rules otherwise.
- C. Request inspections from authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the client's Project Manager s at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.
- D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations:
 - 1. State Building Code
 - 2. State Electrical Code
 - 3. State Fire Protection Code
 - 4. National Fire Protection Association (NFPA)
 - 5. Local Town Regulations and By-laws
 - 6. Underwriter's Laboratories, Inc. (UL)
 - 7. National Electrical Manufacturer's Association (NEMA)
 - 8. American National Standards Institute (ANSI)
- E. All electrical work shall meet or exceed any other state and local codes and/or authorities having jurisdiction including all other standards indicated herein.

1.07 SURVEYS AND MEASUREMENTS

- A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the electrical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing, and do not proceed with the work required until written instructions have been issued by the General Contractor.

1.08 COORDINATION

- A. HVAC and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet Architectural requirements.
- B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.

- C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work, and also furnish information and shop drawings necessary to permit trades affected by the work to install same properly and without delay.
- D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer. Where the electrical work shall interfere with the work of other trades, assist in working out the space conditions to make satisfactory adjustments before installation. Without extra cost to the client, make reasonable modifications to the work as required by normal structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. If any electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the electrical trades involved without extra cost to the client.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.
- G. Protect all materials and work of other trades from damage which may be caused by the electrical work, and repair all damages without extra cost to the client.

1.09 MECHANICAL AND ELECTRICAL COORDINATION

- A. Heating and Ventilating Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.
- B. The Heating and Ventilating and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating and ventilating equipment.
- C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the Heating and Ventilating Subcontractor.
- D. 120V and above power wiring sources extended and connected to heating and ventilating control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostat, zone valve and any switch wiring shall be the responsibility of the Heating and Ventilating Subcontractor.

- E. Temperature control and equipment wiring shall be installed by the Heating and Ventilating Subcontractor.
- F. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

1.10 INSTALLATION REQUIREMENTS

- A. The arrangement of all electrical work shown on the drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.
- B. Check the Architectural plans and specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Designer for his determination prior to proceeding with the work.

1.11 TYPICAL DETAILS

- A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Designer.

1.12 SLEEVES, INSERTS

- A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for electrical work. Internal diameter of sleeve shall be 2" larger than the outside diameter of the conduit or cable passing through it.

1.13 CORING, DRILLING

- A. Core, cut and/or drill all small holes 4.5" diameter or less in walls and floors required for the installation of sleeves and supports for the electrical work.

1.14 ACCESSIBILITY

- A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.
- B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

1.15 SUPPLEMENTARY SUPPORTING STEEL

- A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.
- B. Steelwork shall be firmly connected to building construction as required.
- C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.
- D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
- E. All manufactured steel parts and fittings shall be galvanized.

1.16 TOOLS AND EQUIPMENT

- A. Provide all tools and equipment required for the fabrication and installation of the electrical equipment at the site.

1.17 PORTABLE AND DETACHABLE PARTS

- A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment etc. necessary for the proper operation and maintenance of the mechanical and electrical systems until final completion of the work, at which time they shall be handed over to the Project Manager.

1.18 RECORD DRAWINGS, PROJECT CLOSEOUT

- A. Comply with requirements specified in Section 017000 – CONTRACT CLOSEOUT.
- B. This trade shall submit the record set for approval by the fire and building departments in a form acceptable to the departments, when required by the jurisdiction.
- C. Drawings shall show record condition of details, sections, riser diagrams and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.

1.19 GUARANTEE/WARRANTY

- A. Guarantee Work of this Section in writing for one year following the date of beneficial occupancy by the User Agency. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Designer's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

- B. In addition to guarantee requirements of Division 01 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in User Agency's name.
1. Upon receipt of notice from the Project Manager of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
 2. At nine months into the one-year guarantee period, the contractor shall perform a 100% test of all installed equipment. Any device and/or part found to be defective shall be repaired and/or replaced at no cost to the client. The Contractor shall notify the fire department one month in advance of the 100% test.
 3. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Designer.
 4. Provide 24 hour service beginning on the date the project is accepted by the client, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the client. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and Project Manager's approval. Submit name and a phone number that will be answered on a 24-hour basis each day of the week, for the duration of the service.
 5. Submit copies of equipment and material warranties to Designer before final payment.
 6. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.
 7. This Paragraph shall not be interpreted to limit client's rights under applicable codes and laws and under this Contract.
 8. Part 2 Paragraphs of this Specification may specify warranty requirements that exceed those of this Paragraph. Those paragraphs will govern.
 9. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by the Project Manager, and shall not initiate the guarantee period.
 10. Non-durable items, such as contactor coils, shall be replaced up to the date of acceptance, such that they shall have had no more than 100 hours use prior to this date.
 11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to the Project Manager's satisfaction, advise Designer in

writing, describe efforts to rectify situation, and provide analysis of cause of problem. Designer will direct course of action.

1.20 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

- A. Refer to SECTION 017200 – PROJECT RECORD DOCUMENTS and SECTION 017300 – OPERATING AND MAINTENANCE DATA for submittal procedures pertaining to operating and maintenance manuals.

- B. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:
 - 1. TABLE OF CONTENTS

 - 2. Introduction
 - a. Explanation of manual and its purpose and use.
 - b. Description of the electrical systems.
 - c. Safety precautions necessary for equipment.
 - d. Illustrations, schematics and diagrams.
 - e. Installation drawing.

 - 3. Maintenance
 - a. Maintenance and lubricating instructions.
 - b. Replacement charts.
 - c. Trouble shooting charts for equipment components.
 - d. Testing instructions for each typical component.
 - e. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.

 - 4. Manufacturer's Literature
 - a. The equipment for which shop drawings have been submitted and approved.

1.21 SERVICE CHARACTERISTICS

- A. Secondary Building Voltage - Low Level: 120/208 volts-3 phase-4 wire
- B. All equipment and wiring shall be suitable for the applied voltage.

1.22 QUALITY ASSURANCE

- A. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the latest editions of the codes as referenced herein.
- C. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.
- D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the client.
- E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- F. Equipment and materials shall:
 - 1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
 - 2. Be without blemish or defect.
 - 3. Not be used for temporary light and power purposes.
 - 4. Be in accordance with the latest applicable NEMA standards.
 - 5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.
- G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.
- H. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement if necessary shall be coordinated with Contractor who originally purchased the item.
5. Their field make-up and internal wiring as may be necessary for their proper operation.
6. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

- I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.23 DELIVERY, STORAGE AND HANDLING

- A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.

1.24 TEMPORARY POWER AND LIGHTING

- A. Refer to SECTION 015100 – TEMPORARY UTILITIES for additional requirements pertaining the temporary power and lighting.
- B. The Electrical Subcontractor shall furnish and install metered feeders and distribution electrical equipment of sufficient capacity for the temporary electric light and power required while under construction. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all construction areas.

- C. All necessary meters, cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.
- D. The Electrical Subcontractor shall provide and maintain on each floor of the building, a feeder or feeders of sufficient capacity for the requirements of the construction work and he shall provide a sufficient number of outlets, located at convenient points, so that extension cords of not over 50 ft. in length will reach all work requiring temporary light or power.
- E. The Electrical Subcontractor shall install and maintain the wiring and accessories for the offices of the General Contractor and Project Manager as specified in the contract form.
- F. All temporary electrical work shall meet the requirements of the National Electrical Code Article 590 Temporary Installations, NECA 200 Standard for installing temporary electrical power at construction sites, the Local Utility Company, and all Federal Standards and Laws.
- G. All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.
- H. The General Contractor will pay for the cost of electric energy consumed by himself and by all of his Subcontractors, unless otherwise indicated.
- I. All lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced by the Electrical Subcontractor just prior to date of Use and Occupancy or Final Acceptance.
- J. Provide all temporary lighting and power required above during the normal working hours of the project or a total of twelve (12) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The twelve hours per day shall include manning the temporary power and lighting 2 hour before and 2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time, materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.

1.25 STAGING AND SCAFFOLDING

- A. Refer to requirements specified 1.03 A par. 12

1.26 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

- A. During the execution of the work, required relocation, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Subcontractor, as required

by job conditions and as determined by the Designer in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the User Agency's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the User Agency's working schedule, as many times as required until all work is completed. Any outages of service shall be approved by Project Manager, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Project Manager prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two (2) weeks in advance. User Agency shall make their best efforts to meet this request without adversely affecting the electric service to the existing building.

- B. Prior to any deactivation and relocation or demolition work, consult the drawings and arrange a conference with the Designer and the Project Manager in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.
- C. All deactivation, relocation and temporary tie ins of electrical systems and equipment shall be provided by the Electrical Subcontractor. All demolition and removal of electrical systems and equipment designed to be demolished shall be provided by the Electrical Subcontractor. Place all demolished electrical materials except hazardous as determined by the Authority having jurisdiction in general contractors provided dumpster. All hazardous electrical materials shall be legally disposed by the electrical subcontractor.
- D. Client's Project Manger reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.
- E. Phasing
 - 1. The Electrical Subcontractor shall construct the subject project in phases as directed by the Designer to suit the project progress schedule, as well as the completion date of the project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.
- B. For purpose of establishing a standard of quality and not for purpose of limiting completion, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.

- C. In all cases, standard cataloged materials and systems have been selected. Materials specially manufactured for this particular project and not part of a manufacturer's standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturer's products will be unacceptable.
- D. Where Specifications list manufacturer's names and/or "as approved" or "Equal approved" by Designer, other manufacturer's equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Designer.
- E. All materials shall be new and shall be UL listed.

2.02 RACEWAYS AND FITTINGS

- A. Raceways - General:
 - 1. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90° bends in any one run, and where necessary, pull boxes shall be provided. Intermediate metal conduit is not allowed.
 - 2. Rigid metal conduit conforming to, and installed in accordance with, Article 344 of NFPA 70 shall be heavy wall zinc coated steel conforming to American Standard Specifications C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in mechanical rooms and where raceway may be subject to mechanical damage, i.e., loading docks, work shops, etc.
 - 3. Thin wall conduit (EMT), conforming to, and installed in accordance with, Article 358 of NFPA 70 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings where exposed but not subject to mechanical damage, and shall be used for fire alarm work.
 - 4. Flexible metal conduit shall be used for connections to motors and HVAC equipment. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include a grounding conductor.
 - 5. Acceptable manufacturers:
 - a. Pittsburgh Standard Conduit Company
 - b. Republic Steel and Tube
 - c. Youngstown Sheet Tube Company
 - d. Carlon

- e. Perma-Cote Supreme
- 6. Fittings:
 - a. Provide insulated bushings on all raceways 1 inch diameter or larger.
 - b. Manufacturer's standard fittings shall be used for raceway supports.
 - c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
 - d. Couplings for rigid metal conduit shall be threaded type.
 - e. Threadless fittings for EMT shall be watertight compression type. Set-screw type fittings are not acceptable. All fittings shall be concrete tight. No diecast fittings allowed except for raceways larger than 1 inch diameter.
 - f. Acceptable manufacturers:
 - 1) O.Z.
 - 2) Crouse Hinds
 - 3) Appleton
 - 4) EFCOR
 - 5) Steel City

2.03 WIRING MATERIALS

- A. Building Wire and Cable shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.
- B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.
- C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.
- D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors white or gray. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.

- E. Final connections to motors or exterior HVAC equipment shall be made with 18" of neoprene sheathed flexible conduit.
- F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.
- G. Fire alarm and security system wiring shall be No. 16 twisted non-shielded pairs for alarm and trouble circuits and a minimum of #14 AWG for device power, control and alarm annunciation circuits.
- H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.
- I. Metal Clad sheathed cable NFPA 70, type MC may be used for branch circuitry where shown and where run concealed and not subject to physical damage. All branch circuits shall be run in conduit from the panelboard to the first outlet. All type MC cable used shall contain a full size insulated ground conductor. All conductors shall be copper. All type MC cable insulation used shall have voltage rating of 600 volts, shall have a temperature rating of 75 degrees C. and shall be thermoplastic material. Armor material shall be steel and armor design shall be interlocked metal tape. Fire alarm rated MC cable may be used for fire alarm work where concealed.
- J. Wiring materials shall be manufactured by Triangle, Essex, General Cable or equal.

2.04 WIRING MATERIALS - 600V OR LESS SYSTEMS

- A. Conductors shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.
- B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.
- C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.
- D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors white or gray. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of approved colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.

- E. Final connections to motors or HVAC equipment shall be made with 18" of neoprene sheathed flexible metal conduit.
- F. Minimum conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.
- G. For fire alarm and other specialty systems wiring, refer to manufacturers shop drawings and wiring diagrams for conductor size, electrical characteristics, and approved wire manufacturers.
- H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.
- I. Except for homeruns from the first HVAC device, Type "MC" cable may be used for all concealed 20 AMP 208V-1PH fan coil branch circuits where allowed by code if installed and terminated as specified under Execution Section.
- J. Wiring materials shall be manufactured by Triangle, Republic, Anaconda, General Cable, or equal.

2.05 OUTLET, JUNCTION, PULL BOXES, AND WIRING TROUGHS FOR ALL SYSTEMS

- A. Outlets:
 - 1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction.
 - 2. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved by Designer. Ceiling and bracket outlet boxes shall not be less than 4" octagonal except that smaller boxes may be used where required by particular equipment to be installed. Switch and receptacle boxes shall be 4" square or of comparable volume.
 - 3. Acceptable manufacturers:
 - a. Appleton
 - b. Crouse Hinds
 - c. Steel City

d. RACO

- B. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

2.06 WIRING DEVICES

- A. Provide wiring device type plates for all wall mounted devices. All wall plates shall be smooth high impact nylon for all public areas, offices, classrooms, etc color as directed by the Designer. Provide stainless steel for all Utility, Electric, Mechanical Rooms and Equipment.
- B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:
1. Visible part colors of wiring devices shall be as directed by the Designer for all public areas, offices, classrooms etc. Provide brown devices for all Utility, Electrical and Mechanical Rooms.
 2. Exclude compact or "despard" type devices.
- C. Wiring device switches shall be toggle type, A.C. specification grade, 20 amps on 120 volt circuits and 30 amps on 208 volt 1PH circuits.
1. Single pole switch shall be equal to Hubbell No. HBL1221.
 2. Double pole switch shall be equal to Hubbell No. HBL7832D.
 3. Three-way switch shall be equal to Hubbell No. HBL1223.
 4. Four-way switch shall be equal to Hubbell No. HBL1224.
 5. Single pole pilot light switch shall be equal to Hubbell No. HBL1221PL.
 6. Equivalent 277 volt 20 amp switches shall be used where required.

- D. Standard duplex convenience receptacles shall be 125 volt, 20 amps, three wire (two circuit wires plus ground), "U-bar" ground NEMA slot configuration 5-20R, specification grade with a one-piece ground assembly. Receptacles shall be mounted 18" to center line above finished floor unless noted otherwise.
 - 1. Equal to Hubbell No. HBL5362.
 - 2. Where indicated on plans provide receptacles with ground fault current interrupters, UL class A, 20A, 125V to be equal to Hubbell No. GF5352.
- E. Non-standard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.
- F. Devices and device plates for flush wall devices which are not integrally equipped with same, shall be as directed by the Designer.
- G. For unfinished spaces, plates for surface mounted wall devices which are not integrally equipped with same, shall be galvanized sheet steel, formed raised type which does not overlap box. Where for switches, such plates shall have toggle guards.
- H. Where more than one wiring device is indicated in the same location, the devices shall be mounted in gangs under a common wall plate.
- I. Mount duplex convenience and power receptacles vertically with grounding posts at top of device unless otherwise indicated. Locate grounding post to left when horizontal mounting is indicated.
- J. Wiring devices and associated hardware shall be manufactured by Arrow-Hart, Leviton, or Pass and Seymour.

2.07 GROUNDING REQUIREMENTS

- A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70 and the following:
- B. The ground bus of the new main fused disconnect shall be connected to the grounding bus in the existing main switchboard by means of insulated conductors run in conduit.
- C. Provide grounding bonds between all metallic conduits of the power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.
- D. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.

- E. Provide grounding bonds for all metallic conduits of the power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.
- F. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus.
- G. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.
- H. Bonding conductors on the load side of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.

2.08 PHASING AND COLOR CODING

- A. The insulation or covering of each wire or cable shall be color coded so as to provide for circuit identification as specified below.

120/208 V Circuits

1.	Black	Phase A
2.	Red	Phase B
3.	Blue	Phase C
4.	White	Neutral
5.	Green	Equipment Ground

- B. Color coding shall be achieved by one of the following methods:
 - 1. The insulation or covering shall be coded during manufacture by use of one of the following methods:
 - a. Colored compounds.
 - b. Colored coatings.
 - 2. If sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made.
- C. The same colored cable shall be connected to the same phase throughout the project.
- D. In general, building panelboards shall be phased "A", "B", "C", left to right. The neutral, although it may be in different locations for different equipment, shall be identified.

2.09 ENCLOSURES FOR INDIVIDUALLY MOUNTED OVERCURRENT AND SWITCHING DEVICES

- A. Construction shall be NEMA 1, where installed indoors.
- B. Construction shall be NEMA 3R, where installed outdoors, in mechanical rooms, in locations defined as damp or wet by NFPA 70 or where indicated as weatherproof.
- C. Operating handles shall be front or side type to accommodate hand access space and flush or surface mounting requirements.
- D. Each shall be equipped with padlock for locking operating handle in the open position.

2.10 PANELBOARDS

- A. Panelboards shall consist of factory completed deadfront assemblies of back pans, main busses, overcurrent and switching units, sheet metal cabinets and trims. They shall be so designed that switching and overcurrent devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machining drilling or tapping.
- B. Where indicated as power or distribution panels, they shall be of the "I-Line" (Square D), "Pow-R" (Cutler Hammer) or "spectra" (General Electric).
- C. Bus bars for their mains shall be of copper having current capacities as indicated and sized for such capacities in accordance with Underwriter Laboratory standards. Provide UL listed panels with 100% neutral bus bars and lugs for all 120/208 volt panelboards. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction.
- D. A ground bus shall be provided for each panel. Each ground bus shall be of the same material as the phase and neutral buses.
- E. Cabinets shall be fabricated from industry standard gauge galvanized sheet steel with corners lapped and riveted, or fastened by approved methods.
- F. The inside and outside of the trims shall be factory painted with one rustproofing primer coat and one finish coat. The finish paint shall be of a type to which field applied paint will bond. All trims shall be hinged.
- G. Cabinets and trims shall be suitable for the required mounting. Trims shall be fastened to cabinets and shall be of a type that is self supporting on cabinets.
- H. Cabinets and trims for lighting and appliance panels shall accommodate and conform to the dimensions shown on the Construction Documents.

- I. Where wires or cables are used within panelboards to make up internal connections (factory installed or otherwise) such wire or cable shall have copper conductors only.
- J. Any cabinet for a power or distribution panel shall (regardless of the actual devices required to be in it) have a width, depth and bussing adequate for a three pole branch device equal in rating to the panel mains. In no case shall the cabinet be wider than 42 inches or deeper than 9.5 inches.
- K. Panelboards shall be provided with hinged trims with hinged doors (door-in-door) covering all switching device handles.
- L. Doors in panelboard trims shall conform to the following:
 - 1. In making switching device handles accessible, doors shall not uncover any live parts.
 - 2. Doors shall have flush type paracentric cylinder locks and catches. Two keys shall be supplied for each lock and each key shall open all panelboards. Locks and keys shall conform to a "standard keying policy" as directed.
- M. Where "spaces only" for overcurrent protection and switching devices are called for in a panel, its main bus, and backpan, as well as its cabinet and trim, shall be extended to accommodate these spaces and shall include all necessary hardware including bus connectors to add future devices.
- N. Panelboards shall comply with the following industry standards:
 - 1. UL Standards
 - a. Panelboards - UL67
 - b. Cabinet & Boxes - UL50
 - 2. NEMA Standard - PB1
- O. Panelboards shall be labeled with a UL short circuit rating adequate for the available short circuit and based on the lowest panel mounted circuit breaker available UL listed interrupting current rating, but in no case less than 10 ka for 240 volt panelboards.
- P. Panelboards shall be manufactured by General Electric, Cutler Hammer or Square D.

2.11 MOLDED CASE CIRCUIT BREAKERS

- A. Molded case type circuit breakers shall consist of manually operated quick-make quick-break mechanically trip free operating mechanisms for simultaneous operation of all poles, with contacts, arc interrupters and trip elements for each pole, all enclosed in molded phenolic plastic cases.

1. Their tripping units shall be of the "thermal magnetic" type having bimetallic elements for time delay overload protection and magnetic elements for short circuit protection.
2. They shall be manually operable by means of toggle type operating handles having "tripped" position midway between the "on-off" positions.
3. They shall each be contained in an individual case enclosing only the number of poles required for the particular breaker.
4. All panels and individually mounted circuit breakers shall have short circuit ratings exceeding the available short circuit or the values indicated on the Construction Documents.
5. They shall be of the "bolted-in" type.
6. Where necessary, to accommodate other requirements, their frame sizes shall be increased to conform to such requirements, frame sizes being indicated only as a reference to the minimum acceptable interrupting ratings noted above.
7. Where single pole in trip sizes 20 amps or less, they shall be rated for switching duty.
8. They shall be equipped with 5 milliamp sensitivity ground fault interrupting features where so indicated.

B. They shall be manufactured by Square D, Cutler Hammer, or General Electric.

2.12 CARTRIDGE FUSES

A. Cartridge fuses shall be as follows:

1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses.
2. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.
3. Regardless of actual fault current, they shall, at full recovery voltage, be capable of safely interrupting fault currents of 100,000 amperes RMS symmetrical, deliverable at the line side of the fuse.
4. Fuses shall be suitable for application to fuse gaps which reject other types of fusing.

5. Supply 10 per cent spare fuses of each size and type 60 amps and less. Supply three spare fuses for each size and type over 60 amps.

B. Cartridge fuses shall be manufactured by Bussman, Gould or EFCO.

2.13 MOTOR CONTROLS

A. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of "factory assembled" control panel will be provided under section supplying equipment to be controlled but connected under this section.

1. Provide motor terminal boxes for each motor not furnished with same.

B. Disconnect Switches:

1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three pole toggle switches are not acceptable as substitute for disconnect switches.

2. Disconnect switches shall be of fused or unfused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches shall be for use with current limiting fuses with rejection type fuse clips and those shall be horsepower rated.

3. Enclosures shall be of proper NEMA type for the intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with gray baked enamel finish.

4. Acceptable Manufacturers:

a. General Electric

b. Cutler Hammer

c. Square D

C. Motor Control Circuitry

1. Except as noted below, select materials exactly as specified for feeders. Utilize No. 12 A.W.G. THWN conductors throughout minimum.

2. Motor control circuit wires may be run in the same conduit as the wires of motor power circuits; however, exclude motor control wires from enclosures (other than motor starter enclosures) which contain power circuit overcurrent protection and switching devices; also from pull boxes and junction boxes containing the wires of main and submain feeders. Utilize auxiliary pull boxes to separate motor control

wires from motor power circuit wires before the power circuit wires enter the items from which motor control wires are excluded.

3. Prior to installing any motor control circuitry for a particular motor, notify the Designer of any deviations between the control circuitry requirements of the trade supplying the motor and the indicated electric work.

2.14 FIRE ALARM SYSTEM MODIFICATIONS

A. Scope

1. Provide new initiating devices as shown on the drawings. Provide fire alarm interconnection wiring as recommended by the fire alarm system manufacturer in order to provide a complete fire alarm system. Provide fire alarm testing and documentation as indicated on the contract drawings and this specification.
2. Each initiating device shall have full analog detection capabilities; will maintain operating characteristics stored in dedicated EEPROM memory, identify its' exact location, and shall operate as described elsewhere in these specifications.
3. Work in this section, as shown or specified, shall be in accordance with the related contract documents.
4. All exceptions, variances and substitutions of operating capabilities or equipment called for in these specifications shall be listed in writing and forwarded to the Engineer at the time of bid.
5. Provide automatic and manual, closed circuit, multiplex fire alarm communications according to the contract documents, wired, connected and left in first class operating condition.
6. Final connections, testing, and adjusting of the system shall be done under the direct supervision of the building's FA O&M contractor/system supplier. Provide NICET certified and factory trained technicians to demonstrate the system to the satisfaction of the Project Manager, and make all additional adjustments to the system operation as required by the Project Manager.
7. Provide equipment compatible with the existing Fire-Lite system.
8. The system design and installation shall conform to the following standards:
 - a. All equipment shall be UL listed for its intended purpose.
 - b. NFPA standards 70, 72, 90A, 92A, and 101.
 - c. Current State Building Code.

- d. Current State Fire prevention code.
 - e. The Americans with Disabilities Act (ADA).
 - f. All requirements of all local authorities having jurisdiction.
9. Submit 12 complete sets of shop drawings to include:
- a. Complete point-to-point riser diagram showing all equipment and size, type and number of all conductors and devices.
 - b. Address listing of all new field devices shown on floor plans for coordination of LCD message text assignments.
 - c. Original catalog data sheets for all new items to assure compliance with these specifications. This equipment shall be subject to approval, and no equipment shall be ordered without prior approval.
 - d. Confirmation that the equipment supplier will provide on-site project management and supervision during system installation, and perform system testing and instruction.
10. Conform to all UL standards for testing (and provide re-certification) of the existing/modified system by a UL approved testing company.
11. Provide verification that all room names and numbers on the construction drawings will be coordinated with final room names and numbers as designated by the school. Update all risers and drawings accordingly for Operating & Maintenance manuals at the completion of the project. Addresses shall be programmed using final room names and numbers.
12. Provide copies of Operating & Maintenance manuals with the request for final inspection. O & M Manuals shall include the following:
- a. All of the information submitted in the shop drawings.
 - b. As-built documentation which incorporates all modifications to the system, whether made as a field change or by a change order.
 - c. Include a copy of the final test report, [UL certificate] and test contract.

B. General Requirements

1. All equipment shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials and accessories covered

by these requirements shall be provided by a single manufacturer, or if provided by different manufacturers recognized as compatible by both manufacturers.

2. Circuiting Guidelines. Each initiating device circuit shall be electronically supervised and individually addressable. All wiring shall be as follows:

- a. Individual addressable modules shall be used to monitor the status conditions from any new conventional device.
- b. Addressable control modules or relays shall provide auxiliary control functions.
- c. Addressable loop wiring shall support all devices shown and allow for a minimum of 25% spare capacity and be wired in a Class A, Style 7 fashion.

C. System Components:

1. Intelligent System Devices: Provide intelligent analog devices where shown and required. Each device shall retain operating characteristics in non-volatile memory and conduct algorithms to distinguish real fire conditions from unwanted nuisance alarms. All analog devices shall provide dual LED indicators, a green LED shall flash to denote active communication, and a red LED shall flash to denote an alarm condition. Devices shall be interchangeable with twist-lock bases which may include a supervised remote LED output, fault isolation circuitry, or an auxiliary relay contact. In the event of an addressable loop communications failure, devices shall remain capable of initiating an alarm sequence.

- a. Addressable Duct Smoke Detector: Provide photoelectric duct smoke detectors mounted in air ducts where shown and required. Each detector shall be supplied with duct mounting plate, remote test station/indicator and sampling tubes sized according to duct width. Provide the required auxiliary relay outputs or addressable relay control modules with each detector in order to accomplish the required HVAC control and override functions.
- b. Monitor Module: Provide addressable input monitor modules to monitor related systems or integrate conventional initiating devices onto the addressable loop.
- c. Control Module: Provide addressable output control modules to supervise and control conventional devices (indicating circuits, RTUs, etc.) over the addressable loop. Control modules shall provide a supervised output rated for 1 or 2 amps @ 24VDC, as required.

- d. Isolation Modules: Provide Isolator Modules to protect circuit integrity in the event of a wiring fault. Provide a minimum of one module per floor/zone, or one for every 25 devices; whichever is greater.
 - 2. System Accessories
 - a. Terminal Cabinets: Provide fire alarm terminal cabinets where necessary. The cabinets, which shall have a removable hinged cover with key lock and red finish are intended to house analog/addressable modules and facilitate field wiring junctions.
- D. Installation
 - 1. Installation shall be supervised and tested by the existing building's FA O&M contractor/system supplier. The work shall be performed by skilled technicians under the direction of experienced engineers, all of whom are properly trained and qualified.
- E. Wiring
 - 1. All wiring for the system shall be in accordance with Articles 760, 725, and 800 of the National Electrical Code and local electrical codes.
 - 2. Provide complete wiring and conduit between all equipment. All devices shall be mounted upon and splices made in UL listed boxes. Wiring splices and transposing or changing of colors will not be permitted.
 - 3. All junction boxes shall be painted red and labeled as 'Fire Alarm System' with decal or approved markings
 - 4. Fire Alarm control systems and equipment shall be connected to separate dedicated branch circuits, sized as required for proper service. Circuits shall be labeled 'FIRE ALARM'.
- F. Final Tests / Warranty
 - 1. The system shall be fully tested by a UL certified testing company, in accordance with UL guidelines and NFPA standards. Each and every new device shall be tested.
 - 2. A copy of the final test report [and UL certificate] shall be submitted indicating proper functioning of the system and conformance to the specifications. The test shall be performed by UL certified and factory-trained qualified technicians. Each and every new device shall be tested. Final testing [and UL certification] shall be

performed by the same company that will hold and execute the Test and Inspection contract.

3. The manufacturer shall guarantee all system equipment for a period of three (3) years from the date of final acceptance.
4. The contractor shall guarantee all raceways and wiring to be free from inherent mechanical or electrical defects for one (1) year from the date of final acceptance of the system.

G. Fire Alarm Test and Inspection Contract

1. Each contractor shall include as part of their base bid the cost of a one-year test and inspection contract. This contract shall provide for quarterly tests according to UL, NFPA and local requirements. Upon its' expiration, the contract shall be renewable by the User Agency.

H. Training

1. The contractor shall provide the services of the manufacturer's representative for a period of 4 hours, during normal business hours, to instruct the User Agency's designated personnel and fire department response teams on the operation of the system.

2.15 ACCESS PANELS

- A. Furnish access doors and frames for walls and ceilings to applicable trades for installation. Size as required for access and maintenance, minimum 16 by 16 inches .
- B. 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:
 1. J. L. Industries, Inc, Inc.
 2. Karp Associates, Inc.
 3. Larsen's Manufacturing Company.
 4. Milcor Inc.
 5. Nystrom, Inc.
- C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
 1. Locations: Wall and ceiling surfaces as applicable.
 2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
 3. Frame: Minimum 0.060-inch-thick sheet metal with suitable bead flange.
 4. Hinges: Continuous piano.
 5. Lock: Cylinder, keyed alike.

- D. Fire-Rated, Insulated, Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
1. Locations: Wall and ceiling surfaces as applicable.
 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch .
 5. Frame: Minimum 0.060-inch thick sheet metal with suitable bead flange.
 6. Hinges: Continuous piano.
 7. Automatic Closer: Spring type.
 8. Lock: Self-latching device with cylinder lock, keyed alike.

2.16 EQUIPMENT GROUNDING REQUIREMENTS

- A. Equipment ground all systems and equipment in accordance with best industry practice.
- B. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.
- C. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.
- D. Provide grounding bonds for all metallic conduits of the power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.
- E. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.
- F. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.
- G. Bonding conductors on the load size of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.

- H. Each branch circuit and feeder shall have a dedicated equipment grounding conductor, minimum # 12 AWG. Shared or tapped equipment grounding conductor shall not be acceptable.

2.17 DISTRIBUTION SWITCHES

- A. Quick-make, quick-break type distribution switches shall equal or exceed the performance required for NEMA type heavy duty horsepower rated switches.
 - 1. They shall have arc quenchers and circuit breaker type pressure contacts.
 - 2. Where of the fusible type, they shall be designed for use with "Class R" fuses up to 600 amps.
- B. Distribution switches shall be manufactured by Square D, Eaton Cutler-Hammer, or General Electric.

PART 3 - EXECUTION

3.01 BASIC REQUIREMENTS

- A. Adhere to best industry practice and the following.
- B. All work shall be concealed, as practically possible.
- C. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16 inch in diameter and clearly identify both ends of the raceway.
- D. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the drawings due to symbolic methods of notation.
- E. Utilize lugs of the limiter type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.
- F. Provide all sleeves through fireproof and waterproof slabs, walls, etc. required for electric work.
 - 1. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
 - 2. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.
 - 3. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-thru's, etc.
- G. No splicing of wires will be permitted in Fire Alarm System.

- H. Bundle wiring passing through pull boxes and panel boards in a neat and orderly manner with plastic cable ties. Cable ties shall be Ty-Raps as manufactured by Thomas & Betts, Holub Industries Inc., Quick Wrap, Bundy Unirap or equal.
- I. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.

3.02 TESTING REQUIREMENTS AND INSTRUCTIONS

- A. The Electrical Subcontractor shall provide supervision, labor, materials, tools, test instruments and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout the work.

The Electrical Subcontractor shall pay for all tests specified in this Section, including expenses incident to retests occasioned by defects and failures of equipment to meet specifications, at no additional cost to the client. Any defects or deficiencies discovered in any of the electrical work shall be corrected.

The Electrical Subcontractor shall:

1. Replace wiring and equipment found defective (defined as failing to meet specified requirements) at no additional cost to the client.
2. Submit three copies of test results to the engineer.

- B. Do not void equipment warranties or guarantees by testing and checkout work. Checks and tests shall be supplemental to and compatible with the manufacturer's installation instructions. Where deviations are apparent, obtain the manufacturer's approved review of procedure prior to testing. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the engineer to determine if the work should be performed by or with the manufacturer's representative.

All checks and tests specified for proper operating and safety of equipment and personnel are to be performed concurrent with progression of the work, prior to Final Acceptance by the client.

- C. Test are to:

1. Provide initial equipment/system acceptance.
2. Provide recorded data for future routine maintenance and trouble shooting.
3. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform, its specified function with reasonable reliability throughout the life of the facility.

- D. At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the engineer. Corrective action by the Contractor requires prior engineer approval, retesting, and inspection.
- E. Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in this Section. Check and tighten terminals and connection points, remove shipping blocks and thoroughly clean equipment, repair damaged or scratched finishes, inspect for broken and missing parts and review and collect manufacturer's drawings and instructions for delivery to the engineer. Make routine checks and tests as the job progresses to ensure that wiring and equipment is properly installed.
- F. Testing and checkout work is to be performed with fully qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five years of experience with tests of same type and size as specified:
- G. Inspections and tests shall be in accordance with the following applicable codes and standards as amended to date, unless otherwise specified.
 - 1. National Electrical Manufacturer's Association - NEMA.
 - 2. American Society for Testing and Materials - ASTM.
 - 3. Institute of Electrical and Electronic Engineers -IEEE.
 - 4. National Electrical Testing Association - NETA.
 - 5. American National Standards Institute - ANSI.
 - a. C2: National Electrical Safety Code.
 - b. Z244-1: American National Standard for Personnel Protection.
 - 6. Insulated Cable Engineers Association - ICEA.
 - 7. Occupational Safety and health Administration.
 - a. OSHA Part 1910; Subpart S, 1910.308.
 - b. OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
 - 8. National Fire Protection Association - NFPA.
 - a. 70B: Electrical Equipment Maintenance.
 - b. 70E: Electrical Safety Requirements for Employer Workplaces.

- c. 70: National Electrical Code.
- 9. National Electrical Installation Standards
 - a. NECA1: Good workmanship in electrical construction
 - b. NECA 120: Standards for installing AD and MC cable
 - c. NECA 130: Standard for installing and maintaining wiring devices
 - d. NECA200: Standard for installing and maintaining temporary electric power at construction sites.
- 10. Inspections and tests shall utilize the following references:
 - a. Contract Drawings and Specifications.
 - b. Manufacturer's printed test procedures for respective equipment.
- H. Test Equipment:
 - 1. Test equipment used by the Contractor is to be inspected and calibrated.
 - 2. Perform calibration and setting checks with calibrated test instruments of at least twice that of that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over 6 months old are not acceptable on field test instruments. Inspect test instruments for proper operation prior to proceeding with the tests. Record serial and model numbers of the instruments used on the test forms.
- I. Test Procedures:
 - 1. The Electrical Subcontractor is responsible for the preparation of the procedures and schedules for the work specified herein. This work is to be coordinated and compatible with both the work and schedule of the other crafts. Sequence the tests and checks so that the equipment can be energized immediately after the completion of the application tests.
 - 2. Submit proposed testing and check out forms. The procedures shall provide specific instructions for the checking and testing of each electrical component of each system. Schedule tests and inspections as the job progresses. Test procedures submitted shall include job safety rules.
- J. After each electrical system installation is complete, perform the tests to determine that the entire system is in proper working order and in accordance with applicable codes, manufacturer's instructions, drawings, and specifications. Tests are in addition to shop tests

of individual items at the manufacturer's plant. Perform insulation and ground resistance tests before operating tests.

- K. Perform insulation tests on electrical equipment, apparatus, circuit breakers, switches and similar electrical equipment, at the following times and conditions:
 - 1. Prior to energization and/or placing into service.
 - 2. When damage to the insulation is suspected or known to exist.
 - 3. After repairs or modifications to the equipment affecting the insulation.
 - 4. Where lightning or other surge conditions are known to have existed on the circuit.
- L. Make openings in circuits for test instruments and place and connect instruments, equipment, and devices, required for the tests. Upon completion of tests, remove instruments and instrument connections and restore circuits to permanent condition.
- M. List each circuit and measured resistance as test data. Maintain record of insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in tabular form and submit to Engineer.
- N. Report inspections, tests, and calibrations in writing on engineer-approved reports/forms. The recorded data form shall have the signatures of the persons conducting the tests and authorized witnesses. The forms shall serve as the test and inspection checklist.
- O. When the electrical tests and inspections specified or required within this Section are completed and results reported, reviewed, and approved by the engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the engineer of electrical completion. If the engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification of Substantial Electrical Completion" for approval by the engineer following engineer's acceptance of electrical completion. If later in-service operation or further testing identifies problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.
- P. Specific Tests:
 - 1. Perform the following specific tests. De-energize and isolate equipment and cable prior to performing the tests.
 - 2. Motors:

- a. Before energizing any machine, visually inspect for serviceability. Check nameplate for electrical power requirements.
3. Grounding Systems:
- a. Test main building loops and major equipment grounds to remote earth, directly referenced to an extremely low resistance (approximately 1 ohm) reference ground bench mark. Perform a visual inspection of the systems, raceway and equipment grounds to determine the adequacy and integrity of the grounding. Ground testing results shall be recorded, witnessed, and submitted to the engineer.
 - b. Perform ground tests using a low resistance, Null balance type, ground testing ohmmeter, with test lead resistance compensated for potential and current rod resistances.
 - c. Test each modified and new major electrical equipment grounding for continuity of connections and for resistance. Ground resistance of conduits, equipment cases, and supporting frames, shall not vary from that of system as a whole and shall not exceed 5 ohms to ground. Submit all readings to the engineer.
 - d. Where ground test results identify the need for additional grounding conductors or rods that are not indicated or specified, design changes will be initiated to obtain the acceptable values. The Contractor is responsible for the proper installation of the grounding indicated and specified.
4. Wire and Cable: (All conductors originating from main switchboard and distribution panels).
- a. Before energizing any cable or wire, megger the insulation resistance of every external circuit wire to each other and to ground. Tests shall be conducted at voltages of 500 volts or lower. Continuity test each wire and cable to verify the field applied tag per conductor. Minimum insulation resistance values shall not be less than two megohms.
 - b. Take insulation resistance measurements for motor feeders. With motors disconnected, measure insulation resistance from load side of contactors or circuit breakers.
 - c. Check cables and wires for the proper identification numbering and/or color coding.
 - d. Inspect cables for physical damage and proper connection in accordance with single line diagram.

5. Power Distribution System:

a. New Distribution Panelboard

- 1) Inspect for physical, electrical and mechanical condition.
- 2) Compare equipment nameplate information with latest single line diagram and report discrepancies in writing to engineer within 24 hours.
- 3) Inspect all doors, panels and sections for paint, dents, scratches, fit and missing hardware.
- 4) Verify that fuse and/or circuit breaker sizes and types correspond to drawings. Report deviations to engineer in writing within 24 hours.
- 5) Inspect all bus connections for high resistance. Use low resistance ohmmeter, or check tightness of bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instructions for proper torque levels.
- 6) Clean entire panelboard using manufacturer's approved methods and materials prior to energizing system and a second time just prior to turning over system to User Agency.
- 7) Exercise all active components.
- 8) Perform ground resistance tests.

b. Circuit Breakers - Molded Case

- 1) Circuit breaker shall be checked for proper mounting, conductor size and feeder designation.
- 2) Operate circuit breaker to ensure smooth operation.
- 3) Inspect case for cracks or other defects.
- 4) Check tightness of connections with calibrated torque wrench. Refer to manufacturer's instruction for proper torque levels.
- 5) Perform a contact resistance test or measure millivolt drop at rated current.
- 6) Perform an insulation resistance test at 1000 volts dc for one (1) minute from pole-to-pole and from each pole-to-ground with

breaker closed and across open contacts of each phase - 500V D.C. if circuit breaker is solid state.

- 7) Perform long time delay time-current characteristic tests by passing three hundred percent (300%) rated current through each pole separately. Verify trip unit reset characteristics.
- 8) Perform adjustments for final settings in accordance with breaker setting sheet if applicable to the particular breaker.
- 9) Compare contact resistance or millivolt drop values to adjacent poles and similar breakers. Investigate deviations of more than fifty percent (50%). Investigate any value exceeding manufacturer's recommendations.
- 10) Insulation resistance shall not be less than 100 megohms.
- 11) Trip characteristic of adjustable trip breakers shall fall within manufacturer's published time-current characteristic tolerance band.
- 12) All circuit breakers mounted in distribution boards shall be time-current tested by primary current injection where possible.

c. Panelboards

- 1) Inspect for physical damage and proper grounding.
- 2) Compare nameplate information with schedules and report any discrepancies.
- 3) Inspect all panelboards for cleanliness, workmanship, etc.

d. Operating Instructions: Furnish operating instructions to User Agency's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full five (5) days of Electrical Subcontractor's time shall be included in contract. Cost of providing a manufacturer's representative at site for instructional purposes shall also be included.

3.03 BRANCH CIRCUITRY

- A. Circuits shall be balanced on phases at their supply as evenly as possible.
- B. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.

- C. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one cable for each leg and one neutral cable, if any.
- D. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
 - 1. All 20 amp, 120/208 volt, 3 phase, 4 wire combined branch circuit homeruns shall be provided with a #12 AWG neutral conductor.
 - 2. Minimum conductor size shall be No. 12 A.W.G. copper.
 - 3. Conductors operating at 120 volts extending in excess of 100 Ft., or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 A.W.G. copper throughout.
 - 4. Circuits shall be balanced on phases at their supply point as evenly as possible.
- E. Type MC Cable Installation:
 - 1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
 - a. Cable shall be installed in accordance with the latest version of NECA/NACMA-120.
 - b. Cable shall be supported and secured in accordance with code. Cable supports such as Caddy WMX-6, MX-3 and clamps such as Caddy 449 shall be used. MC wiring must be secured and supported every 6ft with metal clips, tie wires or Teflon tie wraps are not acceptable. MC cables must also be secured within 12in of every box, cabinet, fitting or cable termination and supported properly where they are routed around obstacles.
 - c. All MC wiring shall be untwisted, untangled, bundled, and installed parallel or perpendicular to the wall in a neat and workmanlike manner. No diagonal runs shall be permitted. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek co., not with hacksaw.
 - d. All MC cable splices and terminations must be provided with anti-short bushings and made in a suitable enclosure, box or other suitable fitting such as a conduit body.

3.04 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

- A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.
- B. The finish of threaded steel conduit shall be galvanized only.

- C. Wires for pulling into raceways for appliance branch circuitry shall be limited to "THWN".
- D. Wires for pulling into raceways for feeders shall be limited to "THWN".
- E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.
- F. Final connections of flexible conduit shall be neoprene sheathed.
- G. Apply one layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.
- H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:
 - 1. They shall be constructed with continuously welded joints and seams.
 - 2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
 - 3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.
- I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA 3R weatherproof construction.
- J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.
- K. Panels shall be equipped with doors without exception.
- L. The following shall be interpreted as damp or wet locations within building confines:
 - 1. Spaces where any designations indicating weatherproof (WP) or vaporproof appear on the drawings.
 - 2. Below waterproofing in slabs applied directly on grade.
 - 3. Outdoor locations (I.E. Roof, etc..)
 - 4. Spaces defined as wet or damp locations by article 100 of the National Electric Code.

3.05 IDENTIFICATION AND TAGGING

- A. Identify individually:
 - 1. Each panelboard.

2. Each switch and circuit breaker.
 3. Each feeder, wire or cable of all systems.
 4. Each end of nylon pullwire in empty conduit.
- B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pullbox, junction box and panel gutter through which it passes.
- C. The nomenclature used to identify panelboards or load center shall designate the numbers assigned to them.
- D. The nomenclature used to identify switches or circuit breakers shall:
1. Where they control feeders, designate the feeder number and the name of the load supplied.
 2. Where they control appliance branch circuitry, designate the name of the space and the load supplied.
- E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.
- F. Identification for panelboards or load centers shall be by means of engraved plastic nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.
- G. Identification for switches or circuit breakers shall be by means of the following:
1. Where individually enclosed -- engraved plastic nameplates showing 1/8" high white lettering on a black background fastened on the outside front face of the enclosure.
 2. Where in panelboards -- typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.
- H. Identification for wires and cables shall be by means of wrap around "brady" type labels.
- I. Device plates for local toggle switches, toggle switch type motor starters and the like, whose function is not readily apparent shall be engraved with 1/8" high letters suitably describing the equipment controlled or indicated.
- J. Equip the front face of all pull boxes junction boxes and the like containing cables, busing or devices operating in excess of 600 volts with enameled sheet metal "red on white" signs reading "DANGER--HIGH VOLTAGE."

- K. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Designer.

3.06 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

- A. Perform the following work, in accordance with field instructions issued by the Designer to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the electrical work.
- B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.

3.07 SUPPORTS AND FASTENINGS

- A. Support work in accordance with best industry standards, Mass. Electric Code and the following:
- B. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a free standing position.
- C. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
- D. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.
- E. Nothing shall rest on, or depend for support on, suspended ceiling media.
- F. Support less than 2" trade size, vertically run, conduits at intervals no greater than 8 Ft. Support such conduits, 2-1/2" trade size or larger, at intervals no greater than the story height, or 15 Ft, whichever is smaller.
- G. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7 ft.. Support such conduits, 1" trade size or larger, at intervals no greater than 10 ft.
- H. As a minimum procedure, in suspended ceilings support small runs of circuitry (e.g., conduit not in excess of 1 inch trade size) from ceiling suspension members as defined above. Support larger runs of circuitry directly from structural slabs, decks or framing members.
- I. Fasten electric work to building structure in accordance with the best industry practice.
- J. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to building structural elements.

3.08 SPLICING AND TERMINATING WIRES AND CABLES

- A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.
- B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.
- C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring "wire nut" type connectors. Exclude "wire nuts" employing non-expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.
- D. Join, tap and terminate stranded conductors No. 6 AWG and larger by means of solder sleeves, taps; and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.
- E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half-lapped layers of rubber tape, with an outer layer of friction tape; by means of half-lapped layers of approved plastic electric insulating tape; or by means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non-metallic snaps or clips.
- F. Exclude splicing procedures for neutral conductors in lighting and appliance branch circuitry which utilize device terminals as the splicing points.
- G. Exclude joints or terminations utilizing solder in any conductors used for grounding or bonding purposes.
- H. Exclude all but solder or pressure indent type joints in conductors used for signaling or communications purposes.
- I. Lugs for conductors used to make phase leg connections on the line side of the main service overcurrent and switching device shall be of the limiter type.

3.09 PULLING WIRES INTO CONDUITS AND RACEWAYS

- A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.
- B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2" trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by an 3-1/2" diameter ball mandrel.
- C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.
- D. Include circular wedge-type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10'. Supports shall be located in accessible pull boxes. Supports shall be of a nondeteriorating insulating material manufactured specifically for the purpose.
- E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.
- F. Slack on wires and cables located in cabinets and pull boxes shall be formed and set in place in groupings corresponding to their occupancy of raceways. They shall also be arranged, with insulators and supports provided where necessary, such that cable shims or other such temporary expedients do not have to be left permanently in place to prevent the wires and cables from shifting when covers or trims are removed.

3.10 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES

- A. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.
- B. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)
 - 1. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.
 - 2. For a small (outlet size) box on circuitry concealed in a suspended ceiling, and intended as an outlet for a non-demountable type of recessed equipment, locate box totally hidden but with its removable cover not more than one foot away from the building construction opening occupied by the demountable items.
- C. Apply junction and pull boxes in accordance with the following:

1. Include pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.
 2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.
 3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.
 4. Include all required junction and pull boxes regardless of indications on the drawings (which, due to symbolic methods of notation, may omit to show some of them).
- D. Apply outlet boxes in accordance with the following:
1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device.
 2. Connection to recessed ceiling mounted HVAC fan coil units supplied with pigtailed may be arranged so that more than one, but not more than four, such pieces of equipment are connected into a single outlet box. When adopting this procedure:
 - a. Utilize an outlet box no smaller than 5" square by 2-1/2" deep.
 - b. Allow no equipment to be supplied from an outlet box in another room.
 3. Multiple local switches indicated at a single location shall be gang mounted in a single outlet box.
 4. Include all required outlet boxes regardless of indications on the drawings (which due to symbolic methods of notation, may omit to show some of them).
- E. Install junction boxes, pull boxes and outlet boxes in accordance with the following:
1. Exclude surface mounted outlet boxes in conjunction with concealed circuitry.
 2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.
 3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.

- 4. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.
- F. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.
- G. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

3.11 LOCATING AND ROUTING OF CIRCUITRY

- A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:
 - 1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.
 - 2. Horizontally and vertically in mechanical equipment spaces.
 - 3. Horizontally and vertically in electric equipment rooms.
- B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.
- C. Circuitry run exposed shall be routed parallel to building walls and column lines.
- D. Exposed circuitry located overhead shall be run in a completely accessible manner on the underside of all piping and ductwork.
- E. Circuitry run in suspended ceilings shall be routed parallel to building walls, column lines, etc.
- F. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:

1.	Crossing where uninsulated	3"
2.	Crossing where insulated	1"
3.	Running parallel where uninsulated	36"
4.	Running parallel where insulated	6"

DRAWINGS

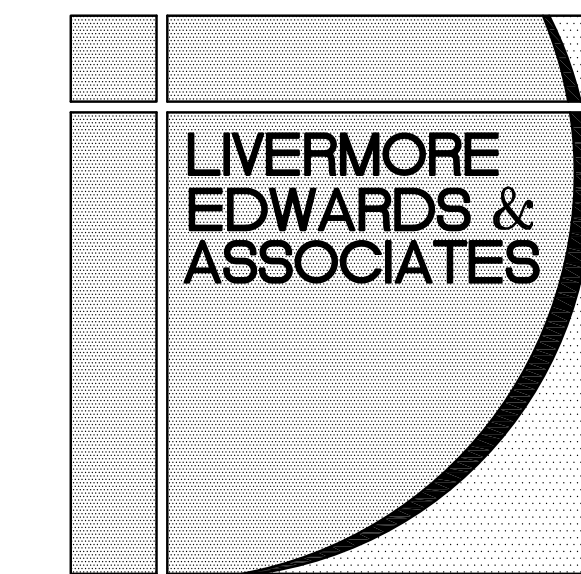
ARCHITECTURAL ABBREVIATIONS

&	AND	EA	EACH	IN	INCH	RAD	RADIUS	WC	WATER CLOSET
@	DIAMETER	E	ELECTRIC(IAL)	INCL	INCLUDE(D), (ING)	RWL	RAIN WATER LEADER	WH	WATER HEATER
ABV	ABOVE	ELEC	ELECTRIC WATER COOLER	IC	INSIDE CLEAR	REC	RECESSED	WR	WATER RESISTANT
AFF	ABOVE FINISHED FLOOR	EW	ELECTRIC WATER COOLER	ID	INSIDE DIAMETER	REF	REFERENCE	WP	WATERPROOFING
AFG	ABOVE FINISHED GRADE	EL	ELEVATION	INSUL	INSULATE(D), (ION)	RFL	REFLECTED, (IVE), (ING)	WT	WEIGHT
AP	ACCESS PANEL	EV	EMERGENCY	INT	INTERIOR	REFR	REFRIGERATOR	WWF	WELDED WIRE FABRIC
ACOUS	ACOUSTICAL	EMER	EMERGENCY	INVT	INVERT	REIN	REINFORCE	WWM	WELDED WIRE MESH
ACT	ACOUSTICAL CEILING TILE	ENC	ENCLOSE (URE)	JAN	JANITOR	REMO	REMOVE	W	WEST, WIDTH, WIDE
ADD	ADDENDUM	ENG	ENGINEER(ING)	JT	JOINT	REQ'D	REQUIRED	WIN	WINDOW
ADH	ADHESIVE	ENAM	ENAMEL	J	JOIST	RES	RESILIENT	WG	WIRE GLASS
ADJ	ADJACENT	EP	EPOXY PAINT(ED)	KIT	KITCHEN	RET	RESILIENT TILE	WM	WIRE MESH
ADJT	ADJUSTABLE	EQ	EQUIPMENT	LAM	LAMINATE	RA	RETURN AIR	WO	WITH OUT
AGG	AGGREGATE	EXH	EXHAUST	LAV	LAVATORY	REV	REVISION	WD	WOOD
AGC	AIR CONDITIONING	EX	EXISTING	LCC	LEAD COATED COPPER	RH	RIGHT HAND	WPT	WORK POINT
AHU	AIR HANDLING UNIT	EXP'D	EXPOSED	LH	LEFT HAND	RIS	RISER	WI	WROUGHT IRON
ALT	ALTERNATE	EJ	EXPANSION JOINT	L	LIGHT	ROOF	ROOF DRAIN		
ALUM	ALUMINUM	EXT	EXTERIOR	LS	LIGHT SWITCH	RM	ROOM		
ANCH	ANCHOR, ANCHORAGE	EIFS	EXTERIOR INSULATION & FINISH SYSTEM	LWT	LIGHT WEIGHT	RO	ROUGH OPENING		
AB	ANCHOR BOLT	EXTD	EXTRUDED	LVL	LINTEL	RB	RUBBER		
ANOD	ANODIZED	FAB	FABRIC	MACH	MACHINE	SND	SANITARY NAPKIN DISPENSER		
APPROX	APPROXIMATE	FWC	FABRIC WALL COVERING	MB	MACHINE BOLT	SCHED	SCHEDULE		
ARCH	ARCHITECTURAL	FOC	FACE OF CONCRETE	MH	MAN HOLE	SLNT	SEALANT		
AD	AREA DRAIN	FOF	FACE OF FINISH	MFR	MANUFACTURE (ER)	SECT	SECTION		
AUTO	AUTOMATIC	FOM	FORM (FINISHED)	MO	MASONRY OPENING	SHT	SHEET		
AVG	AVERAGE	FIN	FINISHED FLOOR	MTR	MATERIAL(S)	SHM	SHEET METAL		
BSMNT	BASEMENT	FF	FINISHED FLOOR	MECH	MECHANICAL	SV	SHEET VINYL		
BM	BEAM	FA	FIRE ALARM	MTL	METAL	SHL	SHIELDING		
BRG	BEARING	FE	FIRE EXTINGUISHER	ME	MEDICINE CABINET	SHR	SHOWER		
BEL	BELOW	FEC	FIRE EXTINGUISHER CABINET	MD	MEDIUM	SIM	SIMILAR		
BET	BETWEEN	FHC	FIRE HOSE CABINET	MTL	METAL	SKY	SKYLIGHT		
BLKG	BILUMINOUS	FR	FIRE RATING	MOD	MODULAR	SOG	SLAB ON GRADE		
BIT	BLOCK	PPRF	FIREPROOF	MR	MISCELLANEOUS	SO	SOAP DISPENSER		
BD	BOARD	FR	FIRE RATING	MIR	MIRROR	SO	SOUND TRANSMISSION GLASS		
BOT	BOTTOM	FT	FIRE TREATED	MIN	MINIMUM	STC	STANDARD TRANSMISSION GLASS		
BW	BOTTOM OF WALL	FIXT	FIXTURE	MIS	MISCELLANEOUS	SC	SOUTH		
BKT	BRACKET	FLG	FLASHING	MIR	MIRROR	SPEC	SPECIFICATION		
BR	BRICK	FLR	FLOORING	MOD	MODULAR	SA	SPRAY ACOUSTIC		
BRZ	BRONZE	FD	FLOOR DRAIN	MR	MOISTURE RESISTANT	SA	SQUARE		
BLDG	BUILDING	FLORS	FLOURESCENT	MLDG	MOLDING, MOULDING	SO	SQUARE		
BUR	BUILT-UP ROOFING	FTG	FOOTING	MTD	MOUNTED	ST	STAINLESS STEEL		
CAB	CABINET	FDN	FOUNDATION	FRM	FRAME	ST	STAIR		
CUH	CABINET UNIT HEATER	FS	FULL SIZE	FURR	FURRED (ING)	STA	STANDARD		
CPT	CARPET (ED)	GA	GAGE, GAUGE			STL	STEEL		
CI	CAST IRON	GALV	GALVANIZED			STRUC	STRUCTURAL		
CB	CATCH BASIN	GC	GENERAL CONTRACTOR			SUSP	SUSPENDED		
CLG	CEILING	GL	GLASS, GLAZING			SYS	SYSTEM		
CMT	CEMENT	GLFRC	GLASS FIBER REINFORCED CONCRETE			TACKB	TACKBOARD		
CTR	CENTER	GMU	GLASS MASONRY UNIT			TEL	TELEPHONE		
CHBD	CERAMIC TILE	GT	GLASS TILE			TEMP	TEMPERED		
CO	CHALK BOARD	GB	GRAB BAR			TC	TERRA COTTA		
CLR	CLEAR	GRD	GRADE (ING)			TZ	TERAZZO		
CLO	CLOSET	GRT	GROUT			TEX	TEXTURED		
COL	COLUMN	GYP	GYP SUM			THK	THICKNESS		
COMP	COMPRESSION, (ION), (IBLE)	GYSUM	GYP SUM WALL BOARD			TPD	TOILET PAPER DISPENSER		
CONC	CONCRETE	GWB	GYP SUM WALL BOARD			TJ	TOUNGE AND GROOVE		
CMU	CONCRETE MASONRY UNIT	HP	HANDICAPPED			T&B	TOP AND BOTTOM		
CONST	CONSTRUCTION	HR	HANDRAIL			TC	TOP OF CONCRETE		
CONT	CONTINUOUS	HBD	HARD BOARD			TDC	TOP DEAD CENTER		
CONTR	CONTRACTOR	HW	HARDWARE			TF	TOP OF FOOTING		
CJT	CONTROL JOINT	HW	HARDWARE			TJ	TOP OF JOIST		
CG	CORNER GUARD	HDW	HARDWARE			TSL	TOP OF SLAB		
CORR	CORRIDOR	HD	HEAD			TST	TOP OF STEEL		
CTSK	COUNTERSINK	HTG	HEATING			TW	TOP OF WALL		
CRS	COURSE	HTG/V	HEATING/VENTILATING/			TB	TOWEL BAR		
CYD	CUBIC YARD	HVAC	AIR CONDITIONING			T	TREAD		
DEPT	DEPARTMENT	HT	HEIGHT			TRNS	TRANSPARENT		
DTL	DETAIL	HPT	HIGH POINT			TYP	TYPICAL		
DIAG	DIAGONAL	H	HOLLOW CORE			UC	UNDERCUT		
DIA	DIAMETER	HC	HOLLOW CORE			UL	UNDERWRITERS LABORATORY		
DIM	DIMENSION	HM	HOLLOW METAL			UR	URINAL		
DW	DISH WASHER	HB	HOSE BIBB			VERT	VERTICAL		
DSPR	DISPENSER	HORIZ	HORIZONTAL			VG	VERTICAL GRAIN		
DISP	DISPOSAL					VIF	VERIFY IN FIELD		
DR	DOOR					VEST	VESTIBLE		
DO	DOOR OPENING					VPL	VENER PLASTER		
DBL	DOUBLE					VIN	VINYL		
DA	DOUBLE ACTING					VCT	VINYL COMPOSITION TILE		
DN	DOWN					VGWB	VINYL FACED GYPSUM WALL BOARD		
DWR	DRAWER					VVC	VINYL WALL COVERING		
DWG	DRAWING								
DF	DRINKING FOUNTAIN								

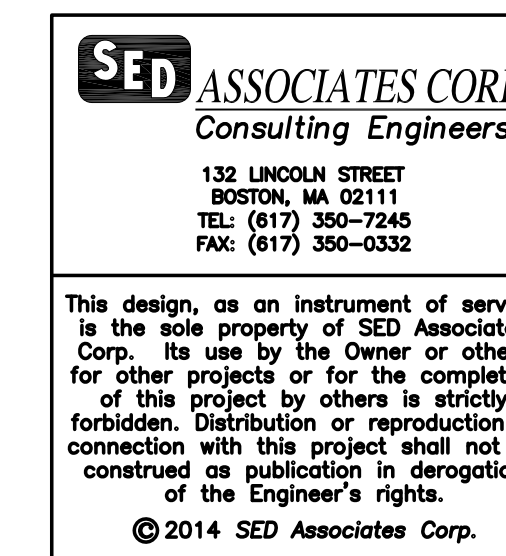
WALTHAM COMMUNITY CULTURAL CENTER HVAC IMPROVEMENTS

BID SET
AUGUST 15, 2017

510 MOODY STREET, WALTHAM, MA

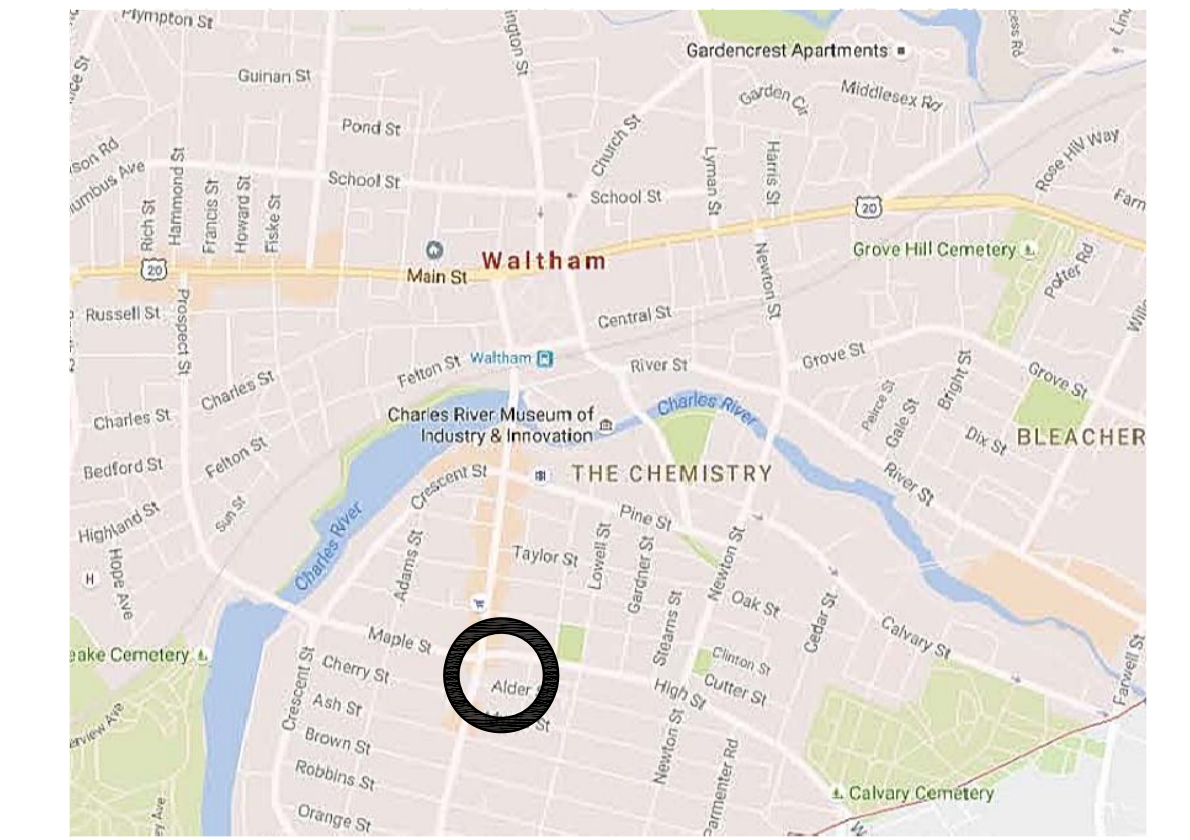


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LOCUS PLAN

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ARCHITECTURAL SYMBOLS

ROOM NAME ####	ROOM NAME #### 100 S.F.	ROOM NAME ROOM NUMBER AREA (WHERE APPLICABLE)	
DOOR TYPE	WINDOW TYPE	LOUVER TYPE	PARTITION TYPE
TITLE REFERENCE	ELEVATION	INTERIOR/ EXTERIOR ELEVATION	BUILDING SECTION
			WALL SECTION
			DETAIL SECTION
			DETAIL REFERENCE
			COLUMN CENTER LINE
			KEY NOTE

CODE REVIEW NARRATIVE
WALTHAM COMMUNITY CULTURAL CENTER

510 MOODY STREET
 WALTHAM, MA
 OCTOBER 18, 2016

REVIEWED TO COMMONWEALTH OF MASSACHUSETTS STATE BUILDING CODE 780 CMR EIGHTH EDITION, INTERNATIONAL BUILDING CODE (IBC) 2009, INTERNATIONAL EXISTING BUILDING CODE (IEBC) 2009, 1/9/09, INTERNATIONAL ENERGY CONSERVATION CODE (IECC) 2009, NFPA 101-1994, ARCHITECTURAL ACCESS BOARD 521 CMR, 1/27/06; AMERICANS WITH DISABILITIES ACT (ADA) - 1990, COMMONWEALTH OF MASSACHUSETTS FUEL GAS AND PLUMBING CODE 248 CMR UPDATED TO 3/11/2005.

SUMMARY: THIS IS A CODE REVIEW OF AN EXISTING 85,000 SF ELEMENTARY SCHOOL BUILDING THAT IS CURRENTLY BEING USED AS SPACE FOR TEACHING, ADMINISTRATIVE USES AND AS CIVIC COMMUNITY CENTER. THE REVIEW IS BEING UNDERTAKEN IN PREPARATION FOR PROVIDING AIR CONDITIONING IMPROVEMENTS TO INDIVIDUAL SPACES AS FOLLOWS: THE FORMER CLASSROOMS, ADMINISTRATION AREAS, "SKATE AND SCOOT", THE GYMNASIUM AND THE AUDITORIUM.

BUILDING BACKGROUND REVIEW

IBC-302 EXISTING BUILDING USE GROUPS:
 IBC-305.1 EDUCATIONAL - UP THROUGH 12TH GRADE
 ADMINISTRATIVE USES
 GYMNASIUM
 COMMUNITY HALL
 BOWLING ALLEY
 DANCE HALLS (SKATE AND SCOOT)

IBC-403.2 THIS BUILDING IS NOT A HIGH-RISE BUILDING (MORE THAN 70' ABOVE MEAN GRADE).

IBC-501 THE BUILDING APPEARS TO BE SPLIT INTO TWO DISCRETE BUILDINGS WITH A FIRE SEPARATION BETWEEN THEM. THE ORIGINAL BUILDING APPEARS TO BE CONSTRUCTED OF MASONRY CONSTRUCTION WITH STRUCTURAL CONCRETE AND CLAY TILE FLOORS. THIS PORTION OF THE BUILDING HAS A FOOT PRINT OF 22,419 SF.

THE LATER CLASSROOM ADDITION IS CONSTRUCTED OF STEEL FRAMING AND POURED CONCRETE FLOORS AND HAS A FOOT PRINT OF 13,350 SF AND IS DIVIDED FROM THE ORIGINAL BUILDING WITH A MASONRY SEPARATION WALL THAT DOES NOT EXTEND THROUGH THE ROOF. NEITHER BUILDING HAS SPRINKLERS.

THE TOTAL FOOT PRINT OF THE TWO STRUCTURES IS 35,769 SF AND EACH BUILDING IS 3 STORIES (37 FEET HIGH)

IBC-TBL 503 ALLOWABLE TABULAR AREA AND HEIGHT:
 ORIGINAL BUILDING NON-COMBUSTIBLE PROTECTED (TYPE III A)
 EDUCATIONAL E - 3 STORIES AND 23,500 SF ALLOWED PER FLOOR

NEW BUILDING ADDITION NON-COMBUSTIBLE UNPROTECTED (TYPE II B)
 EDUCATIONAL E - 2 STORIES AND 14,500 SF ALLOWED PER FLOOR

IBC-506.2 AREA INCREASES ALLOWED BY FRONTAGE EXCESS: BUILDING IS ACCESSIBLE ON 3 SIDES.
 INCREASE = 50% X ALLOWED AREA = AREA INCREASE ALLOWED.

ORIGINAL BUILDING 23,500 X .5 = 11,750 SF (EDUCATIONAL E)
 NEW BUILDING ADDITION 14,500 X .5 = 7,250 (EDUCATIONAL E)

IBC-506.1 TOTAL AREA ALLOWED FOR E OCCUPANCY:
 ORIGINAL BUILDING 23,500 + 11,750 = 35,250 SF
 NEW BUILDING ADDITION 14,500 + 7,250 = 21,250 SF
 TOTAL BUILDING = 57,500 SF

AREAS OF EXISTING BUILDING:	ORIGINAL BLDG	NEW BUILDING	TOTAL BUILDING
BASEMENT LEVEL	22,419 SF	13,350 SF	35,769 SF
LEVEL 1	22,419 SF	8,962 SF	30,781 SF
LEVEL 2	10,271 SF	8,362 SF	18,633 SF
TOTAL EXISTING AREA	55,109 SF	30,077 SF	85,183 SF

DISCUSSION: BUILDING COMPLIES FOR AREA FOR THE MOST STRINGENT USE (E) BY BUILDING CONSTRUCTION TYPE SO BUILDING COMPLIES WITH CURRENT CODES FOR AREA. BY CURRENT CODE THE NEW BUILDING ADDITION PORTION OF THE BUILDING DOES NOT MEET THE HEIGHT REQUIREMENTS OF THE CODE.

DISCUSSION: IF THE BUILDING OCCUPANCY IS CLASSIFIED AS AN EDUCATIONAL OCCUPANCY (E - EDUCATIONAL) THEN THE ALTERATIONS (ADDING TO OR CHANGING THE MECHANICAL SYSTEMS) WOULD FALL UNDER THE REQUIREMENTS OF CHAPTER 7 (ALTERATIONS - LEVEL 2) WHICH APPLIES TO WORK UNDERTAKEN WHERE THERE IS RECONFIGURATION OF ANY BUILDING SYSTEM OR THE ADDITION OF ANY ADDITIONAL EQUIPMENT. (SEE IBC-404)

DISCUSSION: IF THE BUILDING OCCUPANCY IS CLASSIFIED AS AN EDUCATIONAL OCCUPANCY (E - EDUCATIONAL) THEN THE ALTERATIONS (ADDING TO OR CHANGING THE MECHANICAL SYSTEMS) WOULD FALL UNDER THE REQUIREMENTS OF CHAPTER 7 (ALTERATIONS - LEVEL 2) WHICH APPLIES TO WORK UNDERTAKEN WHERE THERE IS RECONFIGURATION OF ANY BUILDING SYSTEM OR THE ADDITION OF ANY ADDITIONAL EQUIPMENT. (SEE IBC-404)

IBC-703 THERE ARE NO CHANGES TO THE BUILDING ELEMENTS, INTERIOR FINISHES AND FLOOR OPENINGS.

DISCUSSION: THIS IS AN IMPORTANT POINT. UNDER THE DEFINITIONS SECTION OF THE CODE "WORK AREA" IS DEFINED AS "RECONFIGURED SPACES". IN THIS REVIEW NO SPACES ARE BEING RECONFIGURED AND THUS EXEMPTS CHANGES MADE TO BUILDING SYSTEMS.

IBC-704 SPRINKLERS DO NOT EXIST IN THE BUILDING. IN E OCCUPANCIES SPRINKLERS WILL NOT BE REQUIRED IF THE WORK AREA IS LESS THAN 50% OF THE FLOOR AREA. (IT IS.)

IBC-705 MEANS OF EGRESS SHALL BE CONSIDERED COMPLIANT IF BUILDING COMPLIES WITH THE CODE UNDER WHICH IT WAS CONSTRUCTED UNLESS CONSIDERED UNSAFE BY THE BUILDING OFFICIAL.

IBC-706 ACCESSIBILITY CHANGES ARE REQUIRED ONLY IN AN ELEMENT WHICH IS ALTERED.

DISCUSSION: THIS BUILDING HAS ONE ACCESSIBLE ENTRANCE AT THE REAR OF THE BUILDING TO THE BASEMENT FLOOR ONLY. AT THIS LOCATION THERE IS AN ELEVATOR. THIS ELEVATOR SERVES ALL THREE FLOORS OF THE BUILDING. THE AUDITORIUM IS ACCESSIBLE BY RAMP FROM THE FIRST FLOOR LEVEL BUT NOT FROM THE MAIN EXTERIOR ENTRANCE. THE AUDITORIUM BALCONY AREA IS NOT ACCESSIBLE. THE BOWLING FUNCTIONS UNDER THE AUDITORIUM ARE ACCESSIBLE BY STEPS ONLY. NONE OF THESE AREAS ARE BEING ALTERED BY THIS PROJECT.

IBC-707 SEISMIC UP DATES ARE REQUIRED FOR ANY ELEMENT WHICH HAS AN INCREASED LOADING MORE THAN 5%.

IBC-708 NEW ELECTRICAL WORK IS TO MEET CURRENT CODES.

IBC-709.2 ALTERED MECHANICAL SYSTEMS SHALL MEET ASHRAE 62.

IBC-710 WHERE THE OCCUPANT LOAD OF THE STORY IS INCREASED BY MORE THAN 20% PLUMBING FIXTURES FOR THE STORY ARE TO BE PROVIDED ACCORDING TO THE CURRENT PLUMBING CODE.

IBC-711 ONLY ALTERED ELEMENTS NEED TO COMPLY TO THE CURRENT ENERGY CONSERVATION CODE.

GENERAL BUILDING REQUIREMENTS - INTERNATIONAL BUILDING CODE (IBC)

IBC-303.1 BUILDING USE GROUP - EDUCATIONAL (E) - CLASSROOMS FOR STUDENTS OLDER THAN 2 1/2 YEARS AND OTHER ANCILLARY USES.

IBC-403 THE BUILDING HAS BEEN DETERMINED NOT TO BE A HIGH-RISE BUILDING (LESS THAN 70').

IBC-403.3 THE BUILDING IS NOT SPRINKLERED.

IBC-602 CONSTRUCTION TYPE II A AND II B (SEPARATED) - THE FIRE AREAS OF THE BUILDING ARE SHOWN ON THE ACCOMPANYING DIAGRAM.

FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS, CONSTRUCTION TYPE II A

IBC-TBL 601 BUILDING ELEMENT:	
STRUCTURAL FRAME (INCL COLUMNS, GIRDERS, TRUSSES)	1 HR
BEARING WALLS	1 HR
NON BEARING INTERIOR WALLS	0 HRS
FLOOR (INCL BEAMS & JOISTS)	1 HR
ROOF (INCL BEAMS & JOISTS)	1 HR

FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS, CONSTRUCTION TYPE II B

IBC-TBL 601 BUILDING ELEMENT:	
STRUCTURAL FRAME (INCL COLUMNS, GIRDERS, TRUSSES)	0 HRS
BEARING WALLS	0 HRS
NON BEARING INTERIOR WALLS	0 HRS
FLOOR (INCL BEAMS & JOISTS)	0 HRS
ROOF (INCL BEAMS & JOISTS)	0 HRS

IBC-TBL 602 EXTERIOR WALLS (USE GROUP E)	
< 5'	1 HR
≥ 5' < 10'	1 HR
≥ 10' < 30'	1 HR
≥ 30'	0 HRS

IBC-708.4 SHAFT ENCLOSURES SHALL BE RATED FOR 2 HOURS WHERE CONNECTING 4 STORIES OR MORE AND ONE HOUR FOR LESS THAN 4 STORIES BUT NOT LESS THAN THE FLOOR RATING.

IBC-TBL 1018.1 CORRIDOR ENCLOSURES IN AN UNSPRINKLERED OCCUPANCY (E) BUILDING SHALL BE RATED ONE HOUR.

REVIEWED BY:

LIVERMORE, EDWARDS AND ASSOCIATES

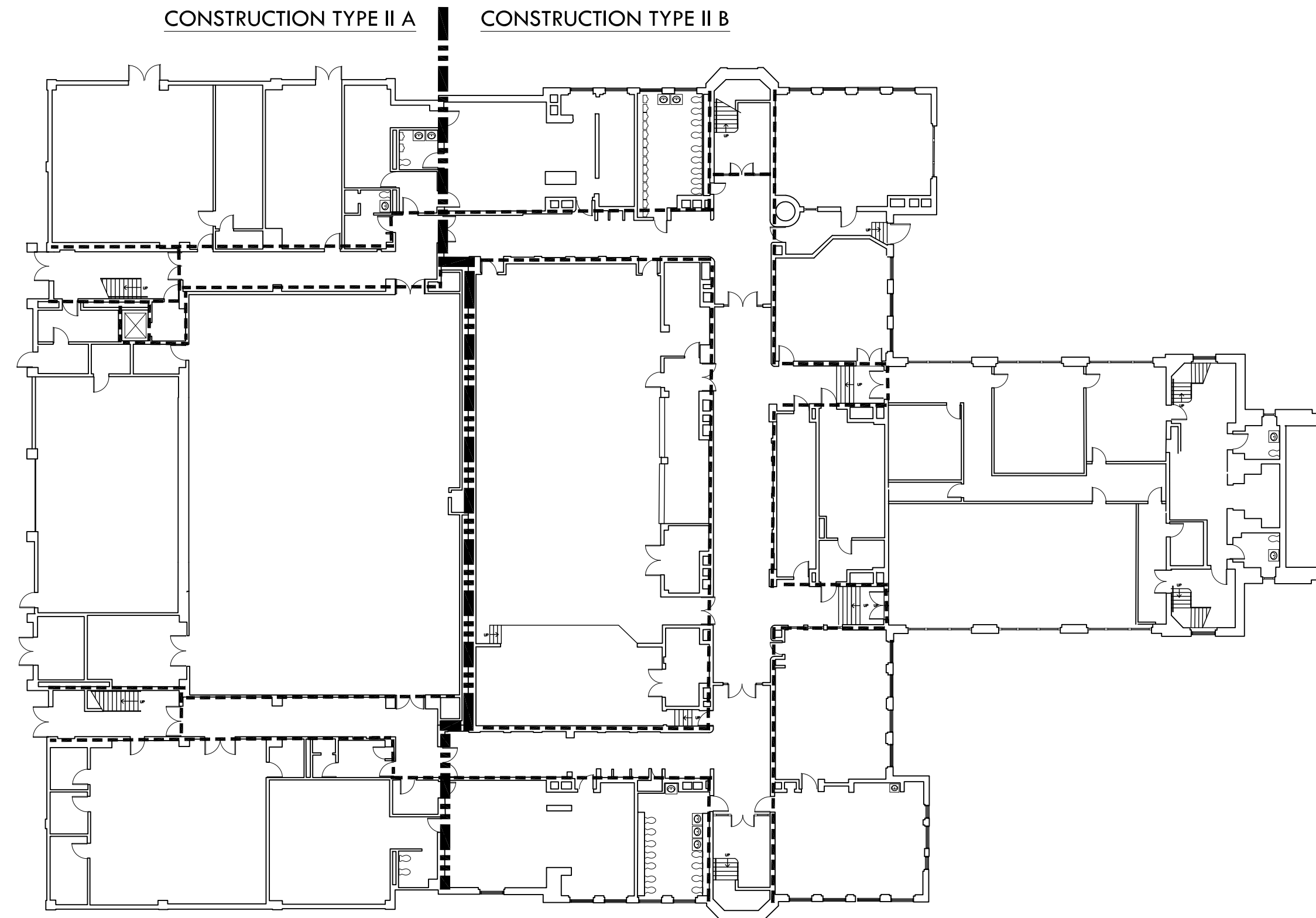
10/18/16
 DATE

LEGEND

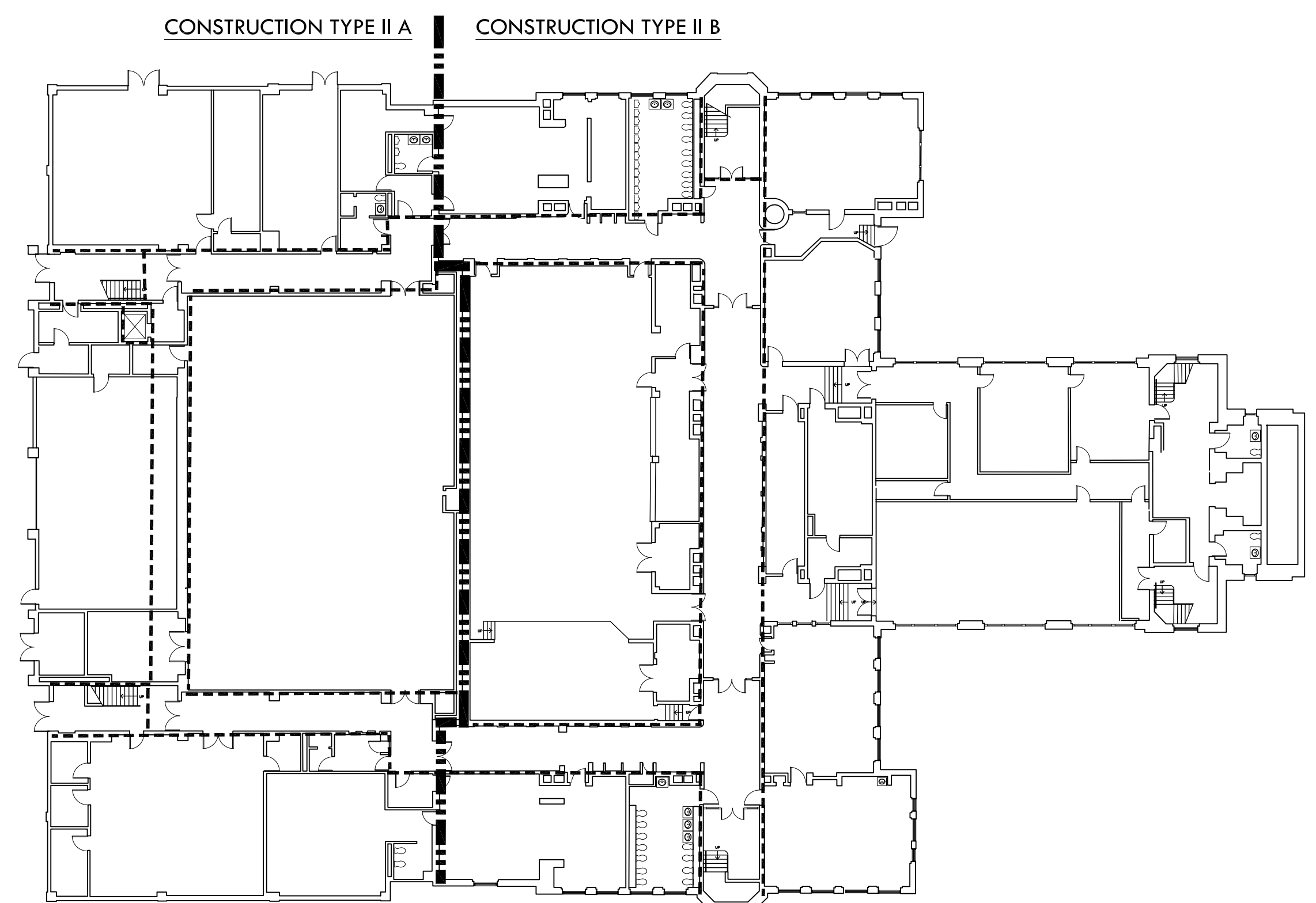
- ■ — ■ ■ ■ — BUILDING SEPARATION FOR CONSTRUCTION TYPE (1 HOUR RATING REQUIRED)
- - - - - ONE HOUR RATED WALL REQUIRED

GENERAL NOTES

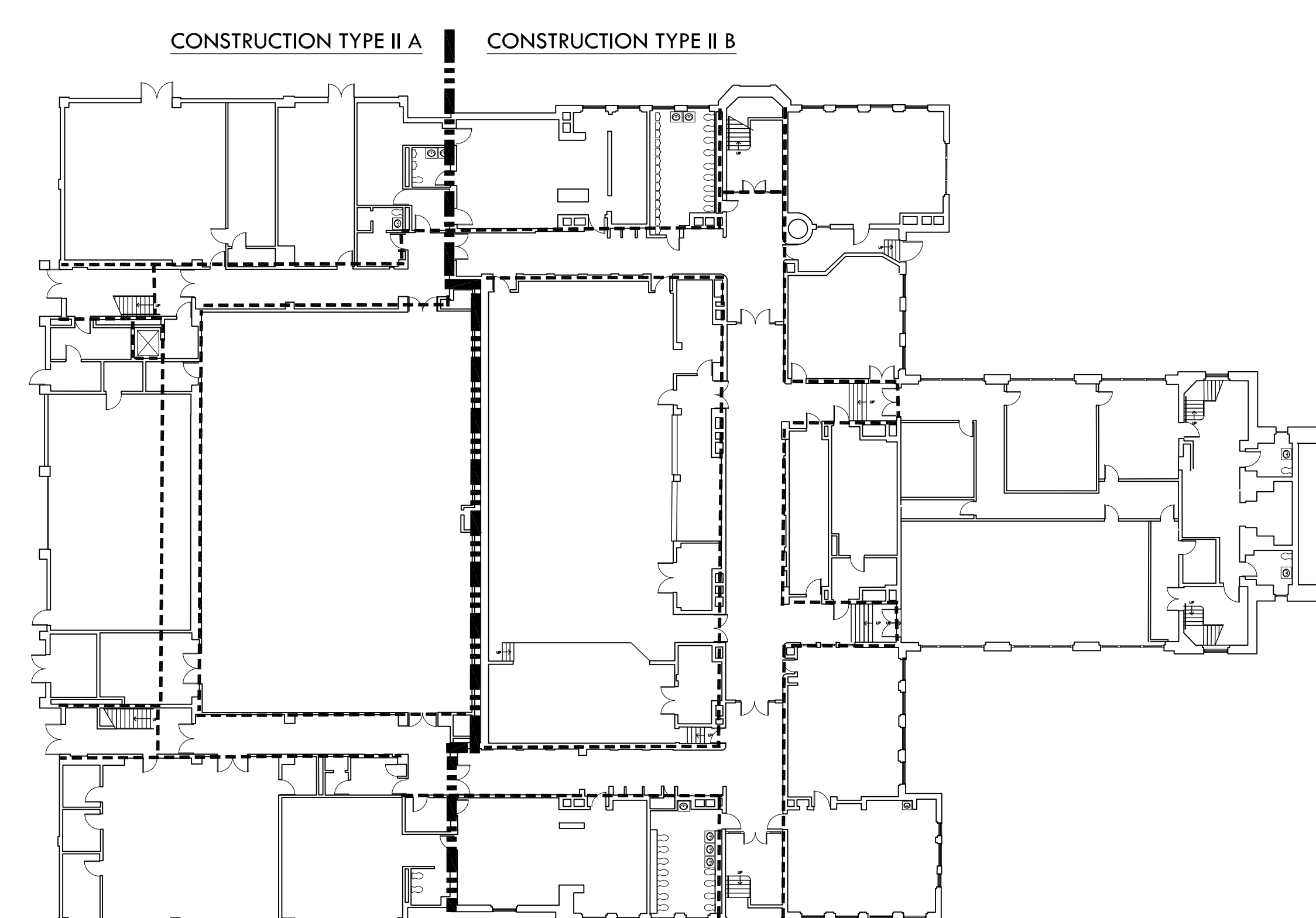
1. PROVIDE 1 HOUR FIRE RATING AT ALL PENETRATIONS OF WALLS AS INDICATED ON DRAWINGS ON THIS SHEET
2. PROVIDE 1 HOUR RATING OF ALL FLOOR AND ROOF PENETRATIONS AS INDICATED BY BUILDING TYPE
3. PROVIDE 1 HOUR RATING AT ALL STAIR ENCLOSURES AND VERTICAL SHAFTS



1 SECOND LEVEL FLOOR PLAN
 NTS



3 GROUND LEVEL FLOOR PLAN
 NTS



2 FIRST LEVEL FLOOR PLAN
 NTS

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PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

PROJECT #: LE 1607
 DRAWN BY:
 CHECKED BY: RL
 APPROVED BY: RL
 SCALE:

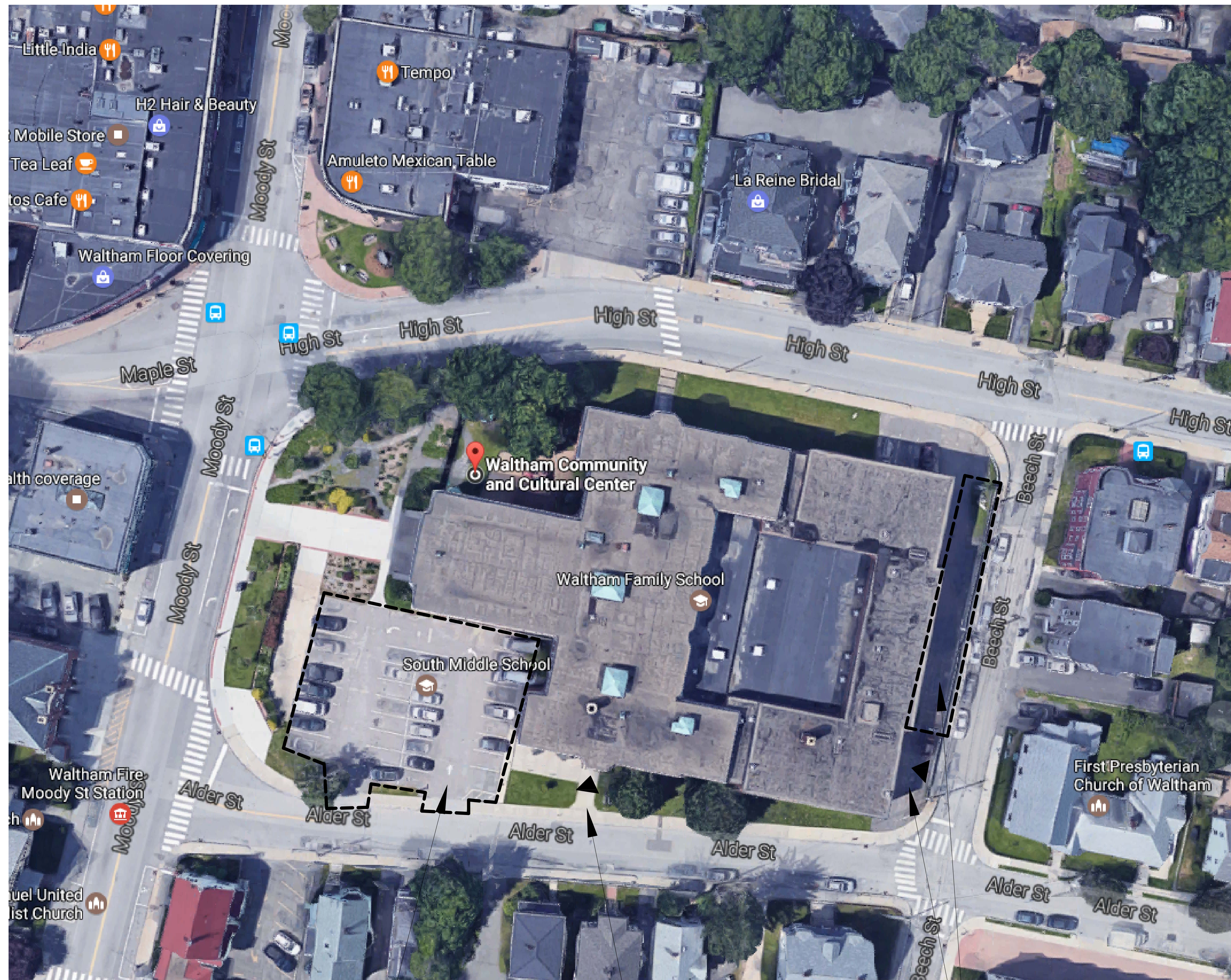
STATUS:
 SCHEMATIC DESIGN
 REVIEW
 DESIGN DEVELOPMENT
 FINAL REVIEW
 BIDDING
 PERMIT
 CONSTRUCTION
 NOT FOR CONSTRUCTION
 AS-BUILT

DATE: 8/15/17

REVISIONS:
 △ _____ △ _____
 △ _____ △ _____
 △ _____ △ _____
 △ _____ △ _____

DRAWING:
CODE REVIEW PLANS

GO-0



PARKING

PUBLIC ENTRANCE

CONSTRUCTION LAY DOWN AREA

CONSTRUCTION ENTRANCE

1 SITE PLAN
NTS

GENERAL NOTES

1. THIS SITE PLAN INDICATES LOCATION OF MAJOR ELEMENTS.
2. SITE ACCESS POINTS INDICATED.
3. DOTTED LINES INDICATES AREAS WHERE CRANES MAY BE LOCATED FOR LIFTING EQUIPMENT TO THE ROOF.
4. AREA INDICATED ALONG BEECH STREET MAY BE USED FOR CONTRACTOR LAYOUT AND STORAGE ACCORDING AS PERMITTED BY BUILDING MANAGER.

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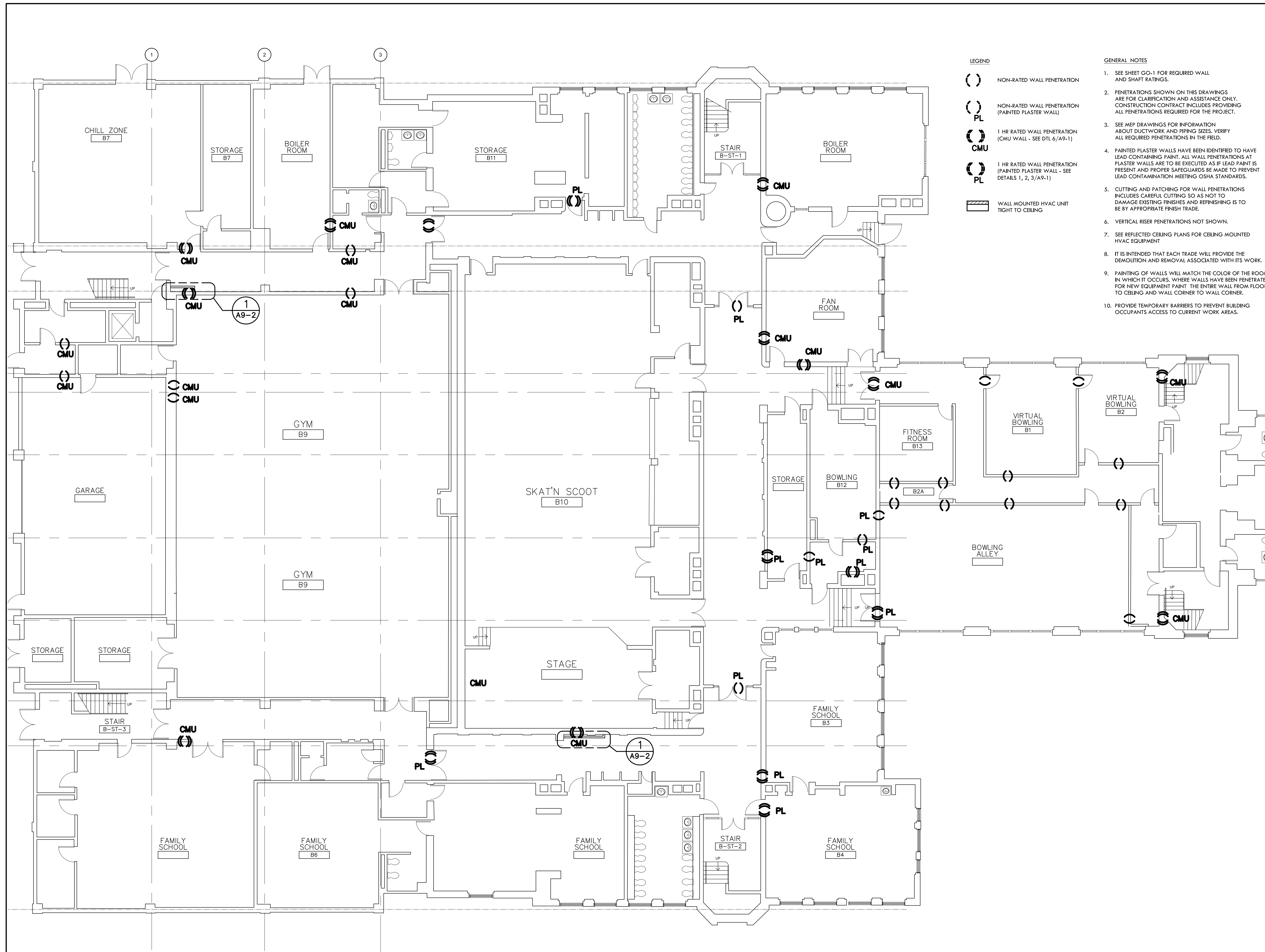
REVISIONS:

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△	△
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DRAWING:

SITE AND ACCESS
PLAN

C1-1



- LEGEND**
- (/) NON-RATED WALL PENETRATION
 - (PL) NON-RATED WALL PENETRATION (PAINTED PLASTER WALL)
 - (CMU) 1 HR RATED WALL PENETRATION (CMU WALL - SEE DETL 6/A9-1)
 - (PL) 1 HR RATED WALL PENETRATION (PAINTED PLASTER WALL - SEE DETAILS 1, 2, 3/A9-1)
 - ▭ WALL MOUNTED HVAC UNIT TIGHT TO CEILING

- GENERAL NOTES**
1. SEE SHEET GO-1 FOR REQUIRED WALL AND SHAFT RATINGS.
 2. PENETRATIONS SHOWN ON THIS DRAWINGS ARE FOR CLARIFICATION AND ASSISTANCE ONLY. CONSTRUCTION CONTRACT INCLUDES PROVIDING ALL PENETRATIONS REQUIRED FOR THE PROJECT.
 3. SEE MEP DRAWINGS FOR INFORMATION ABOUT DUCTWORK AND PIPING SIZES. VERIFY ALL REQUIRED PENETRATIONS IN THE FIELD.
 4. PAINTED PLASTER WALLS HAVE BEEN IDENTIFIED TO HAVE LEAD CONTAINING PAINT. ALL WALL PENETRATIONS AT PLASTER WALLS ARE TO BE EXECUTED AS IF LEAD PAINT IS PRESENT AND PROPER SAFEGUARDS BE MADE TO PREVENT LEAD CONTAMINATION MEETING OSHA STANDARDS.
 5. CUTTING AND PATCHING FOR WALL PENETRATIONS INCLUDES CAREFUL CUTTING SO AS NOT TO DAMAGE EXISTING FINISHES AND REFINISHING IS TO BE BY APPROPRIATE FINISH TRADE.
 6. VERTICAL RISER PENETRATIONS NOT SHOWN.
 7. SEE REFLECTED CEILING PLANS FOR CEILING MOUNTED HVAC EQUIPMENT.
 8. IT IS INTENDED THAT EACH TRADE WILL PROVIDE THE DEMOLITION AND REMOVAL ASSOCIATED WITH ITS WORK.
 9. PAINTING OF WALLS WILL MATCH THE COLOR OF THE ROOM IN WHICH IT OCCURS, WHERE WALLS HAVE BEEN PENETRATED FOR NEW EQUIPMENT PAINT THE ENTIRE WALL FROM FLOOR TO CEILING AND WALL CORNER TO WALL CORNER.
 10. PROVIDE TEMPORARY BARRIERS TO PREVENT BUILDING OCCUPANTS ACCESS TO CURRENT WORK AREAS.

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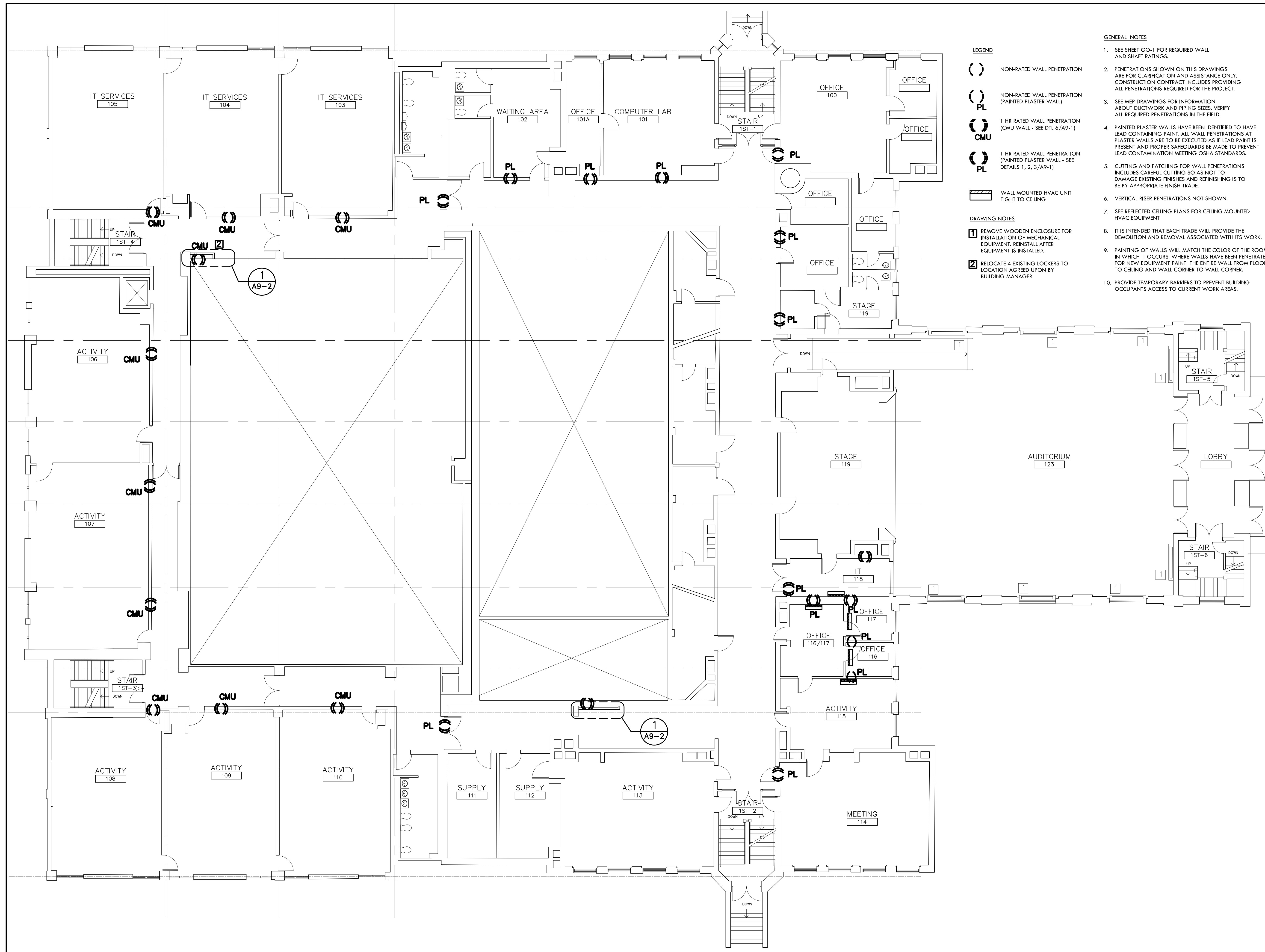
DATE: 8/15/17

REVISIONS:

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DRAWING:
GROUND FLOOR PLAN

A1-0



- LEGEND**
- (C) NON-RATED WALL PENETRATION
 - (PL) NON-RATED WALL PENETRATION (PAINTED PLASTER WALL)
 - (CMU) 1 HR RATED WALL PENETRATION (CMU WALL - SEE DTL 6/A9-1)
 - (PL) 1 HR RATED WALL PENETRATION (PAINTED PLASTER WALL - SEE DETAILS 1, 2, 3/A9-1)
 - [Symbol] WALL MOUNTED HVAC UNIT TIGHT TO CEILING

- DRAWING NOTES**
- 1 REMOVE WOODEN ENCLOSURE FOR INSTALLATION OF MECHANICAL EQUIPMENT. REINSTALL AFTER EQUIPMENT IS INSTALLED.
 - 2 RELOCATE 4 EXISTING LOCKERS TO LOCATION AGREED UPON BY BUILDING MANAGER

- GENERAL NOTES**
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Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

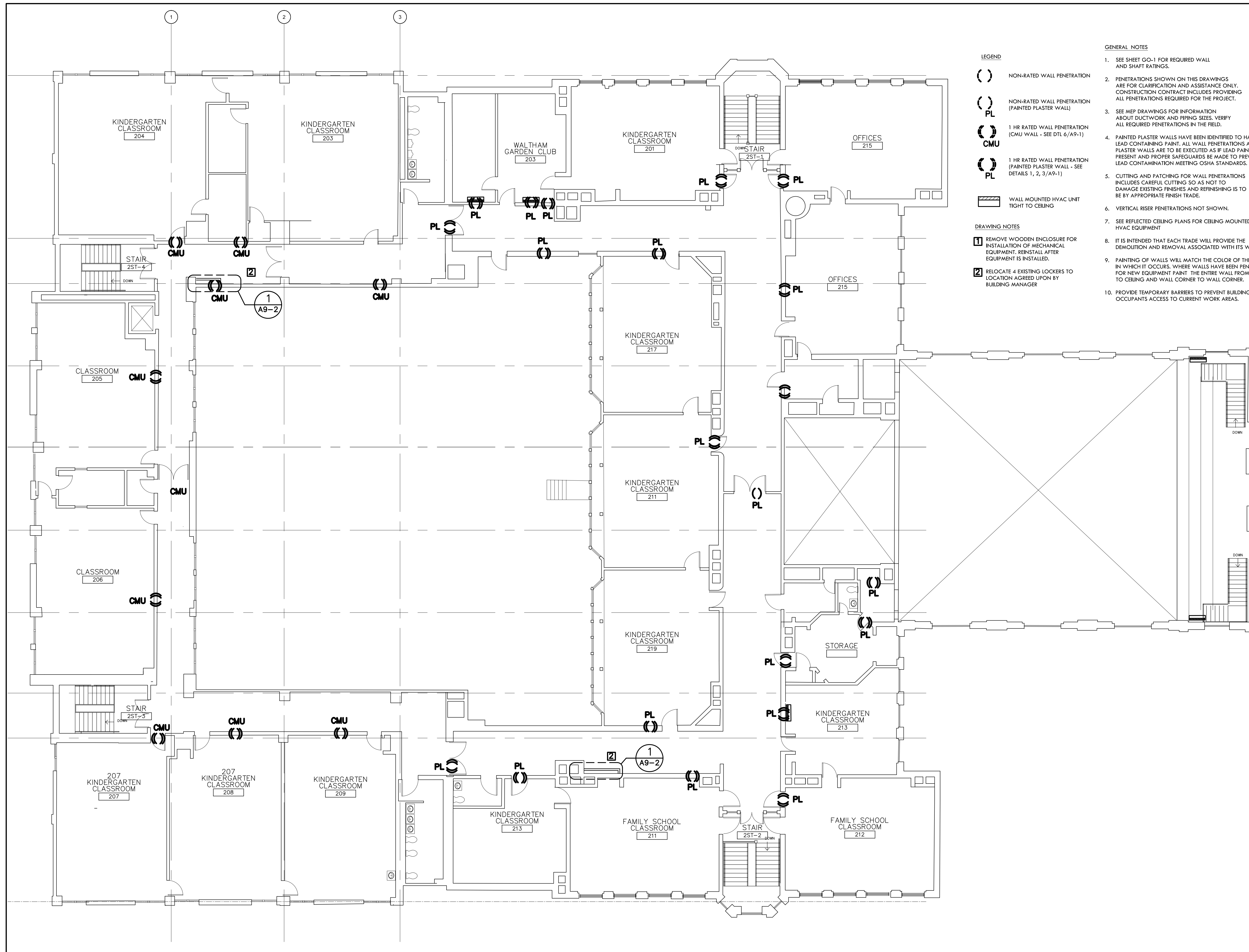
PROJECT #: LE 1607
 DRAWN BY: RL
 CHECKED BY: RL
 APPROVED BY: RL
 SCALE:

STATUS:
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 REVIEW
 DESIGN DEVELOPMENT
 FINAL REVIEW
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DRAWING:
FIRST FLOOR PLAN

A1-1



LEGEND

- () NON-RATED WALL PENETRATION
- (PL) NON-RATED WALL PENETRATION (PAINTED PLASTER WALL)
- (CMU) 1 HR RATED WALL PENETRATION (CMU WALL - SEE DTL 6/A9-1)
- (PL) 1 HR RATED WALL PENETRATION (PAINTED PLASTER WALL - SEE DETAILS 1, 2, 3/A9-1)
- [] WALL MOUNTED HVAC UNIT TIGHT TO CEILING

DRAWING NOTES

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GENERAL NOTES

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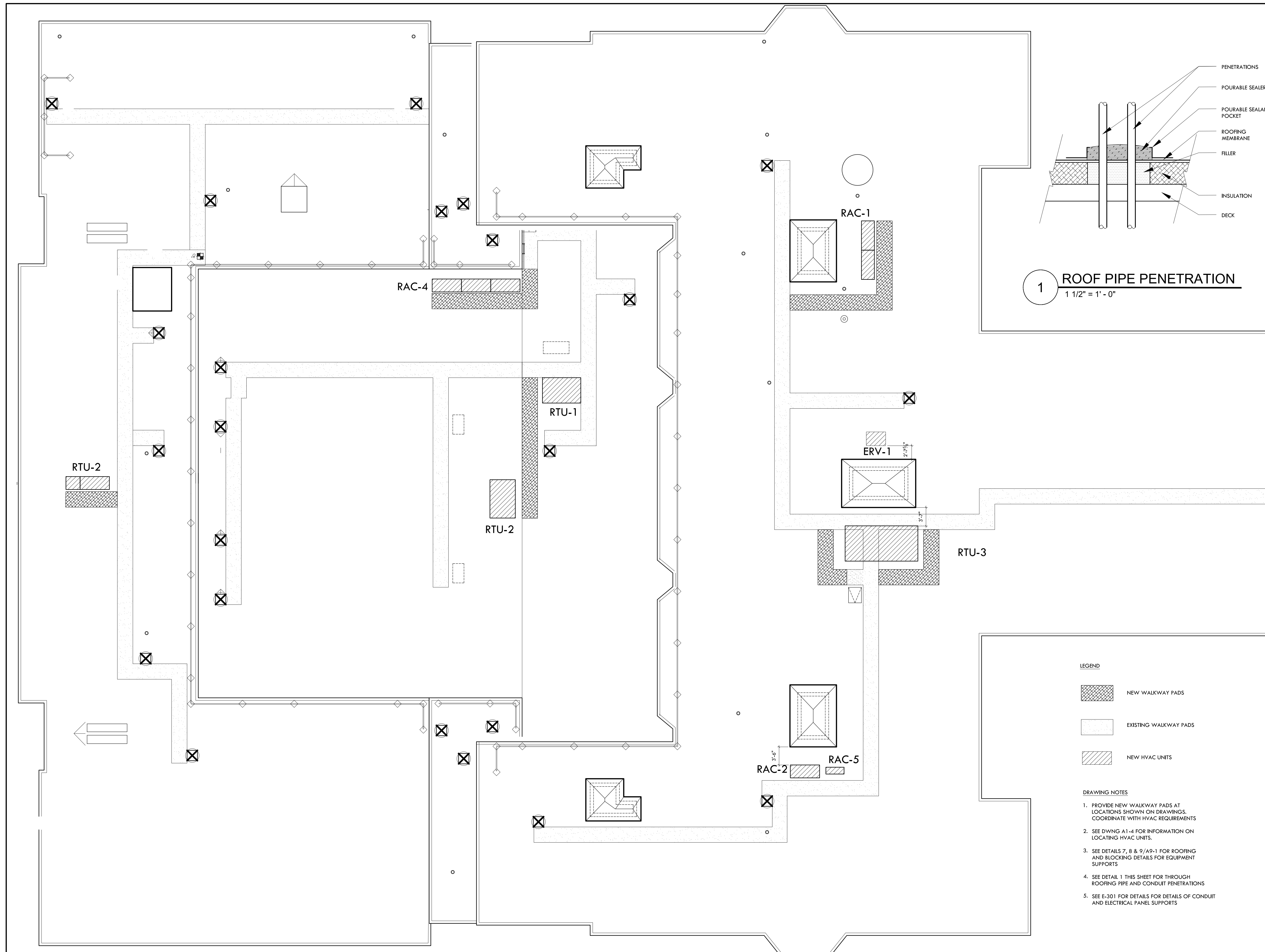
REVISIONS:

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DRAWING:

SECOND FLOOR PLAN

A1-2



1 ROOF PIPE PENETRATION
1 1/2" = 1' - 0"

LEGEND

- NEW WALKWAY PADS
- EXISTING WALKWAY PADS
- NEW HVAC UNITS

DRAWING NOTES

1. PROVIDE NEW WALKWAY PADS AT LOCATIONS SHOWN ON DRAWINGS. COORDINATE WITH HVAC REQUIREMENTS
2. SEE DWNG A1-4 FOR INFORMATION ON LOCATING HVAC UNITS.
3. SEE DETAILS 7, 8 & 9/A9-1 FOR ROOFING AND BLOCKING DETAILS FOR EQUIPMENT SUPPORTS
4. SEE DETAIL 1 THIS SHEET FOR THROUGH ROOFING PIPE AND CONDUIT PENETRATIONS
5. SEE E-301 FOR DETAILS FOR DETAILS OF CONDUIT AND ELECTRICAL PANEL SUPPORTS

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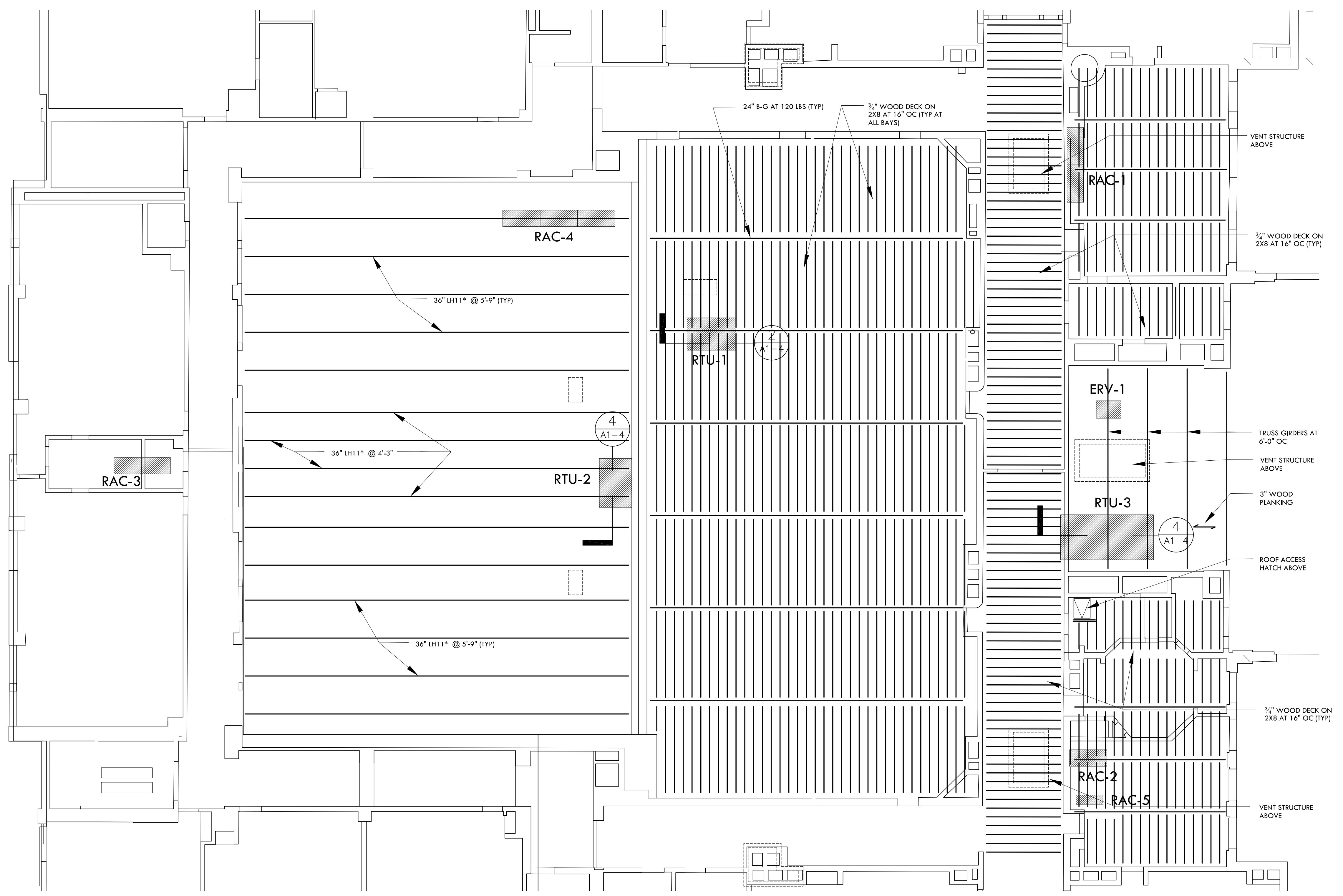
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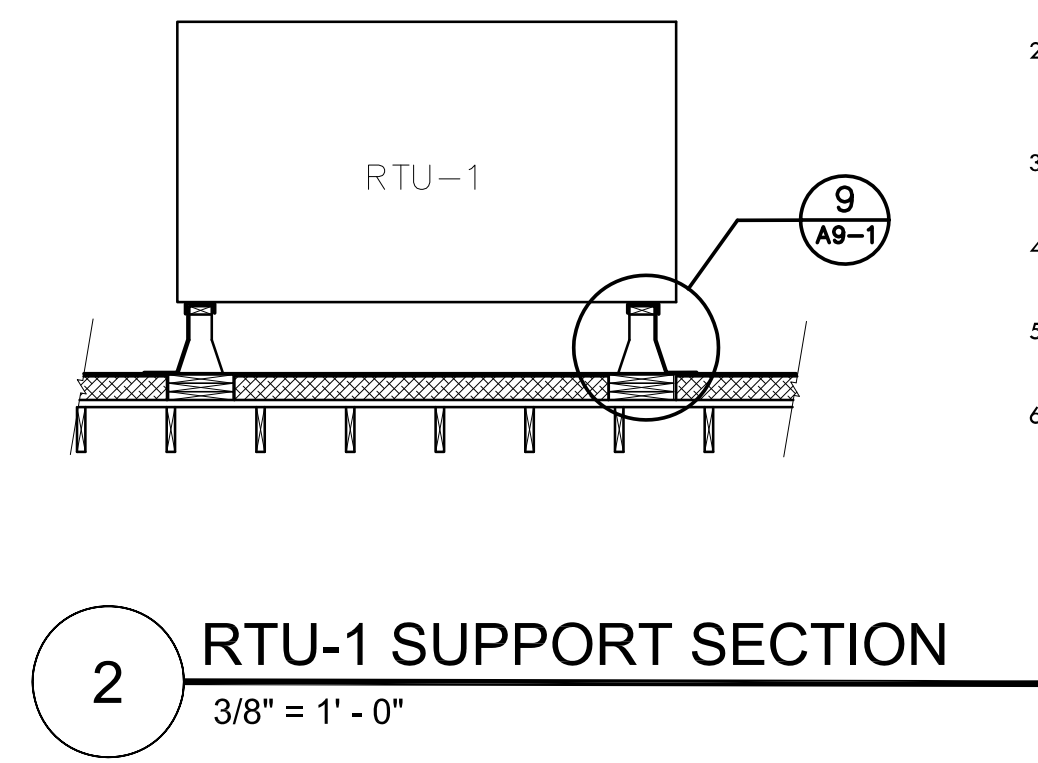
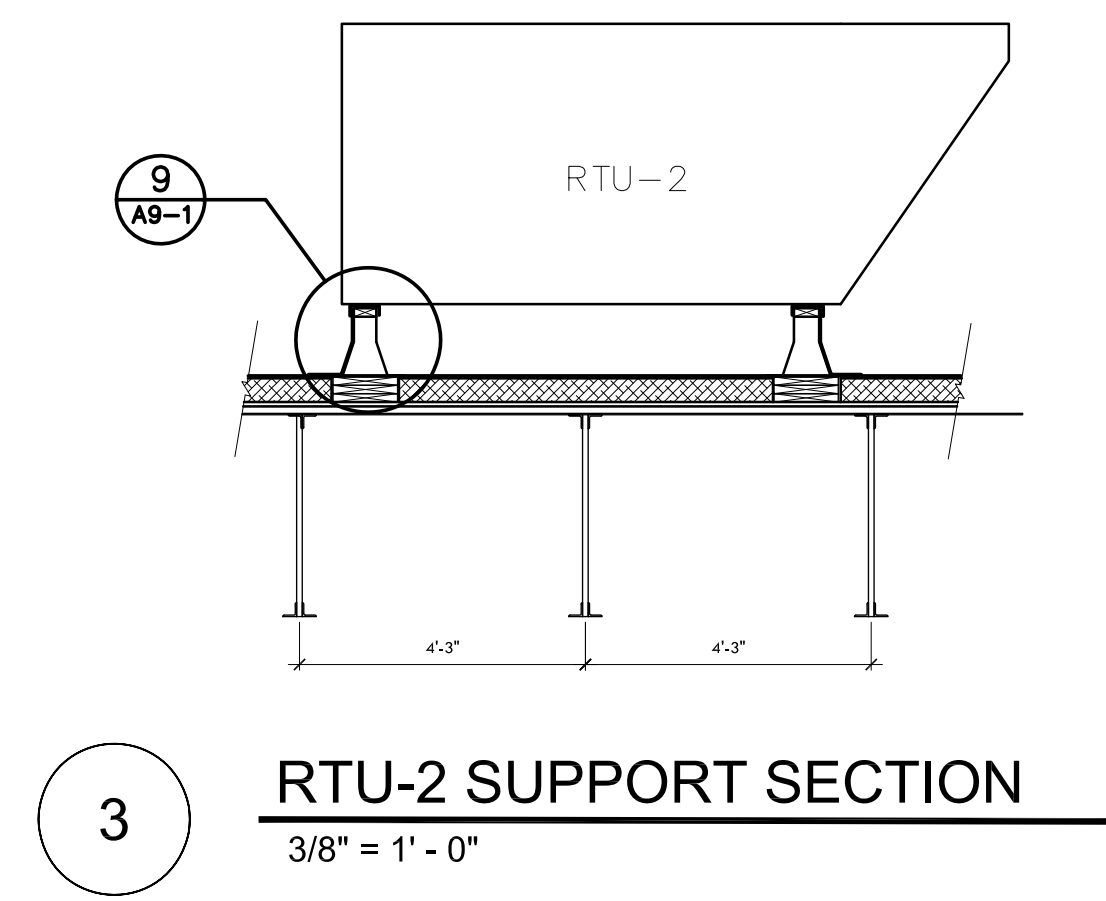
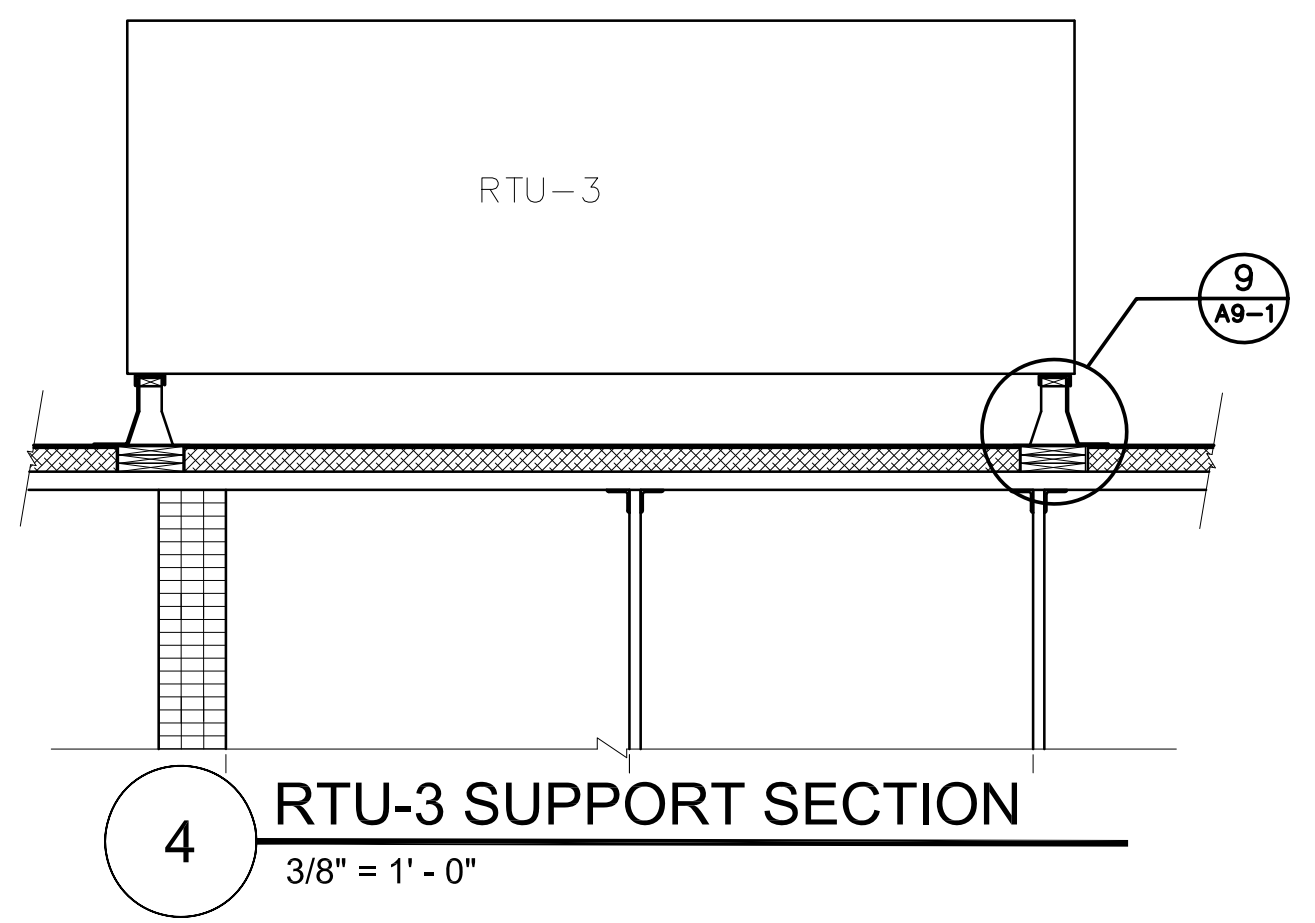
DATE: 8/15/17
REVISIONS:
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DRAWING:
ROOF PLAN

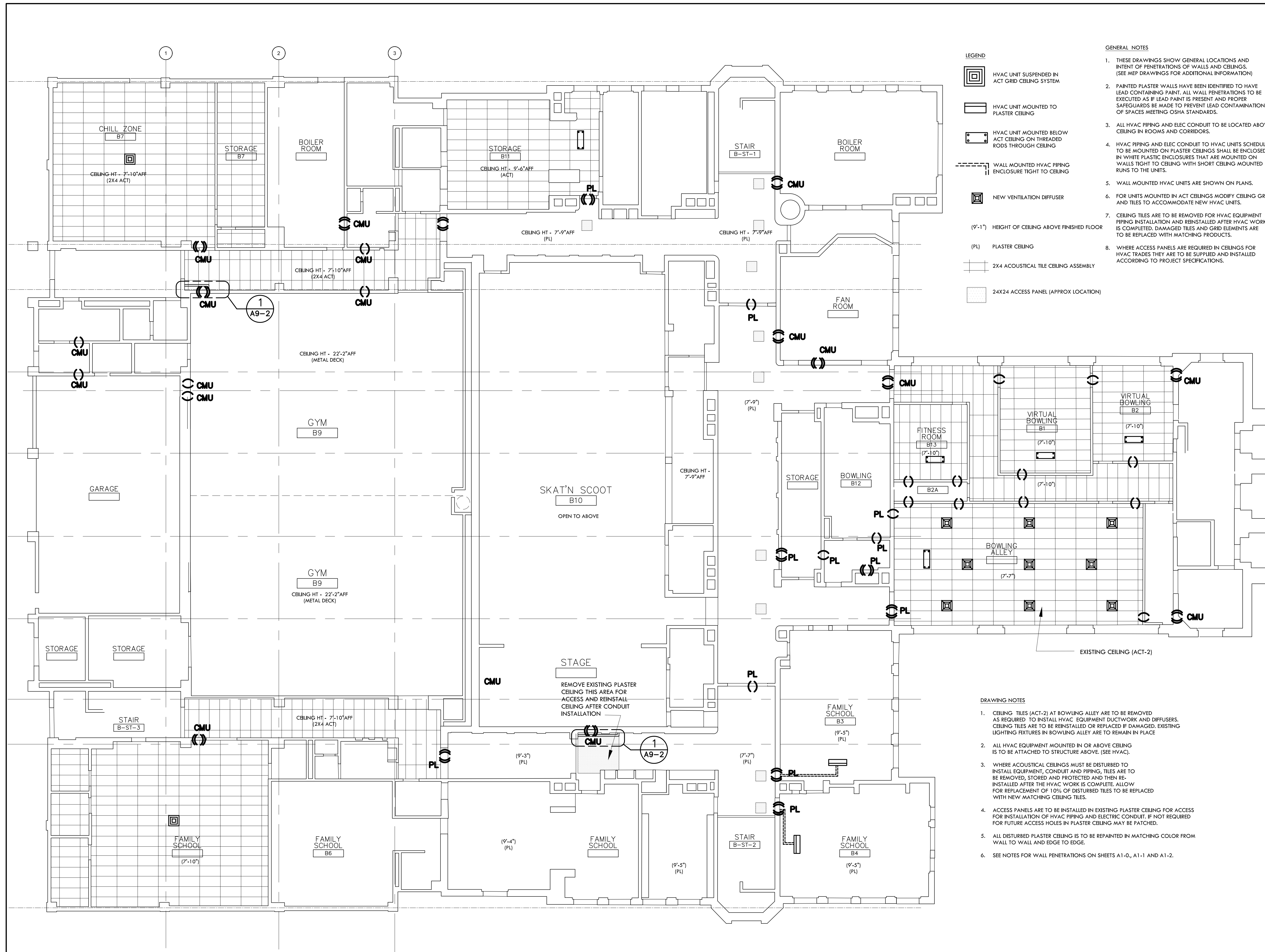
A1-3



1 STRUCTURAL FRAMING PLAN
1/16" = 1' - 0"



- GENERAL NOTES
- FRAMING IS GENERALLY INDICATED - VERIFY ACTUAL CONDITIONS IN FIELD
 - CURBS FOR RTU UNITS ARE CONTINUOUS AT UNIT PERIMETERS - LOCATE OVER EXISTING FRAMING AS INDICATED
 - ALL ROOFING WORK TO BE PROVIDED BY ROOFER HOLDING EXISTING WARRANTY
 - SEE CURB DETAIL 9/A9-1 - CURB FOR ERV-1 SIMILAR TO RTU-3
 - CENTER HVAC EQUIPMENT OVER FRAMING SUPPORT SPANS AS SHOWN
 - SEE DETAILS 7&8/A9-1 FOR SUPPORTS FOR RAC UNITS



- LEGEND**
- HVAC UNIT SUSPENDED IN ACT GRID CEILING SYSTEM
 - HVAC UNIT MOUNTED TO PLASTER CEILING
 - HVAC UNIT MOUNTED BELOW ACT CEILING ON THREADED RODS THROUGH CEILING
 - WALL MOUNTED HVAC PIPING ENCLOSURE TIGHT TO CEILING
 - NEW VENTILATION DIFFUSER
 - (9'-1") HEIGHT OF CEILING ABOVE FINISHED FLOOR
 - (PL) PLASTER CEILING
 - 2X4 ACOUSTICAL TILE CEILING ASSEMBLY
 - 24X24 ACCESS PANEL (APPROX LOCATION)
- GENERAL NOTES**
1. THESE DRAWINGS SHOW GENERAL LOCATIONS AND INTENT OF PENETRATIONS OF WALLS AND CEILINGS. (SEE MEP DRAWINGS FOR ADDITIONAL INFORMATION)
 2. PAINTED PLASTER WALLS HAVE BEEN IDENTIFIED TO HAVE LEAD CONTAINING PAINT. ALL WALL PENETRATIONS TO BE EXECUTED AS IF LEAD PAINT IS PRESENT AND PROPER SAFEGUARDS BE MADE TO PREVENT LEAD CONTAMINATION OF SPACES MEETING OSHA STANDARDS.
 3. ALL HVAC PIPING AND ELEC CONDUIT TO BE LOCATED ABOVE CEILING IN ROOMS AND CORRIDORS.
 4. HVAC PIPING AND ELEC CONDUIT TO HVAC UNITS SCHEDULED TO BE MOUNTED ON PLASTER CEILINGS SHALL BE ENCLOSED IN WHITE PLASTIC ENCLOSURES THAT ARE MOUNTED ON WALLS TIGHT TO CEILING WITH SHORT CEILING MOUNTED RUNS TO THE UNITS.
 5. WALL MOUNTED HVAC UNITS ARE SHOWN ON PLANS.
 6. FOR UNITS MOUNTED IN ACT CEILINGS MODIFY CEILING GRID AND TILES TO ACCOMMODATE NEW HVAC UNITS.
 7. CEILING TILES ARE TO BE REMOVED FOR HVAC EQUIPMENT PIPING INSTALLATION AND REINSTALLED AFTER HVAC WORK IS COMPLETED. DAMAGED TILES AND GRID ELEMENTS ARE TO BE REPLACED WITH MATCHING PRODUCTS.
 8. WHERE ACCESS PANELS ARE REQUIRED IN CEILINGS FOR HVAC TRADES THEY ARE TO BE SUPPLIED AND INSTALLED ACCORDING TO PROJECT SPECIFICATIONS.

- DRAWING NOTES**
1. CEILING TILES (ACT-2) AT BOWLING ALLEY ARE TO BE REMOVED AS REQUIRED TO INSTALL HVAC EQUIPMENT DUCTWORK AND DIFFUSERS. CEILING TILES ARE TO BE REINSTALLED OR REPLACED IF DAMAGED. EXISTING LIGHTING FIXTURES IN BOWLING ALLEY ARE TO REMAIN IN PLACE.
 2. ALL HVAC EQUIPMENT MOUNTED IN OR ABOVE CEILING IS TO BE ATTACHED TO STRUCTURE ABOVE. (SEE HVAC).
 3. WHERE ACOUSTICAL CEILINGS MUST BE DISTURBED TO INSTALL EQUIPMENT, CONDUIT AND PIPING, TILES ARE TO BE REMOVED, STORED AND PROTECTED AND THEN RE-INSTALLED AFTER THE HVAC WORK IS COMPLETE. ALLOW FOR REPLACEMENT OF 10% OF DISTURBED TILES TO BE REPLACED WITH NEW MATCHING CEILING TILES.
 4. ACCESS PANELS ARE TO BE INSTALLED IN EXISTING PLASTER CEILING FOR ACCESS FOR INSTALLATION OF HVAC PIPING AND ELECTRIC CONDUIT. IF NOT REQUIRED FOR FUTURE ACCESS HOLES IN PLASTER CEILING MAY BE PATCHED.
 5. ALL DISTURBED PLASTER CEILING IS TO BE REPAINTED IN MATCHING COLOR FROM WALL TO WALL AND EDGE TO EDGE.
 6. SEE NOTES FOR WALL PENETRATIONS ON SHEETS A1-0, A1-1 AND A1-2.

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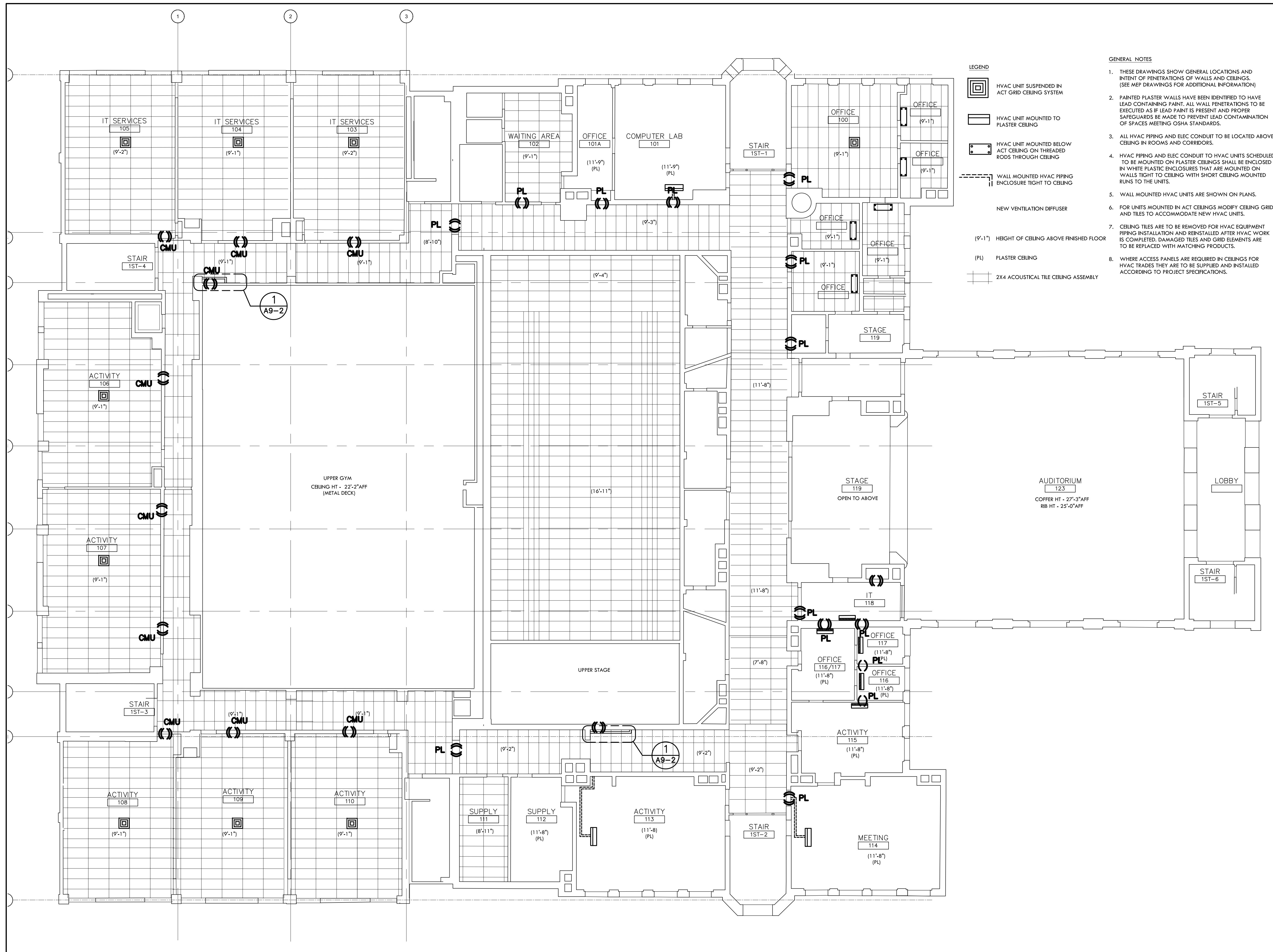
DATE: 8/15/17

REVISIONS:

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△	△
△	△
△	△

DRAWING: GROUND FLOOR RCP PLAN

A7-0



- LEGEND**
- HVAC UNIT SUSPENDED IN ACT GRID CEILING SYSTEM
 - HVAC UNIT MOUNTED TO PLASTER CEILING
 - HVAC UNIT MOUNTED BELOW ACT CEILING ON THREADED RODS THROUGH CEILING
 - WALL MOUNTED HVAC PIPING ENCLOSURE TIGHT TO CEILING
 - NEW VENTILATION DIFFUSER
 - (9'-1") HEIGHT OF CEILING ABOVE FINISHED FLOOR
 - (PL) PLASTER CEILING
 - 2X4 ACOUSTICAL TILE CEILING ASSEMBLY

- GENERAL NOTES**
1. THESE DRAWINGS SHOW GENERAL LOCATIONS AND INTENT OF PENETRATIONS OF WALLS AND CEILINGS. (SEE MEP DRAWINGS FOR ADDITIONAL INFORMATION)
 2. PAINTED PLASTER WALLS HAVE BEEN IDENTIFIED TO HAVE LEAD CONTAINING PAINT. ALL WALL PENETRATIONS TO BE EXECUTED AS IF LEAD PAINT IS PRESENT AND PROPER SAFEGUARDS BE MADE TO PREVENT LEAD CONTAMINATION OF SPACES MEETING OSHA STANDARDS.
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 5. WALL MOUNTED HVAC UNITS ARE SHOWN ON PLANS.
 6. FOR UNITS MOUNTED IN ACT CEILINGS MODIFY CEILING GRID AND TILES TO ACCOMMODATE NEW HVAC UNITS.
 7. CEILING TILES ARE TO BE REMOVED FOR HVAC EQUIPMENT PIPING INSTALLATION AND REINSTALLED AFTER HVAC WORK IS COMPLETED. DAMAGED TILES AND GRID ELEMENTS ARE TO BE REPLACED WITH MATCHING PRODUCTS.
 8. WHERE ACCESS PANELS ARE REQUIRED IN CEILINGS FOR HVAC TRADES THEY ARE TO BE SUPPLIED AND INSTALLED ACCORDING TO PROJECT SPECIFICATIONS.

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PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
WALTHAM, MA

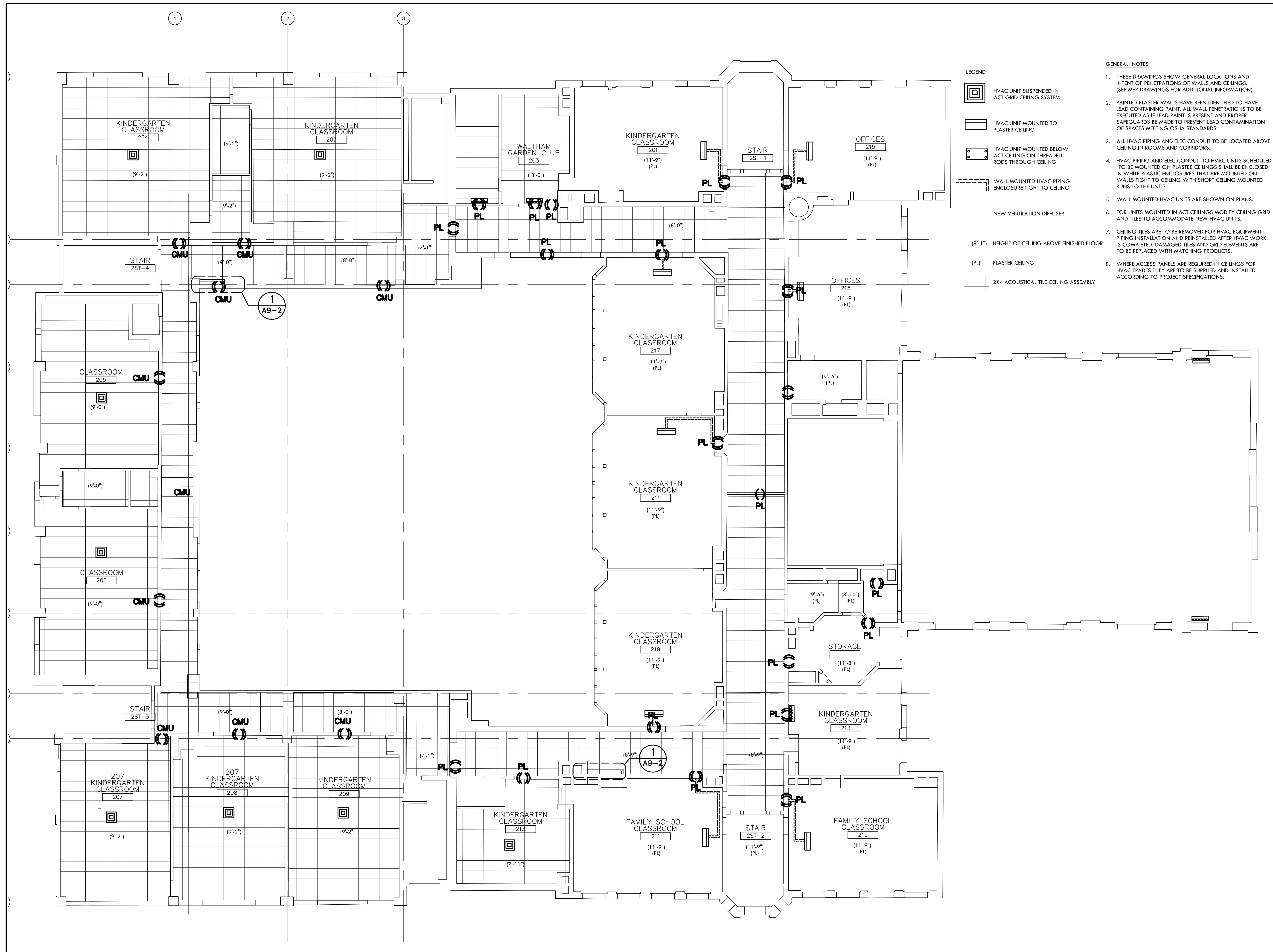
PROJECT #: LE 1607
DRAWN BY: RL
CHECKED BY: RL
APPROVED BY: RL
SCALE:

STATUS:
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 REVIEW
 DESIGN DEVELOPMENT
 FINAL REVIEW
 BIDDING
 PERMIT
 CONSTRUCTION
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 AS-BUILT

DATE: 8/15/17
REVISIONS:
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△ _____ △ _____

DRAWING:
FIRST FLOOR RCP PLAN

A7-1



- LEGEND**
- HVAC UNIT SUSPENDED IN ACT GRID CEILING SYSTEM
 - HVAC UNIT MOUNTED TO PLASTER CEILING
 - HVAC UNIT MOUNTED BELOW ACT CEILING ON THREADED RODS THROUGH CEILING
 - WALL MOUNTED HVAC PIPING ENCLOSURE TIGHT TO CEILING
 - NEW VENTILATION DIFFUSER
 - (9'-1") HEIGHT OF CEILING ABOVE FINISHED FLOOR
 - (PL) PLASTER CEILING
 - 2X4 ACOUSTICAL TILE CEILING ASSEMBLY

- GENERAL NOTES**
1. THESE DRAWINGS SHOW GENERAL LOCATIONS AND INTENT OF PENETRATIONS OF WALLS AND CEILINGS. (SEE MEP DRAWINGS FOR ADDITIONAL INFORMATION)
 2. PAINTED PLASTER WALLS HAVE BEEN IDENTIFIED TO HAVE LEAD CONTAINING PAINT. ALL WALL PENETRATIONS TO BE EXECUTED AS IF LEAD PAINT IS PRESENT AND PROPER SAFEGUARDS BE MADE TO PREVENT LEAD CONTAMINATION OF SPACES MEETING OSHA STANDARDS.
 3. ALL HVAC PIPING AND ELEC CONDUIT TO BE LOCATED ABOVE CEILING IN ROOMS AND CORRIDORS.
 4. HVAC PIPING AND ELEC CONDUIT TO HVAC UNITS SCHEDULED TO BE MOUNTED ON PLASTER CEILINGS SHALL BE ENCLOSED IN WHITE PLASTIC ENCLOSURES THAT ARE MOUNTED ON WALLS TIGHT TO CEILING WITH SHORT CEILING MOUNTED RUNS TO THE UNITS.
 5. WALL MOUNTED HVAC UNITS ARE SHOWN ON PLANS.
 6. FOR UNITS MOUNTED IN ACT CEILINGS MODIFY CEILING GRID AND TILES TO ACCOMMODATE NEW HVAC UNITS.
 7. CEILING TILES ARE TO BE REMOVED FOR HVAC EQUIPMENT PIPING INSTALLATION AND REINSTALLED AFTER HVAC WORK IS COMPLETED. DAMAGED TILES AND GRID ELEMENTS ARE TO BE REPLACED WITH MATCHING PRODUCTS.
 8. WHERE ACCESS PANELS ARE REQUIRED IN CEILINGS FOR HVAC TRADES THEY ARE TO BE SUPPLIED AND INSTALLED ACCORDING TO PROJECT SPECIFICATIONS.

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PROJECT: **Waltham Community Cultural Center HVAC Improvements**

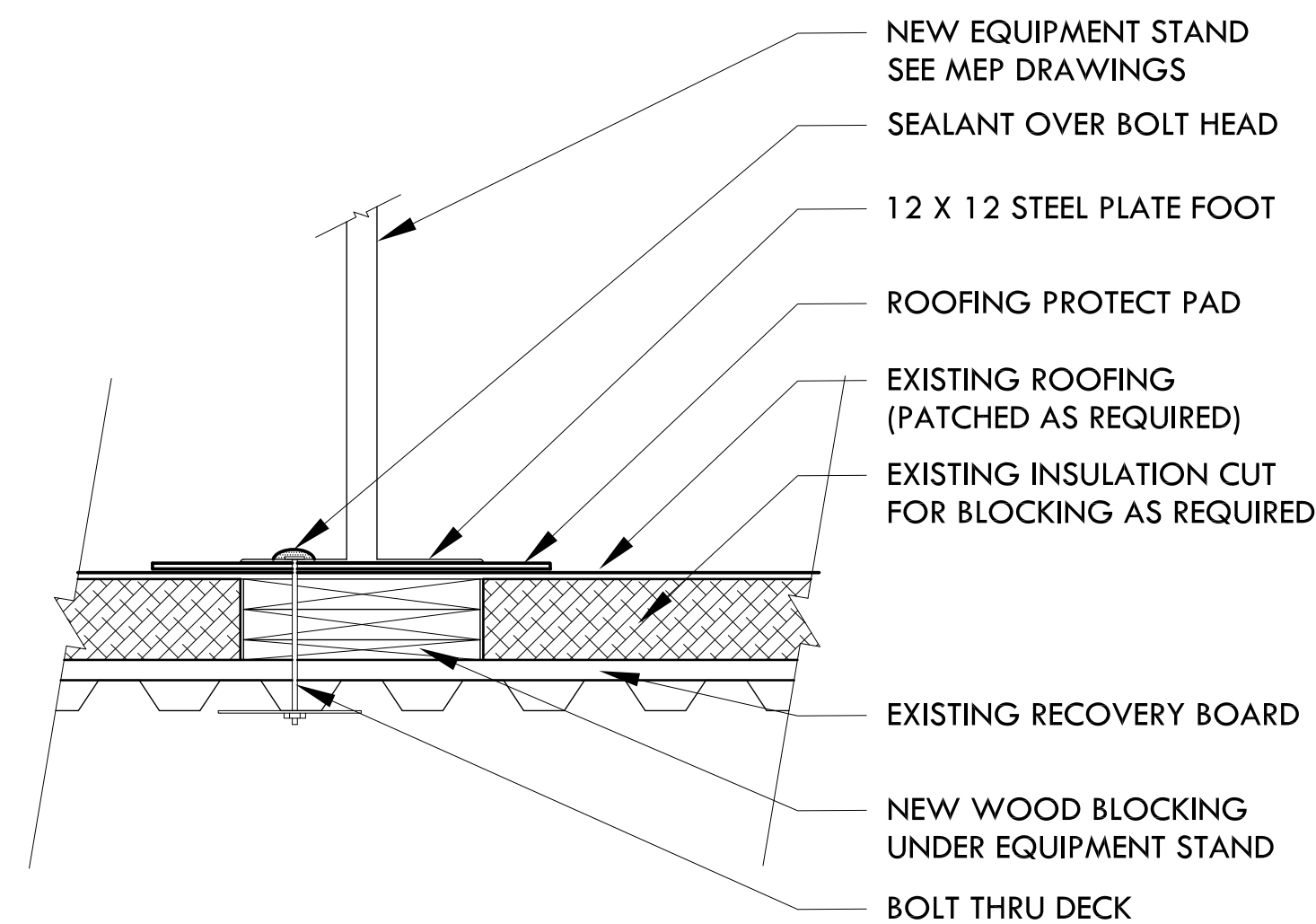
510 MOODY STREET
WALTHAM, MA

PROJECT #: LE 1607
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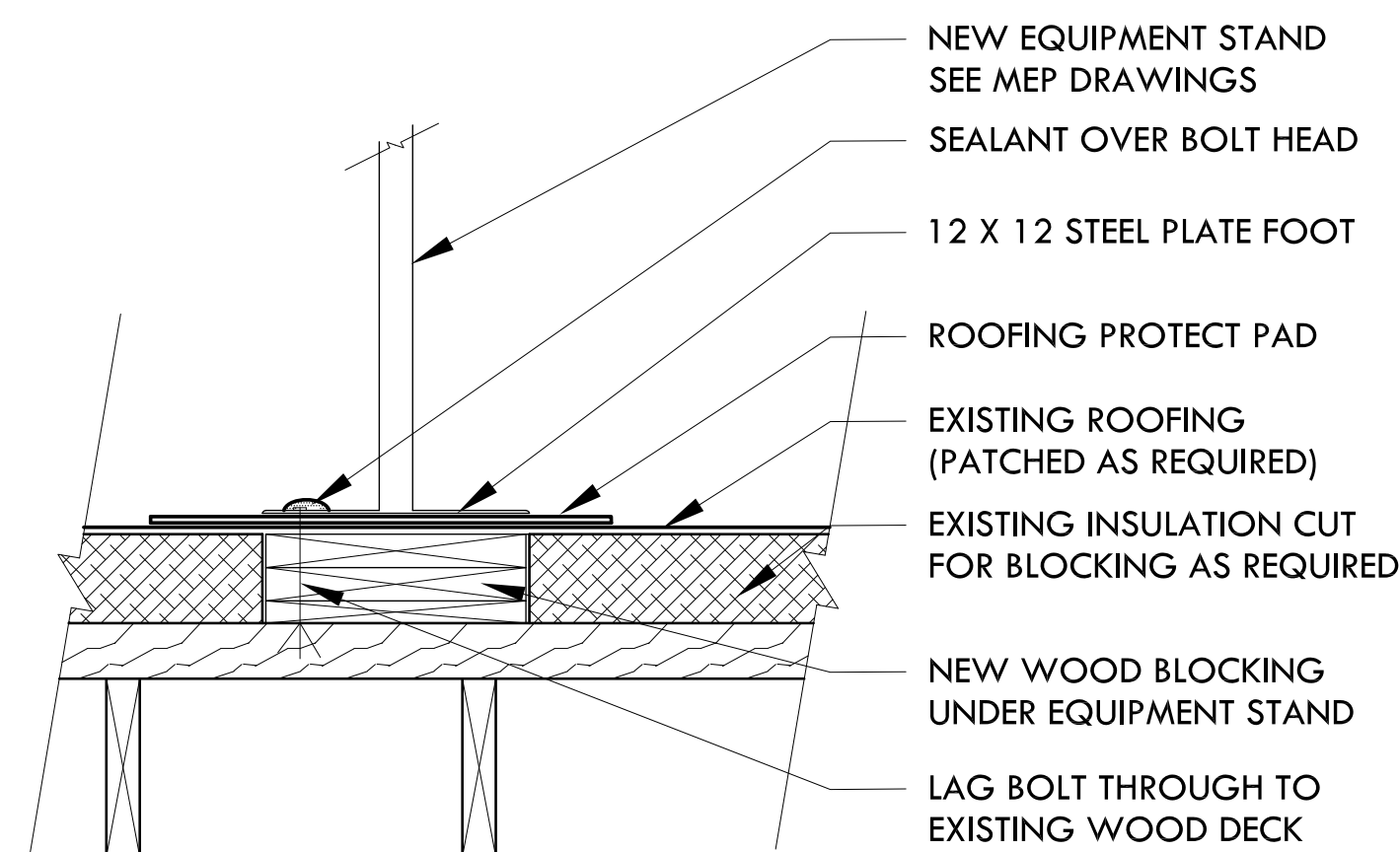
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 - AS-BUILT
- DATE: 8/15/17
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|---|---|
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DRAWING: **SECOND FLOOR RCP PLAN**

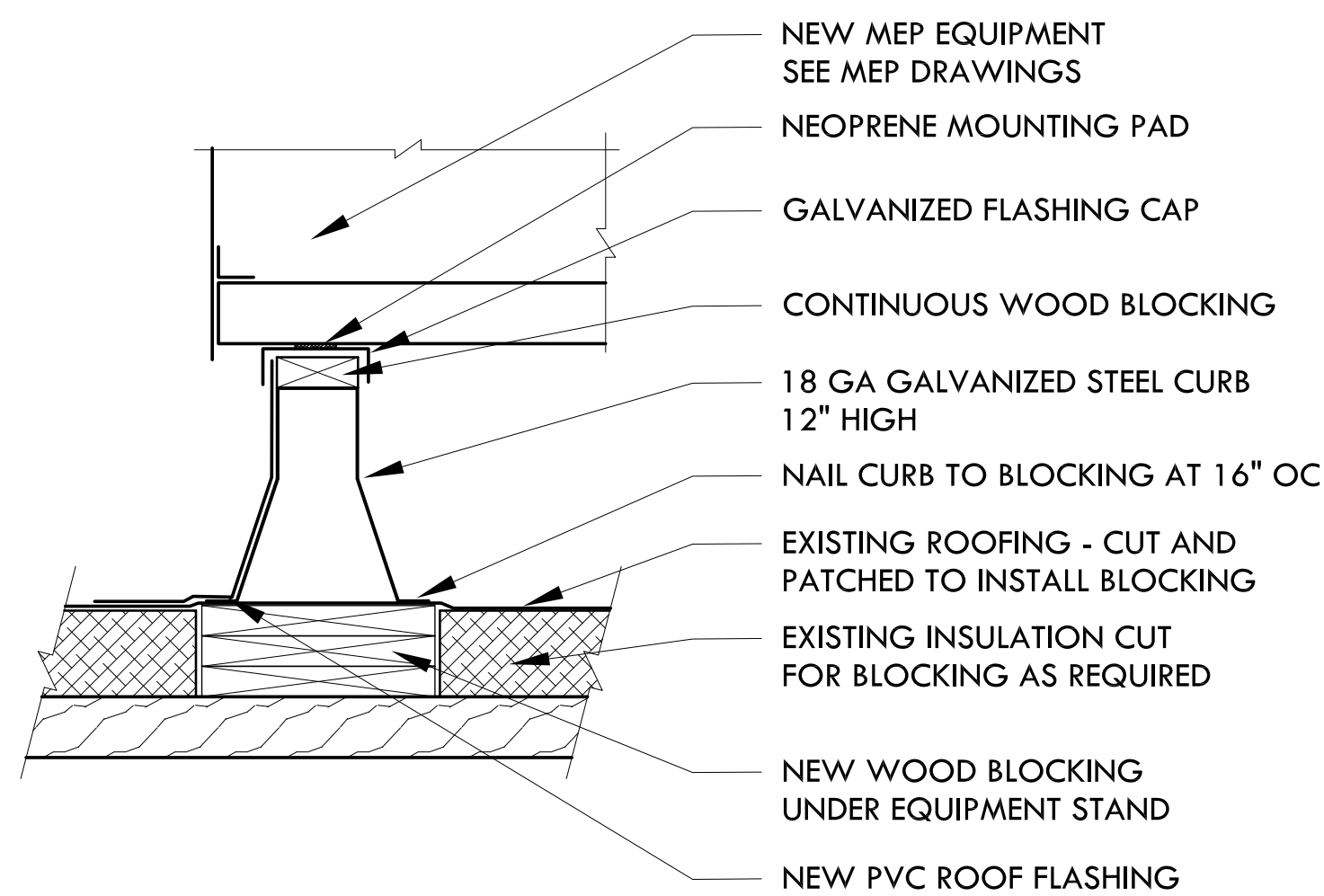
A7-2



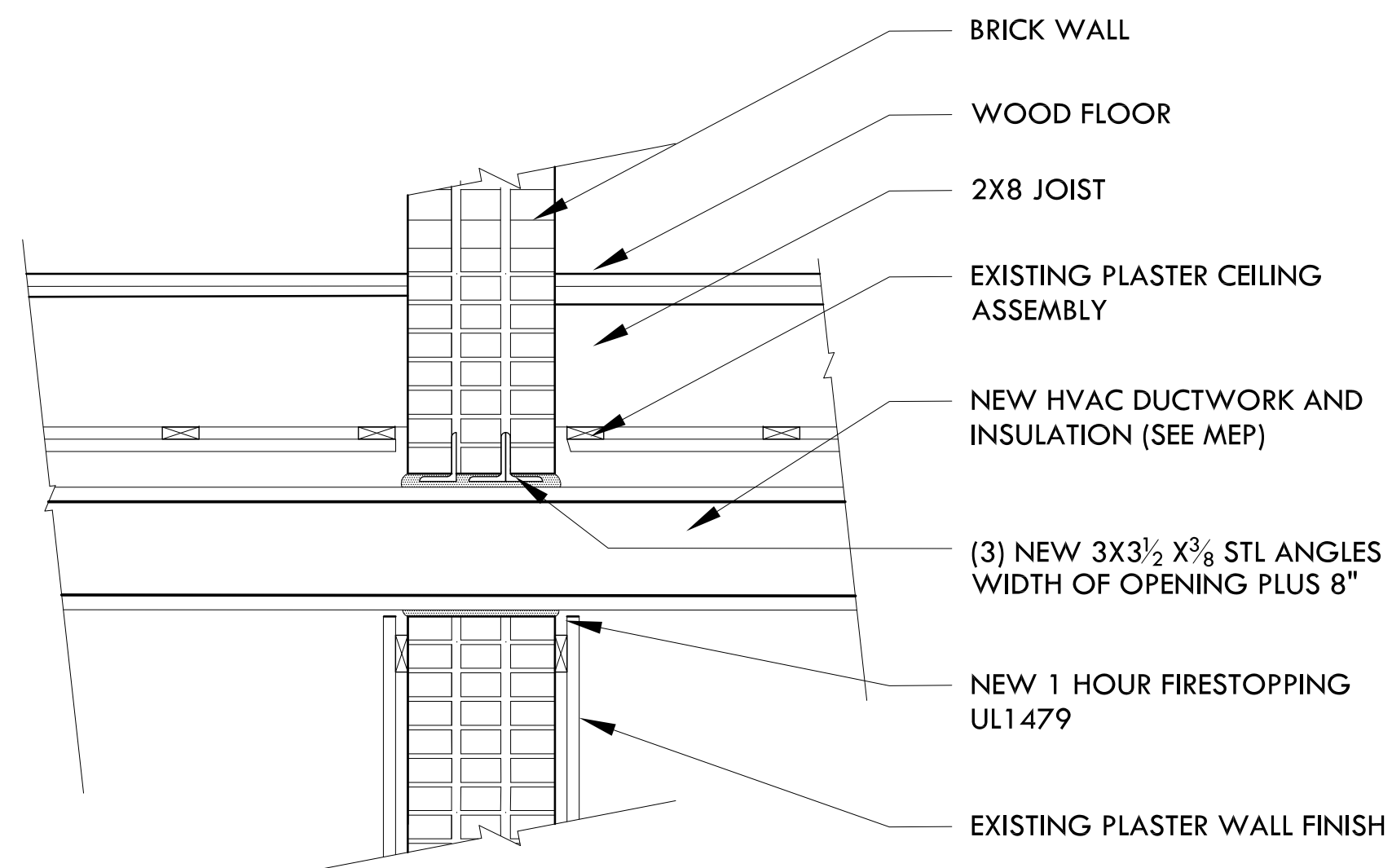
7 EQUIPMENT STAND DETAIL AT METAL ROOF
1 1/2" = 1'-0"



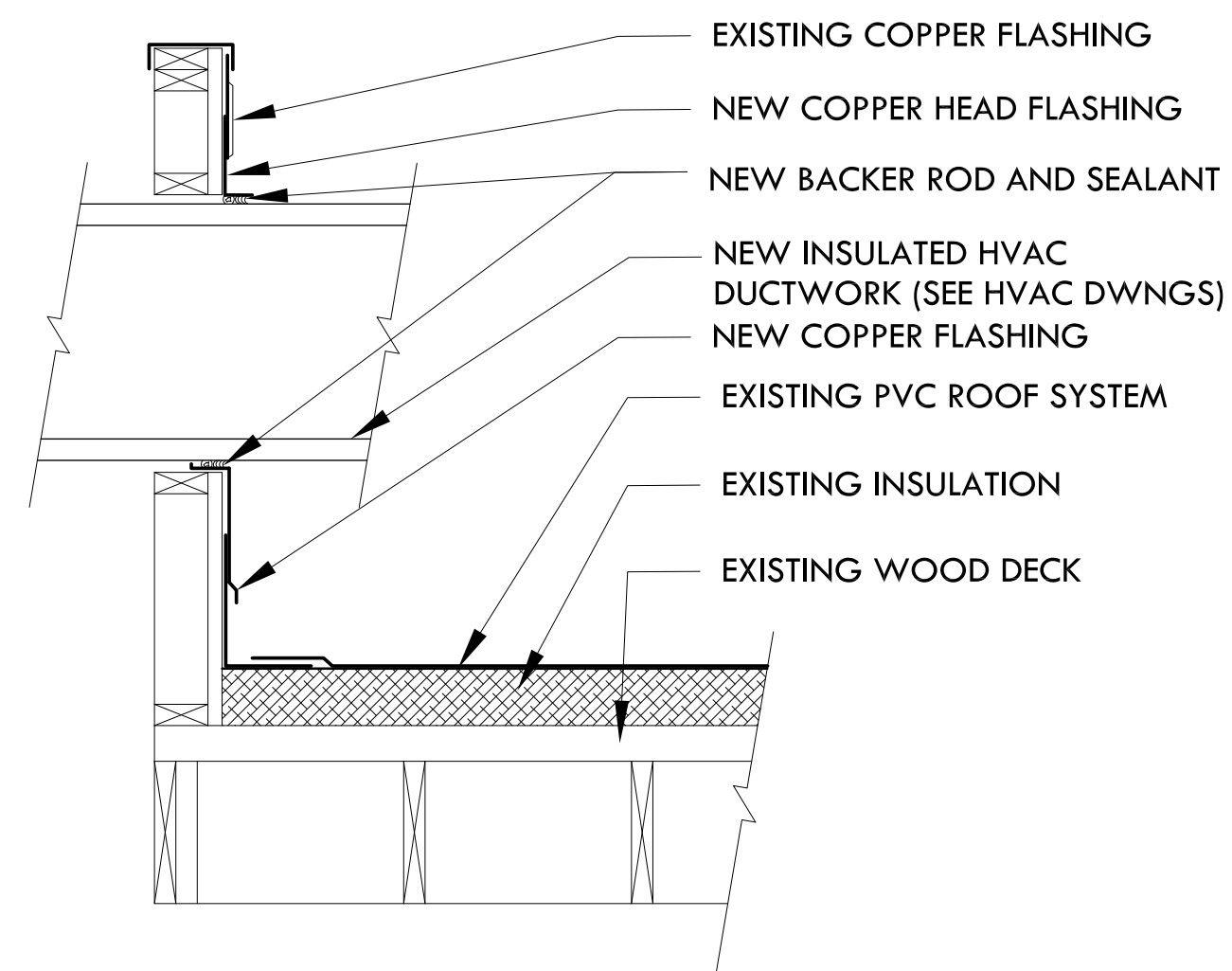
8 EQUIPMENT STAND DETAIL AT WOOD ROOF
1 1/2" = 1'-0"



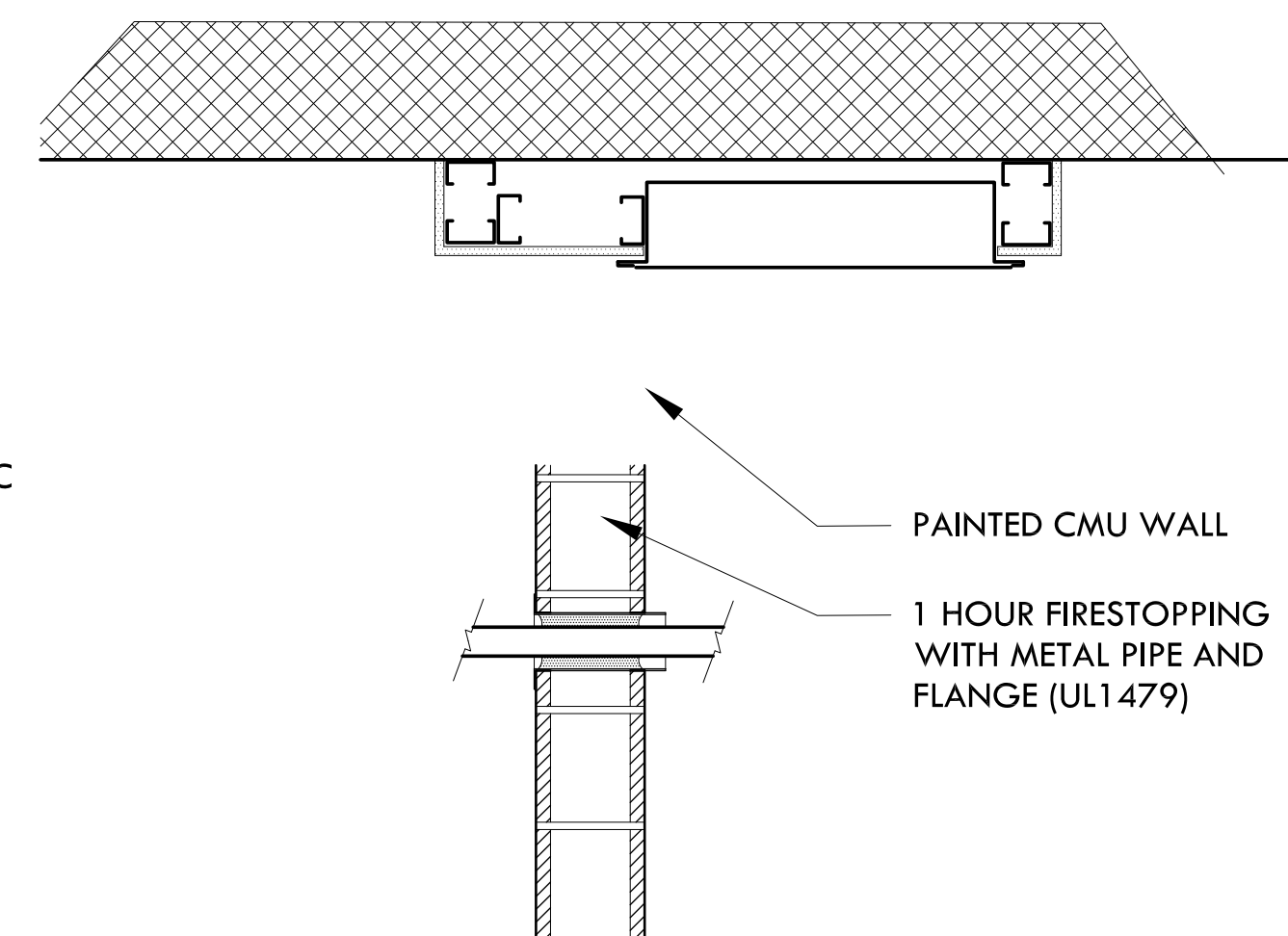
9 TYPICAL EQUIPMENT CURB DETAIL
1 1/2" = 1'-0"



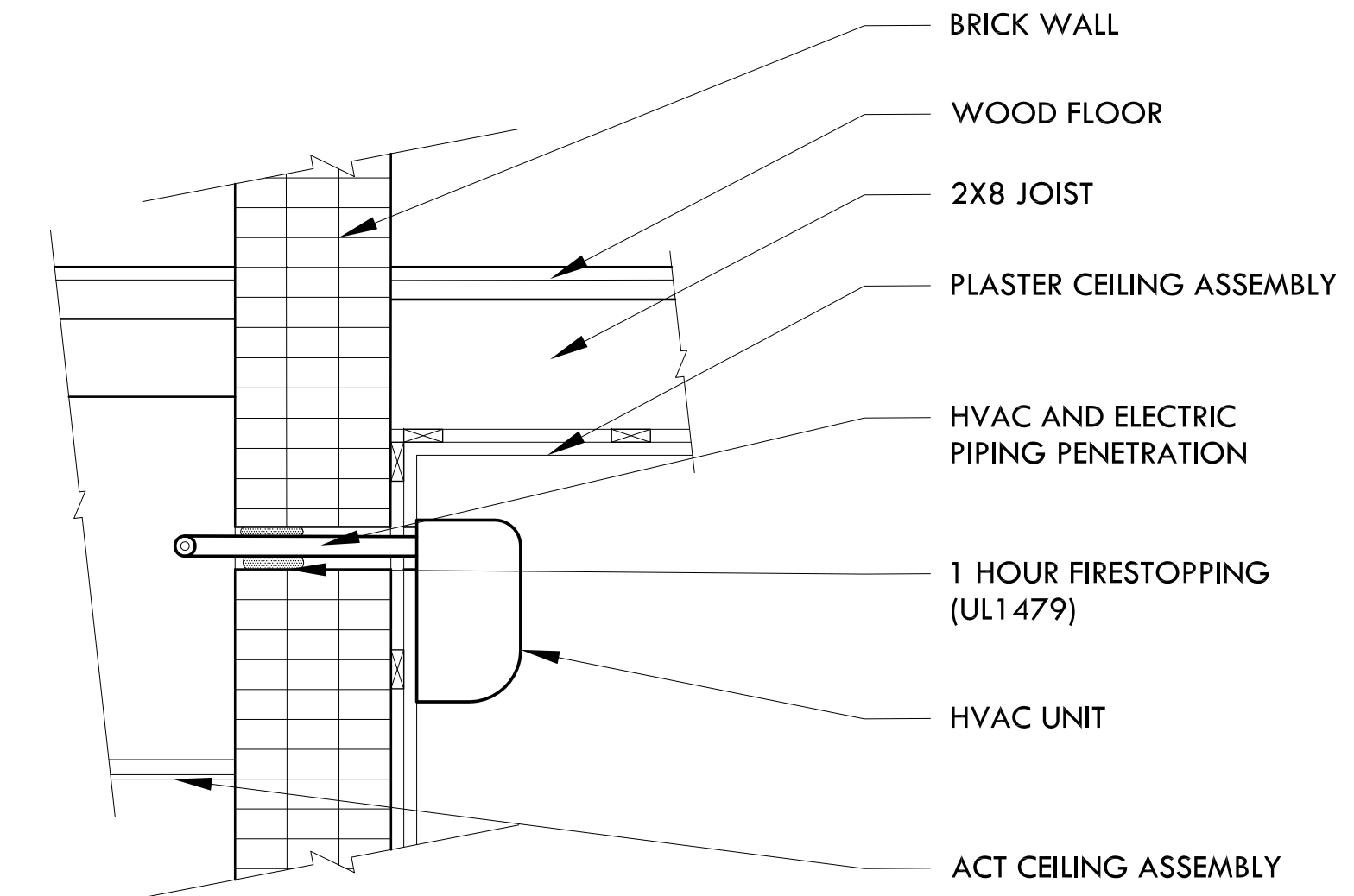
4 DUCT PENETRATION DETAIL
1" = 1'-0"



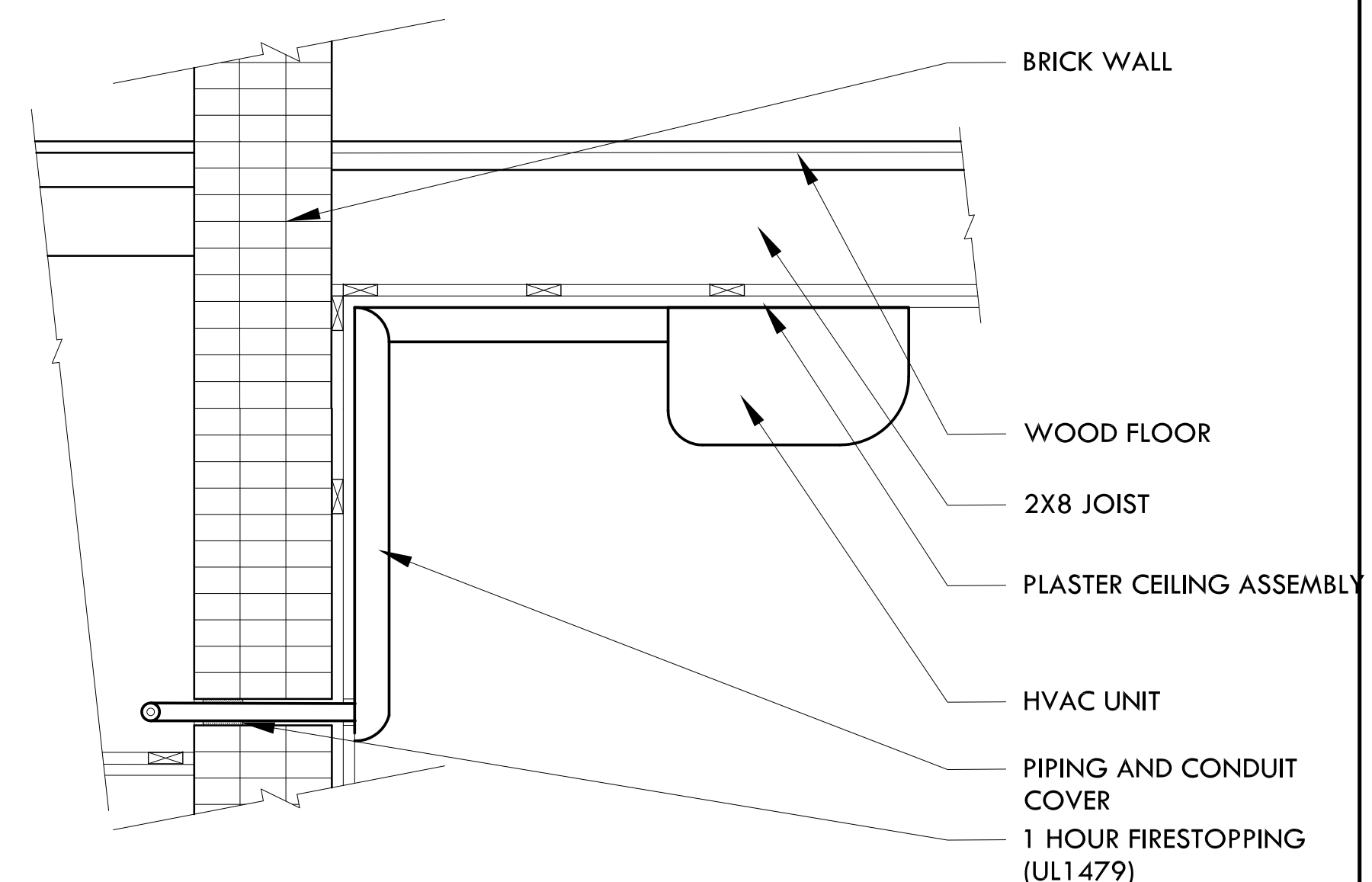
5 CUPPOLA PENETRATION DETAIL
1" = 1'-0"



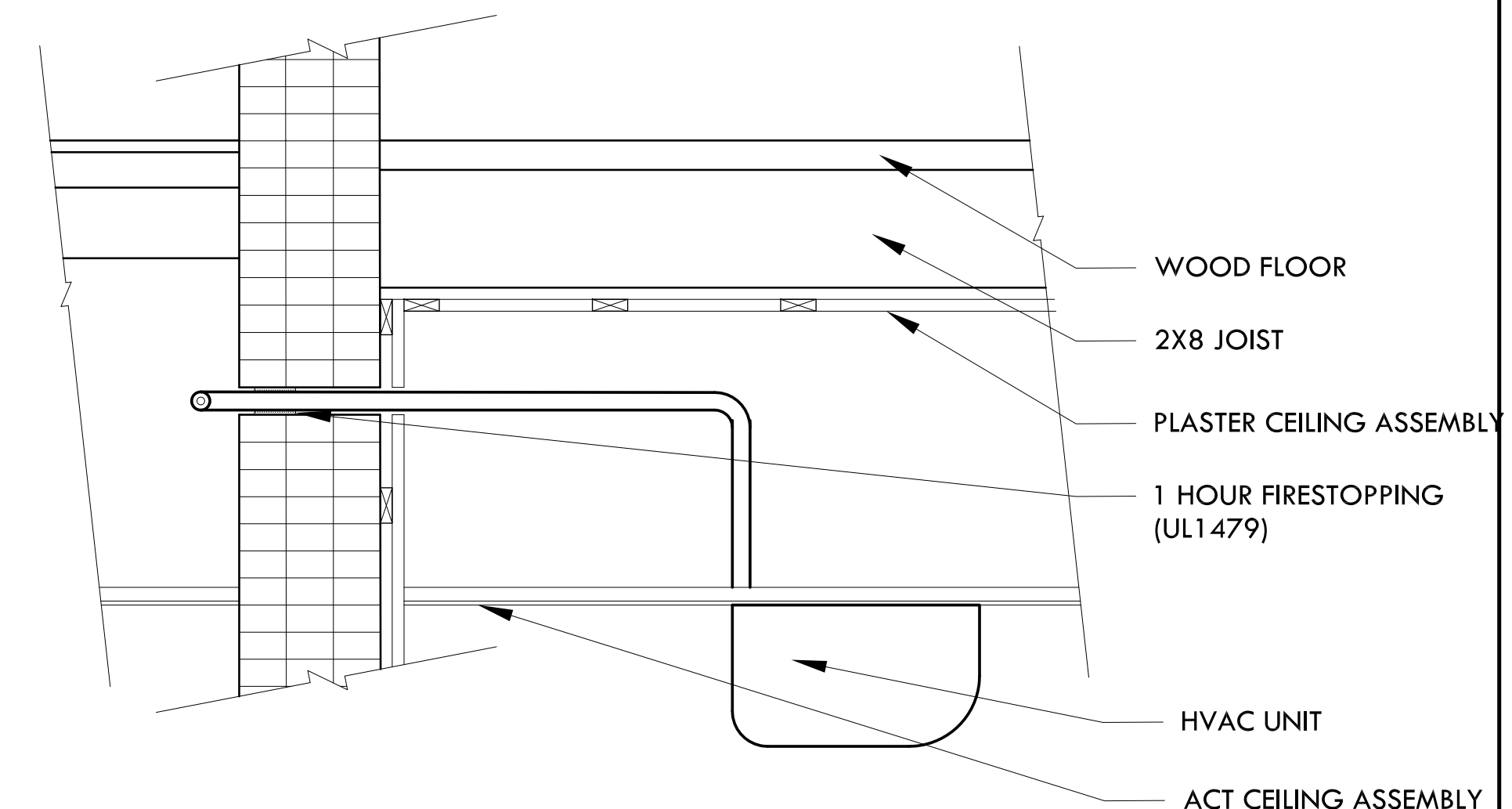
6 CMU WALL PENETRATION DETAIL
1" = 1'-0"



1 WALL PENETRATION DETAIL
1" = 1'-0"



2 WALL PENETRATION DETAIL
1" = 1'-0"



3 WALL PENETRATION DETAIL
1" = 1'-0"

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PROJECT:

Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: LE 1607
DRAWN BY: RL
CHECKED BY: RL
APPROVED BY: RL
SCALE:

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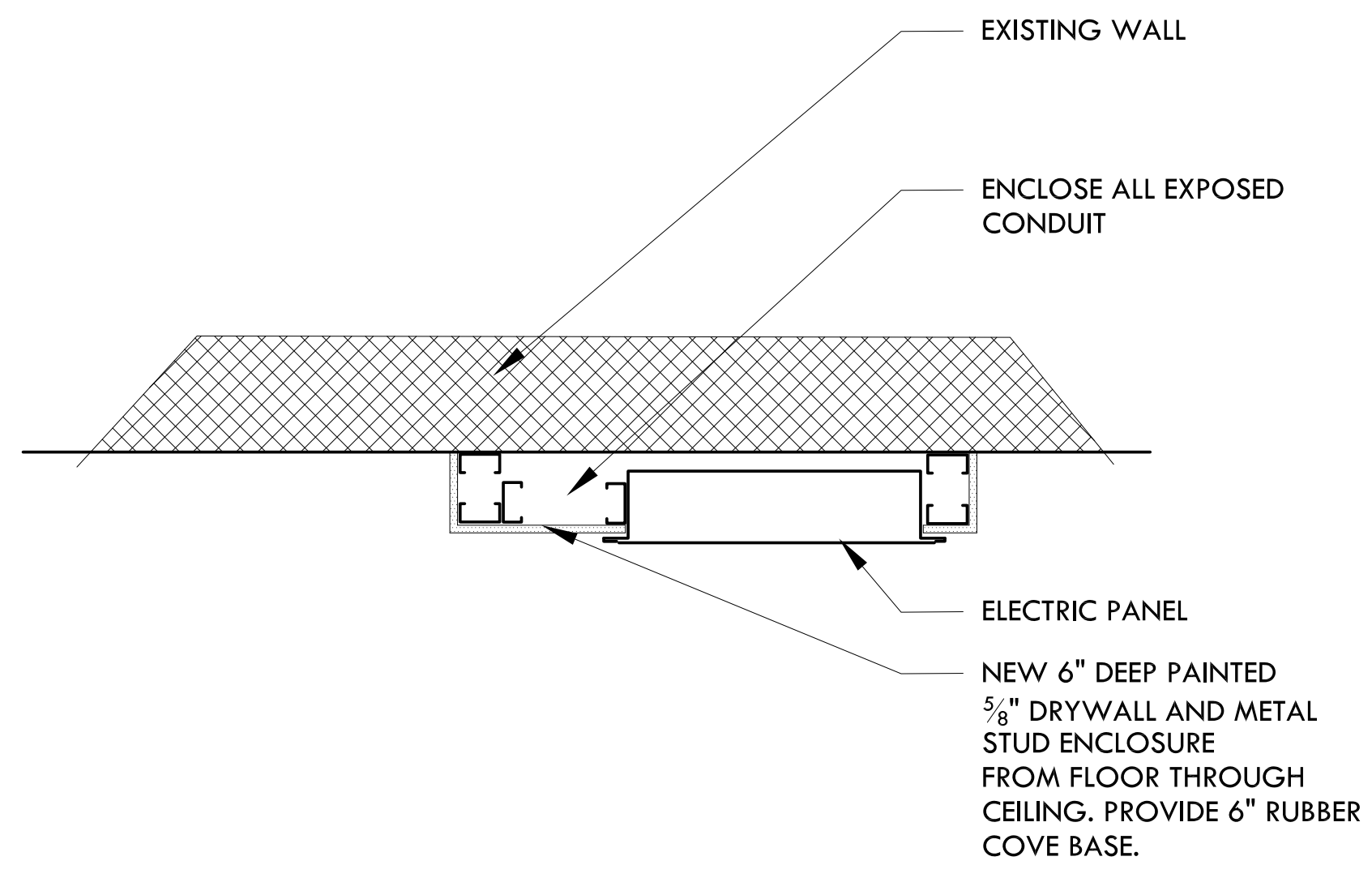
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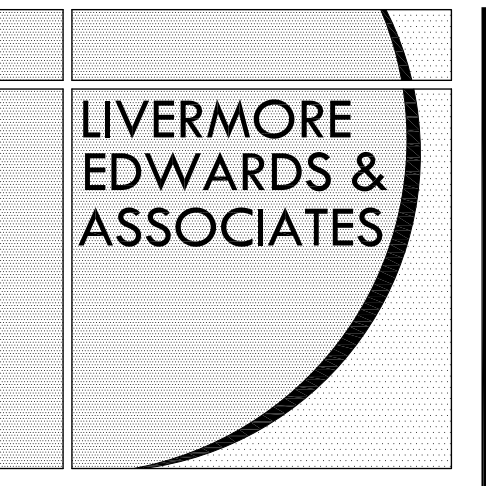
DRAWING:

DETAILS

A9-1



1 **ELECTRIC PANEL ENCLOSURE**
1" = 1'-0"



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510 MOODY STREET
WALTHAM, MA

PROJECT #: LE 1607
DRAWN BY:
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SCALE:

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DATE: 8/15/17

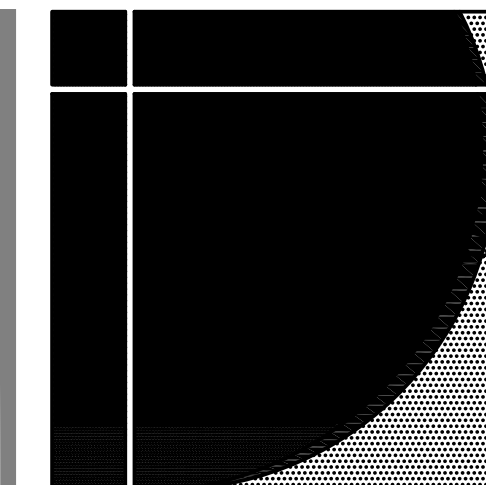
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DRAWING:

DETAILS

A9-2



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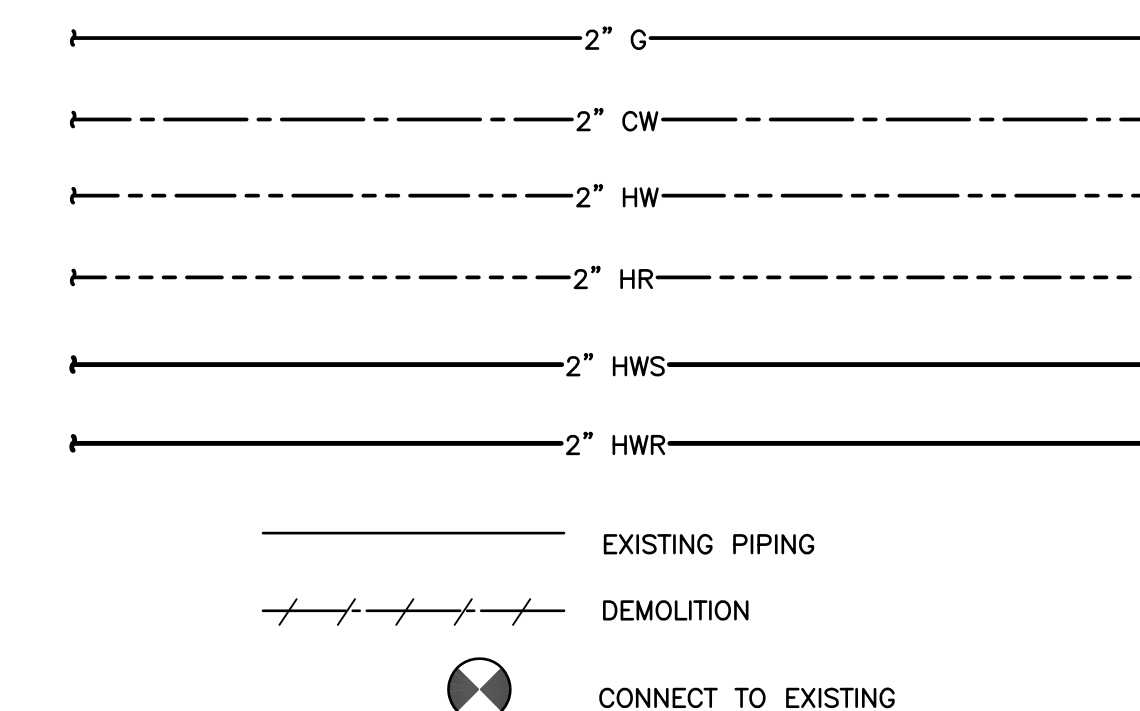
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GENERAL NOTES

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL A COMPLETE AND OPERABLE MECHANICAL SYSTEM AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. CONTRACT DOCUMENT DRAWINGS FOR THE MECHANICAL WORK ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
3. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS AND APPLICABLE CODES AND REGULATIONS.
4. PROVIDE VIBRATION ISOLATION FOR ALL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
5. THE LOCATION OF EXISTING SYSTEMS AND EQUIPMENT IS SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL PAY FOR AND REPAIR ALL DAMAGES CAUSED BY FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES UNLESS OTHERWISE INDICATED.
6. COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
7. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.
8. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UPSTREAM AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.
9. TESTING, ADJUSTING AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCING COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU. TESTING, ADJUSTING AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH AABC STANDARDS.
10. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
11. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
12. ALL CONTROL WIRING SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND DIVISION 16 OF THE SPECIFICATION.
13. WHEN THE MECHANICAL WORK IS SUBCONTRACTED, IT SHALL BE THE MECHANICAL CONTRACTOR'S SOLE RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
14. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT FIXED DEFINITELY BY DIMENSIONS ARE APPROXIMATE ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
15. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK AND EQUIPMENT (UNLESS OTHER NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
16. ALL FLUE, PIPING AND EQUIPMENT SUPPORTED FROM THE STRUCTURAL STEEL SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. ALL ATTACHMENTS TO STEEL BAR JOISTS, TRUSSES OR JOIST GIRDERS SHALL BE AT PANEL POINTS. PROVIDE BEAM CLAMPS MEETING MSS STANDARDS. WELDING TO STRUCTURAL MEMBERS SHALL NOT BE PERMITTED.
17. NO PIPING, FLUE, EQUIPMENT, ETC. SHALL BE REMOVED, DISCONNECTED, OR SHUT DOWN WITHOUT PRIOR REVIEW WITH THE OWNER AND/OR THE ENGINEER TO CONFIRM THAT AREAS TO REMAIN IN OPERATION ARE NOT AFFECTED. IF ANY AREAS NOT IN WITHIN THE SCOPE OF WORK ARE AFFECTED BY ANY SHUT DOWN, REMOVAL OR DISCONNECTION, THE MECHANICAL CONTRACTOR SHALL GIVE SUFFICIENT NOTICE TO THE OWNER INDICATING WHICH AREAS WILL BE AFFECTED, WHEN THE PROPOSED SHUT DOWN WILL OCCUR AND HOW LONG A PERIOD OF TIME. THE CONTRACTOR SHOULD ASSUME THAT ALL SHUT DOWNS OF SYSTEM WILL BE PERFORMED ON PREMIUM TIME.
18. THIS CONTRACTOR SHALL CLEAN THE JOB SITE DAILY AND REMOVE FROM THE PREMISES ANY DIRT AND DEBRIS CAUSED BY THE PERFORMANCE OF THE WORK INCLUDED IN THIS CONTRACT.
19. THIS CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND EXISTING/FIELD CONDITIONS PRIOR TO PROCEEDING WITH ANY WORK. WHERE DISCREPANCIES OCCUR BETWEEN THESE DOCUMENTS AND EXISTING/FIELD CONDITIONS, THE DISCREPANCY SHALL BE REPORTED TO THE OWNER AND/OR ENGINEER FOR EXPEDITING AND RESOLVE.
20. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFEKEEPING OF HIS OWN PROPERTY ON THE JOB SITE. THE OWNER ASSUMES NO RESPONSIBILITY FOR THE PROTECTION OF PROPERTIES LEFT AT THE JOB SITE AGAINST FIRE, THEFT, ENVIRONMENTAL DAMAGE OR OTHER UNFORESEEN INCIDENT.
21. CERTAIN ITEMS AND EQUIPMENT, ETC., ARE INDICATED ON THE CONTRACT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS.
22. PROVIDE ALL RELATED ELECTRICAL WORK BY LICENSED ELECTRICAL CONTRACTOR.
23. PROVIDE ALL RELATED PLUMBING WORK (FLUE GAS & VENT) BY LICENSED PLUMBING CONTRACTOR.

LEGEND & SYMBOLS



ABBREVIATIONS

C&C	CUT & CAP
CTE	CONNECT TO EXISTING
ETR	EXISTING TO REMAIN
G	GAS, NATURAL
TYP	TYPICAL
VIF	VERIFY IN FIELD
X	EXISTING

PROJECT:

**Waltham Community
Cultural Center
HVAC Improvements**

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: ADR
CHECKED BY: RL
APPROVED BY: RL
SCALE: NONE

STATUS:

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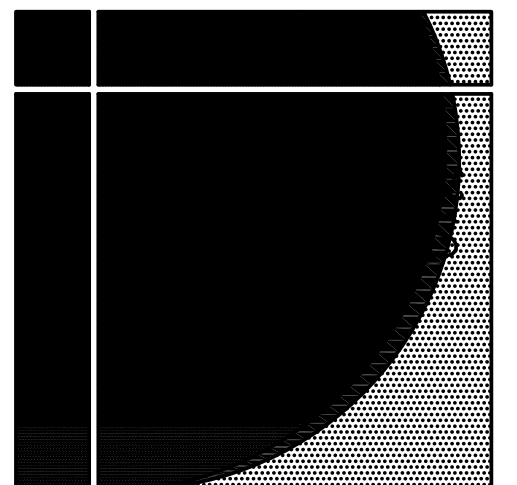
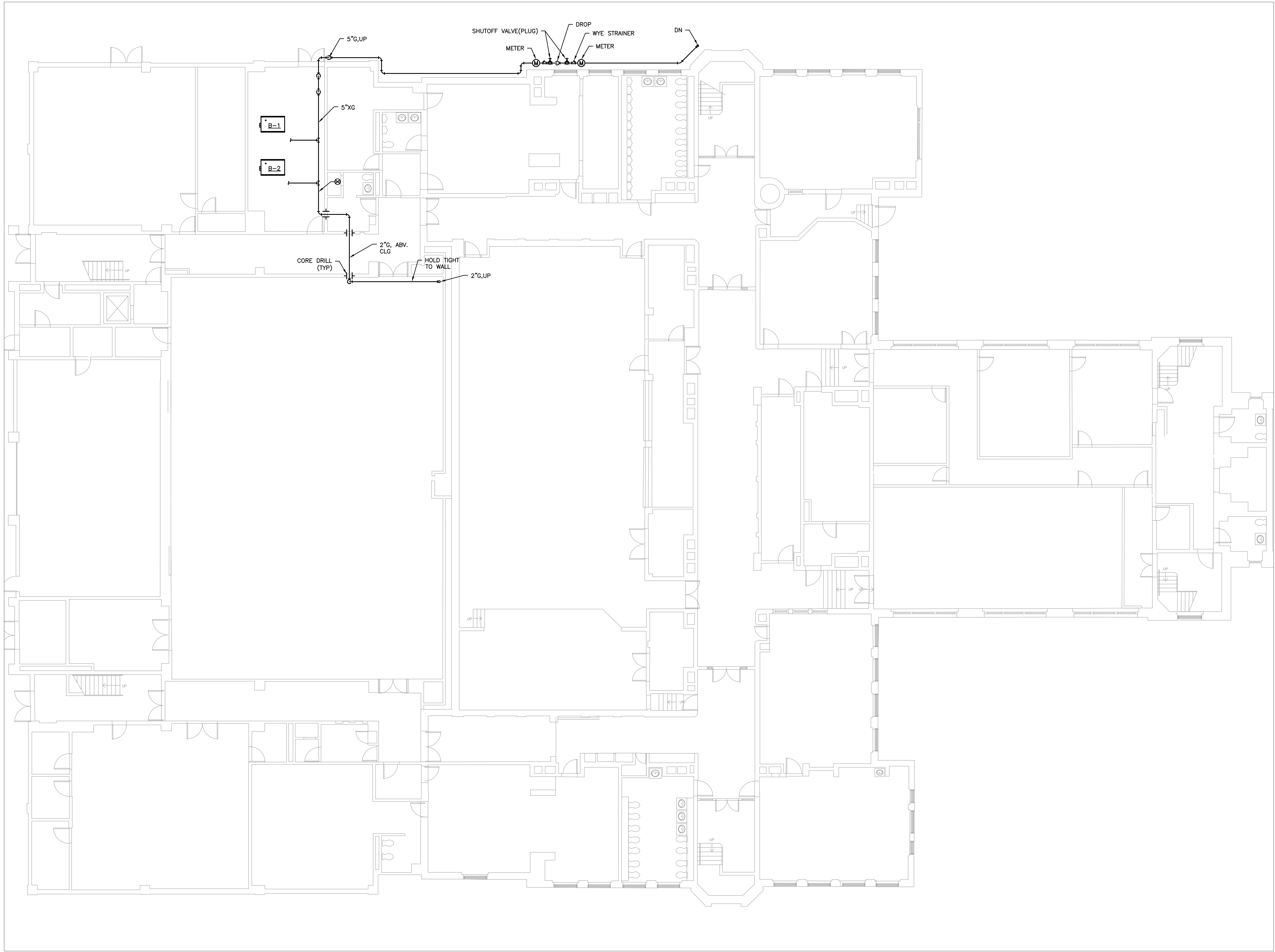
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DRAWING:

**PLUMBING
LEGEND &
GENERAL NOTES**

P0.01



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PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

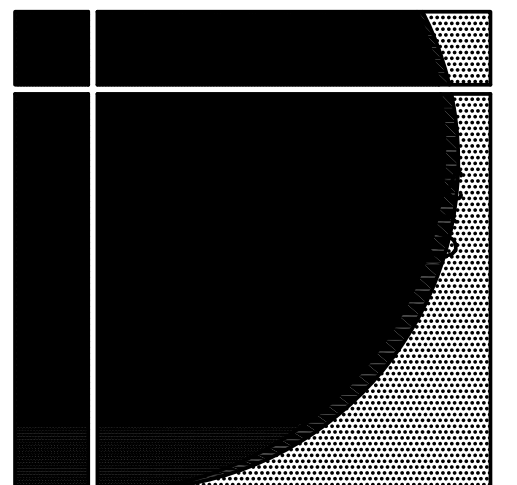
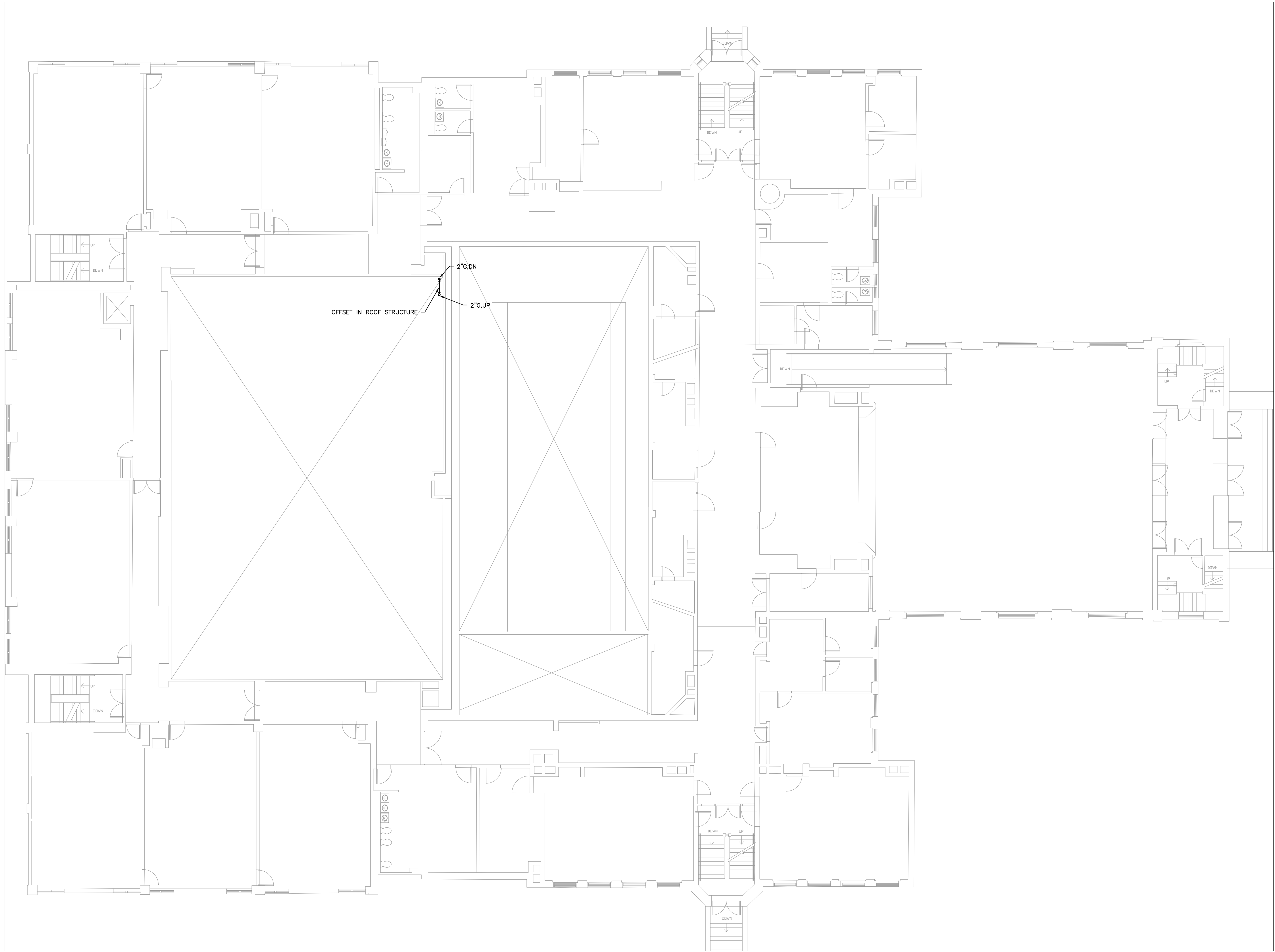
PROJECT #: SED 16076
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 CHECKED BY: RL
 APPROVED BY: RL
 SCALE: 1/8"=1'-0"

STATUS:
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DRAWING:
**PLUMBING
 GROUND FLOOR
 PROPOSED PLAN**

P1.11



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PROJECT:
**Waltham Community Cultural Center
 HVAC Improvements**

510 MOODY STREET
 WALTHAM, MA

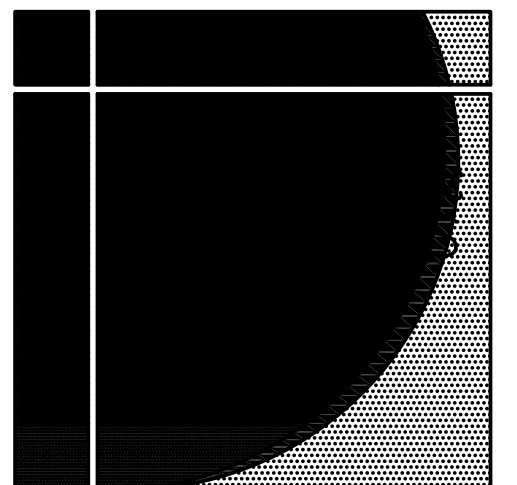
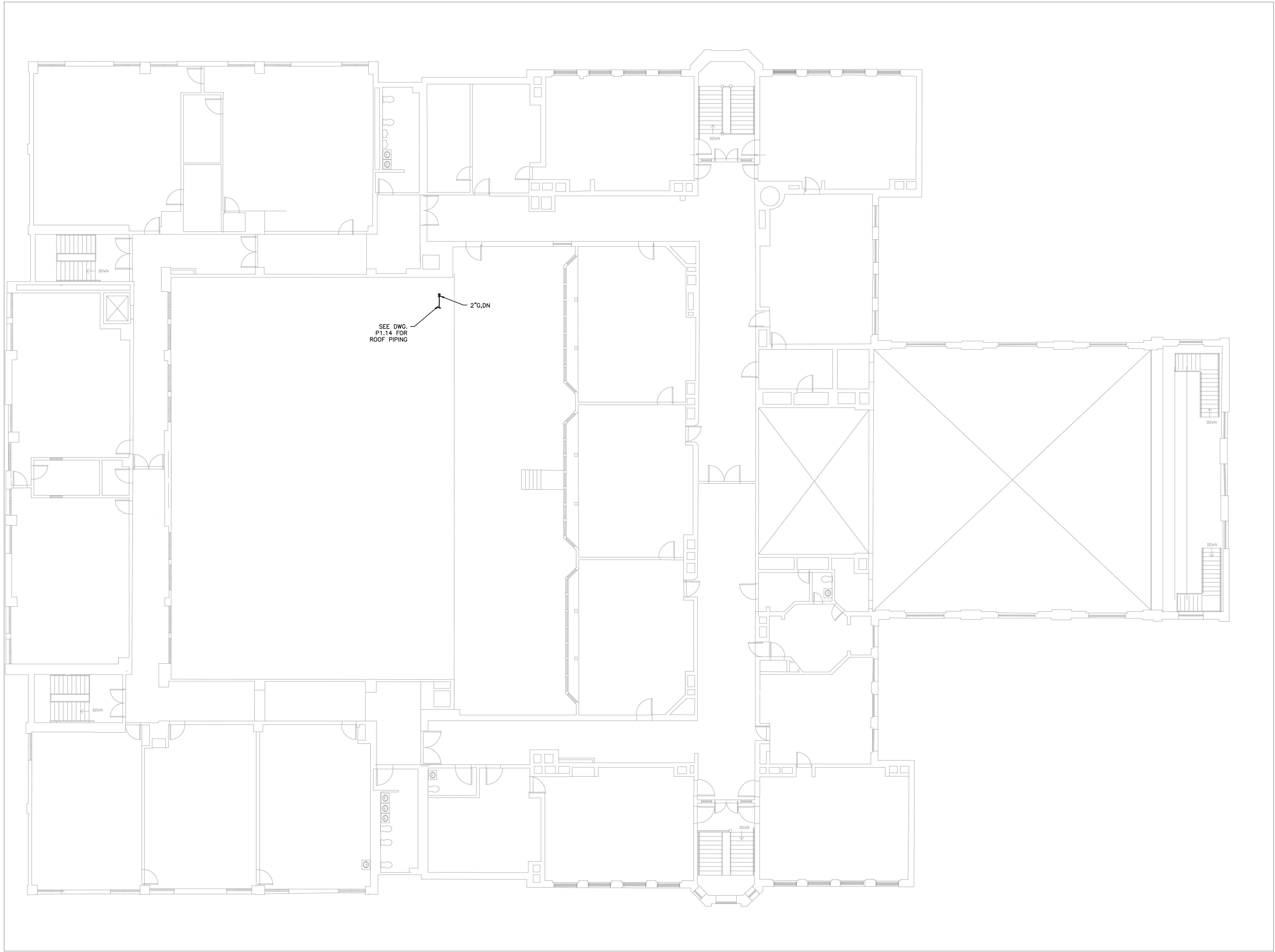
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DRAWING:
**PLUMBING
 FIRST FLOOR
 PROPOSED PLAN**

P1.12



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PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

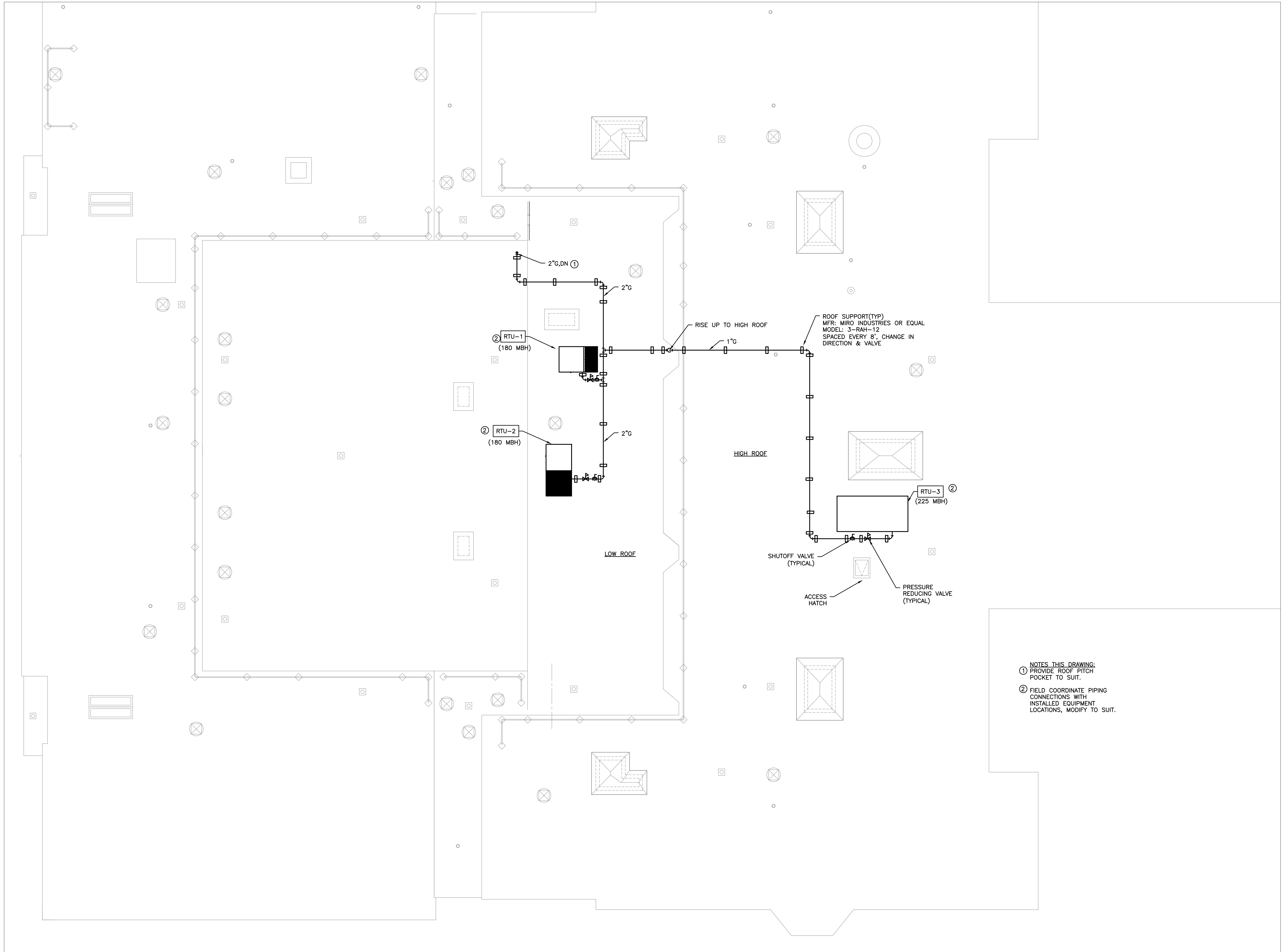
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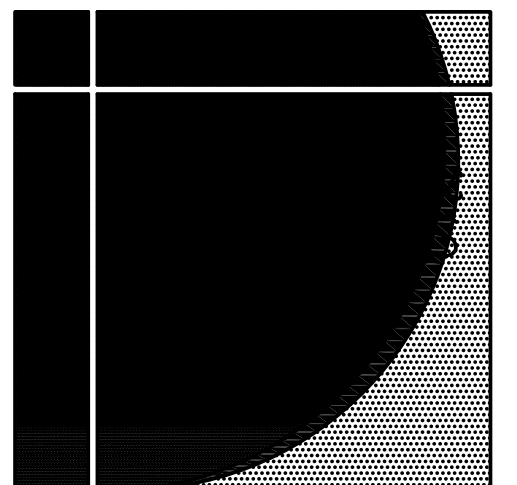
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DRAWING:
**PLUMBING
 SECOND FLOOR
 PROPOSED PLAN**

P1.13



NOTES THIS DRAWING:
 ① PROVIDE ROOF PITCH POCKET TO SUIT.
 ② FIELD COORDINATE PIPING CONNECTIONS WITH INSTALLED EQUIPMENT LOCATIONS, MODIFY TO SUIT.



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DRAWING:
**PLUMBING
 ROOF
 PROPOSED PLAN**



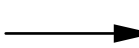
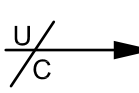






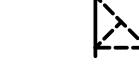
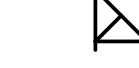

P1.14

GENERAL NOTES

1. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL A COMPLETE AND OPERABLE MECHANICAL SYSTEM AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
2. CONTRACT DOCUMENT DRAWINGS FOR THE MECHANICAL WORK ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
3. INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS AND APPLICABLE CODES AND REGULATIONS.
4. PROVIDE VIBRATION ISOLATION FOR ALL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
5. COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
6. MAINTAIN A MINIMUM OF 6'-8" CLEARANCE TO THE UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT, ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.
7. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.
8. LOCATE ALL TEMPERATURE, PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UPSTREAM AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.
9. TESTING, ADJUSTING AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCING COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU. TESTING, ADJUSTING AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH AABC STANDARDS.
10. WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
11. COORDINATE ALL EQUIPMENT CONNECTIONS WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
12. ALL CONTROL WIRING SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND DIVISION 16 OF THE SPECIFICATION.
13. WHEN THE MECHANICAL WORK IS SUBCONTRACTED, IT SHALL IT SHALL BE THE MECHANICAL CONTRACTOR'S SOLE RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
14. THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS THAT ARE NOT FIXED DEFINITELY BY DIMENSIONS ARE APPROXIMATE ONLY. THE EXACT LOCATIONS NECESSARY TO SECURE THE BEST CONDITIONS AND RESULTS MUST BE DETERMINED BY THE PROJECT SITE CONDITIONS AND SHALL HAVE THE APPROVAL OF THE ENGINEER BEFORE BEING INSTALLED. DO NOT SCALE DRAWINGS.
15. ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK AND EQUIPMENT (UNLESS OTHER NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
16. PROVIDE ACCESS PANELS FOR INSTALLATION IN WALLS AND CEILINGS, WHERE REQUIRED, TO SERVICE DAMPERS, VALVES, SMOKE DETECTORS AND OTHER CONCEALED MECHANICAL EQUIPMENT. ACCESS PANELS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR FOR INSTALLATION.
17. ALL EQUIPMENT, DUCTWORK, PIPING, ETC., SHALL BE SUPPORTED AS DETAILED, SPECIFIED AND REQUIRED TO PROVIDE A VIBRATION FREE INSTALLATION.
18. ALL DUCTWORK, PIPING AND EQUIPMENT SUPPORTED FROM THE STRUCTURAL STEEL SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. ALL ATTACHMENTS TO STEEL BAR JOISTS, TRUSSES OR JOIST GIRDERS SHALL BE AT PANEL POINTS. PROVIDE BEAM CLAMPS MEETING MSS STANDARDS. WELDING TO STRUCTURAL MEMBERS SHALL NOT BE PERMITTED. THE USE OF C-CLAMPS SHALL NOT BE PERMITTED.
19. MECHANICAL EQUIPMENT, DUCTWORK AND PIPING SHALL NOT BE SUPPORTED FROM METAL DECK.
20. ALL ROOF MOUNTED EQUIPMENT CURBS FOR EQUIPMENT PROVIDED BY THE MECHANICAL CONTRACTOR SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR AND INSTALLED BY THE GENERAL CONTRACTOR.
21. LOCATIONS AND SIZES OF ALL FLOOR, WALL AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED.
22. ALL OPENINGS IN FIRE RATED WALLS DUE TO DUCTWORK, PIPING, ETC. SHALL BE FIRE STOPPED AS DETAILED WITH AN APPROVED SEALANT.
23. ALL AIR CONDITIONING CONDENSATE DRAINS FROM EACH AIR-HANDLING UNIT AND ROOFTOP UNIT SHALL BE PIPED THE FULL SIZE OF THE UNIT DRAIN OUTLET, WITH "P" TRAP AND PIPED TO THE NEAREST DRAIN. SEE DETAILS SHOWN ON THE DRAWINGS OR THE CONTRACT SPECIFICATIONS FOR DEPTH OF AIR CONDITIONING TRAP.
24. REFER TO TYPICAL DETAILS FOR DUCTWORK, PIPING AND EQUIPMENT INSTALLATION.
25. NO PIPING, DUCTWORK, EQUIPMENT, ETC. SHALL BE REMOVED, DISCONNECTED, OR SHUT DOWN WITHOUT PRIOR REVIEW WITH THE OWNER AND/OR THE ENGINEER TO CONFIRM THAT AREAS TO REMAIN IN OPERATION ARE NOT AFFECTED. IF ANY AREAS NOT IN WITHIN THE SCOPE OF WORK ARE AFFECTED BY ANY SHUT DOWN, REMOVAL OR DISCONNECTION, THE MECHANICAL CONTRACTOR SHALL GIVE SUFFICIENT NOTICE TO THE OWNER INDICATING WHICH AREAS WILL BE AFFECTED, WHEN THE PROPOSED SHUT DOWN WILL OCCUR AND HOW LONG A PERIOD OF TIME. THE CONTRACTOR SHOULD ASSUME THAT ALL SHUT DOWNS OF SYSTEM WILL BE PERFORMED ON PREMIUM TIME.
26. THE CONTRACTOR SHALL CLEAN THE JOB SITE DAILY AND REMOVE FROM THE PREMISIS ANY DIRT AND DEBRIS CAUSED BY THE PERFORMANCE OF THE WORK INCLUDED IN THIS CONTRACT.
27. THE MECHANICAL CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND EXISTING/FIELD CONDITIONS PRIOR TO PROCEEDING WITH ANY WORK. WHERE DISCREPANCIES OCCUR BETWEEN THESE DOCUMENTS AND EXISTING/FIELD CONDITIONS, THE DISCREPANCY SHALL BE REPORTED TO THE OWNER AND/OR ENGINEER FOR EXPEDITING AND RESOLVE.
28. THE USE OF THE OWNER'S ELEVATORS AND BUILDING CORRIDORS FOR THE HANDLING OF THE OWNER AND REMOVED EQUIPMENT AND MATERILAS SHALL BE AT THE SOLE

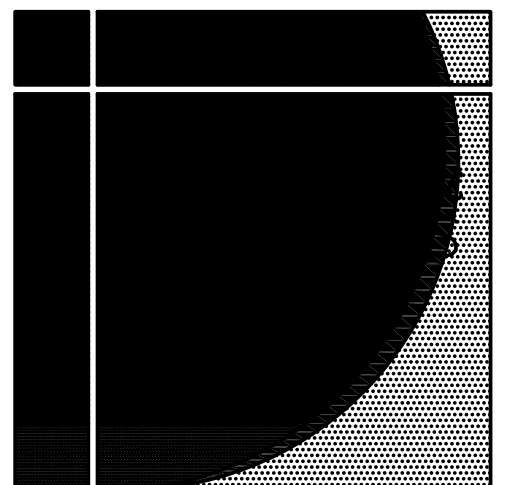
- DISCRETION OF THE OWNER. THE MECHANICAL CONTRACTOR SHALL COORDINATE THE USE OF THE BUILDING ELEVATOR'S AND CORRIDORS PRIOR TO THEIR USE.
29. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFEKEEPING OF HIS OWN PROPERTY ON THE JOB SITE. THE OWNER ASSUMES NO RESPONSIBILITY FOR THE PROTECTION OF PROPERITES LEFT AT THE JOB SITE AGAINST FIRE, THEFT, ENVIROMENTAL DAMAGE OR OTHER UNFORESEEN INCIDENT.
 30. UNLESS OTHERWISE NOTED, ALL PIPING IS OVERHEAD, TIGHT TO THE UNDERSIDE OF THE STRUCTURE OR SLAB, WITH SPACE FOR INSULATION AS REQUIRED.
 31. INSTALL PIPING SO THAT ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.
 32. ALL VALVES SHALL BE INSTALLED SO THAT THE VALVE REMAINS IN SERVICE WHEN EQUIPMENT OR PIPING ON THE EQUIPMENT SIDE OF THE VALVE IS REMOVED.
 33. INSTALL ALL PIPING WITHOUT FORCING OR SPRINGING.
 34. ALL DUCTWORK AND PIPING SHALL CLEAR DOORS AND WINDOWS.
 35. ALL VALVES SHALL BE ADJUSTED FOR SMOOTH AND EASY OPERATION.
 36. ALL PIPING WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO EXTRA COST TO THE PROJECT.
 37. SLOPE REFRIGERANT PIPING ONE PERCENT IN THE DIRECTION OF OIL RETURN. LIQUID LINES MAY BE INSTALLED LEVEL.
 38. INSTALL HORIZONTAL REFRIGERANT HOT GAS DISCHARGE PIPING 1/2" PER 10' DOWNWARD SLOPE AWAY FROM THE COMPRESSOR.
 39. INSTALL HORIZONTAL REFRIGERANT SUCTION LINES WITH 1/2" PER 10' DOWNWARD SLOPE TO THE COMPRESSOR, WITH NO LONG TRAPS OR DEAD ENDS WHICH MAY CAUSE OIL TO SEPARATE FROM THE SUCTION GAS AND RETURN TO THE COMPRESSOR IN DAMAGING SLUGS.
 40. PROVIDE LINE SIZE LIQUID INDICATORS IN MAIN LIQUID LINE LEAVING CONDENSER OR RECEIVER. INSTALL MOISTURE-LIQUID INDICATORS IN LIQUID LINES BETWEEN FILTER DRYERS AND THERMOSTATIC EXPANSION VALVES AND IN LIQUID LINE TO THE RECEIVER.
 41. PROVIDE LINE SIZE STRAINER UPSTREAM OF EACH AUTOMATIC VALVE. PROVIDE SHUTOFF VALVE ON EACH SIDE OF STRAINER.
 42. PROVIDE PERMANENT FILTER DRYERS IN LOW TEMPERATURE SYSTEMS AND SYSTEMS USING HERMETIC COMPRESSORS.
 43. PROVIDE REFRIGERANT CHARGING VALVE CONNECTIONS IN LIQUID LINE BETWEEN RECEIVER SHUTOFF VALVE AND EXPANSION VALVE.
 44. CERTAIN ITEMS SUCH AS RISES AND DROPS IN DUCTWORK, ACCESS DOOR, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS.
 45. IN CORRIDORS WHERE CEILING SPEAKERS AND AIR DIFFUSERS ARE INDICATE BETWEEN THE SAME LIGHT FIXTURE, INSTALL BOTH DEVICE AT THE QUARTER POINTS BETWEEN THE SAME FIXTURE.
 46. UNLESS OTHERWISE NOTED, LOCATE ALL ROOM THERMOSTATS AND HUMIDISTATS 5'-0" (CENTERLINE) ABOVE FINISHED FLOOR. NOTIFY THE ENGINEER OF ANY ROOMS WHERE THE ABOVE LOCATION CANNOT BE MAINTAINED OR WHERE THERE IS A QUESTION ON LOCATION. CONSULT THE ARCHITECTURAL DRAWINGS FOR ANY FURNITURE OR MILLWORK AND COORDINATE ALL THERMOSTAT AND HUMIDISTAT LOCATIONS WITH THE ARCHITECT PRIOR TO THEIR INSTALLATION.
 47. ALL DUCTWORK DIMENSIONS, AS SHOWN ON THE DRAWINGS, ARE INTERNAL CLEAR DIMENSIONS AND DUCT SIZES SHALL BE INCREASED TO COMPENSATE FOR DUCT LINING THICKNESS.
 48. PROVIDE ALL 90° SQUARE ELBOWS WITH DOUBLE RADIUS TURNING VANES UNLESS OTHERWISE INDICATED. ELBOWS IN DISHWASHER, KITCHEN AND LAUNDRY EXHAUST SHALL BE UNVANED SMOOTH RADIUS CONSTRUCTION WITH A RADIUS OF 1 1/2 TIMES THE WIDTH OF THE DUCT. PROVIDE ACCESS DOORS UPSTREAM OF ALL ELBOWS WITH TURNING VANES.
 49. COORDINATE DIFFUSER, REGISTER AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING AND OTHER CEILING ITEMS AND MAKE MINOR DUCT MODIFICATIONS TO SUIT.
 50. ALL AIR HANDLING UNITS SHALL OPERATE WITHOUT MOISTURE CARRYOVER.
 51. PROVIDE FLEXIBLE CONNECTIONS IN ALL DUCTWORK SYSTEMS (SUPPLY, RETURN AND EXHAUST) CONNECTED TO AIR HANDLING UNITS, FANS AND OTHER EQUIPMENT WHICH REQUIRE VIBRATION ISOLATION. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT THE POINT OF CONNECTION TO THE EQUIPMENT UNLESS OTHERWISE NOTED.
 52. UNLESS OTHERWISE NOTED, ALL DUCTWORK IS OVERHEAD, TIGHT TO THE UNDERSIDE OF THE STRUCTURE, WITH SPACE FOR INSULATION AS REQUIRED.
 53. RUNS OF FLEXIBLE DUCT SHALL NOT EXCEED 5'.
 54. ALL DUCTWORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN DUCTS, INCLUDING DIVIDED DUCTS AND TRANSITIONS AROUND OBSTRUCTIONS, SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE PROJECT.
 55. PROVIDE ACCESS DOORS IN DUCTWORK TO PROVIDE ACCESS FOR ALL SMOKE DETECTORS, FIRE DAMPERS, SMOKE DAMPERS, VOLUME DAMPER, HUMIDIFIERS, COILS AND OTHER ITEMS LOCATED IN THE DUCTWORK WHICH REQUIRES SERVICE AND/OR INSPECTIONS.
 56. PROVIDE ACCESS DOORS IN DUCTWORK FOR OPERATION, ADJUSTMENT AND MAINTENANCE OF ALL FANS, VALVES AND MECHANICAL EQUIPMENT.
 57. SMOKE DETECTORS SHALL BE FURNISHED, INSTALLED AND WIRED BY THE ELECTRICAL CONTRACTOR. THE MECHANICAL CONTRACTOR TO PROVIDE ACCESS DOOR FOR INSPECTION AND SERVICING OF SMOKE DETECTOR.
 58. SEE SPECIFICATIONS FOR DUCTWORK GAUGES, BRACING, HANGERS AND OTHER REQUIREMENTS.
 59. EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. DETAILED DESCRIPTIONS ARE PROVIDED IN THE ARCHITECTURAL SPECIFICATIONS.
 60. EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. LOUVER SIZES, LOCATIONS AND DETAILS SHALL BE COORDINATED THE GENERAL CONTRACTOR AND ALL TRADES INVOLVED.
 61. ALL BRANCH DUCT SHALL BE PROVIDED WITH A VOLUME DAMPER. DAMPER'S IN THE NECK OF DIFFUSERS OR GRILLES IS NOT ALLOWED.

HVAC LEGEND & SYMBOLS

	AIR FLOW (RETURN/EXHAUST)		FLEXIBLE DUCT
	AIR FLOW (SUPPLY)	FD L - -	FIRE DAMPER WITH ACCESS DOOR
	UNDER DOOR CUT WITH (CFM) AIR FLOW (SUPPLY)	VD	VOLUME DAMPER
(CFM) 	CEILING SUPPLY DIFFUSER (RECTANGULAR) W/ FLOW DESIGNATION 4-WAY	FD/AD - - - -	FIRE DAMPER WITH ACCESS DOOR
(CFM) 	CEILING RETURN REGISTER (RECTANGULAR) W/ FLOW DESIGNATION AND SQUARE NECK	SD	SMOKE DAMPER
	SUPPLY DUCT DOWN	MD - - - -	MOTOR OPERATED DAMPER
	SUPPLY DUCT UP	T	THERMOSTAT, MANUFACTURER
	RETURN DUCT DOWN	TC	TIME CLOCK
	RETURN DUCT UP	AC-1	AIR CONDITIONING UNIT
	EXHAUST DUCT DOWN	RAC-1	REMOTE AIR COOLED CONDENSER W/DESIGNATION
	EXHAUST DUCT UP	FCU-1	FAN COIL UNIT W/DESIGNATION
		RTU-1	ROOFTOP UNIT W/DESIGNATION
		ERV-1	ENERGY RECOVER VENTILATOR W/DESIGNATION
			CONNECT TO EXISTING

ABBREVIATIONS

AFF	ABOVE FINISH FLOOR
ATC	AUTOMATIC TEMPERATURE CONTROLS
C&C	CUT & CAP
CFM	CUBIC FEET PER MINUTE
COND	CONDENSATE (A/C)
CTE	CONNECT TO EXISTING
DN	DOWN
DUCT	DUCTWORK
E	EXISTING
EA	EXHAUST AIR
EAR	EXHAUST AIR REGISTER
EC	ELECTRICAL CONTRACTOR
ED	EXHAUST DUCT
ETR	EXISTING TO REMAIN
MC	MECHANICAL(HVAC) CONTRACTOR
MD	MOTOR OPERATED DAMPER
N	NEW
OA	OUTSIDE AIR
R	PLUMBING CONTRACTOR
PC	RELOCATED
RA	RETURN AIR
RAR	RETURN AIR REGISTER
SA	SUPPLY AIR
SAD	SUPPLY AIR DIFFUSER
SD	SMOKE DAMPER
TFP	TYPICAL
VD	VOLUME DAMPER
VIF	VERIFY IN FIELD
X	EXISTING



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PROJECT:

Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: ADR
CHECKED BY: RL
APPROVED BY: RL
SCALE: NONE

STATUS:

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- REVIEW
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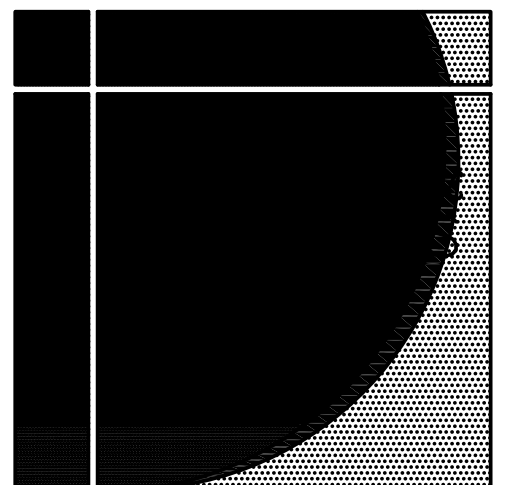
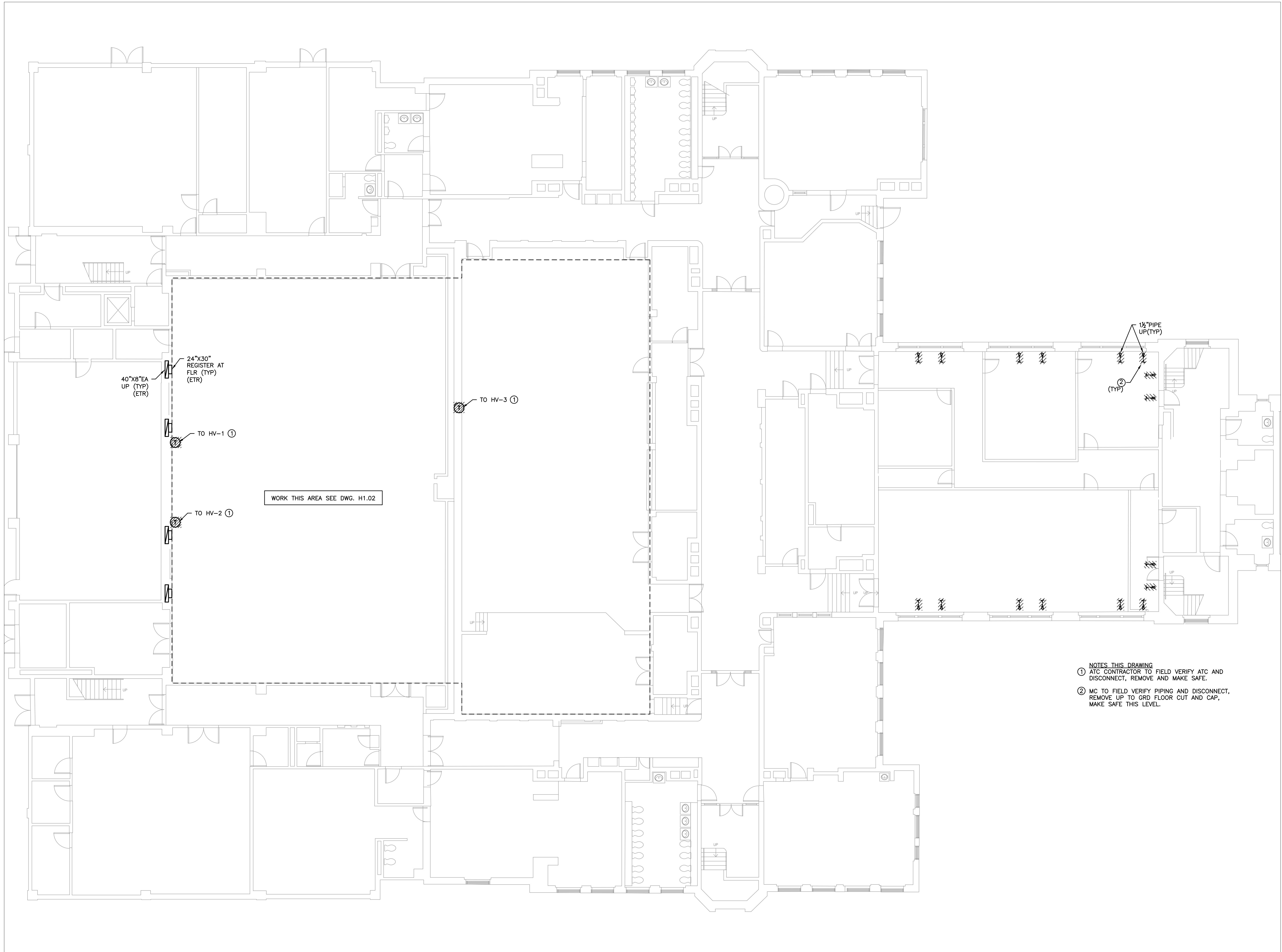
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DRAWING:

**HVAC
LEGEND &
GENERAL NOTES**

H0.01



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Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

PROJECT #: SED 16076
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 CHECKED BY: RL
 APPROVED BY: RL
 SCALE: 1/8"=1'-0"

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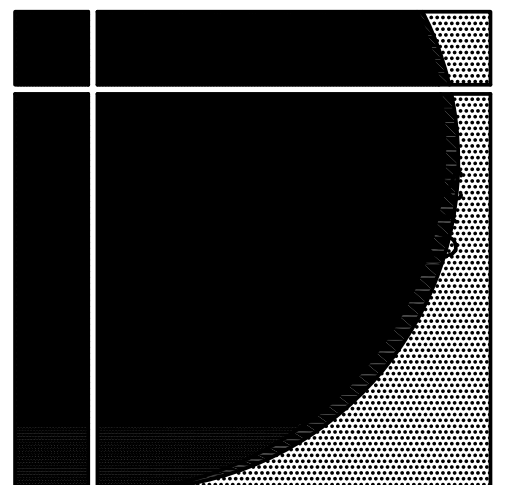
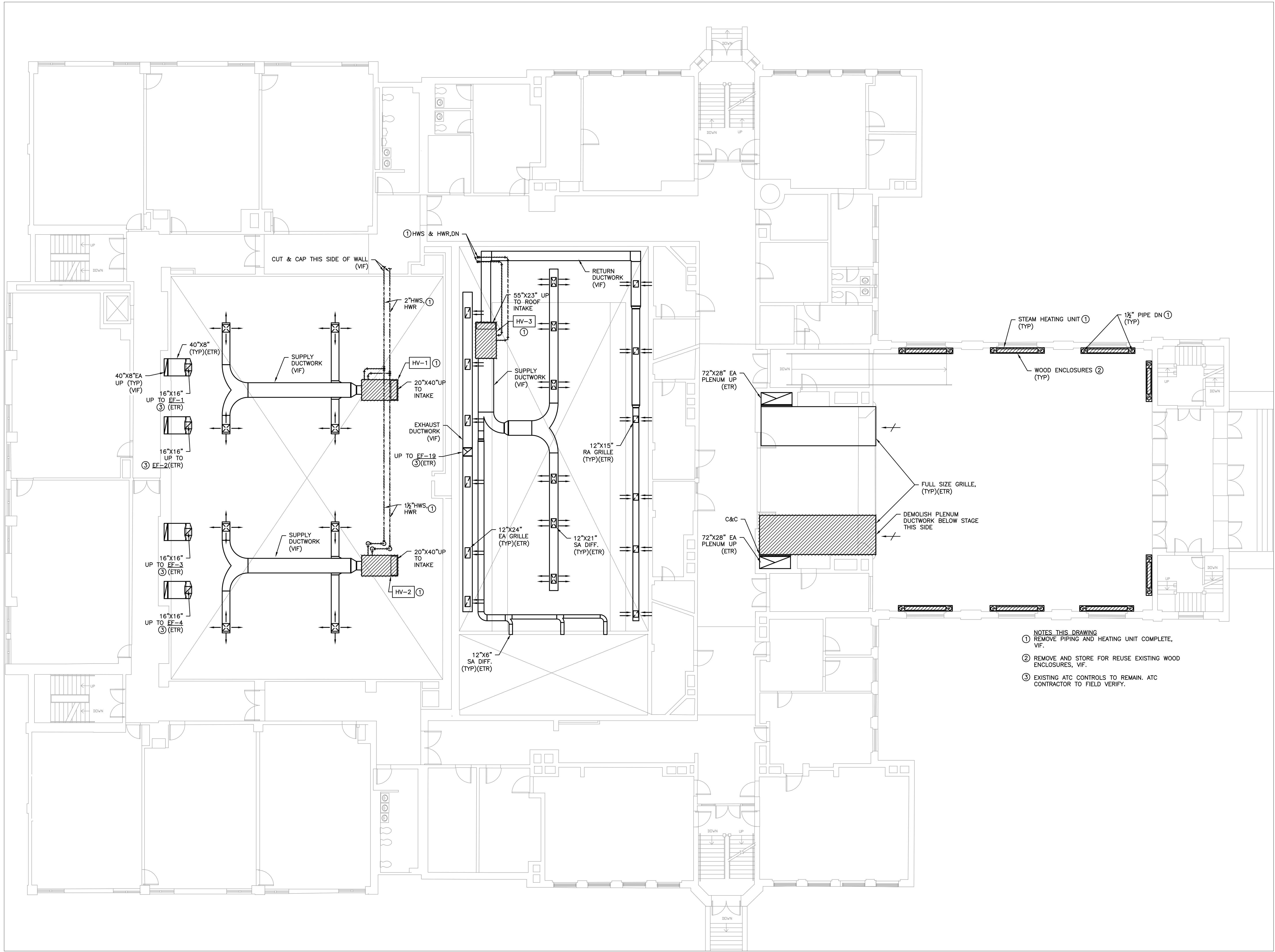
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DRAWING:
**HVAC
 GROUND FLOOR
 DEMOLITION PLAN**

H1.01

- NOTES THIS DRAWING
 ① ATC CONTRACTOR TO FIELD VERIFY ATC AND DISCONNECT, REMOVE AND MAKE SAFE.
 ② MC TO FIELD VERIFY PIPING AND DISCONNECT, REMOVE UP TO GRD FLOOR CUT AND CAP, MAKE SAFE THIS LEVEL.

WORK THIS AREA SEE DWG. H1.02



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Waltham Community Cultural Center HVAC Improvements

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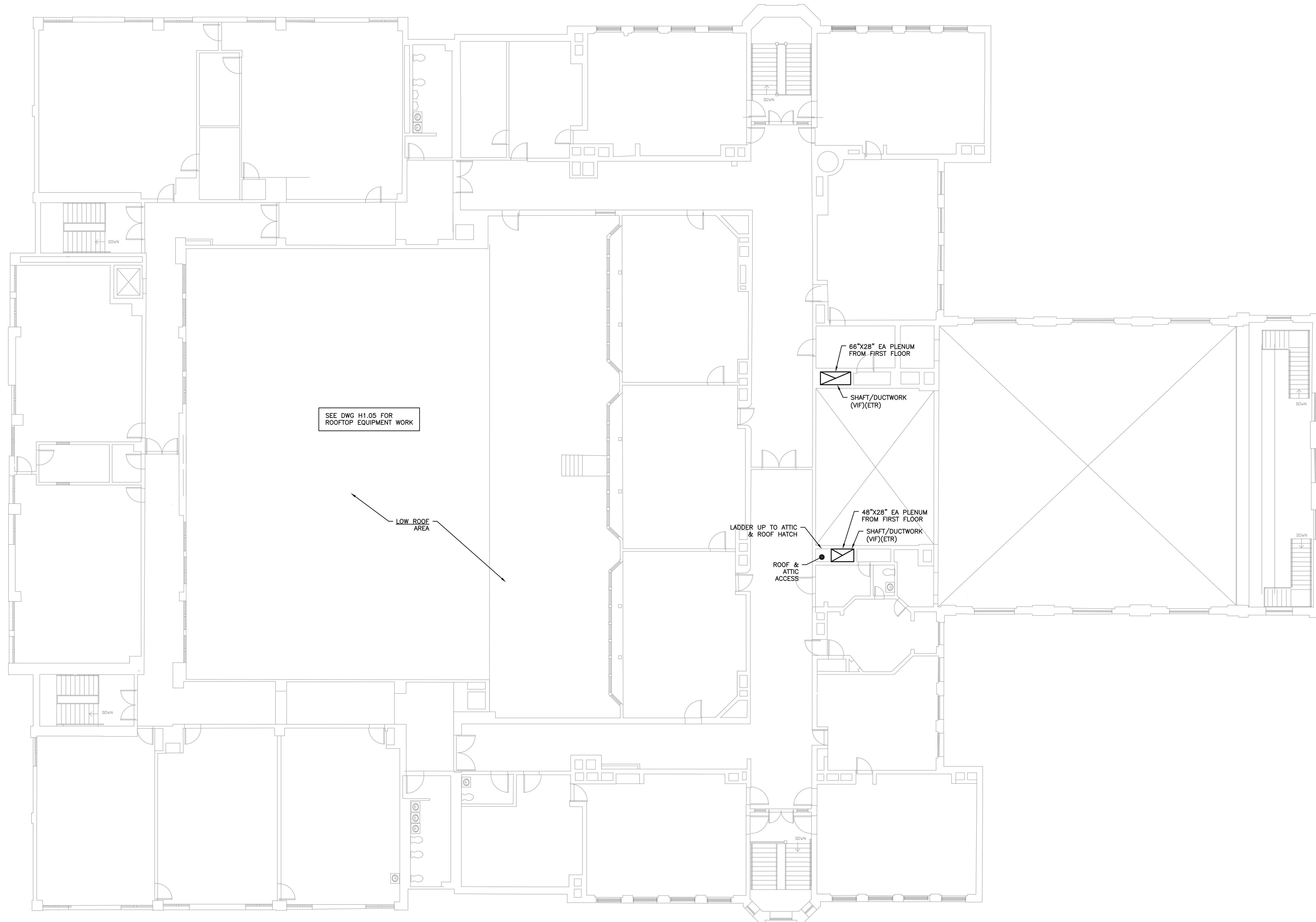
- NOTES THIS DRAWING
 ① REMOVE PIPING AND HEATING UNIT COMPLETE, VIF.
 ② REMOVE AND STORE FOR REUSE EXISTING WOOD ENCLOSURES, VIF.
 ③ EXISTING ATC CONTROLS TO REMAIN. ATC CONTRACTOR TO FIELD VERIFY.

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DRAWING:
**HVAC
 FIRST FLOOR
 DEMOLITION PLAN**

H1.02

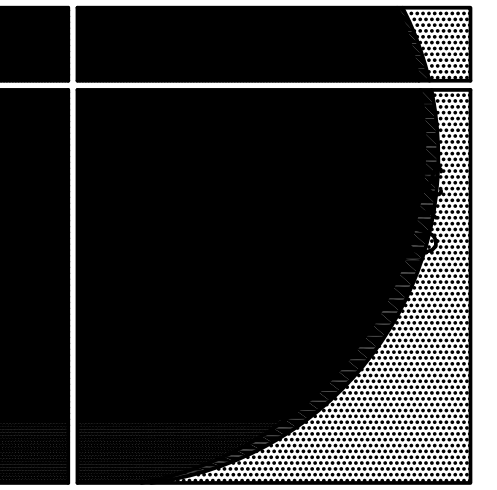


SEE DWG H1.05 FOR
ROOFTOP EQUIPMENT WORK

LOW ROOF
AREA

66"X28" EA PLENUM
FROM FIRST FLOOR
SHAFT/DUCTWORK
(VIF)(ETR)

LADDER UP TO ATTIC
& ROOF HATCH
ROOF &
ATTIC
ACCESS
48"X28" EA PLENUM
FROM FIRST FLOOR
SHAFT/DUCTWORK
(VIF)(ETR)



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PROJECT:

Waltham Community
Cultural Center
HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: ADR
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SCALE: 1/8"=1'-0"

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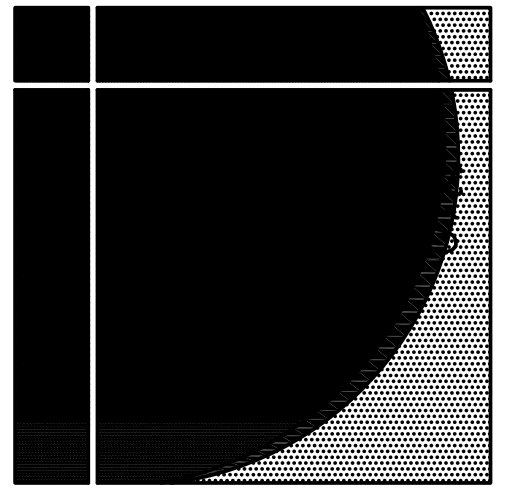
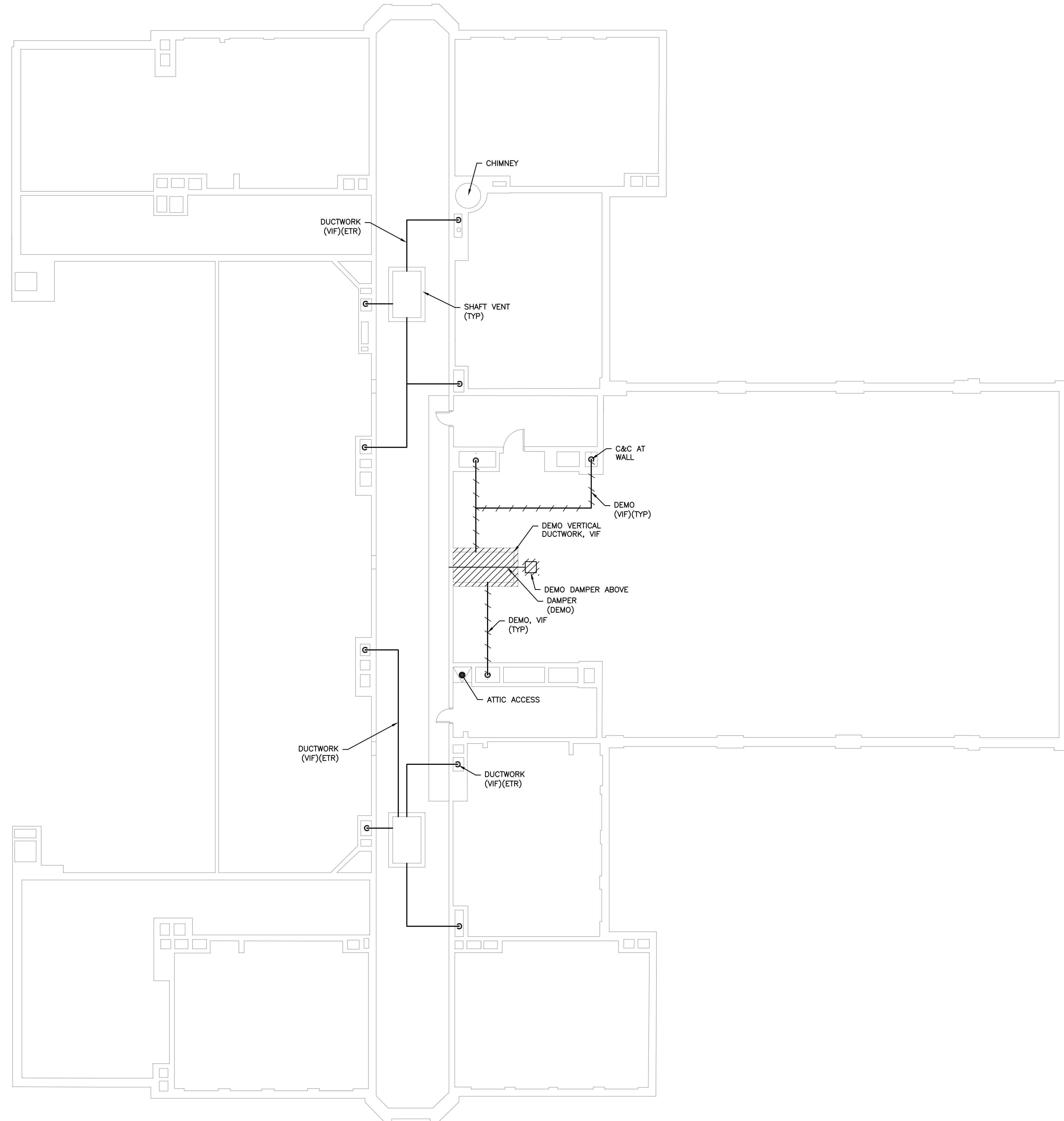
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DRAWING:
HVAC
SECOND FLOOR
DEMOLITION PLAN

H1.03



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Waltham Community Cultural Center HVAC Improvements

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 WALTHAM, MA

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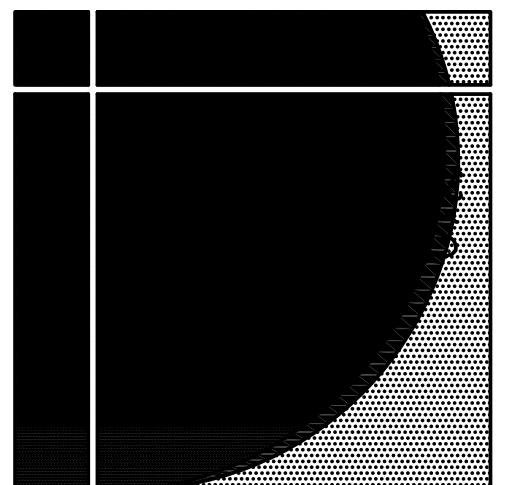
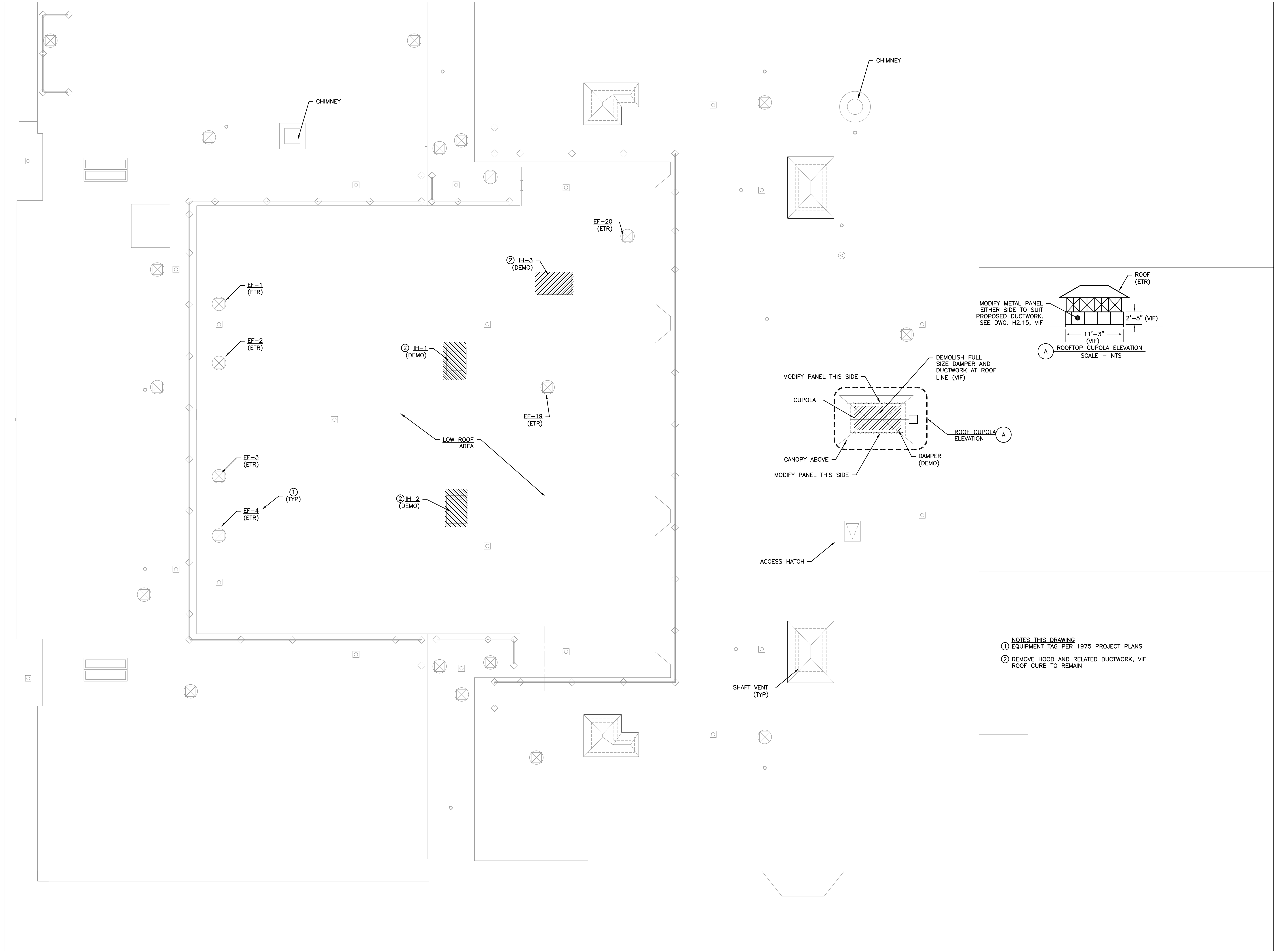
DATE: 8/15/17

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DRAWING:
**HVAC
 ATTIC
 DEMOLITION PLAN**

H1.04



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Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

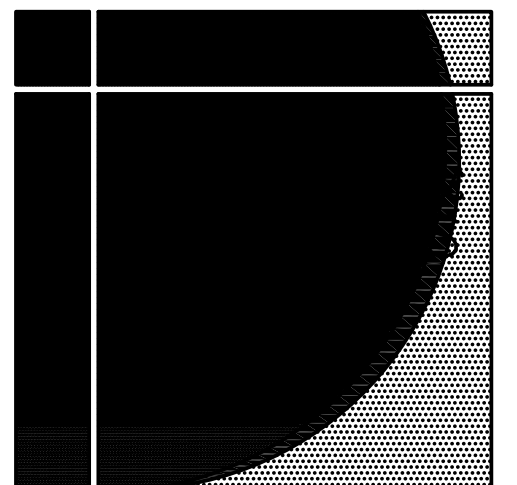
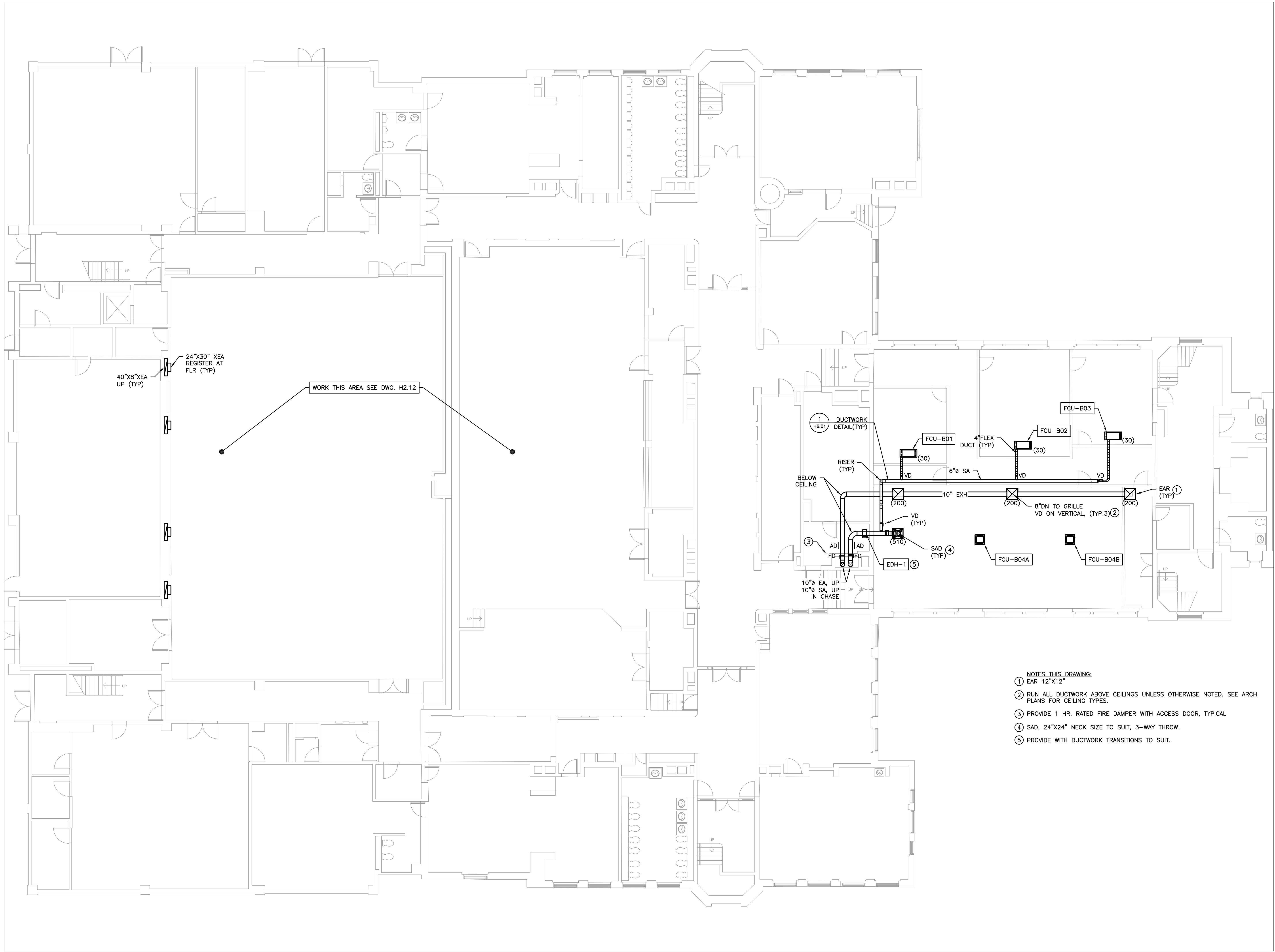
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 CHECKED BY: RL
 APPROVED BY: RL
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STATUS:
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DATE: 8/15/17
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DRAWING:
HVAC ROOF DEMOLITION PLAN

H1.05



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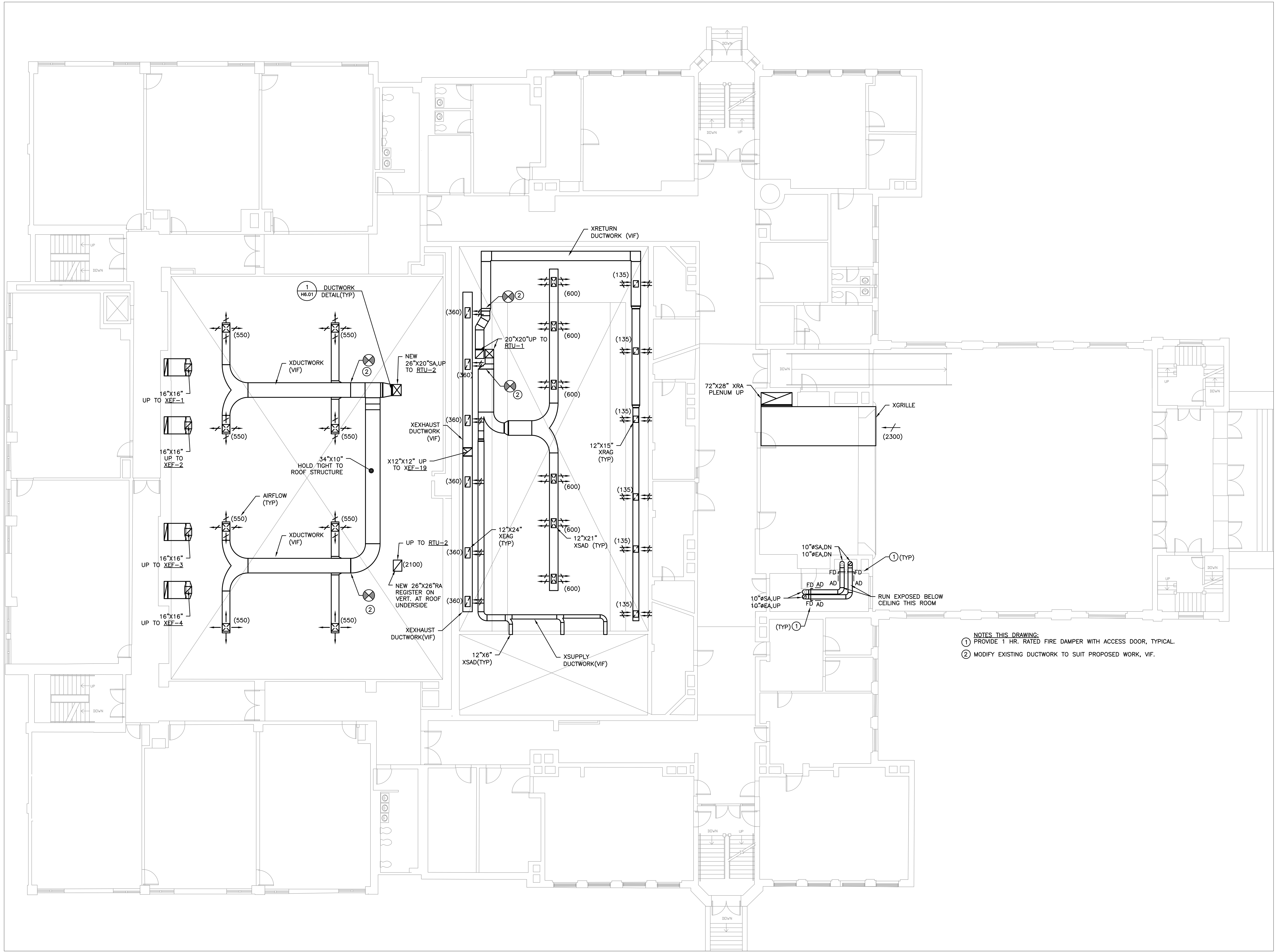
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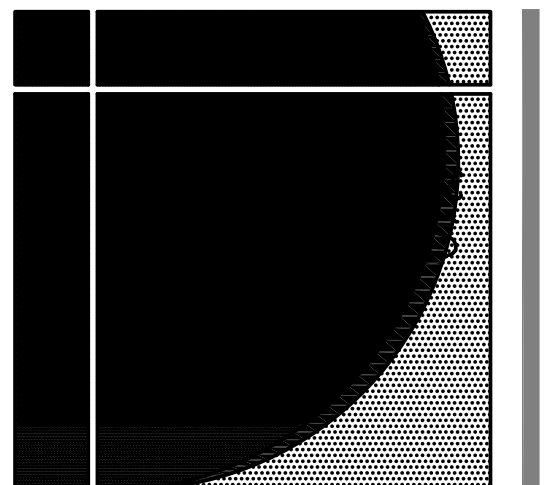
DRAWING:
**HVAC DUCTWORK
 GROUND FLOOR
 PROPOSED PLAN**

H2.11

- NOTES THIS DRAWING:**
- ① EAR 12"x12"
 - ② RUN ALL DUCTWORK ABOVE CEILINGS UNLESS OTHERWISE NOTED. SEE ARCH. PLANS FOR CEILING TYPES.
 - ③ PROVIDE 1 HR. RATED FIRE DAMPER WITH ACCESS DOOR, TYPICAL
 - ④ SAD, 24"x24" NECK SIZE TO SUIT, 3-WAY THROW.
 - ⑤ PROVIDE WITH DUCTWORK TRANSITIONS TO SUIT.



NOTES THIS DRAWING:
 ① PROVIDE 1 HR. RATED FIRE DAMPER WITH ACCESS DOOR, TYPICAL.
 ② MODIFY EXISTING DUCTWORK TO SUIT PROPOSED WORK, VIF.



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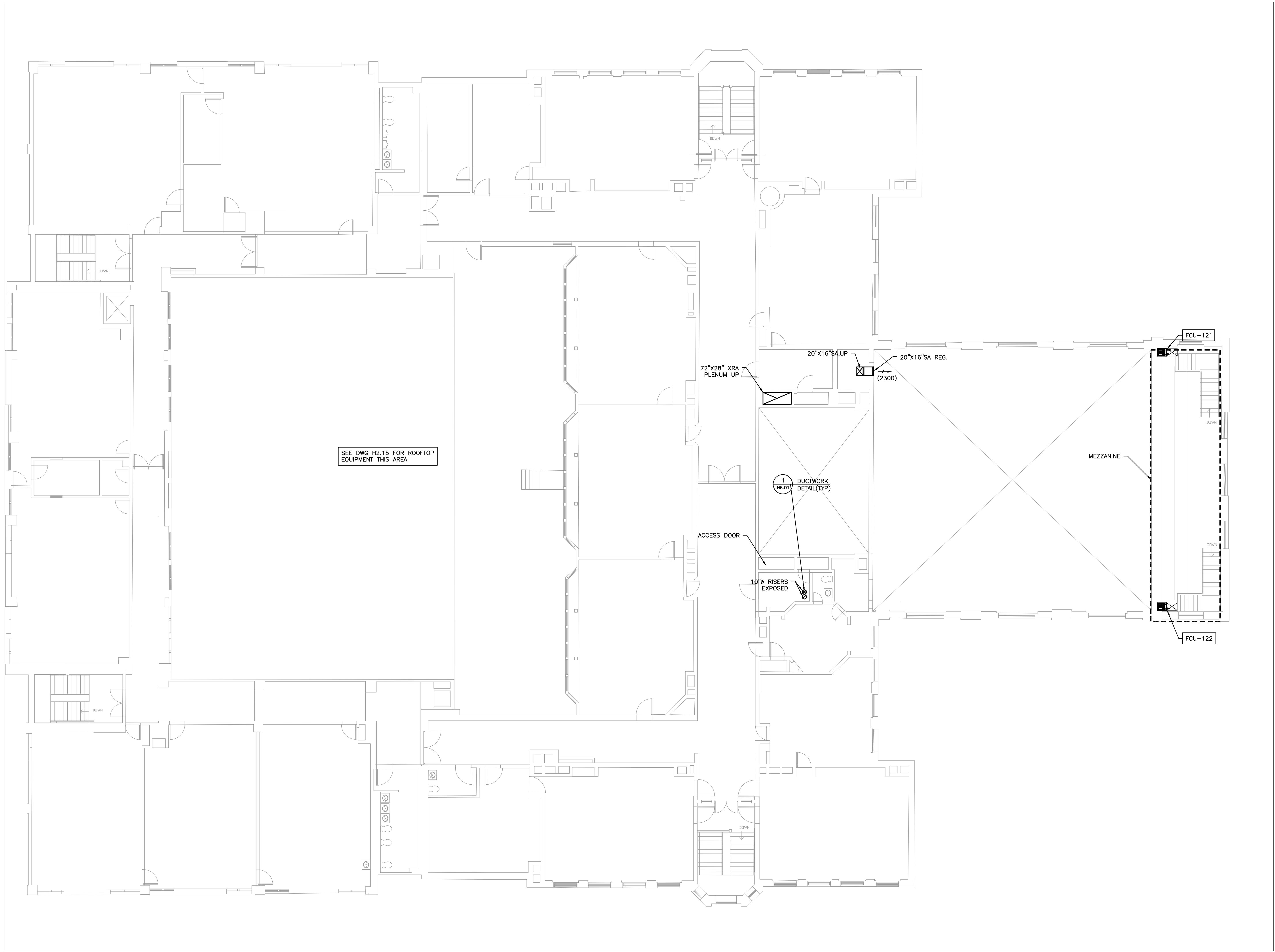
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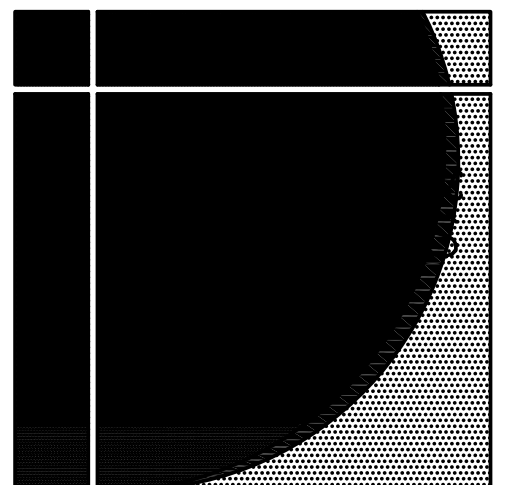
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DRAWING:
**HVAC DUCTWORK
 FIRST FLOOR
 PROPOSED PLAN**

H2.12



SEE DWG H2.15 FOR ROOFTOP EQUIPMENT THIS AREA



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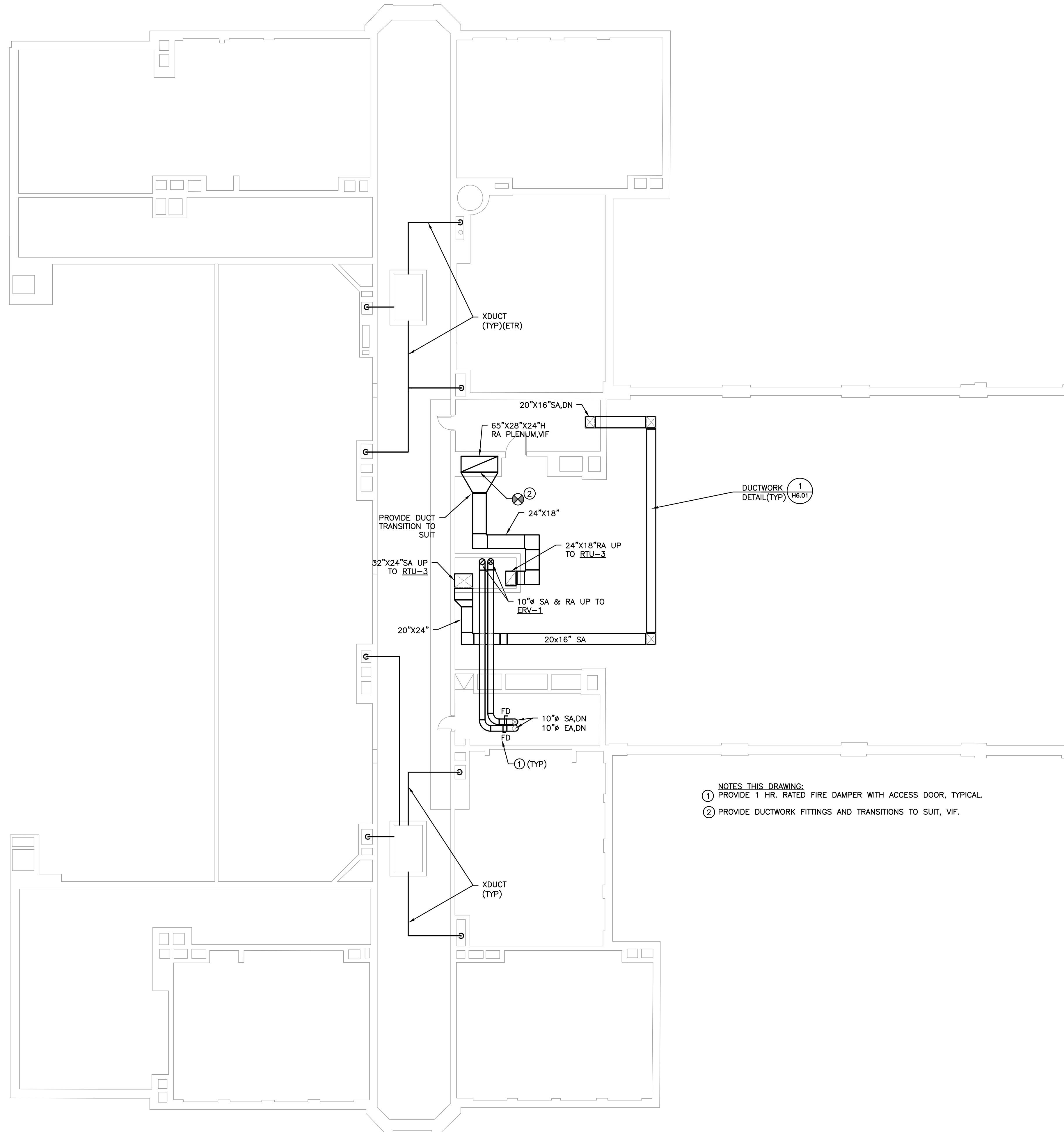
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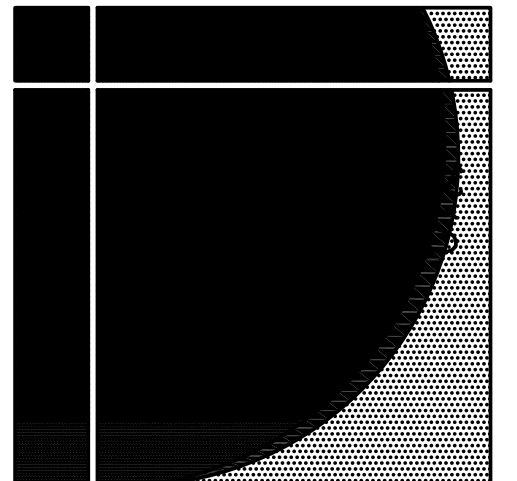
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DRAWING:
**HVAC DUCTWORK
SECOND FLOOR
PROPOSED PLAN**

H2.13



- NOTES THIS DRAWING:**
- ① PROVIDE 1 HR. RATED FIRE DAMPER WITH ACCESS DOOR, TYPICAL.
 - ② PROVIDE DUCTWORK FITTINGS AND TRANSITIONS TO SUIT, VIF.



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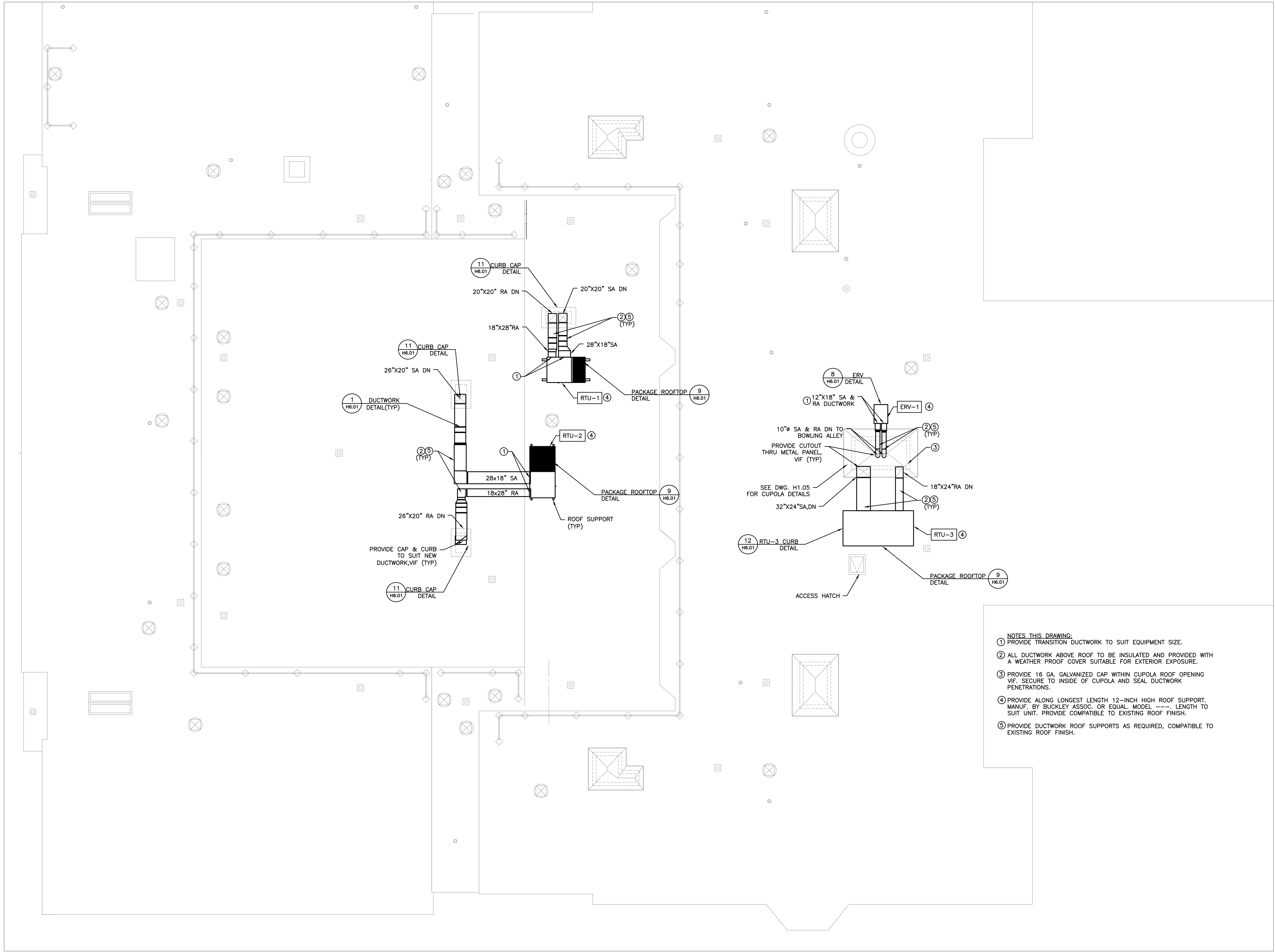
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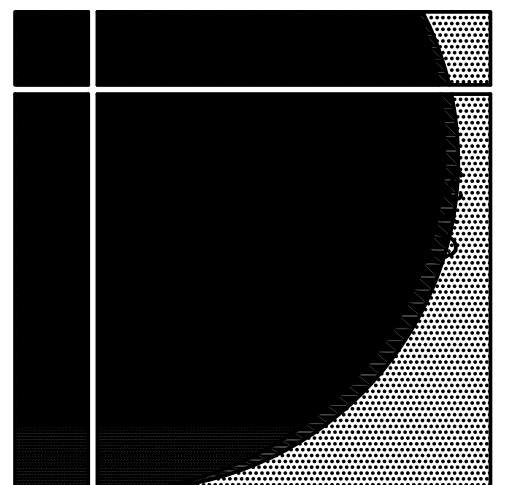
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DRAWING:
**HVAC DUCTWORK
 ATTIC
 PROPOSED PLAN**

H2.14



- NOTES THIS DRAWING:**
- ① PROVIDE TRANSITION DUCTWORK TO SUIT EQUIPMENT SIZE.
 - ② ALL DUCTWORK ABOVE ROOF TO BE INSULATED AND PROVIDED WITH A WEATHER PROOF COVER SUITABLE FOR EXTERIOR EXPOSURE.
 - ③ PROVIDE 16 GA. GALVANIZED CAP WITHIN CUPOLA ROOF OPENING VIF. SECURE TO INSIDE OF CUPOLA AND SEAL DUCTWORK PENETRATIONS.
 - ④ PROVIDE ALONG LONGEST LENGTH 12-INCH HIGH ROOF SUPPORT. MANUF. BY BUCKLEY ASSOC. OR EQUAL. MODEL ---. LENGTH TO SUIT UNIT. PROVIDE COMPATIBLE TO EXISTING ROOF FINISH.
 - ⑤ PROVIDE DUCTWORK ROOF SUPPORTS AS REQUIRED, COMPATIBLE TO EXISTING ROOF FINISH.



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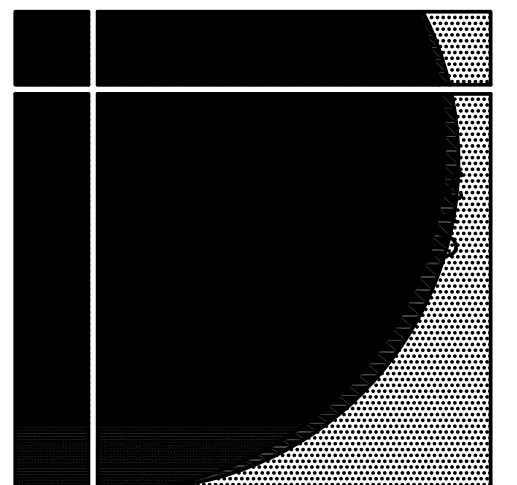
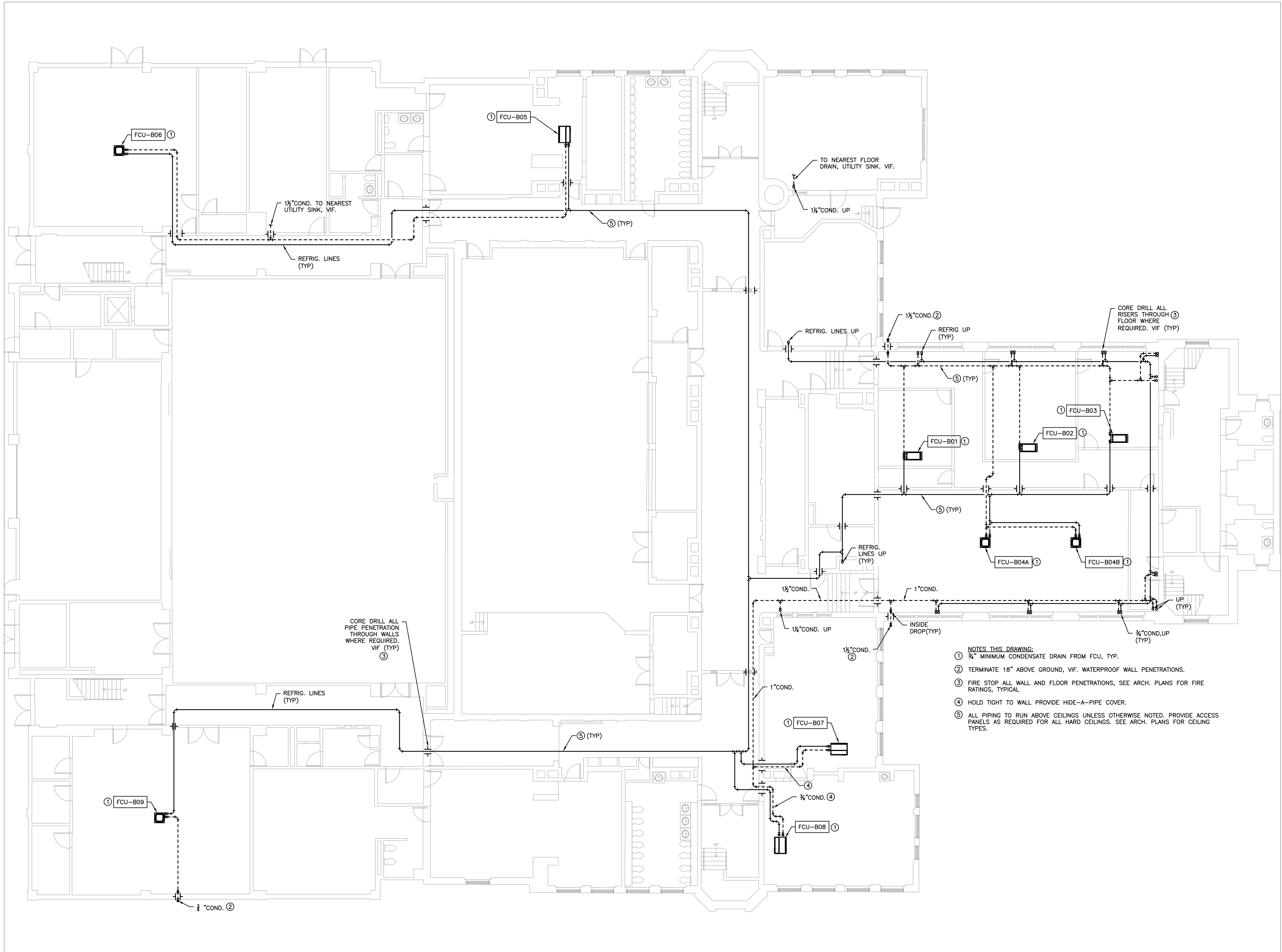
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DRAWING:
HVAC DUCTWORK ROOF PROPOSED PLAN

H2.15



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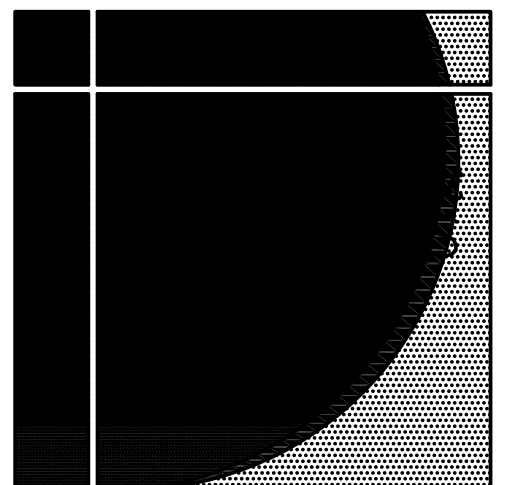
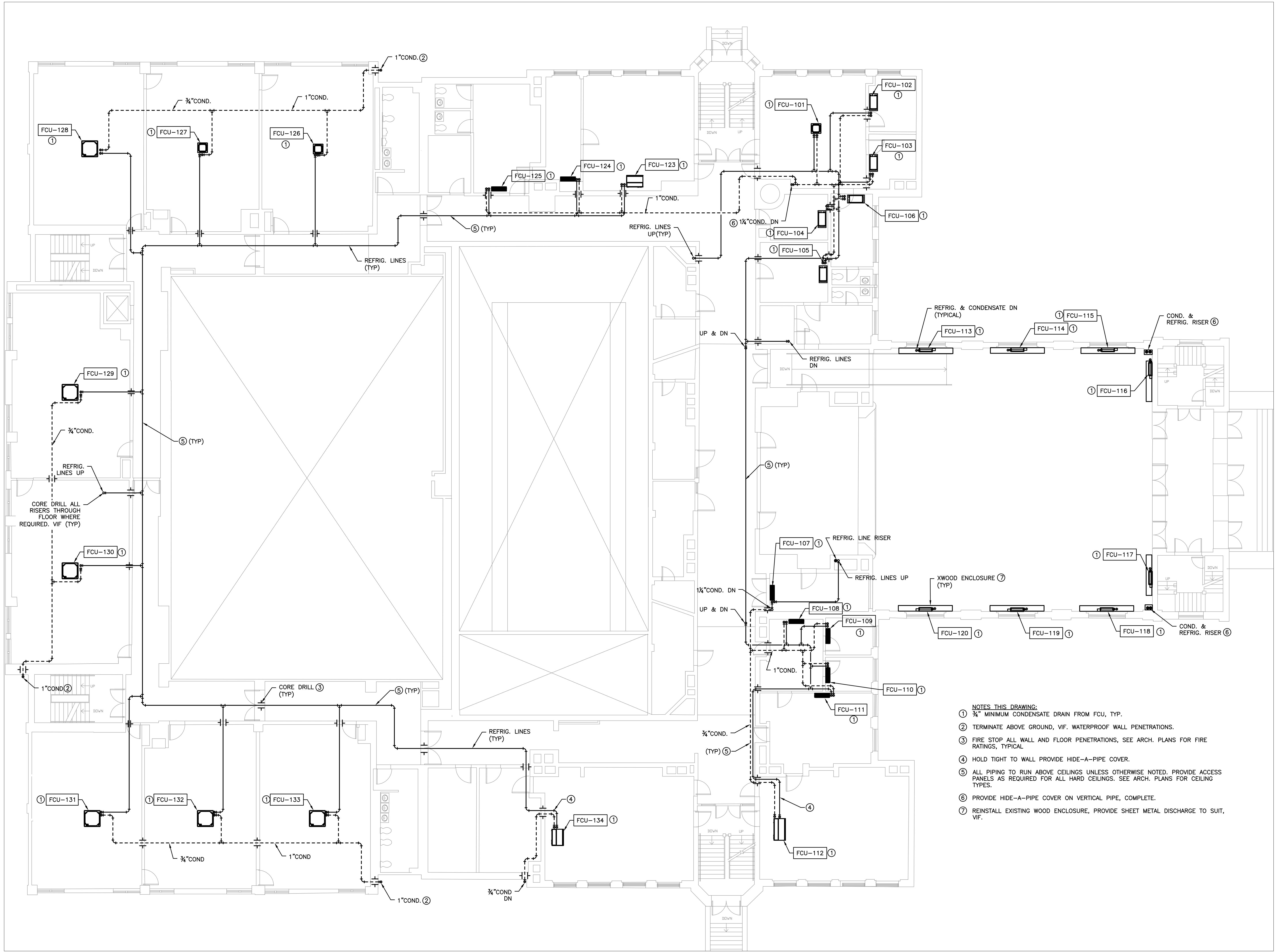
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DRAWING:
**HVAC PIPING
 GROUND FLOOR
 PROPOSED PLAN**

H3.11



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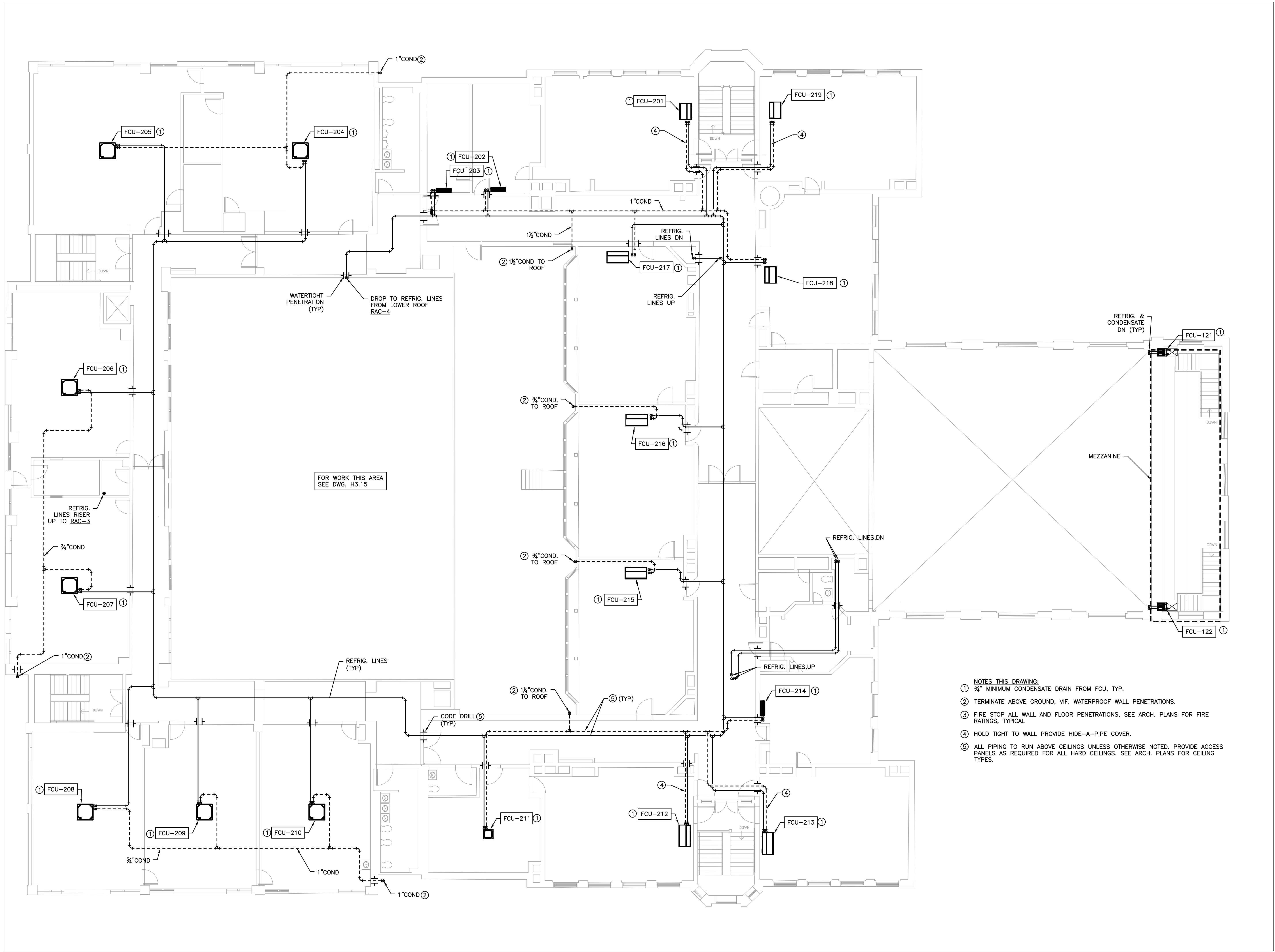
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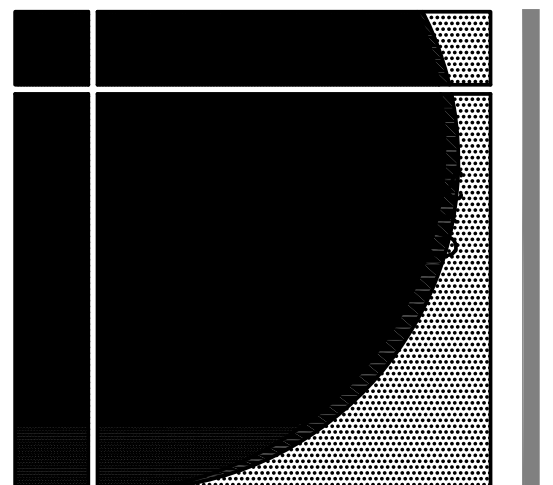
DRAWING:
**HVAC PIPING
 FIRST FLOOR
 PROPOSED PLAN**

- NOTES THIS DRAWING:**
- ① 3/4" MINIMUM CONDENSATE DRAIN FROM FCU, TYP.
 - ② TERMINATE ABOVE GROUND, VIF. WATERPROOF WALL PENETRATIONS.
 - ③ FIRE STOP ALL WALL AND FLOOR PENETRATIONS, SEE ARCH. PLANS FOR FIRE RATINGS, TYPICAL
 - ④ HOLD TIGHT TO WALL PROVIDE HIDE-A-PIPE COVER.
 - ⑤ ALL PIPING TO RUN ABOVE CEILINGS UNLESS OTHERWISE NOTED. PROVIDE ACCESS PANELS AS REQUIRED FOR ALL HARD CEILINGS. SEE ARCH. PLANS FOR CEILING TYPES.
 - ⑥ PROVIDE HIDE-A-PIPE COVER ON VERTICAL PIPE, COMPLETE.
 - ⑦ REINSTALL EXISTING WOOD ENCLOSURE, PROVIDE SHEET METAL DISCHARGE TO SUIT, VIF.

H3.12



- NOTES THIS DRAWING:**
- ① 3/4" MINIMUM CONDENSATE DRAIN FROM FCU, TYP.
 - ② TERMINATE ABOVE GROUND, VIF. WATERPROOF WALL PENETRATIONS.
 - ③ FIRE STOP ALL WALL AND FLOOR PENETRATIONS, SEE ARCH. PLANS FOR FIRE RATINGS, TYPICAL.
 - ④ HOLD TIGHT TO WALL PROVIDE HIDE-A-PIPE COVER.
 - ⑤ ALL PIPING TO RUN ABOVE CEILINGS UNLESS OTHERWISE NOTED. PROVIDE ACCESS PANELS AS REQUIRED FOR ALL HARD CEILINGS. SEE ARCH. PLANS FOR CEILING TYPES.



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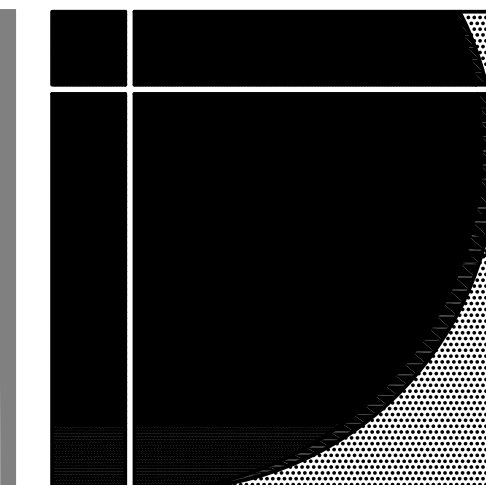
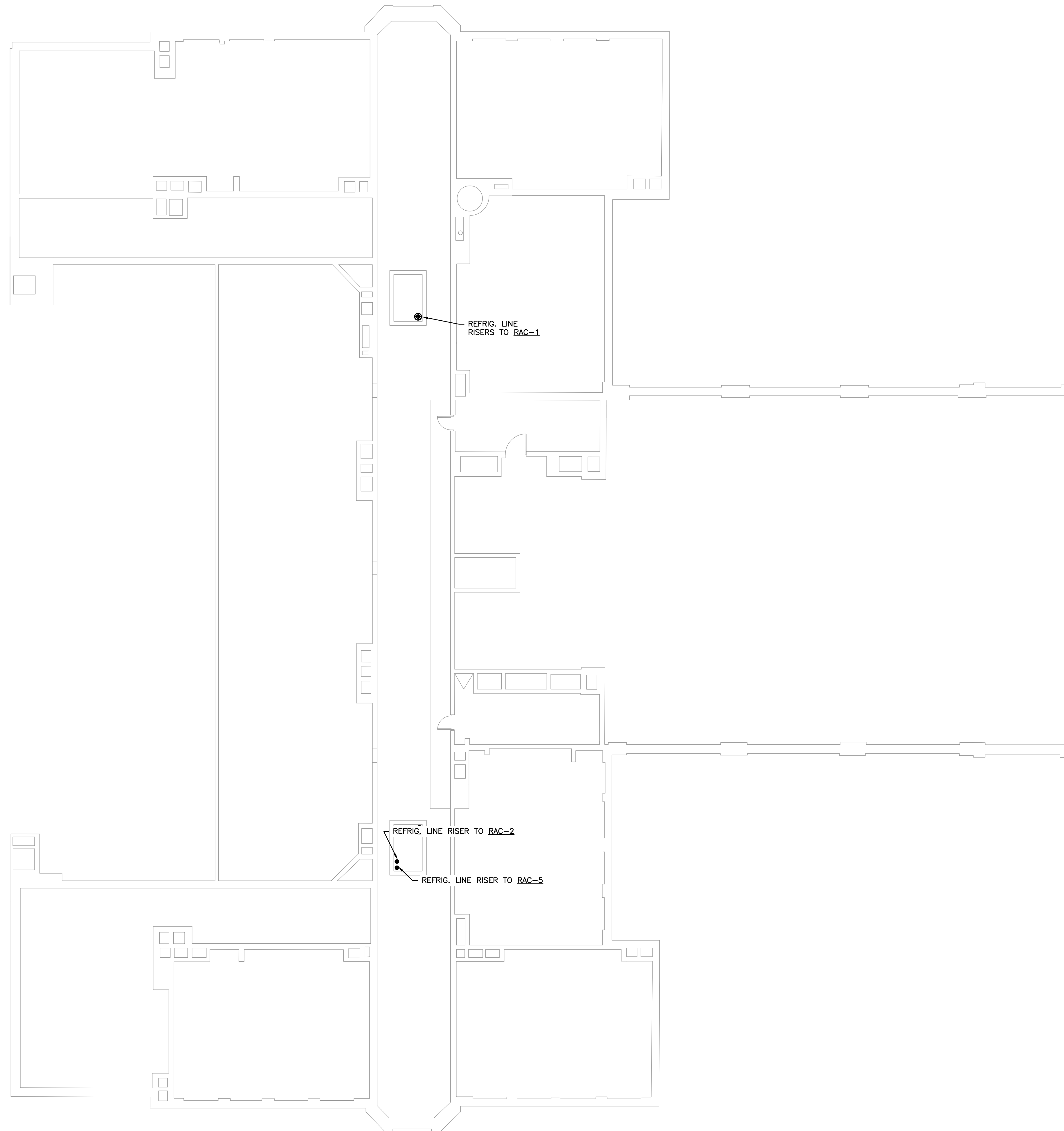
510 MOODY STREET
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DRAWING:
**HVAC PIPING
 SECOND FLOOR
 PROPOSED PLAN**

H3.13



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PROJECT:

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 HVAC Improvements**

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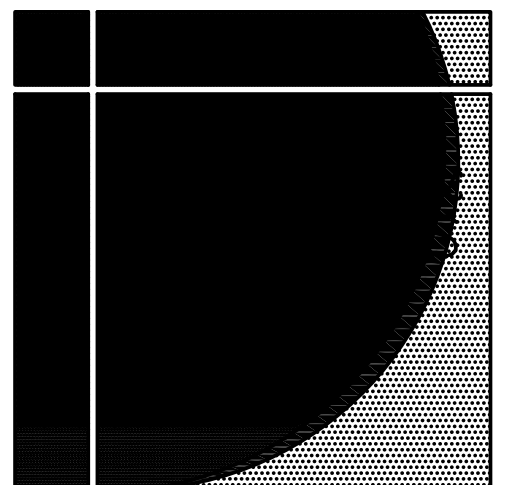
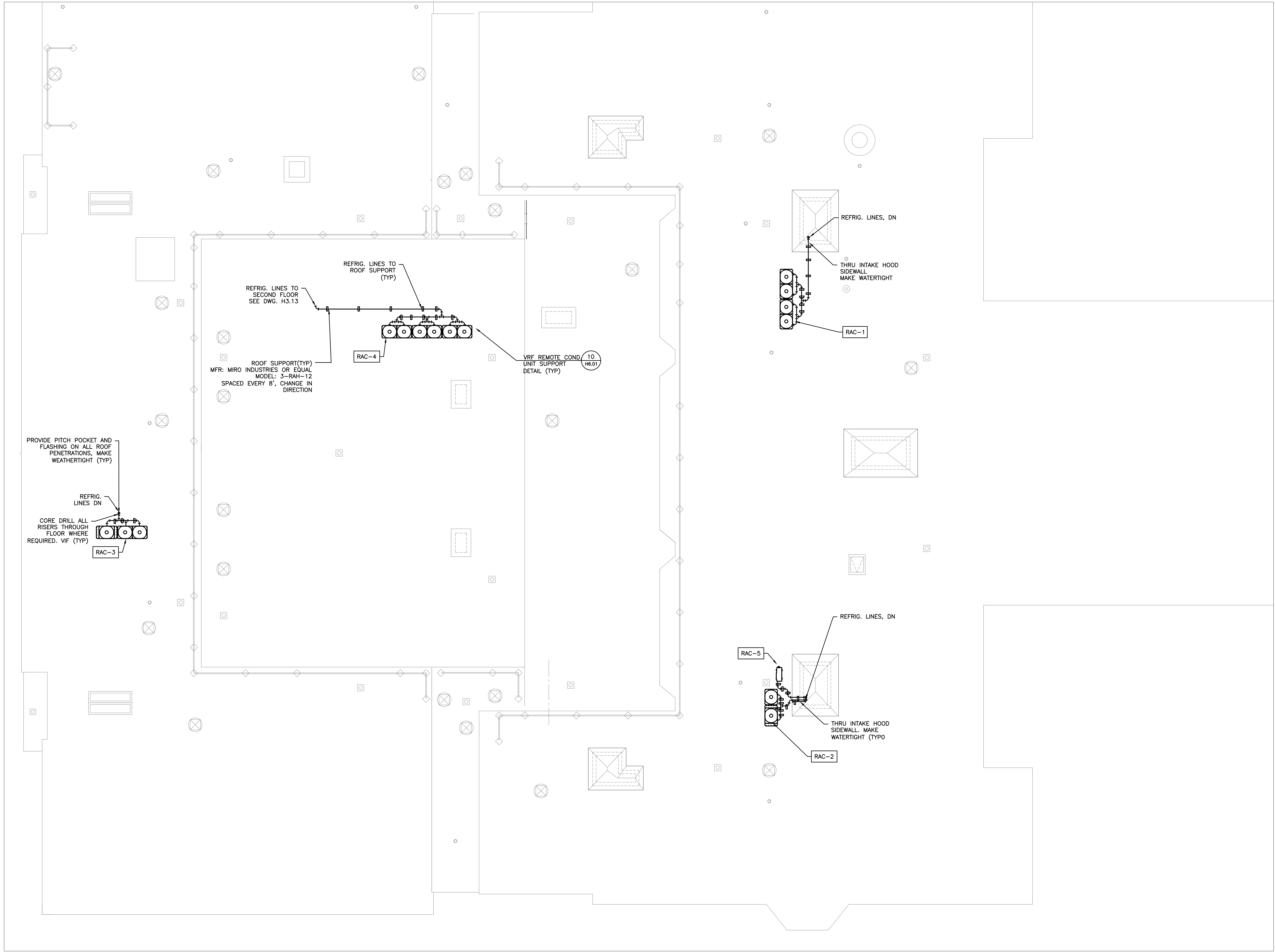
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DRAWING:
**HVAC PIPING
 ATTIC
 PROPOSED PLAN**

H3.14



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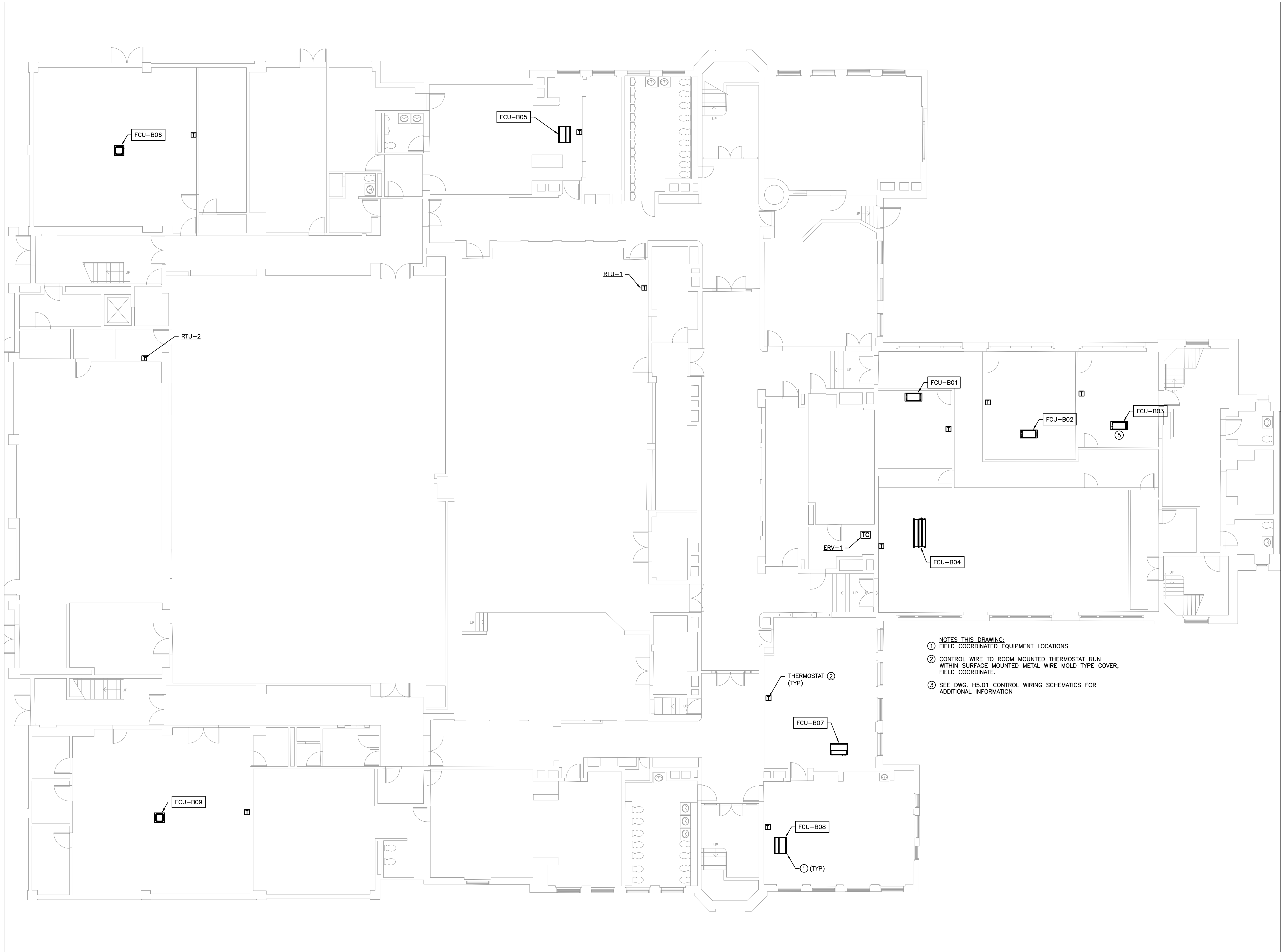
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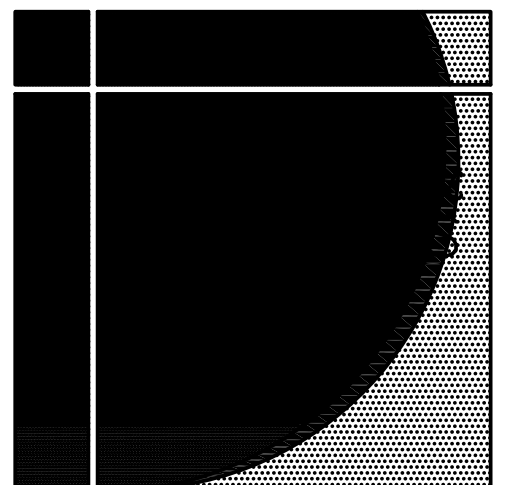
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DRAWING:
**HVAC PIPING
 ROOF
 PROPOSED PLAN**

H3.15



NOTES THIS DRAWING:
 ① FIELD COORDINATED EQUIPMENT LOCATIONS
 ② CONTROL WIRE TO ROOM MOUNTED THERMOSTAT RUN WITHIN SURFACE MOUNTED METAL WIRE MOLD TYPE COVER, FIELD COORDINATE.
 ③ SEE DWG. H5.01 CONTROL WIRING SCHEMATICS FOR ADDITIONAL INFORMATION



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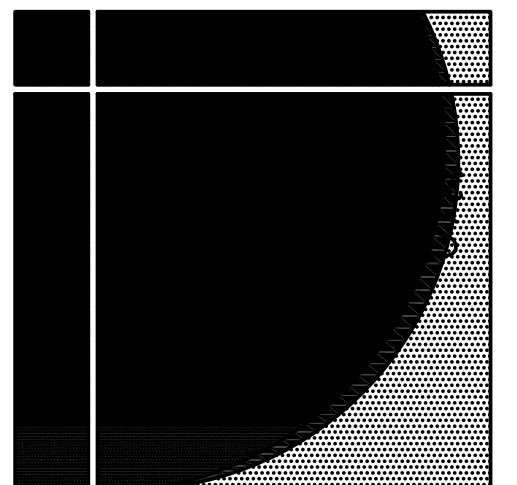
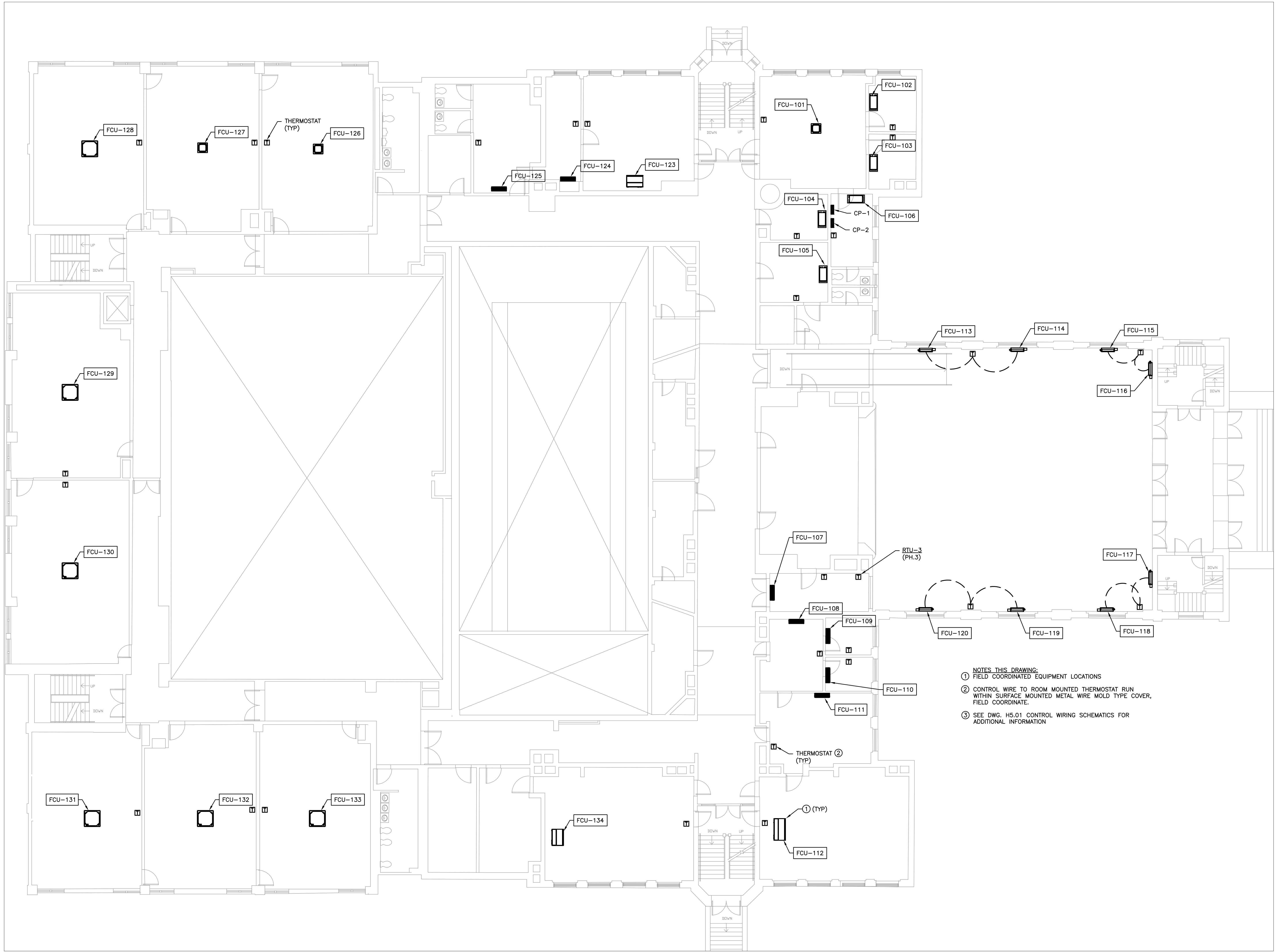
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DRAWING:
**HVAC CONTROLS
 GROUND FLOOR
 PROPOSED PLAN**

H4.11



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PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

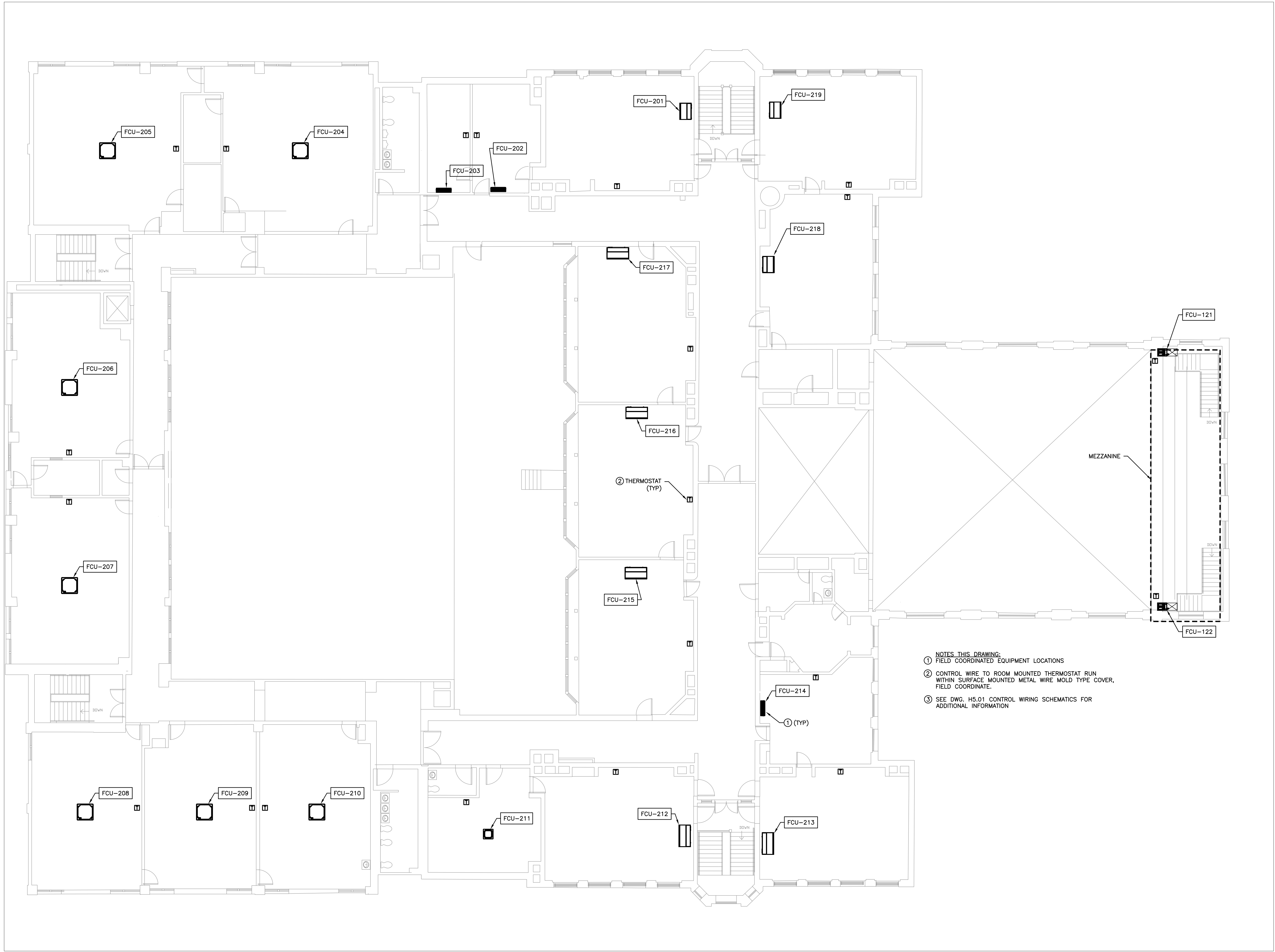
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 DRAWN BY: ADR
 CHECKED BY: RL
 APPROVED BY: RL
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 REVIEW
 DESIGN DEVELOPMENT
 FINAL REVIEW
 BIDDING
 PERMIT
 CONSTRUCTION
 NOT FOR CONSTRUCTION
 AS-BUILT

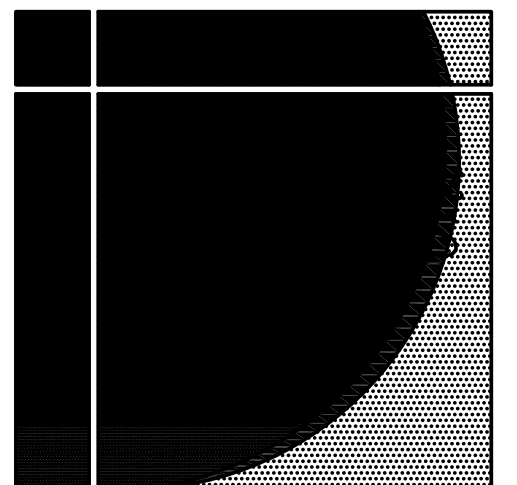
DATE: 8/15/17
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DRAWING:
**HVAC CONTROLS
 FIRST FLOOR
 PROPOSED PLAN**

H4.12



- NOTES THIS DRAWING:
- ① FIELD COORDINATED EQUIPMENT LOCATIONS
 - ② CONTROL WIRE TO ROOM MOUNTED THERMOSTAT RUN WITHIN SURFACE MOUNTED METAL WIRE MOLD TYPE COVER, FIELD COORDINATE.
 - ③ SEE DWG. H5.01 CONTROL WIRING SCHEMATICS FOR ADDITIONAL INFORMATION



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PROJECT:
Waltham Community Cultural Center HVAC Improvements

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 WALTHAM, MA

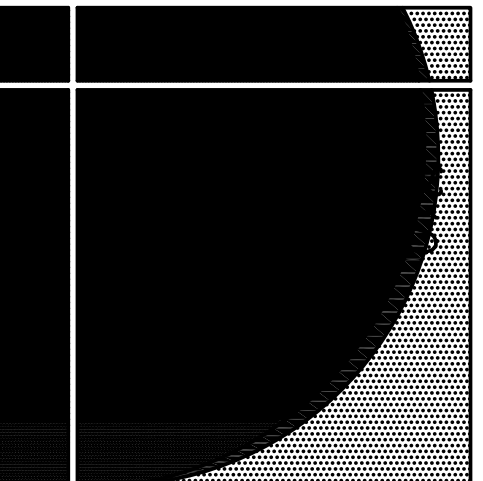
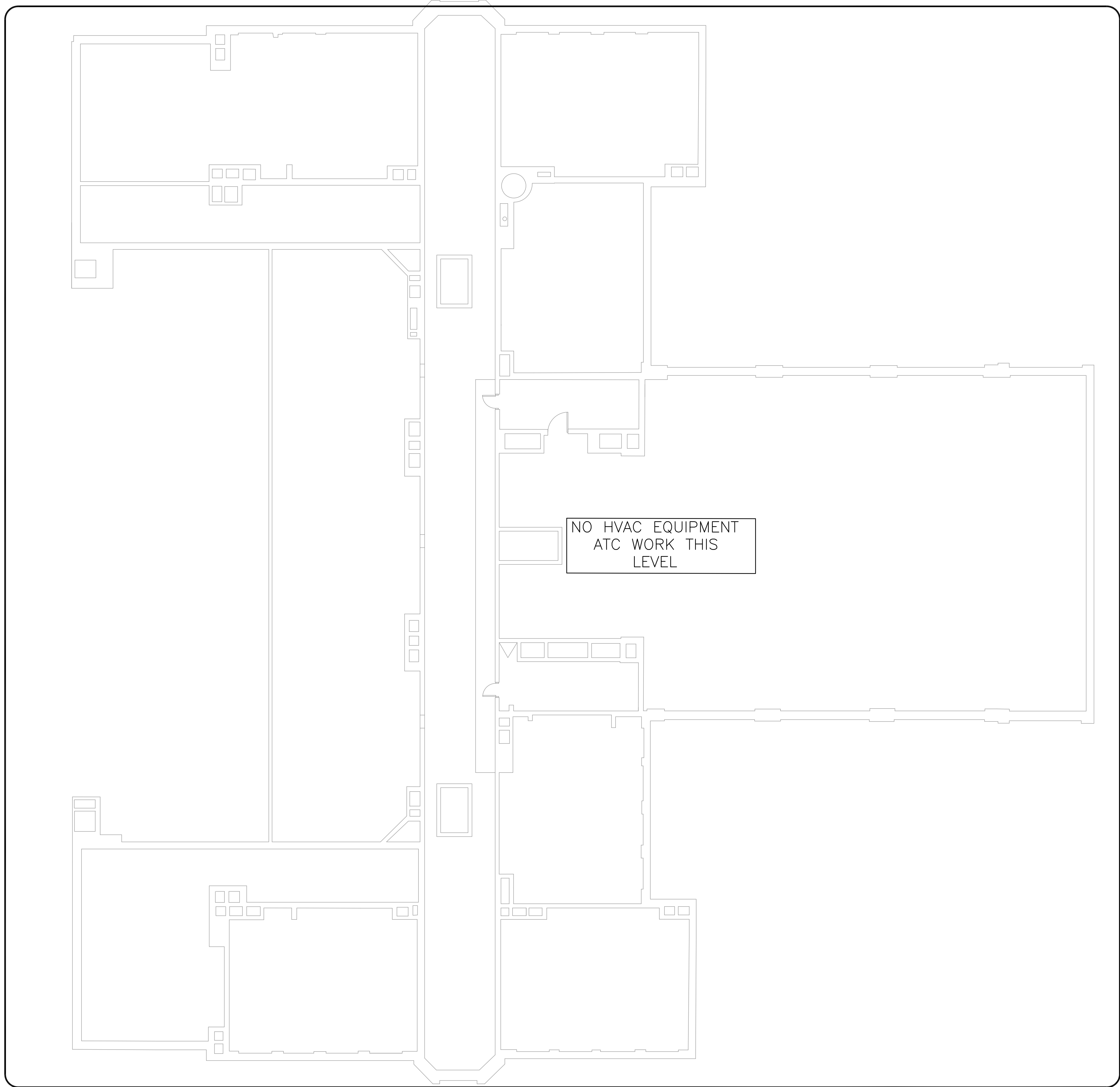
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 APPROVED BY: RL
 SCALE: 1/8"=1'-0"

STATUS:
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 AS-BUILT

DATE: 8/15/17
 REVISIONS:
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DRAWING:
**HVAC CONTROLS
 SECOND FLOOR
 PROPOSED PLAN**

H4.13



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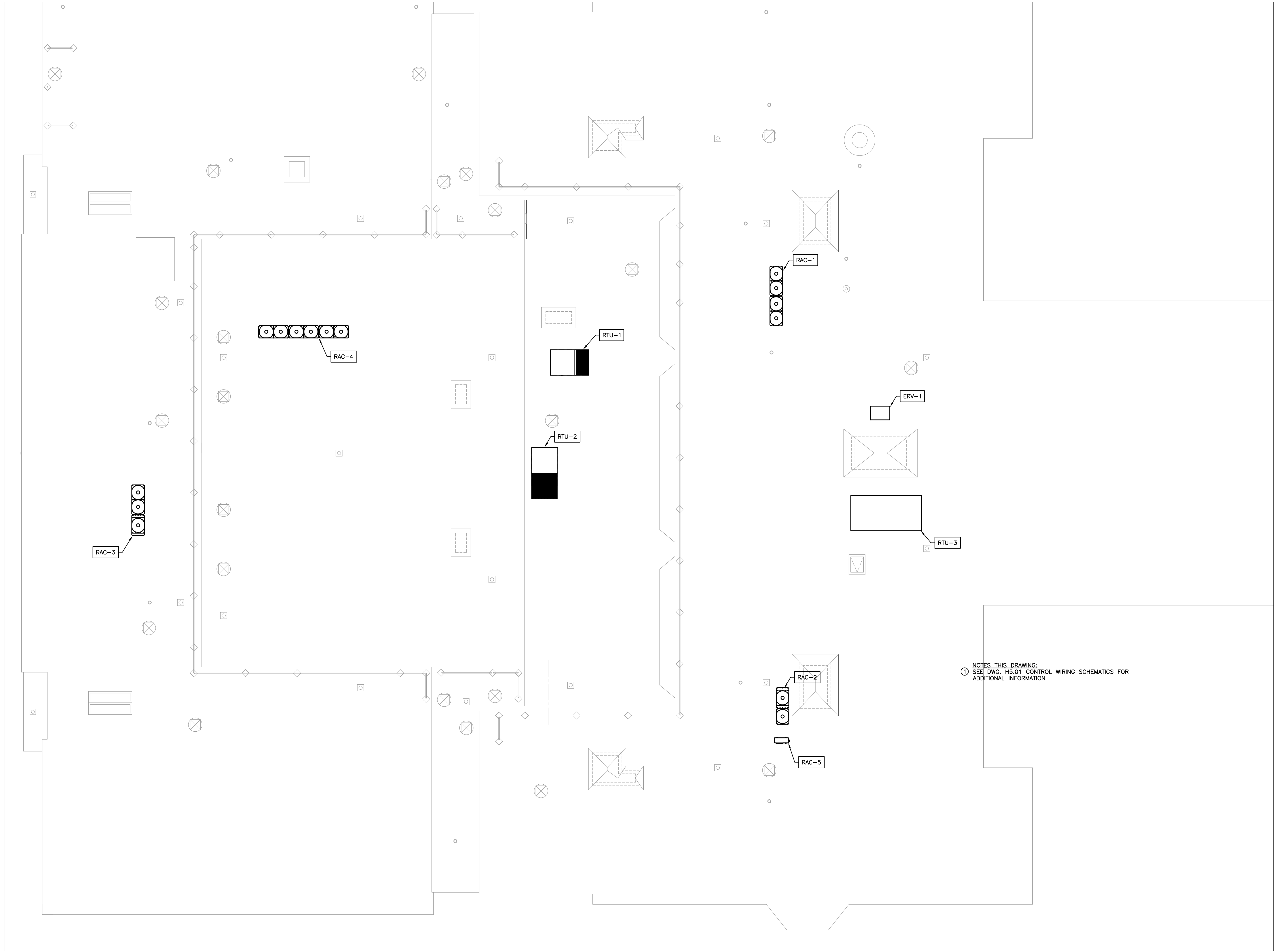
PROJECT #: SED 16076
 DRAWN BY: ADR
 CHECKED BY: RL
 APPROVED BY: RL
 SCALE: 1/8"=1'-0"

- STATUS:
- SCHEMATIC DESIGN
 - REVIEW
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 - FINAL REVIEW
 - BIDDING
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 - CONSTRUCTION
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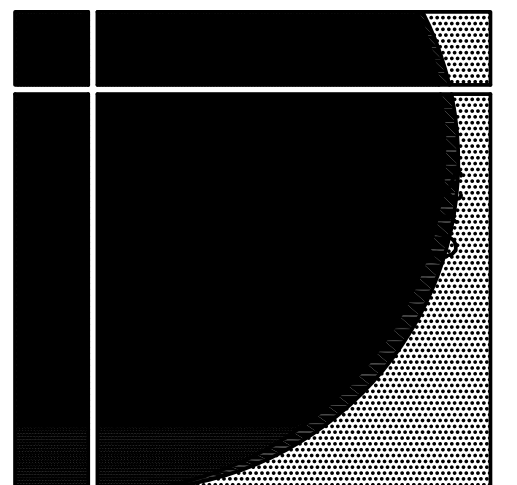
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DRAWING:
**HVAC CONTROLS
 ATTIC
 PROPOSED PLAN**

H4.14



NOTES THIS DRAWING:
 ① SEE DWG. H5.01 CONTROL WIRING SCHEMATICS FOR ADDITIONAL INFORMATION



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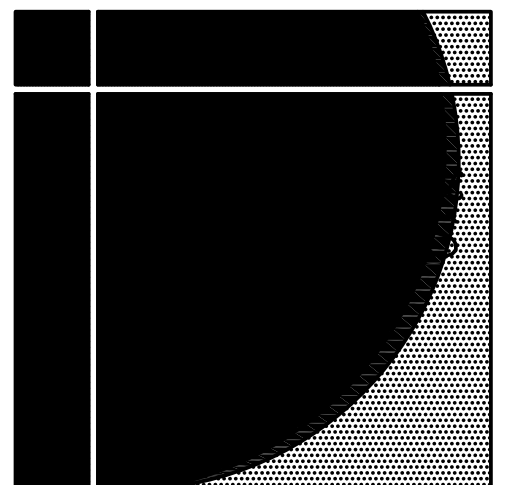
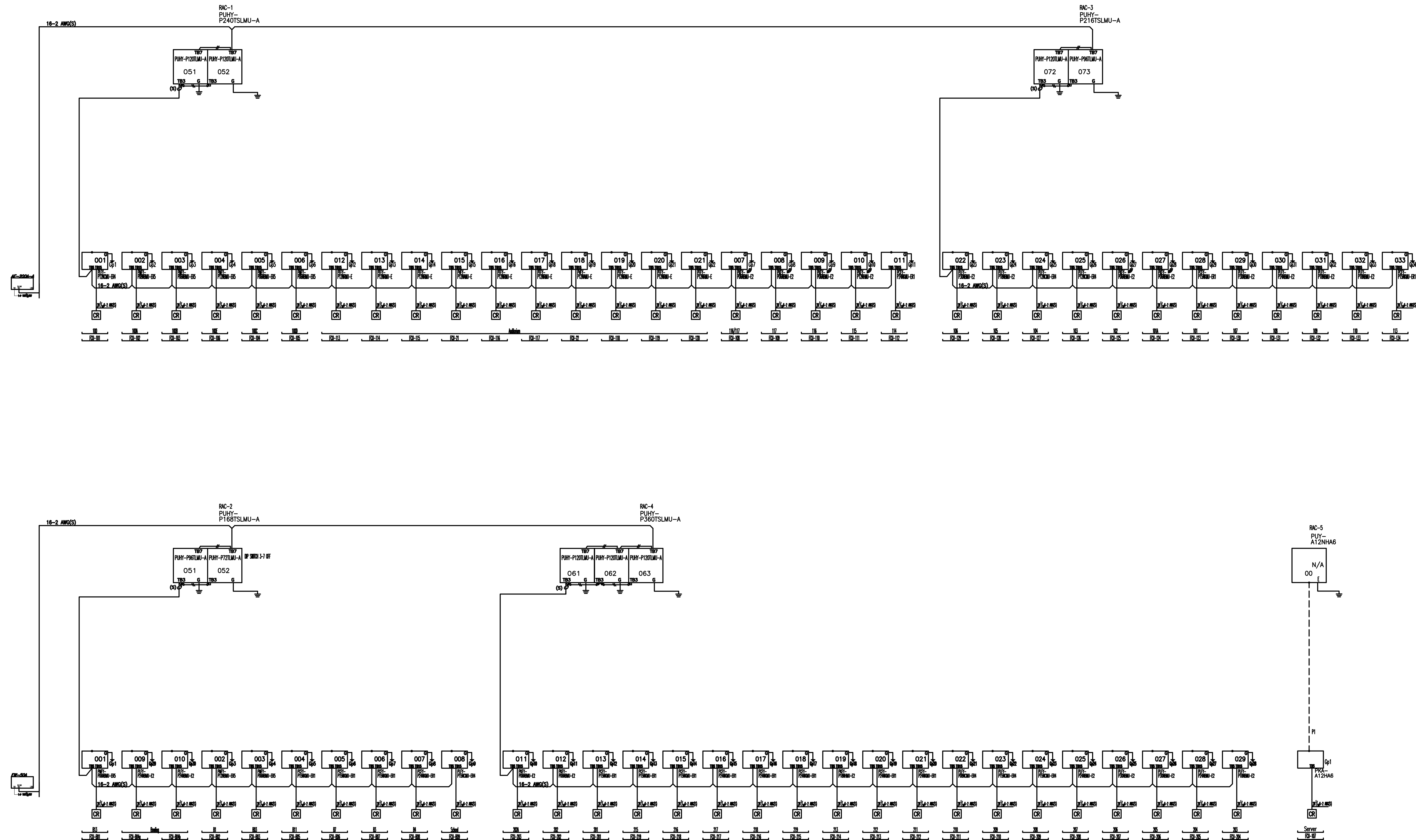
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 DESIGN DEVELOPMENT
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DRAWING:
**HVAC CONTROLS
 ROOF
 PROPOSED PLAN**

H4.15

Waltham Community Center	
DIAGRAM SYMBOL LEGEND	PAGE
DISPLAY DESCRIPTION	
CONTROL WIRING	



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PROJECT:

Waltham Community Center
HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: ADR
CHECKED BY: RL
APPROVED BY: RL
SCALE: NONE

- STATUS:
- SCHEMATIC DESIGN
 - REVIEW
 - DESIGN DEVELOPMENT
 - FINAL REVIEW
 - BIDDING
 - PERMIT
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 - AS-BUILT

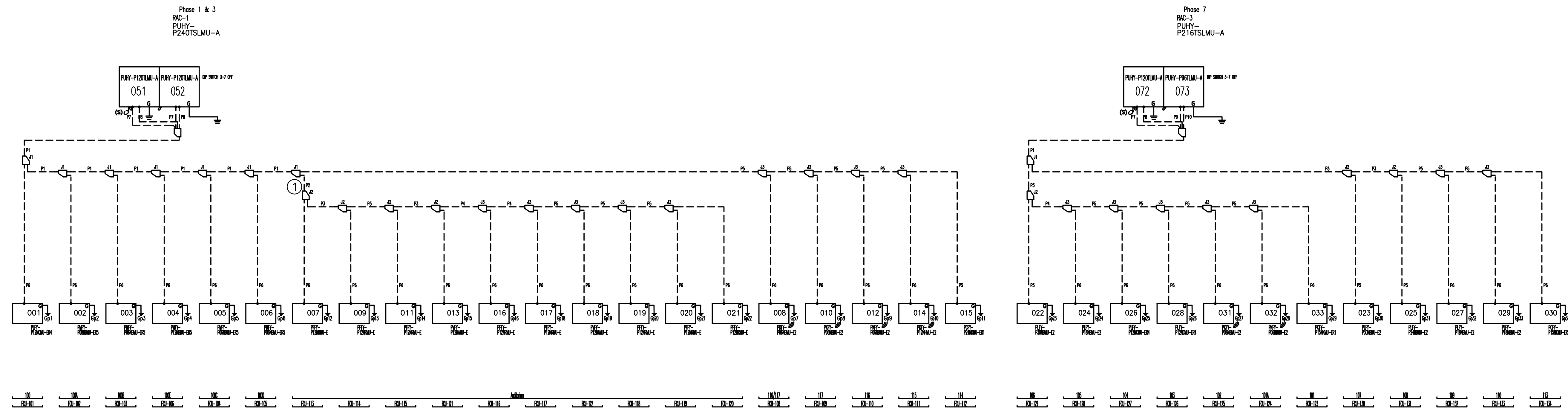
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DRAWING:
HVAC
CONTROL WIRING
SCHEMATICS

H5.01

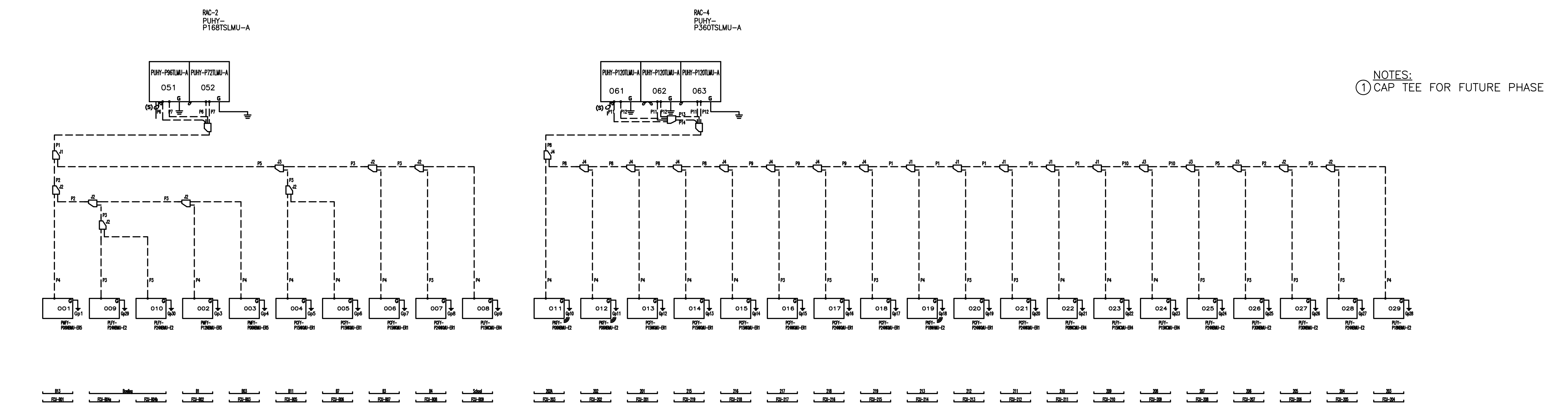
Waltham Community Center			
DIAGRAM	SYMBOL	LEGEND	PAGE
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PIPING LIST	
NO.	DESCRIPTION
P1	5/8" / 1-1/8"
P2	1/2" / 7/8"
P3	3/8" / 1-1/8"
P4	3/8" / 7/8"
P5	1/4" / 1-1/8"
P6	1/2" / 1-1/8"
P7	3/8" / 7/8"
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P9	1/2" / 1-1/8"
P10	3/8" / 7/8"

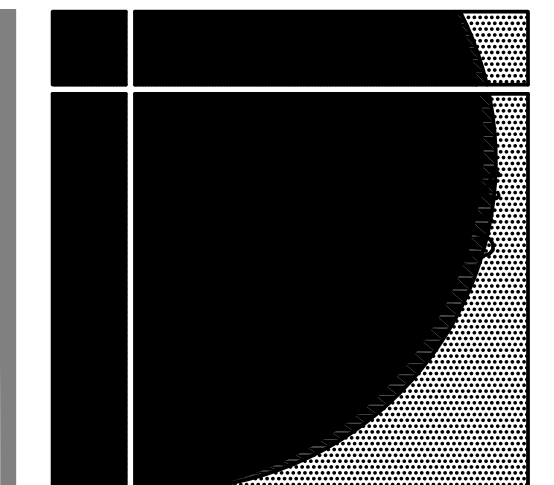


Waltham Community Center			
DIAGRAM	SYMBOL	LEGEND	PAGE
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PIPING LIST	
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P8	3/4" / 1-3/8"
P9	1/2" / 1-3/8"
P10	1/2" / 1-1/8"
P11	1/2" / 1-1/8"
P12	3/4" / 1-3/8"
P13	3/4" / 1-3/8"
P14	1-3/8" / 1-3/8"



NOTES:
 ① CAP TEE FOR FUTURE PHASE



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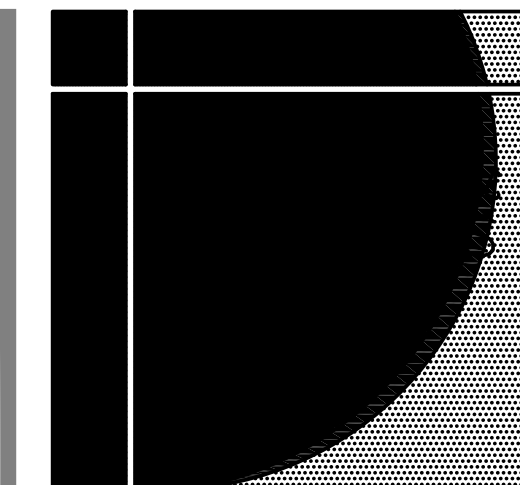
510 MOODY STREET
 WALTHAM, MA

PROJECT #: SED 16076
 DRAWN BY: ADR
 CHECKED BY: RL
 APPROVED BY: RL
 SCALE: NONE

STATUS:
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DRAWING:
HVAC PIPING SCHEMATICS

H5.02



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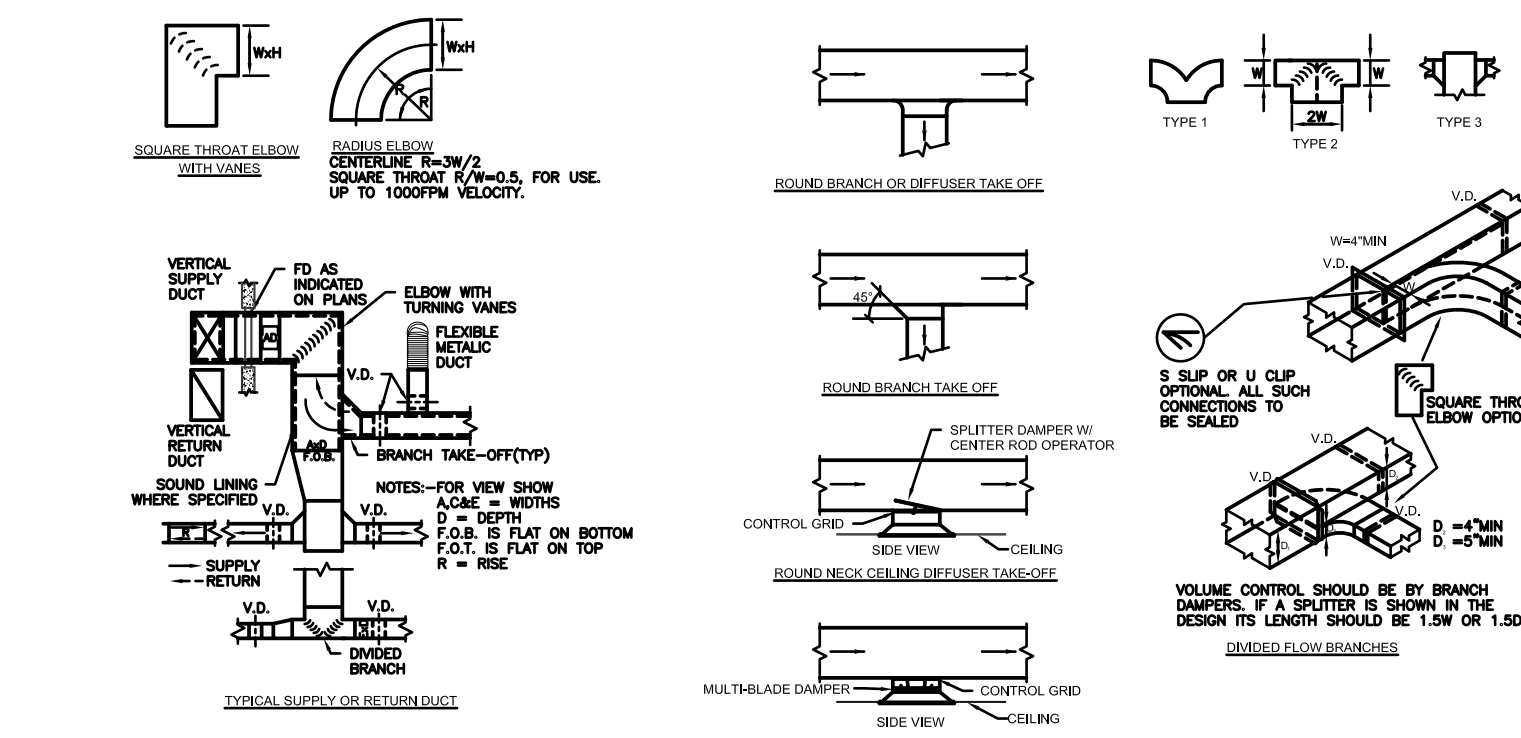
510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: ADR
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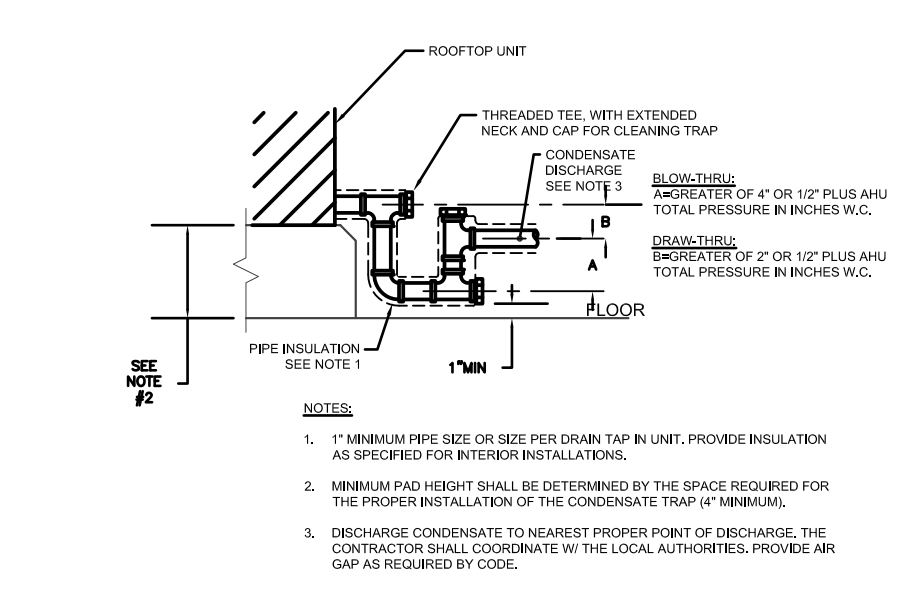
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DATE: 8/15/17
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DRAWING:
HVAC DETAILS

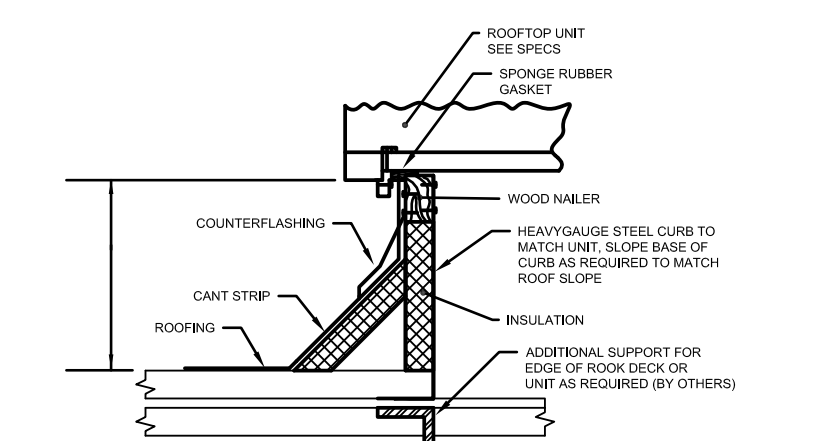
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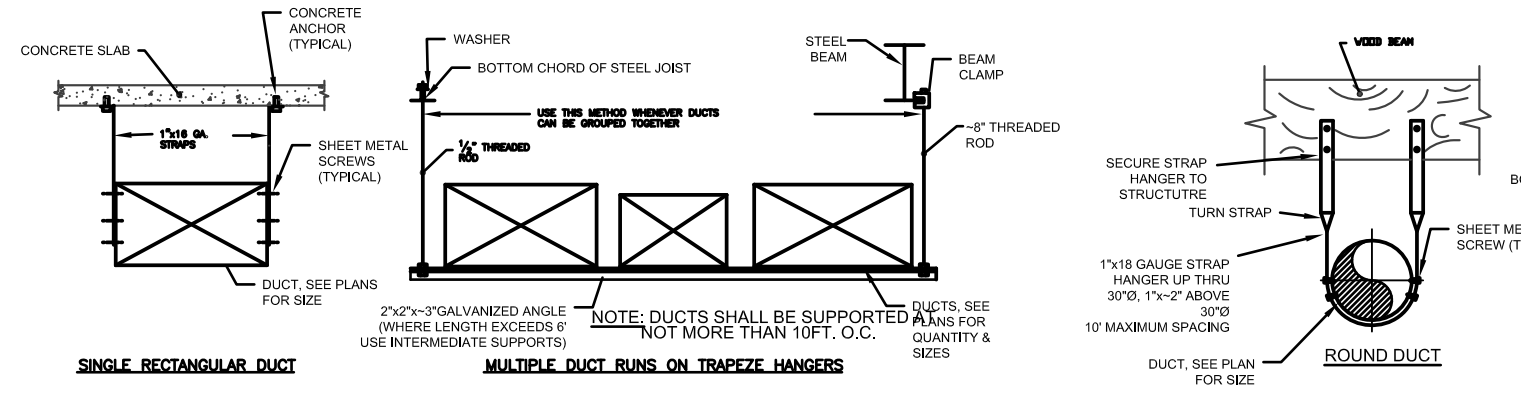
1 DUCTWORK DETAILS - TYPICAL
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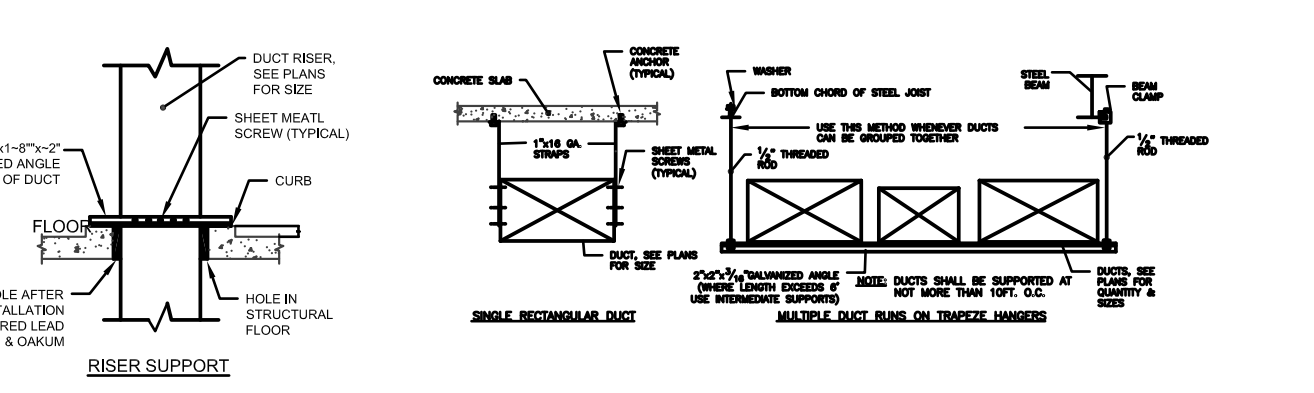
3 CONDENSATE DRAIN DETAIL - TYPICAL
NOT TO SCALE



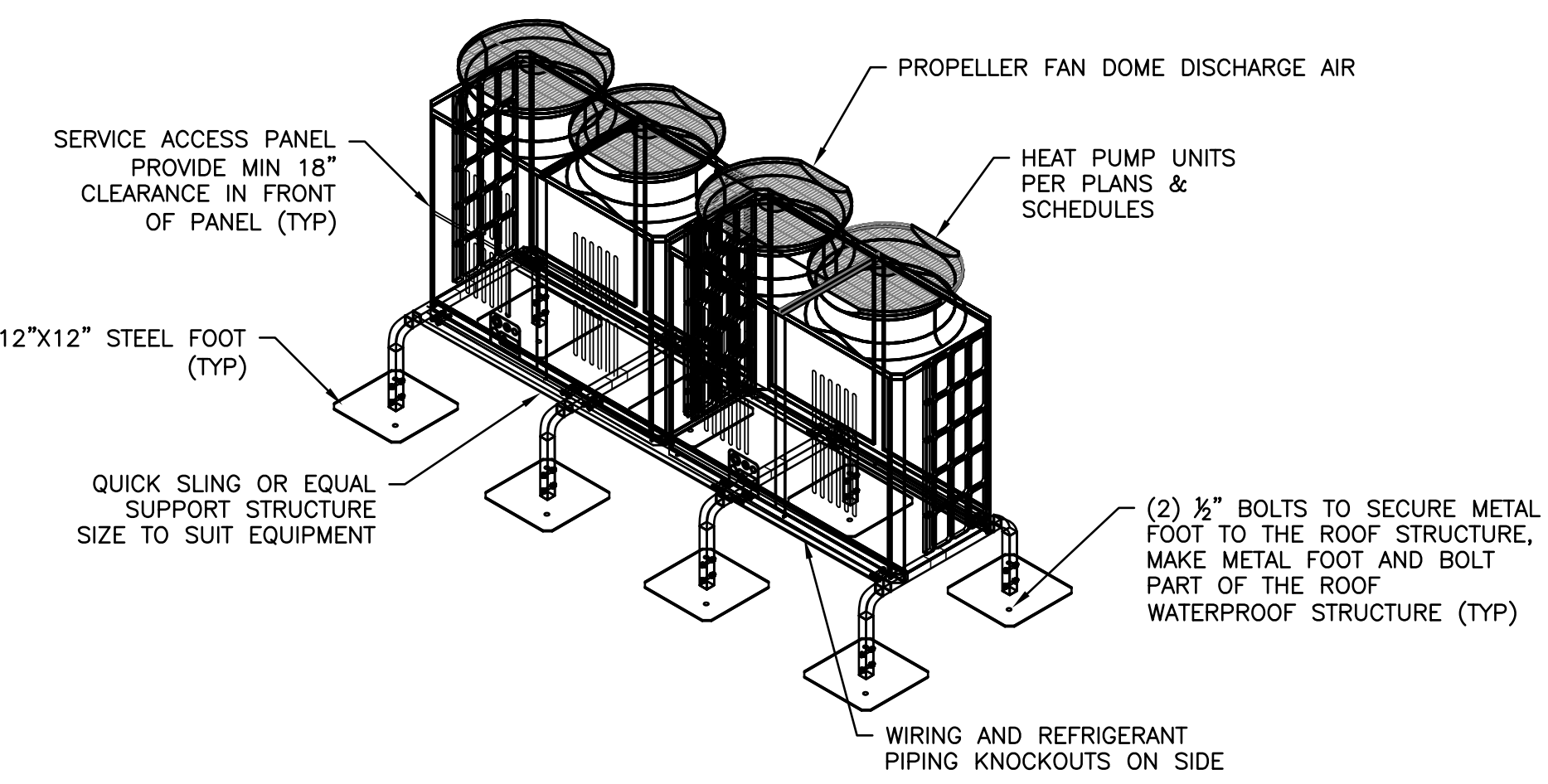
4 ROOFTOP EQUIPMENT CURB DETAIL
NOT TO SCALE



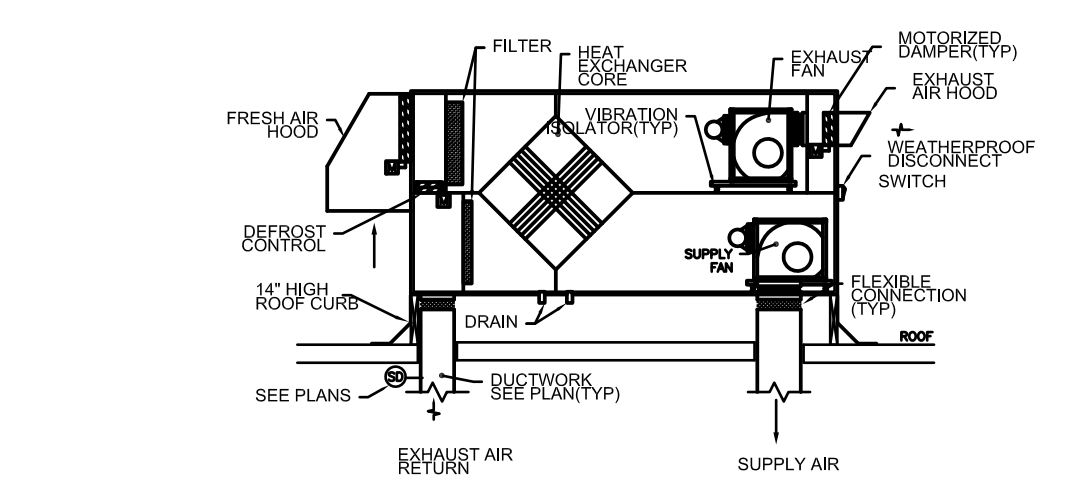
2 HANGER AND SUPPORT DETAILS FOR LOW PRESSURE DUCTWORK (THRU 2\"/>



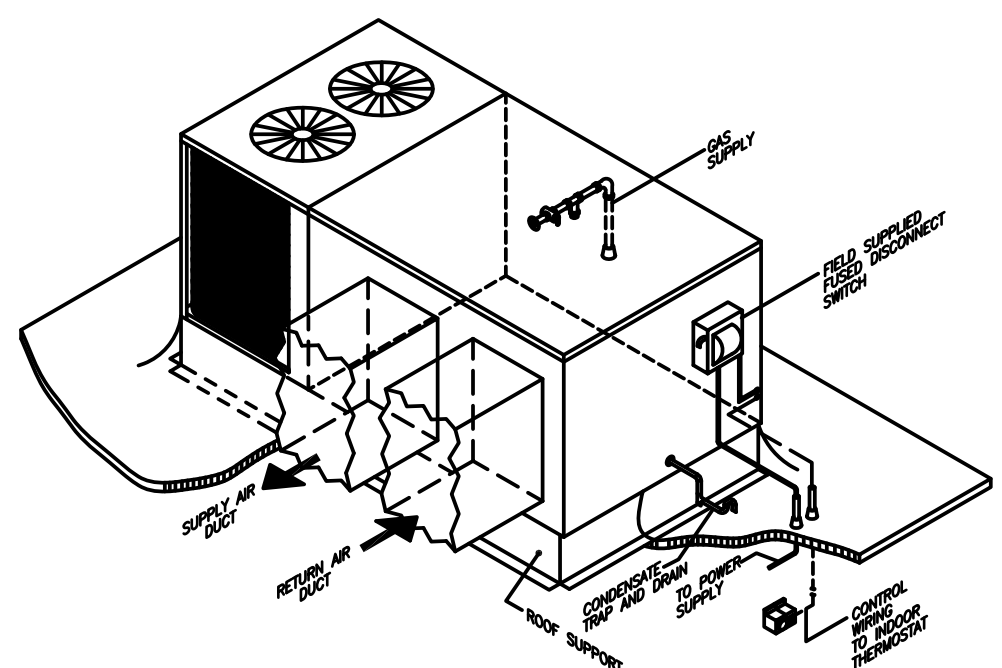
7 FIRE DAMPER DETAIL - TYPICAL
NOT TO SCALE



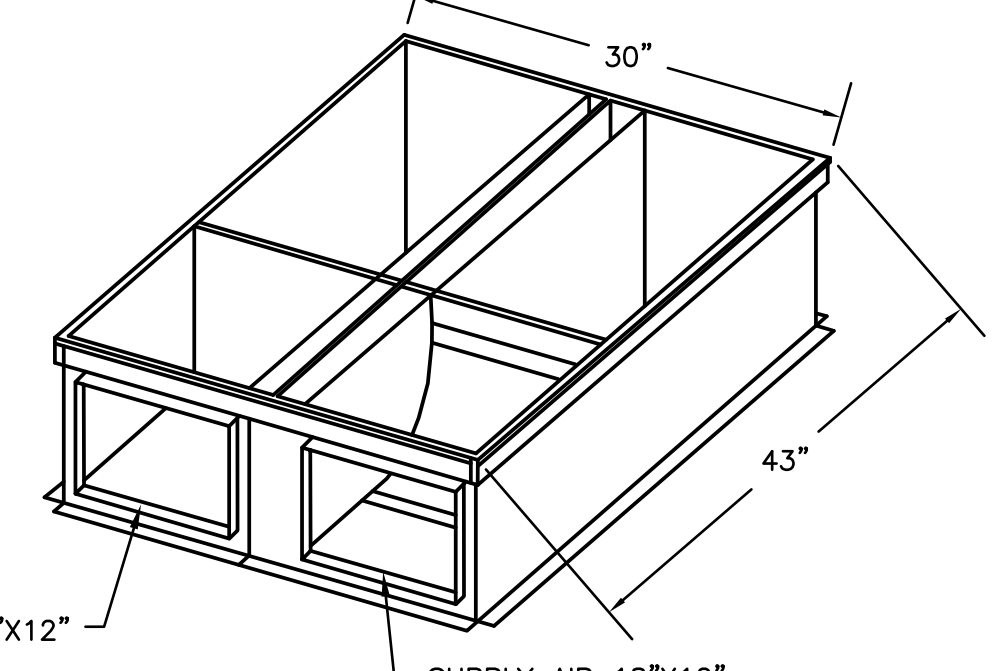
10 VRF REMOTE CONDENSER UNIT SUPPORT DETAIL - TYPICAL
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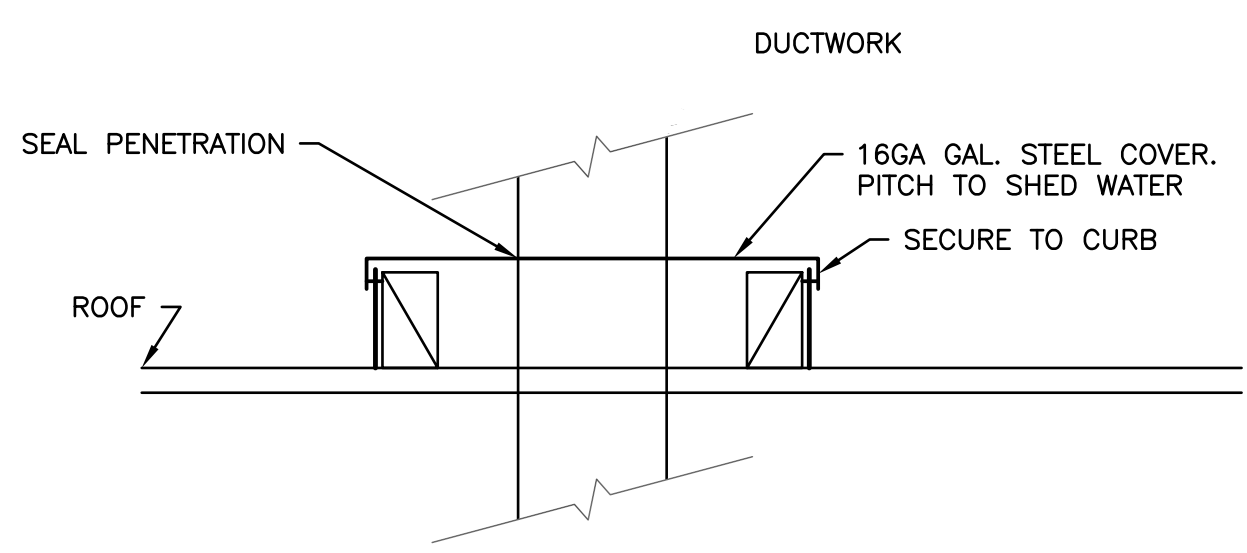
5 ERV ROOF - DETAIL
NOT TO SCALE



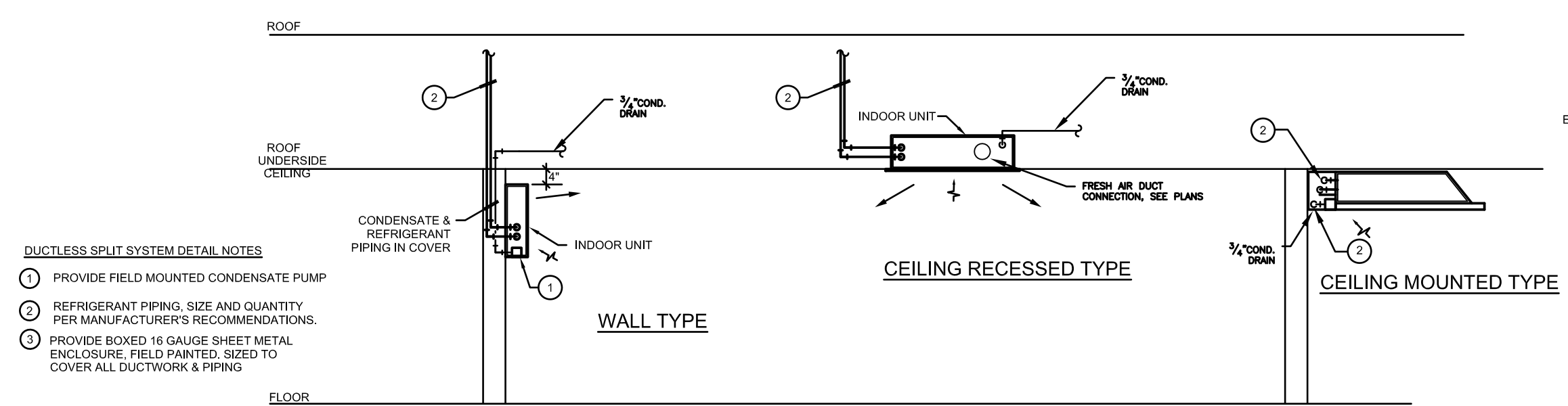
6 PACKAGED ROOFTOP DETAIL
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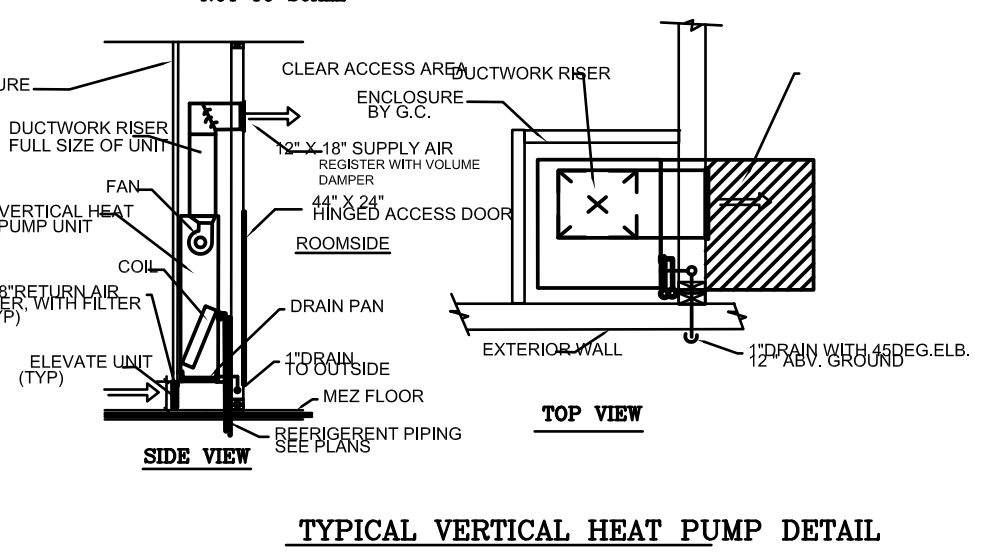
8 ERV CURB DETAIL
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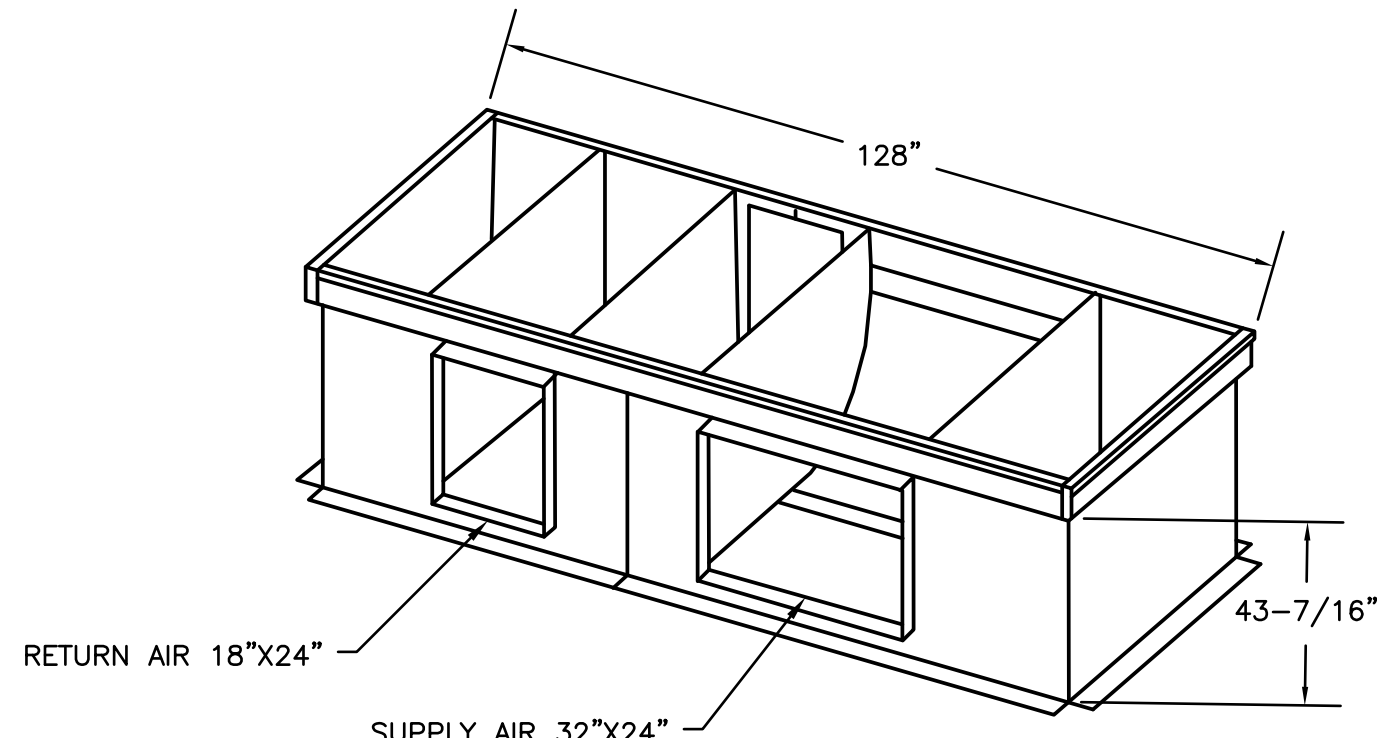
11 CURB CAP DETAIL - TYPICAL
NOT TO SCALE



9 DUCTLESS SPLIT SYSTEM UNIT TYPICAL DETAILS - TYPICAL
NOT TO SCALE



TYPICAL VERTICAL HEAT PUMP DETAIL



12 RTU-3 CURB DETAIL
NOT TO SCALE

MITSUBISHI CITY MULTI VRF INDOOR UNIT SCHEDULE																
RAC	Tag Reference	Room Name	Model	Type	Nominal Cooling Capacity (BTU/h)	Nominal Heating Capacity (BTU/h)	Cooling Design Entering Temp DB/WH (°F) / (Water in Temp)	Heating Design Entering Temp DB/WH (°F) / (Water in Temp)	Cooling Diversity Full/Partial (See Note 5, 6)	Cooling Total Capacity (BTU/h)	Heating Diversity Full/Partial (See Note 5, 6)	Heating Capacity (BTU/h)	Peak Fan Airflow (cfm) / (Liters/min)	Voltage / Phase	Notes / Options	
RAC-1	FCU-101	100	PUFY-P12N2CMU-ER4	Ceiling cassette (4-way airflow) type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,605.4	FULL DEMAND	8,463.1	390	208/230V/1-ph	8
RAC-1	FCU-102	100A	PMFY-P08N2BMU-E2	Ceiling cassette (1-way airflow) type	8,000.0	9,000.0	80.0/67.0	70.0	FULL DEMAND	8,020.0	6,223.5	FULL DEMAND	5,842.1	328	208/230V/1-ph	8
RAC-1	FCU-103	100B	PMFY-P08N2BMU-E2	Ceiling cassette (1-way airflow) type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	5,089.0	FULL DEMAND	4,200.2	307	208/230V/1-ph	8
RAC-1	FCU-106	100E	PMFY-P12N2CMU-E2	Ceiling cassette (1-way airflow) type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	7,916.2	FULL DEMAND	8,463.1	328	208/230V/1-ph	8
RAC-1	FCU-104	100C	PMFY-P08N2BMU-E2	Ceiling cassette (1-way airflow) type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	5,089.0	FULL DEMAND	4,200.2	307	208/230V/1-ph	8
RAC-1	FCU-105	100D	PMFY-P08N2BMU-E2	Ceiling cassette (1-way airflow) type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	5,089.0	FULL DEMAND	4,200.2	307	208/230V/1-ph	8
RAC-1	FCU-113	Auditorium	PFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-114	Auditorium	PFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-115	Auditorium	PFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-21	Auditorium	PMFY-P12N2CMU-E	Vertical type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	9,581.6	FULL DEMAND	8,463.1	400	208/230V/1-ph	7, 8
RAC-1	FCU-116	Auditorium	PMFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-117	Auditorium	PFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-22	Auditorium	PMFY-P12N2CMU-E	Vertical type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	9,581.6	FULL DEMAND	8,463.1	400	208/230V/1-ph	7, 8
RAC-1	FCU-118	Auditorium	PMFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-119	Auditorium	PFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-120	Auditorium	PFY-P12N2CMU-E	Floor standing type (concealed)	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,089.5	FULL DEMAND	8,463.1	318	208/230V/1-ph	7, 8
RAC-1	FCU-108	116/117	PKFY-P08N2BMU-E2	Wall mounted type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	4,264.8	FULL DEMAND	4,200.2	208	208/230V/1-ph	7, 8
RAC-1	FCU-109	117	PKFY-P08N2BMU-E2	Wall mounted type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	4,264.8	FULL DEMAND	4,200.2	208	208/230V/1-ph	7, 8
RAC-1	FCU-110	116	PKFY-P08N2BMU-E2	Wall mounted type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	4,264.8	FULL DEMAND	4,200.2	208	208/230V/1-ph	7, 8
RAC-1	FCU-111	115	PKFY-P12N2CMU-E2	Wall mounted type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,941.9	FULL DEMAND	8,463.1	413	208/230V/1-ph	7, 8
RAC-1	FCU-112	114	PCFY-P24N2CMU-E2	Ceiling type (suspended)	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,060.0	15,891.2	FULL DEMAND	16,926.2	636	208/230V/1-ph	7, 8
RAC-2	FCU-B01	B13	PMFY-P08N2BMU-E2	Ceiling cassette (4-way airflow) type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	5,089.0	FULL DEMAND	4,327.6	307	208/230V/1-ph	8
RAC-2	FCU-B04a	Bowling	PMFY-P24N2CMU-E2	Ceiling cassette (4-way airflow) type	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,060.0	17,162.9	FULL DEMAND	17,439.7	777	208/230V/1-ph	8
RAC-2	FCU-B04b	Bowling	PMFY-P24N2CMU-E2	Ceiling cassette (4-way airflow) type	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,060.0	17,162.9	FULL DEMAND	17,439.7	777	208/230V/1-ph	8
RAC-2	FCU-B02	B1	PMFY-P12N2CMU-E2	Ceiling cassette (1-way airflow) type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	7,916.2	FULL DEMAND	8,719.8	328	208/230V/1-ph	8
RAC-2	FCU-B03	B03	PMFY-P08N2BMU-E2	Ceiling cassette (1-way airflow) type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	5,089.0	FULL DEMAND	4,327.6	307	208/230V/1-ph	8
RAC-2	FCU-B05	B11	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,037.5	10,019.1	FULL DEMAND	10,980.5	459	208/230V/1-ph	7, 8
RAC-2	FCU-B06	B7	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,037.5	10,019.1	FULL DEMAND	10,980.5	459	208/230V/1-ph	7, 8
RAC-2	FCU-B07	B3	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,037.5	10,019.1	FULL DEMAND	10,980.5	459	208/230V/1-ph	7, 8
RAC-2	FCU-B08	B4	PCFY-P24N2CMU-E2	Ceiling type (suspended)	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,060.0	15,891.2	FULL DEMAND	17,439.7	636	208/230V/1-ph	7, 8
RAC-2	FCU-B09	School	PMFY-P15N2CMU-E2	Ceiling cassette (4-way airflow) type	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,037.5	9,916.5	FULL DEMAND	10,980.5	390	208/230V/1-ph	8
RAC-3	FCU-129	106	PMFY-P24N2CMU-E2	Ceiling cassette (4-way airflow) type	30,000.0	34,000.0	80.0/67.0	70.0	FULL DEMAND	30,075.1	20,829.9	FULL DEMAND	21,047.9	777	208/230V/1-ph	8
RAC-3	FCU-128	105	PMFY-P18N2CMU-E2	Ceiling cassette (4-way airflow) type	18,000.0	20,000.0	80.0/67.0	70.0	FULL DEMAND	18,045.0	13,646.8	FULL DEMAND	12,381.1	636	208/230V/1-ph	8
RAC-3	FCU-127	104	PMFY-P12N2CMU-E2	Ceiling cassette (4-way airflow) type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,605.4	FULL DEMAND	8,357.2	390	208/230V/1-ph	8
RAC-3	FCU-126	103	PMFY-P12N2CMU-E2	Ceiling cassette (4-way airflow) type	12,000.0	13,500.0	80.0/67.0	70.0	FULL DEMAND	12,030.0	8,605.4	FULL DEMAND	8,357.2	390	208/230V/1-ph	8
RAC-3	FCU-125	102	PKFY-P08N2BMU-E2	Wall mounted type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	4,264.8	FULL DEMAND	4,147.7	208	208/230V/1-ph	7, 8
RAC-3	FCU-124	101A	PKFY-P08N2BMU-E2	Wall mounted type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,015.0	4,264.8	FULL DEMAND	4,147.7	208	208/230V/1-ph	7, 8
RAC-3	FCU-123	101	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,037.5	10,019.1	FULL DEMAND	10,523.9	459	208/230V/1-ph	7, 8
RAC-3	FCU-130	107	PMFY-P30N2CMU-E2	Ceiling cassette (4-way airflow) type	30,000.0	34,000.0	80.0/67.0	70.0	FULL DEMAND	30,075.1	20,829.9	FULL DEMAND	21,047.9	777	208/230V/1-ph	8
RAC-3	FCU-131	108	PMFY-P24N2CMU-E2	Ceiling cassette (4-way airflow) type	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,060.0	17,162.9	FULL DEMAND	16,714.5	777	208/230V/1-ph	8
RAC-3	FCU-132	109	PMFY-P18N2CMU-E2	Ceiling cassette (4-way airflow) type	18,000.0	20,000.0	80.0/67.0	70.0	FULL DEMAND	18,045.0	13,646.8	FULL DEMAND	12,381.1	636	208/230V/1-ph	8
RAC-3	FCU-133	110	PMFY-P15N2CMU-E2	Ceiling cassette (4-way airflow) type	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,037.5	10,019.1	FULL DEMAND	10,523.9	459	208/230V/1-ph	7, 8
RAC-3	FCU-134	113	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,037.5	10,019.1	FULL DEMAND	10,523.9	459	208/230V/1-ph	7, 8
RAC-4	FCU-203	202A	PKFY-P08N2BMU-E2	Wall mounted type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,022.0	4,287.7	FULL DEMAND	3,902.0	208	208/230V/1-ph	7, 8
RAC-4	FCU-202	202	PKFY-P08N2BMU-E2	Wall mounted type	6,000.0	6,700.0	80.0/67.0	70.0	FULL DEMAND	6,022.0	4,287.7	FULL DEMAND	3,902.0	208	208/230V/1-ph	7, 8
RAC-4	FCU-201	201	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,054.9	10,026.6	FULL DEMAND	9,900.5	459	208/230V/1-ph	7, 8
RAC-4	FCU-219	215	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,054.9	10,026.6	FULL DEMAND	9,900.5	459	208/230V/1-ph	7, 8
RAC-4	FCU-218	216	PCFY-P15N2CMU-E2	Ceiling type (suspended)	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,054.9	10,026.6	FULL DEMAND	9,900.5	459	208/230V/1-ph	7, 8
RAC-4	FCU-217	217	PCFY-P24N2CMU-E2	Ceiling type (suspended)	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,087.9	15,703.4	FULL DEMAND	15,724.4	636	208/230V/1-ph	7, 8
RAC-4	FCU-216	218	PCFY-P24N2CMU-E2	Ceiling type (suspended)	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,087.9	15,703.4	FULL DEMAND	15,724.4	636	208/230V/1-ph	7, 8
RAC-4	FCU-215	219	PCFY-P24N2CMU-E2	Ceiling type (suspended)	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,087.9	15,703.4	FULL DEMAND	15,724.4	636	208/230V/1-ph	7, 8
RAC-4	FCU-214	213	PKFY-P18N2CMU-E2	Wall mounted type	18,000.0	20,000.0	80.0/67.0	70.0	FULL DEMAND	18,065.9	12,001.0	FULL DEMAND	11,647.7	424	208/230V/1-ph	7, 8
RAC-4	FCU-213	212	PCFY-P24N2CMU-E2	Ceiling type (suspended)	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,087.9	15,703.4	FULL DEMAND	15,724.4	636	208/230V/1-ph	7, 8
RAC-4	FCU-212	211	PCFY-P24N2CMU-E2	Ceiling type (suspended)	24,000.0	27,000.0	80.0/67.0	70.0	FULL DEMAND	24,087.9	15,703.4	FULL DEMAND	15,724.4	636	208/230V/1-ph	7, 8
RAC-4	FCU-211	210	PMFY-P08N2CMU-E2	Ceiling cassette (4-way airflow) type	8,000.0	9,000.0	80.0/67.0	70.0	FULL DEMAND	8,029.3	6,562.3	FULL DEMAND	5,241.5	350	208/230V/1-ph	8
RAC-4	FCU-210	209	PMFY-P15N2CMU-E2	Ceiling cassette (4-way airflow) type	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,054.9	9,924.0	FULL DEMAND	9,900.5	390	208/230V/1-ph	8
RAC-4	FCU-209	208	PMFY-P15N2CMU-E2	Ceiling cassette (4-way airflow) type	15,000.0	17,000.0	80.0/67.0	70.0	FULL DEMAND	15,054.9	9,924.0	FULL DEMAND	9,900.5	390	208/230V/1-ph	8

ROOFTOP EQUIPMENT SCHEDULE

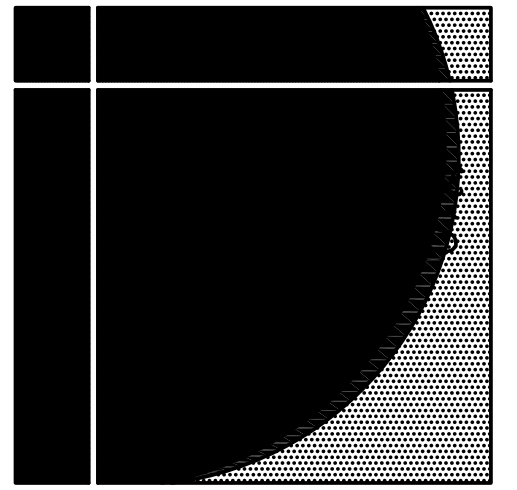
UNIT TAG	PHASE	SERVICE	SUPPLY			EXHAUST			RETURN	HEATING BURNER			WHEEL SUMMER			WHEEL WINTER			COOLING COIL					ELECTRICAL	MANUFACTURER	MODEL#	REMARKS	WEIGHT	DIMENSIONS		
			AIR FLOW (CFM)	ESP (IN W.G.)	MOTOR (HP)	AIR FLOW (CFM)	ESP (IN W.G.)	MOTOR (HP)	AIR FLOW (CFM)	INPUT (MBH)	OUTPUT (MBH)	STAGES (MODULE)	INTAKE (OSA) AIR		EXHAUST (RM) AIR		INTAKE (ROOM) AIR		EXHAUST (LVG) AIR		ENT. AIR (deg.F)	LVG. AIR (deg.F)	CAPACITY (TMBH/SMBH)							SCROLL COMPRES (QTY)	MOTOR HP
													ENT. (dB/wB)	LVG. (dB/wB)	ENT. (dB/%RH)	ENT. (dB/wB)	LVG. (dB/wB)	ENT. (dB/%RH)	ENT. (dB/wB)	LVG. (dB/wB)											
RTU-1	4	SKATE & SCOOT	3000	0.75	2	2200	0.75	-	800	180	144	2	94/78	78.6/66.8	75/50	0/0	56.2/46	72/35	78.6/66.8	57.5/55.7	98.5/63.7	2	-	208/3PH	YORK	J08ZJS18B2B6FCD4E1	ROOF	1225			
RTU-2	2	GYM	4400	0.75	5	1300	0.75	-	2100	180	144	2	94/78	79.8/67.8	75/50	0/0	56.3/46	72/35	79.8/67.8	52.9/52.4	146.9/101.1	2	-	208/3PH	YORK	J12ZJS18D2B6FCD4E1	ROOF	1475			
RTU-3	3	AUDITORIUM	2300	0.75	2	2300	0.75	2	-	225	205	1	94/78	81.3/69.1	75/50	0/0	51.6/43.1	72/35	81.3/69.1	54.4/54.4	110.37/71.57	2	-	208/3PH	YORK	JDMA-120	ROOF	2273			
ERV-1	5	BOWLING	600	0.75	1.5	600	0.75	1.5	-	-	-	-	94/78	77/65	75/50	0/0	59/48	72/35	-	-	-	-	-	208/3PH	YORK	VD-11	ROOF	389			

ELECTRIC DUCT HEATER SCHEDULE

Tag	Service	AirFlow(CFM)	Heat(KW)	Steps	Duct Size	Duct Adapter	Electrical	Manuf: Warren Tech inc.
EDH-1	ERV-1	600	5	1	12X12	10"ø	120/208-1PH	MODEL: SL5A

NOTES:

1. Provide with ductwork transitions as required.
2. Provide supports to suit.



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PROJECT:

Waltham Community
Cultural Center
HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: ADR
CHECKED BY: RL
APPROVED BY: RL
SCALE: NONE

STATUS:

- SCHEMATIC DESIGN
- REVIEW
- DESIGN DEVELOPMENT
- FINAL REVIEW
- BIDDING
- PERMIT
- CONSTRUCTION
- NOT FOR CONSTRUCTION
- AS-BUILT

DATE: 8/15/17

REVISIONS:

△	△
△	△
△	△
△	△

DRAWING:

HVAC
SCHEDULES II

H7.02

GENERAL ELECTRICAL NOTES

- ALL ELECTRICAL EQUIPMENT AND INSTALLATION WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL, MASSACHUSETTS STATE AND LOCAL CITY BUILDING AND ELECTRICAL CODES APPLICABLE SECTIONS. ALL ELECTRICAL PERMITS AND INSPECTIONS AND ANY ASSOCIATED COSTS SHALL BE OBTAINED AND PAID FOR BY THE ELECTRICAL CONTRACTOR.
- ALL ELECTRICAL MATERIAL SHALL BE OF THE HIGHEST QUALITY SPECIFICATION GRADE AND UL LISTED. THE ELECTRICAL CONTRACTOR SHALL SUBMIT ALL ELECTRICAL MATERIAL SHOP DRAWINGS TO THE ENGINEER FOR REVIEW AND ACCEPTABILITY PRIOR TO INSTALLATION.
- ALL ELECTRICAL INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE LOCAL ELECTRICAL INSPECTOR REQUIREMENTS. THE ELECTRICAL CONTRACTOR SHALL COORDINATE ALL ELECTRICAL INSPECTOR REQUIREMENTS PRIOR TO ANY CONSTRUCTION.
- ALL ELECTRICAL CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE PROJECT'S CONSTRUCTION PHASING PLAN. ALL EXISTING ELECTRICAL SYSTEMS SHALL BE KEPT FULLY OPERATIONAL WITH MINIMUM SHUTDOWNS UNTIL THE NEW SYSTEMS ARE FULLY OPERATIONAL. ALL SYSTEMS DISRUPTIONS AND SHUTDOWNS MUST BE PLANNED, SCHEDULED AND ACCEPTABLE TO THE OWNER/TENANT.
- ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL HAVE ENGRAVED PLASTIC NAMEPLATES. ALL PANELBOARDS CIRCUIT DIRECTORIES SHALL BE TYPED. ALL WIRING SHALL BE IDENTIFIED BY ALPHANUMERICAL TAGS.
- ALL ELECTRICAL CONDUCTORS SHALL BE COPPER WITH TYPE "THHN/THWN" INSULATION. THE MINIMUM CONDUIT AND POWER CONDUCTOR SIZES SHALL BE 3/4 INCH AND # 12 AWG. RACEWAYS SHALL BE TERMINATED WITH FLEXIBLE RACEWAYS TO EQUIPMENT FOR BOTH VIBRATION ISOLATION AND MAINTENANCE.
- ALL MATERIAL AND CONSTRUCTION WORK SHALL BE ROUGH AND FINAL INSPECTED BY THE ENGINEER AND TOWN CODE ENFORCEMENT OFFICIAL PRIOR TO ACCEPTANCE. ALL CIRCUITS AND EQUIPMENT SHALL BE VERIFIED FOR PROPER WIRING AND OPERATION.
- CONDUIT RUNS ARE SHOWN DIAGRAMMATICALLY ONLY AND SHALL BE INSTALLED IN A MANNER TO PREVENT CONFLICTS WITH EQUIPMENT AND BUILDING CONDITIONS. ALL "AS-SUPPLIED" ELECTRICAL EQUIPMENT AND WIRING MUST BE FULLY COORDINATED BY THE EC PRIOR TO RELEASE AND/OR INSTALLATION.
- EC SHALL FIELD SURVEY AND REVISE THE ELECTRICAL EQUIPMENT WIRING IF FOUND TO BE AFFECTED BY ANY DEMOLITION AND/OR NEW CONSTRUCTION. INCLUDING BUT NOT LIMITED TO RELOCATION OF ANY EXISTING ELECTRICAL WIRING IN THE WALLS WHICH ARE BEING DEMOLISHED AND THE REMOVAL OF ANY UNUSED ELECTRICAL CONDUCTORS.
- THE EQUIPMENT LAYOUTS, CONDUIT/WIRE SIZES AND WIRING DIAGRAM REPRESENT A SUGGESTED DESIGN BASED UPON GENERALLY AVAILABLE ELECTRICAL EQUIPMENT SIZES AND WIRING REQUIREMENTS. THIS ALSO APPLIES TO EQUIPMENT PROVIDED BY OTHERS BUT WIRED BY THE ELECTRICAL CONTRACTOR. MODIFICATION ACCEPTABLE TO THE ARCHITECT MAY BE MADE BY THE ELECTRICAL CONTRACTOR TO ACCOMMODATE ACTUALLY INSTALLED EQUIPMENT. THE BASIC SEQUENCE AND METHOD OF CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS. THE ELECTRICAL CONTRACTOR SHALL COORDINATE ALL EQUIPMENT WIRING REQUIREMENTS, PRIOR TO ANY CONSTRUCTION. PRIOR TO RELEASING EQUIPMENT FOR PURCHASE AND INSTALLATION, EC SHALL PROVIDE COMPLETE 1/4" SCALE PLANS FOR ALL SPACES CONTAINING ELECTRICAL EQUIPMENT, USING ACTUAL EQUIPMENT DIMENSIONS, SHOWING ALL EQUIPMENT, AND CONDUITS, AND ALL REQUIRED CODE AND INSTALLATION CLEARANCES.
- ALL ITEMS REQUIRING ELECTRICAL POWER, AND SHOWN ON THE ELECTRICAL DRAWINGS, WHETHER OR NOT A CIRCUIT HAS BEEN ASSIGNED, SHALL BE POWERED AND WIRED BY THE EC, UNLESS SPECIFICALLY NOTED OTHERWISE. EC SHALL INCLUDE ALL SUCH ITEMS IN ITS BID, ASSUMING, FOR BIDDING PURPOSES, THAT THE CIRCUIT EMANATES FROM THE SAME SOURCE AS OTHER SIMILAR ITEMS IN THE AREA. NO ADDITIONAL FUNDING WILL BE ALLOWED FOR WIRING OF ITEMS SHOWN IN THE ELECTRICAL DRAWINGS BUT NOT ASSIGNED A SPECIFIC CIRCUIT, UNLESS CIRCUIT SOURCE DIFFERS SIGNIFICANTLY FROM ABOVE ASSUMPTION.
- CONDUIT AND WIRE AS INDICATED BY THE CONDUIT/WIRE SCHEDULE SHALL BE GALVANIZED RMC, EMT OR MC AS SPECIFIED FOR DIFFERENT AREAS. GENERALLY, THE TYPES OF WIRING PER BUILDING AREA ARE AS FOLLOWS:

GENERALLY, ALL LOW VOLTAGE WIRING SHALL BE INSTALLED EXPOSED ABOVE HUNG CEILING, IN WALLS, ETC. EXCEPT FOR INSTALLATION IN OR ON HARD MASONRY WALLS OR FLOORS. FOR CONCEALED WIRING WITHIN MASONRY WALLS USE EMT SLEEVES FROM THE OUTLET TO ABOVE THE CLOSEST HUNG CEILING. FOR CONCEALED WIRING WITHIN CONCRETE FLOORS USE PVC SLEEVES FROM THE OUTLET TO ABOVE THE CLOSEST HUNG CEILING. USE SURFACE MOUNTED RACEWAYS FOR EXPOSED WIRING ON EXISTING MASONRY WALLS WHICH CANNOT BE FISHED WITH CONCEALED WIRING.

IN THE BUILDING AREAS WITH HUNG CEILINGS, GENERALLY ALL ELECTRICAL WIRING SHALL BE CONCEALED ABOVE THE HUNG CEILINGS AND WITHIN THE WALLS, SOFFITS AND FURRED OUT BUILDING STRUCTURE BEAMS.

A) USE TYPE "EMT" WIRING FOR ALL EXPOSED WIRING IN AREAS WITHOUT HUNG CEILINGS.

B) USE TYPE "MC" WIRING FOR ALL WIRING WITHIN WALLS, BEAMS AND ABOVE HUNG CEILINGS. ALL EXISTING WALLS SHALL BE "FISHED" WITH NEW "MC" WIRING UNLESS EXISTING WALLS ARE HARD MASONRY TYPE WALLS WHERE SURFACE MOUNTED RACEWAYS (WIREFOLD TYPE "G6000") SHALL BE FURNISHED AND INSTALLED.

C) USE FA MC CABLE FOR CONCEALED FA WIRING. MC CABLE FOR AUDIBLE/VISUAL DEVICES SHALL BE SINGLE MC CABLE WITH INTEGRAL 12/2(STROBES) AND 16TSP (SPEAKERS)

D) USE TYPE "PVC-40" WIRING FOR ALL WIRING WITHIN THE CONCRETE AND BUILDING FLOORS AND "EMT" WIRING WITHIN MASONRY WALLS.

E) USE TYPE GALVANIZED "RMC" WIRING FOR ALL OUTDOOR WIRING.
- ALL CONCRETE FLOOR CUTTING, PATCHING, ETC. SHALL BE FURNISHED AND INSTALLED BY THE GENERAL CONTRACTOR. ALL ELECTRICAL SLEEVES (I.E. - THRU WALLS, ETC.) AND CORING SHALL BE URNISHED AND INSTALLED BY THE EC.
- CONDUIT AND WIRE NOT SHOWN INTERCONNECTING THE FIRE ALARM, DEVICES SHALL BE PROVIDED AS INDICATED IN THE CONTRACT DOCUMENTS.
- PANELBOARD 3-PHASE BRANCH CIRCUIT HOMERUNS SHALL PROVIDED WITH OVERSIZED NEUTRALS.
- OUTLET BOXES, SWITCHES, RECEPTACLES, PULL/JUNCTION BOXES, TERMINAL BOXES, ETC. SHALL BE PROVIDED WITH NEMA "1" ENCLOSURES FOR ALL INDOOR LOCATIONS AND NEMA "3R" ENCLOSURES FOR ALL OUTDOOR LOCATIONS.
- ALL WIRING PENETRATIONS THRU FIRE OR SMOKE RATED WALLS AND FLOORS SHALL BE SEALED WITH A FIRE STOPPING CAULKING. ALL WIRING CROSSING BUILDING EXPANSION JOINTS SHALL HAVE EXPANSION FITTINGS. ALL FIRE STOPPING SHALL BE FURNISHED AND INSTALLED BY THE GENERAL CONTRACTOR.
- ALL ELECTRICAL EQUIPMENT AND ASSOCIATED WIRING SHALL BE FURNISHED, INSTALLED AND WIRED IN STRICT ACCORDANCE WITH ALL APPLICABLE MANUFACTURER'S TECHNICAL REQUIREMENTS. CONTRACTOR'S WORK INCLUDES ALL NECESSARY COORDINATION WITH MANUFACTURER'S RECOMMENDATIONS.
- EC'S WORK INCLUDES ALL COORDINATION WITH "AS-SUPPLIED" EQUIPMENT. ALL MINOR ELECTRICAL REVISIONS SHALL BE PROVIDED BY THE EC TO SUIT THE ACTUAL EQUIP/BLDG CONDITIONS WITHOUT ANY ADDITIONAL COSTS TO THE OWNER. NO ROUGH WIRING START UNTIL A MECHANICAL EQUIPMENT LAYOUT HAS BEEN APPROVED BY THE MECHANICAL CONTRACTOR.
- ELECTRICAL EQUIPMENT LAYOUT HAS BEEN DRAWN TO SCALE BASED ON SQUARE D EQUIPMENT. OTHER ACCEPTABLE MANUFACTURERS INCLUDE Eaton, General Electric, and SIEMENS.

- EC SHALL NOTE THE HVAC AUTOMATIC TEMPERATURE CONTROLS AND ASSOCIATED WIRING IS PART OF THE HVAC CONTRACTOR'S WORK. HOWEVER, ALL ATC WORK (I.E. - EQUIP AND WIRING) SHALL BE COMPLETED IN STRICT ACCORDANCE WITH THE APPLICABLE ELECTRICAL CONTRACT DOCUMENT'S TECHNICAL REQUIREMENTS.
- EC WORK ALSO INCLUDES ALL REQUIRED TECH ASSISTANCE TO THE GC AND THEIR EQUIP REPS DURING THE NEW HVAC EQUIPMENT FIELD TESTING.
- EC SHALL FURNISH/INSTALL NEW ACCESS PANELS TO ALLOW THE INSTALLATION OF NEW ELECTRICAL WIRING ABOVE THE HARD CEILINGS ON THE BUILDING'S CORRIDOR. CONDUITING ELECTRICAL JUNCTION BOXES WILL NOT BE ACCEPTABLE. EC SHALL SURVEY THE EXISTING BUILDING CONDITIONS TO DETERMINE THE NUMBER OF REQUIRED ACCESS PANELS.

GENERAL ELECTRICAL DEMOLITION NOTES

- PRIOR TO STARTING NEW WORK, THE ELECTRICAL CONTRACTOR (EC) MUST VISIT THE SITE IN ORDER TO DETERMINE IF THERE ARE ANY CONFLICTS BETWEEN THE CONSTRUCTION DOCUMENTS AND THE ACTUAL EXISTING BUILDING CONDITIONS THAT COULD AFFECT THE DEMOLITION/NEW WORK.
- NO EXISTING AS-BUILT ELECTRICAL DRAWINGS ARE AVAILABLE. THE ELECTRICAL CONTRACTOR (EC) SHALL PROVIDE ALL NECESSARY MATERIAL AND LABOR TO SELECTIVELY DEMOLISH/REVISE THE INDICATED EXISTING EQUIPMENT, LIGHTING FIXTURES, CONTROLS AND WIRING AS REQUIRED DUE TO THE ELECTRICAL, MECHANICAL AND GENERAL CONSTRUCTION DEMOLITION AND NEW CONSTRUCTION WORK.
- EC SHALL NOTE THAT EXIST ELECTRICAL DEVICES INDICATED ON THE DRAWINGS ARE NOT "AS BUILT". INFORMATION INDICATED WAS OBTAINED FROM A/E GENERAL FIELD WALK-THRU INVESTIGATIONS. EC SHALL MAKE FIELD ADJUSTMENTS AND DEMOLITION SCOPE OF WORK ADJUSTMENTS AS NECESSARY DURING THE FIELD SURVEYS AND ELECTRICAL DEMOLITION WORK. NOTE, NOT ALL OF THE EXISTING ELECTRICAL EQUIPMENT/DEVICES ARE INDICATED ON THE DRAWINGS. EC SHALL VISIT THE SITE PRIOR STARTING NEW WORK TO DETERMINE CONFLICTS ON THE EXIST BLDG CONDITIONS.
- THE ELECTRICAL DEMOLITION WORK SHALL BE PERFORMED BY THE ELECTRICAL CONTRACTOR IN COOPERATION WITH THE OTHER TRADES AND AS SCHEDULED AND APPROVED BY THE GC. THE DEMO WORK SHALL INCLUDE THE FIELD SURVEY AS SPECIFIED, AND SHALL BE COMPLETED IN ACCORDANCE WITH THE OVERALL PROJECT PHASING PLAN.
- ELECTRICAL DEMOLITION WORK INCLUDES FIELD SURVEY OF EXISTING ELECTRICAL FEEDERS ASSOCIATED WITH THE DEMOLISHED MECHANICAL EQUIPMENT INCLUDING FIRE ALARM WIRING FOR DUCT MOUNTED SMOKE DETECTORS. SUCH FIELD SURVEYS SHALL INCLUDE LOCATING CONDUITS AND/OR WIRING WHICH MIGHT BE ACCIDENTALLY CUT INTO OR DAMAGED DURING ELECTRICALLY- OR MECHANICALLY- ASSOCIATED CORE DRILLING DURING THE CONSTRUCTION PHASE.
- THE ELECTRICAL SUBCONTRACTOR SHALL PROVIDE FIELD SURVEY MARKED UP ELECTRICAL DRAWINGS, "AS-BUILT" ELECTRICAL DRAWINGS, AND INTERCONNECTION WIRING DIAGRAMS. NO ROUGH WIRING SHALL COMMENCE UNTIL THE INTERCONNECTION WIRING DIAGRAMS HAVE BEEN SUBMITTED/APPROVED. REFER TO PHASING, SITE AND BUILDING CONSTRUCTION SCHEDULE. IT IS OF THE UTMOST IMPORTANCE THAT ALL EXISTING TO BE DEMOLISHED POWER AND LOW VOLTAGE WIRING & CONDUITS, ASSOCIATED WITH THE DEMOLISHED MECHANICAL EQUIPMENT BE FULLY FIELD-TRACED AND DOCUMENTED AS TO EXACT ROUTING LOCATIONS AND ENDPOINTS. THIS DOCUMENTED INFORMATION SHALL BE MADE AVAILABLE TO THE GC FOR DISTRIBUTION TO THE APPROPRIATE TRADES PRIOR TO COMMENCING ANY DEMO WORK, TO MINIMIZE ACCIDENTAL CUTTING OF WIRES AND DISRUPTION OF SERVICES.
- ALL EXISTING CONDUIT/WIRING AND JUNCTION BOXES NOT BEING REUSED SHALL BE REMOVED. CONDUIT TURNING UP IN WALLS BEING REMOVED SHALL BE CUT FLUSH WITH FLOORS. CUT RACEWAY SHALL BE GROUDED BY THE GENERAL CONTRACTOR. THE EC SHALL ASSUME THE WORST CASE FOR EXISTING WIRING (I.E. - CONCEALED OR EXPOSED) FOR PRICING OF THE ELECTRICAL DEMOLITION WORK.
- ALL POWER SOURCES FEEDING CIRCUITS, FEEDERS OR EQUIPMENT THAT ARE TO BE REMOVED SHALL BE DISCONNECTED AND "TAGGED OFF" AT THE SOURCE PRIOR TO REMOVAL OF ANY WORK PER OSHA REQUIREMENTS.
- ALL EXISTING ELECTRICAL POWER WIRING, RACEWAYS, PANELBOARDS, PULL BOXES, JUNCTION BOXES, LIGHTING FIXTURES, DEVICES AND SUPPORTS NOT SHOWN ON THE PLAN SHALL REMAIN UNLESS THE AREA IS TO BE REVISED ONLY TO THE EXTENT SHOWN ON THE CONTRACT DRAWINGS.
- ALL DEMOLITION WORK MUST BE PROVIDED IN STRICT ACCORDANCE WITH THE MASSACHUSETTS ELECTRICAL CODE, NATIONAL CODES AND ALL LOCAL CODES, AND THE APPROVAL OF THE ENGINEER, ARCHITECT AND OWNER.
- PRIOR TO REMOVAL FROM THE SITE, ALL ELECTRICAL EQUIPMENT, CONDUIT AND WIRE SHALL BE EXAMINED BY REPRESENTATIVES OF THE SCHOOL TO DETERMINE IF ANY MATERIALS WILL BE RETAINED FOR MAINTENANCE OR SALVAGE PURPOSES. ANY KEPT LITG SHALL BE BOXED, LABELED AND DELIVERED TO THE BUILDING OWNER FOR THEIR STORAGE.
- ANY NON-EXPOSED ELECTRICAL CONDUIT OR WIRING UNCOVERED BY THE REMOVAL OF EXISTING PARTITIONS, WALLS OR CEILINGS THAT SUPPLIES POWER TO CIRCUITS OR EQUIPMENT THAT ARE TO REMAIN, SHALL BE RELOCATED OR REROUTED TO SUIT THE FIELD CONDITIONS INCLUDING NEW CONSTRUCTION.
- ALL EXISTING ELECTRICAL WORK, CONDUIT, JUNCTION BOXES, CIRCUITS, SPLICES, ETC. TO REMAIN SHALL BE LEFT IN SATISFACTORY OPERATING CONDITION IN COMPLIANCE WITH ALL CODES AND CONDITIONS AS SPECIFIED UNDER THIS CONTRACT.
- ALL CONFLICTS BETWEEN EXISTING CONCEALED ELECTRICAL WORK AND THE INSTALLATION OF NEW WORK OF ANY TRADE SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER FOR RESOLUTION PRIOR TO PROCEEDING WITH THE WORK.
- ADEQUATE ACCESS SHALL BE PROVIDED FOR ALL NEW OR RELOCATED EQUIPMENT, JUNCTION OR PULL BOXES TO COMPLY WITH CODES.
- THE LOCATIONS OF EXISTING EQUIPMENT TO REMAIN, ARE SHOWN IN AN APPROXIMATE LOCATION ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING EQUIPMENT BEFORE COMMENCING WORK. THE EC AGREES TO BE RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THEIR FAILURE TO EXACTLY LOCATE AND PROTECT ANY AND ALL EQUIPMENT.
- EC SHALL KEEP ALL ELEC SYSTEMS "ON LINE" WITH MINIMUM SHUTDOWNS WHICH ARE SCHEDULED AND APPROVED BY THE SCHOOL MANAGEMENT STAFF. SHUT-DOWNS SHALL BE COORDINATED WITH POWER UTILITY COMPANY BEFORE COMMENCING WORK IN THE MAIN SWITCHBOARD. ANY PRIME TIME REQUIRED TO PERFORM ELECTRICAL DEMOLITION WORK OR NEW ELECTRICAL WORK SHALL BE CARRIED AS PART OF THE CONTRACT COST.
- PRIOR TO DE-ENERGIZING ANY PANELBOARDS, BRANCH CIRCUITS OR OTHER ELECTRICAL EQUIPMENT, EC SHALL FIELD SURVEY TO VERIFY NO CRITICAL EQUIPMENT, LIGHTING, RECEPTACLES, ETC WILL BE ADVERSELY AFFECTED.
- ALL REMOVED ELECTRICAL DEVICES IN EXISTING "GYP-BOARD" WALLS OR CEILINGS TO REMAIN SHALL HAVE ASSOCIATED BOXES AND CONDUITS REMOVED, SO WALL/CEILING CAN BE PATCHED AND REFINISHED. ALL REMOVED ELECTRICAL DEVICES IN EXISTING "BLOCK" WALLS TO REMAIN SHALL HAVE BLANKING FIELD PAINTABLE PLATES, MATCHING EXISTING BUILDING STANDARD, FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR. ALL FIELD PATCHING AND REFINISHING SHALL BE BY GENERAL CONTRACTOR.
- EC SHALL CONTACT AND COORDINATE ALL FIRE ALARM DEVICES AND DEMOLITION WORK WITH THE SCHOOL'S FIRE ALARM O&M CONTRACTOR/SUPPLIER. THE EC'S WORK INCLUDES MAINTAINING A TEMPORARY FA SYSTEM INCLUDING BUT NOT LIMITED TO HEAT DETECTORS, PULL STATIONS AND SIGNALING DEVICES. ONLY THE SCHOOL'S FA CONTRACTOR SHALL DISCONNECT AND RECONNECT ANY ACTIVE FA WIRING.

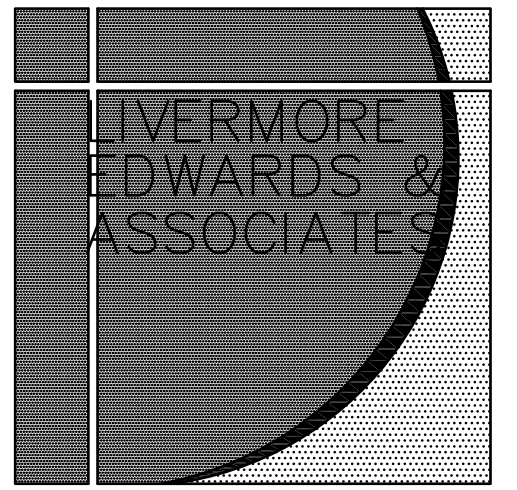
ELECTRICAL ABBREVIATIONS LIST

A	AMPERES
AF	AMP FRAME
AF	ABOVE FINISHED FLOOR
AIC	AMPERES INTERRUPTING CAPACITY
AL	ALUMINUM
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
CLF	CURRENT LIMITING FUSE
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CP	CONTROL PANEL OR EQUIPMENT'S CONNECTION PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CT	CURRENT TRANSFORMER
CTL	CONTROL
CWS	CONDUIT WALL SLEEVE
E	EXISTING TO REMAIN
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
E/G	ENGINE GENERATOR
EM	EXISTING ELECTRICAL EQUIPMENT OR DEVICE TO BE MODIFIED AT SAME LOCATION.
ER	EXISTING ELECTRICAL EQUIPMENT SHALL BE REMOVED AND RELOCATED, EXISTING WIRING SHALL REMAIN, EXTEND TO LOCATION AND RECONNECT TO EQUIPMENT.
EX	EXISTING ELECTRICAL EQUIPMENT OR DEVICE AND WIRING TO BE REMOVED. AT SAME LOCATION INSTALL NEW EQUIPMENT OR DEVICE AND WIRING, REUSE EXISTING CONDUIT.
EY	EXISTING ELECTRICAL EQUIPMENT OR DEVICE AND WIRING TO BE REMOVED. REUSE EXISTING CONDUIT BUT EXTEND TO NEW LOCATION. AT NEW EQUIPMENT OR DEVICE AND WIRING, EXISTING ELECTRICAL EQUIPMENT TO REMAIN, EQUIPMENT TO BE REWIRED.
EZ	FIXED TEMPERATURE
F	FIRE ALARM
FA	FLEXIBLE
FLUOR	FLUORESCENT
G	GROUND CABLE
GF	GROUND FAULT INTERRUPTER
GN	GROUND
HP	HORSEPOWER
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
JB	JUNCTION BOX
KVA	KILO-VOLT AMPERES
KW	KILO-WATTS
LGT	LIGHTING
MCB	MAIN CIRCUIT BREAKER
MTD	MOUNTED
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NIC	NOT IN CONTRACT
NO	NUMBER OR NORMALLY OPEN
NTS	NOT TO SCALE
OL	OVERLOAD
P	POLES
PH	PHASE
PNLBD	PANELBOARD
PWR	POWER
RGS	RIGID GALVANIZED STEEL
SMR	SURFACE MTD RACEWAY
SW	SWITCH
TX	TRANSFORMER
TD	TIME DELAY RELAY
TELE	TELEPHONE
TRANSF	TRANSFORMER
UL	UNDERWRITERS LABORATORY
UON	UNLESS OTHERWISE NOTED
V	VOLTS
WP	WEATHERPROOF

NOT ALL SYMBOLS AND ABBREVIATIONS ARE USED. PROVIDED FOR GENERAL REFERENCE (ONLY)

ELECTRICAL SYMBOLS

A1	WP	DUPLEX NEMA 5-20R WALL MTD RECEPTACLE W/CIRCUIT NUMBER AND WEATHERPROOF ENCLOSURE (MOUNTED 18" AFF UON)
A1		DUPLEX NEMA 5-20R WALL MTD RECEPTACLE W/CIRCUIT NUMBER (MOUNTED 18" AFF UON)
		JUNCTION BOX
		BLANKED OFF ELECTRICAL JUNCTION BOX
		CONDUIT INSTALLED EXPOSED
		CONDUIT INSTALLED CONCEALED
		CONDUIT TURNING DOWN
		CONDUIT TURNING UP
A1	///	BRANCH CIRCUIT HOMERUN TO PANELBOARD WITH NO. OF CONDUCTORS AND PNLBD CKT NO. NOTED
C-1		CONDUIT AND WIRE HOMERUN TO EQUIPMENT NOTED WITH CONDUIT NUMBER (REFER TO C&W SCHEDULE)
3 HP		MOTOR WITH HORSEPOWER RATING NOTED
		HVAC DAMPER MOTOR
30/25A	3P	FUSED DISCONNECT SAFETY SWITCH WITH RATINGS NOTED
30A	3P	UNFUSED DISCONNECT SAFETY SWITCH WITH RATINGS NOTED
		2 POLE TOGGLE TYPE, MOTOR RATED SAFETY DISCONNECT SWITCH
ICB	1000/800	CIRCUIT BREAKER WITH FRAME AND TRIP SIZES NOTED "ICB" DENOTES INSULATED CIRCUIT BREAKER TYPE
PB-A		PANELBOARD - SURFACE MTD WITH TAG NO. NOTED
PB-B		PANELBOARD - RECESSED MTD WITH TAG NO. NOTED
CT'S		CURRENT TRANSFORMERS
GFCS		GROUND FAULT CURRENT TRANSFORMER
		DENOTES ELECTRICAL DEMOLITION WORK
		DENOTES DEVICE OR EQUIPMENT WHICH IS RECESSED MOUNTED
		DENOTES DEVICE OR EQUIPMENT WHICH IS SURFACE MOUNTED
MCB		MOLDED CASE CIRCUIT BREAKER
		SURFACE MOUNTED RACEWAY



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PROJECT:

Waltham Community
Cultural Center
HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: LMR
CHECKED BY:
APPROVED BY:
SCALE: NOT TO SCALE

STATUS:

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- DESIGN DEVELOPMENT
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DATE: 8/15/17

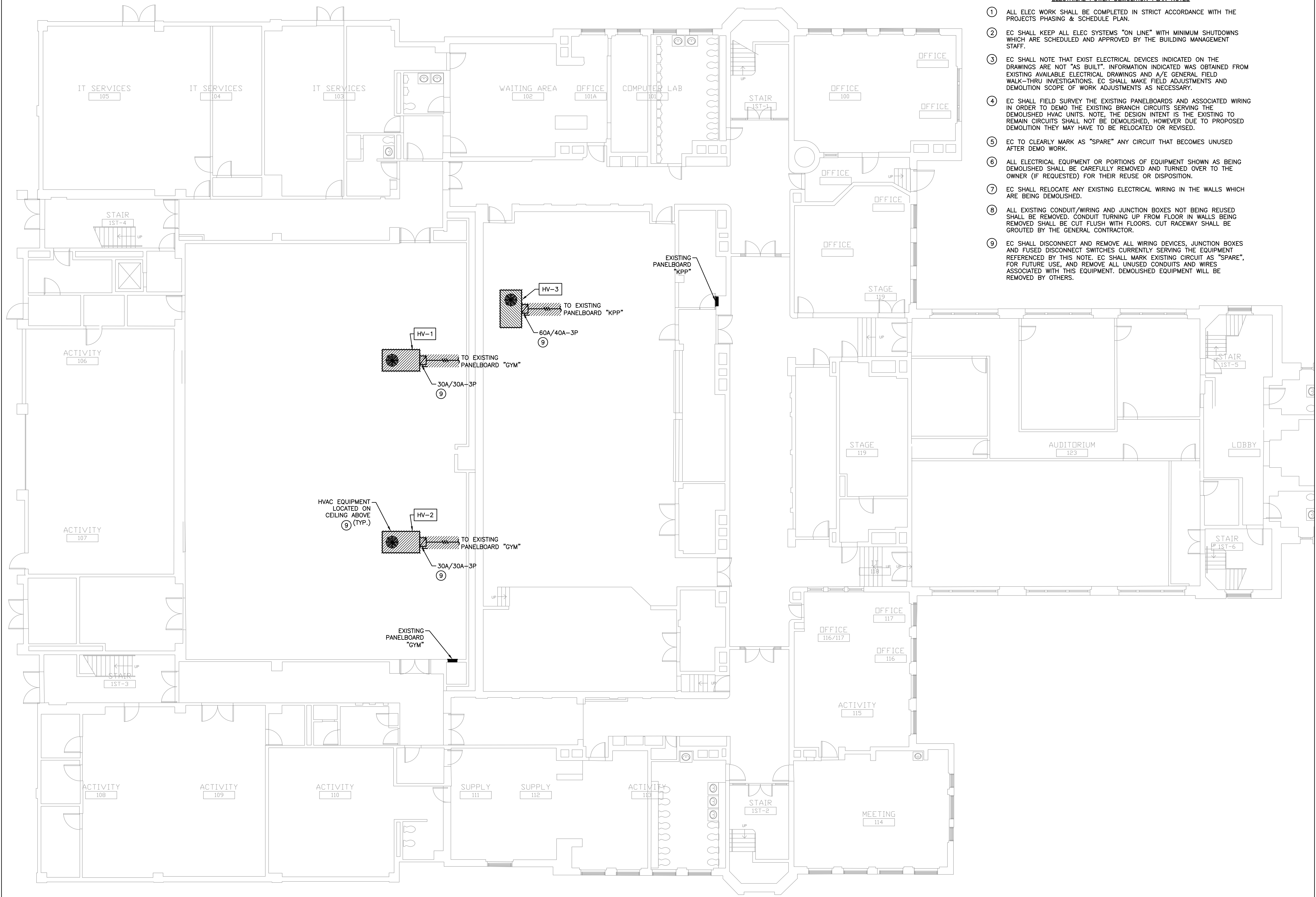
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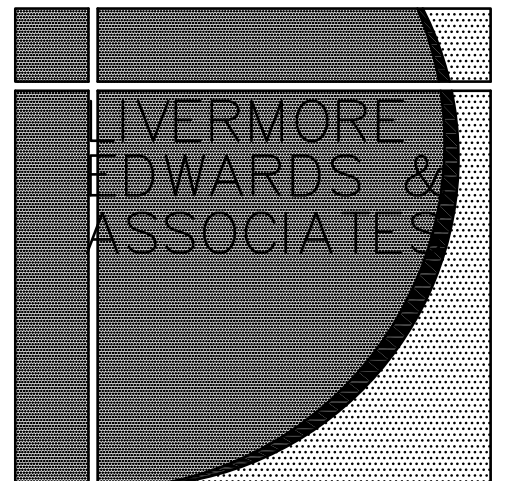
DRAWING:

ELECTRICAL
GENERAL NOTES,
SYMBOLS &
ABBREVIATIONS

E0.01



- ELECTRICAL POWER DEMOLITION PLAN NOTES**
- ALL ELEC WORK SHALL BE COMPLETED IN STRICT ACCORDANCE WITH THE PROJECTS PHASING & SCHEDULE PLAN.
 - EC SHALL KEEP ALL ELEC SYSTEMS "ON LINE" WITH MINIMUM SHUTDOWNS WHICH ARE SCHEDULED AND APPROVED BY THE BUILDING MANAGEMENT STAFF.
 - EC SHALL NOTE THAT EXIST ELECTRICAL DEVICES INDICATED ON THE DRAWINGS ARE NOT "AS BUILT". INFORMATION INDICATED WAS OBTAINED FROM EXISTING AVAILABLE ELECTRICAL DRAWINGS AND A/E GENERAL FIELD WALK-THRU INVESTIGATIONS. EC SHALL MAKE FIELD ADJUSTMENTS AND DEMOLITION SCOPE OF WORK ADJUSTMENTS AS NECESSARY.
 - EC SHALL FIELD SURVEY THE EXISTING PANELBOARDS AND ASSOCIATED WIRING IN ORDER TO DEMO THE EXISTING BRANCH CIRCUITS SERVING THE DEMOLISHED HVAC UNITS. NOTE, THE DESIGN INTENT IS THE EXISTING TO REMAIN CIRCUITS SHALL NOT BE DEMOLISHED, HOWEVER DUE TO PROPOSED DEMOLITION THEY MAY HAVE TO BE RELOCATED OR REVISED.
 - EC TO CLEARLY MARK AS "SPARE" ANY CIRCUIT THAT BECOMES UNUSED AFTER DEMO WORK.
 - ALL ELECTRICAL EQUIPMENT OR PORTIONS OF EQUIPMENT SHOWN AS BEING DEMOLISHED SHALL BE CAREFULLY REMOVED AND TURNED OVER TO THE OWNER (IF REQUESTED) FOR THEIR REUSE OR DISPOSITION.
 - EC SHALL RELOCATE ANY EXISTING ELECTRICAL WIRING IN THE WALLS WHICH ARE BEING DEMOLISHED.
 - ALL EXISTING CONDUIT/WIRING AND JUNCTION BOXES NOT BEING REUSED SHALL BE REMOVED. CONDUIT TURNING UP FROM FLOOR IN WALLS BEING REMOVED SHALL BE CUT FLUSH WITH FLOORS. CUT RACEWAY SHALL BE GROUDED BY THE GENERAL CONTRACTOR.
 - EC SHALL DISCONNECT AND REMOVE ALL WIRING DEVICES, JUNCTION BOXES AND FUSED DISCONNECT SWITCHES CURRENTLY SERVING THE EQUIPMENT REFERENCED BY THIS NOTE. EC SHALL MARK EXISTING CIRCUIT AS "SPARE", FOR FUTURE USE, AND REMOVE ALL UNUSED CONDUITS AND WIRES ASSOCIATED WITH THIS EQUIPMENT. DEMOLISHED EQUIPMENT WILL BE REMOVED BY OTHERS.



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PROJECT:
Waltham Community Cultural Center HVAC Improvements

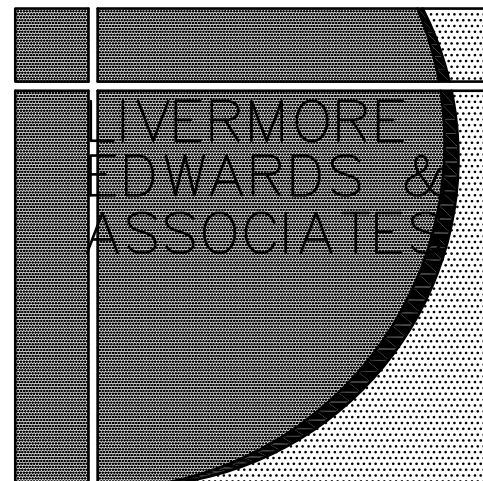
510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: LMR
CHECKED BY:
APPROVED BY:
SCALE: 1/8" = 1' - 0"

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DRAWING:
ELECTRICAL DEMOLITION PLAN FIRST FLOOR

E1.01



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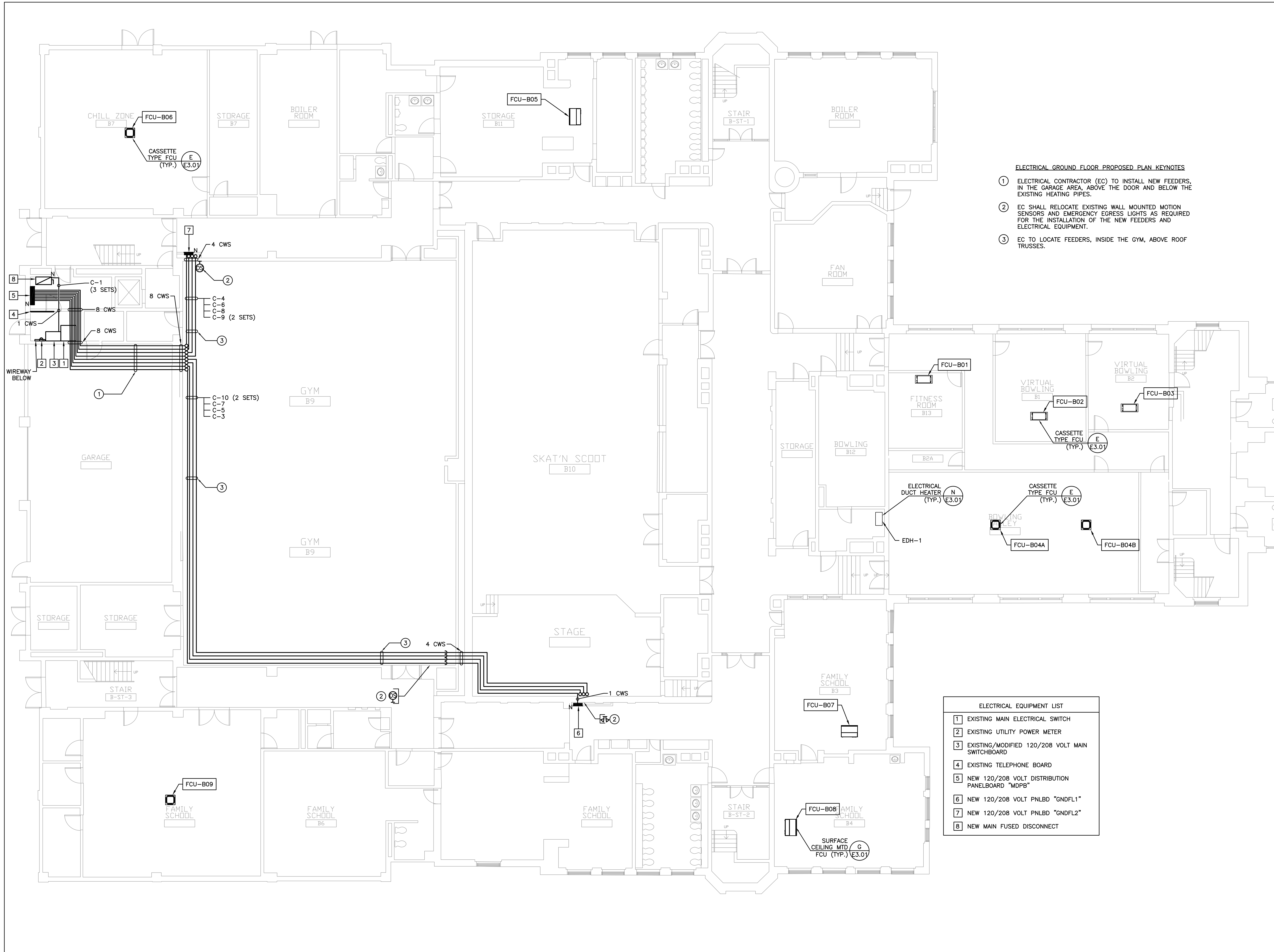
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DRAWING:

ELECTRICAL PROPOSED PLAN GROUND FLOOR

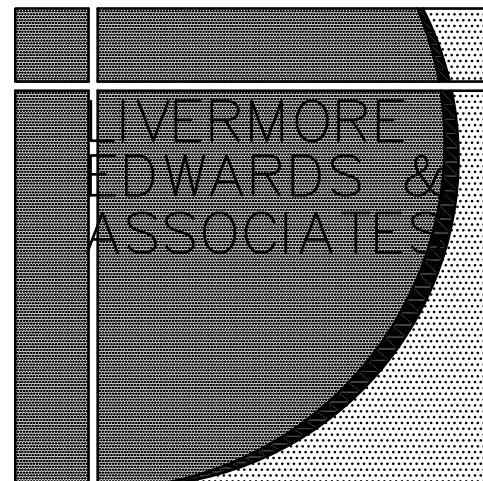
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ELECTRICAL GROUND FLOOR PROPOSED PLAN KEYNOTES

- ① ELECTRICAL CONTRACTOR (EC) TO INSTALL NEW FEEDERS, IN THE GARAGE AREA, ABOVE THE DOOR AND BELOW THE EXISTING HEATING PIPES.
- ② EC SHALL RELOCATE EXISTING WALL MOUNTED MOTION SENSORS AND EMERGENCY EGRESS LIGHTS AS REQUIRED FOR THE INSTALLATION OF THE NEW FEEDERS AND ELECTRICAL EQUIPMENT.
- ③ EC TO LOCATE FEEDERS, INSIDE THE GYM, ABOVE ROOF TRUSSES.

ELECTRICAL EQUIPMENT LIST	
①	EXISTING MAIN ELECTRICAL SWITCH
②	EXISTING UTILITY POWER METER
③	EXISTING/MODIFIED 120/208 VOLT MAIN SWITCHBOARD
④	EXISTING TELEPHONE BOARD
⑤	NEW 120/208 VOLT DISTRIBUTION PANELBOARD "MDPB"
⑥	NEW 120/208 VOLT PNLBD "GNDFL1"
⑦	NEW 120/208 VOLT PNLBD "GNDFL2"
⑧	NEW MAIN FUSED DISCONNECT



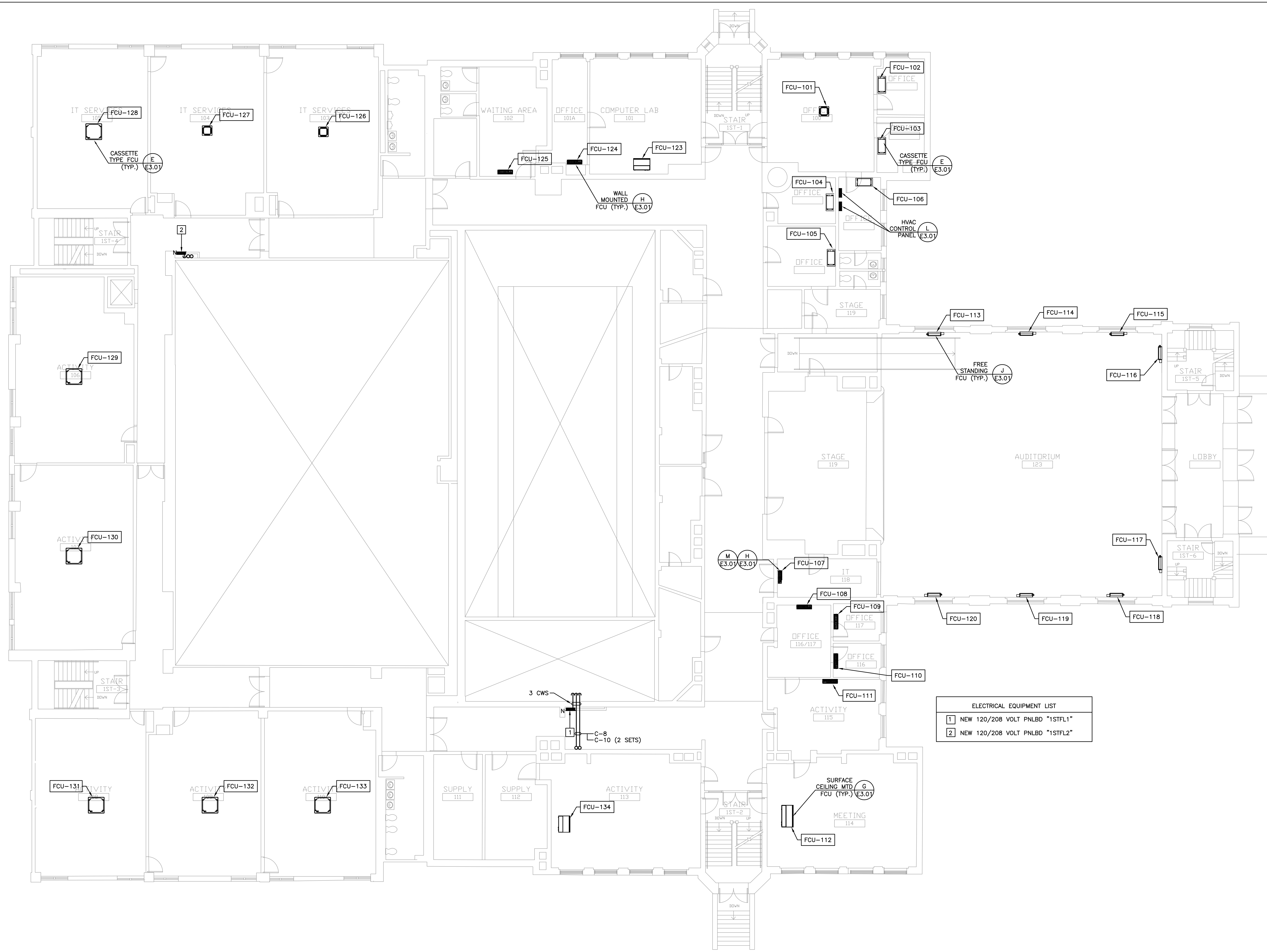
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ELECTRICAL EQUIPMENT LIST	
1	NEW 120/208 VOLT PNLBD "1STFL1"
2	NEW 120/208 VOLT PNLBD "1STFL2"

PROJECT:

Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: LMR
CHECKED BY:
APPROVED BY:
SCALE: 1/8" = 1' - 0"

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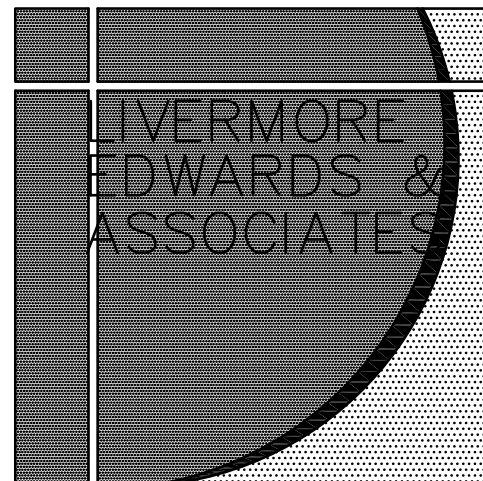
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DRAWING:

ELECTRICAL PROPOSED PLAN FIRST FLOOR

E1.12



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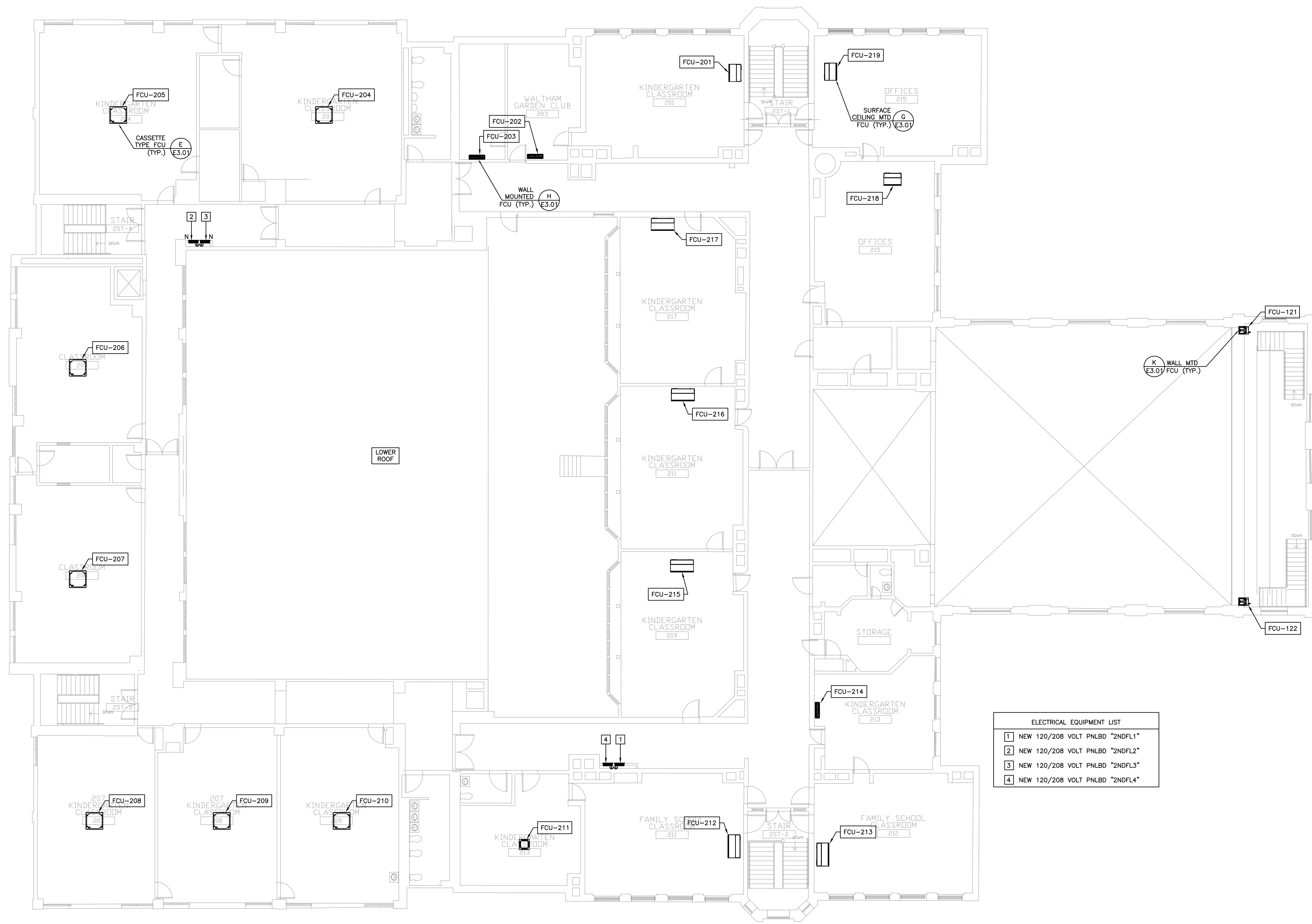
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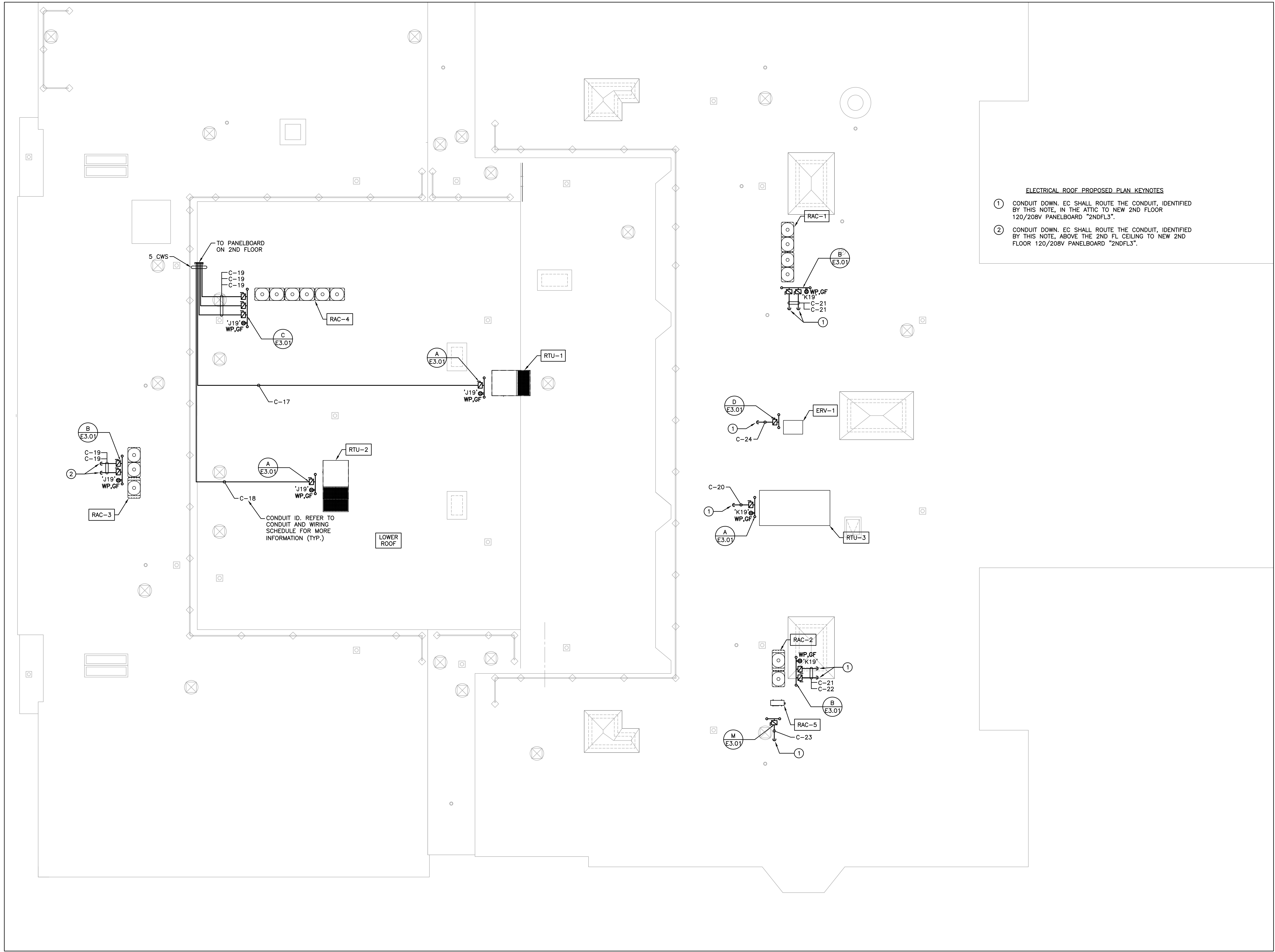
DRAWING:

**ELECTRICAL
PROPOSED PLAN
SECOND FLOOR**

E1.13



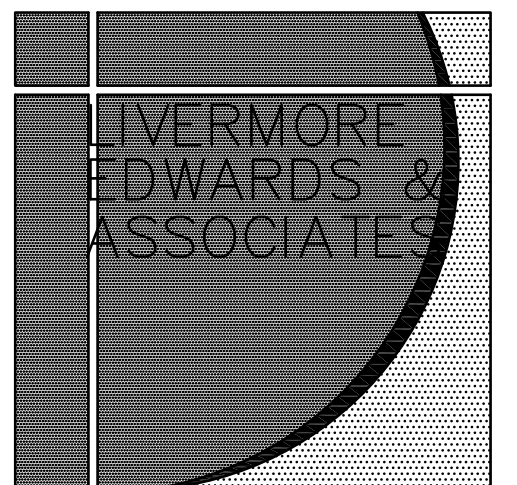
ELECTRICAL EQUIPMENT LIST	
1	NEW 120/208 VOLT PNLBD "2NDFL1"
2	NEW 120/208 VOLT PNLBD "2NDFL2"
3	NEW 120/208 VOLT PNLBD "2NDFL3"
4	NEW 120/208 VOLT PNLBD "2NDFL4"



ELECTRICAL ROOF PROPOSED PLAN KEYNOTES

① CONDUIT DOWN. EC SHALL ROUTE THE CONDUIT, IDENTIFIED BY THIS NOTE, IN THE ATTIC TO NEW 2ND FLOOR 120/208V PANELBOARD "2NDFL3".

② CONDUIT DOWN. EC SHALL ROUTE THE CONDUIT, IDENTIFIED BY THIS NOTE, ABOVE THE 2ND FL CEILING TO NEW 2ND FLOOR 120/208V PANELBOARD "2NDFL3".



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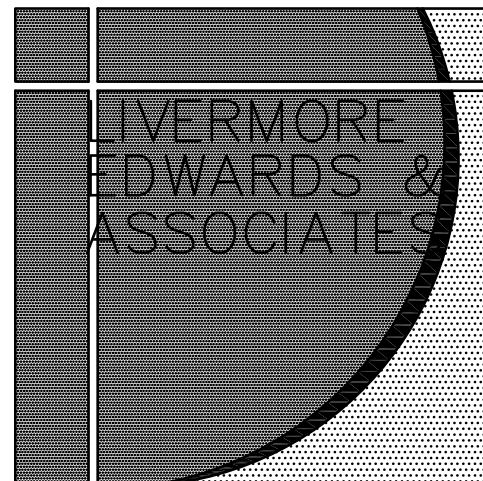
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DRAWING:
ELECTRICAL PROPOSED PLAN ROOF

E1.14



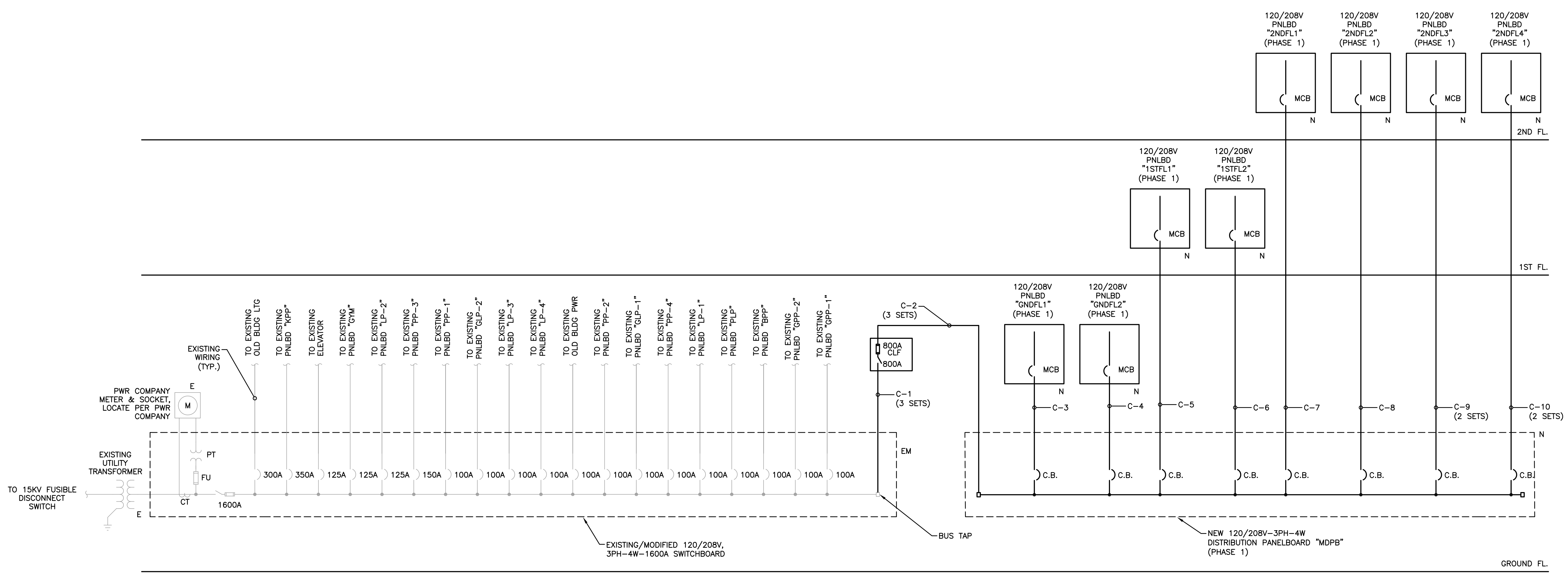
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POWER DISTRIBUTION
RISER DIAGRAM
NOT TO SCALE

LOAD ANALYSIS		
DESCRIPTION	KVA	AMP
PEAK DEMAND LOAD	84.0	233
ADDED LOAD	194.1	538
NEW EST. DEMAND LOAD	278.1	771

- LOAD ANALYSIS NOTES**
- PEAK DEMAND LOAD IS BASED ON HISTORIC KW DATA SHOWN ON THE ELECTRICAL UTILITY BILLS FOR YEARS 2011 TO PRESENT AND ASSUMING A 0.8 POWER FACTOR.
 - AMPS CALCULATED AT 208V-3PH.

POWER DISTRIBUTION RISER DIAGRAM NOTES

- EC SHALL FIELD MODIFY THE EXISTING/AFFECTED POWER DISTRIBUTION EQUIPMENT & THEIR ASSOCIATED BRANCH CIRCUIT BREAKERS AS INDICATED. NOTE THE DESIGN INTENT IS THAT THE EXISTING TO REMAIN CIRCUITS, SERVING OUT OF SCOPE AREAS, SHALL NOT BE DEMOLISHED.
- EC SHALL FURNISH/INSTALL NEW ELECTRICAL POWER DISTRIBUTION EQUIPMENT (IE: PANELBOARDS, PWR DISC SWITCHES, ETC). FOR THE LOCATION OF THE EXISTING/MODIFIED AND NEW POWER EQUIPMENT, REFER TO THE PROPOSED BLDG POWER PLANS DWGS.
- THE ENTIRE ELECTRICAL INSTALLATION SHALL BE SUPPLIED AND INSTALLED IN STRICT ACCORDANCE WITH ALL APPLICABLE STATE AND LOCAL BUILDING/ELECTRICAL CODES, LAWS, ORDINANCES AND INSURANCE REQUIREMENTS. EC'S WORK INCLUDES ALL COORDINATION WITH THE LOCAL ELECTRICAL INSPECTOR PRIOR TO ANY DEMOLITION OR NEW ELECTRICAL CONSTRUCTION WORK.
- EC'S WORK INCLUDES CLEANING, TIGHTENING AND FIELD TESTING TO VERIFY THE OPERATING CONDITION OF THE EXISTING/MODIFIED AND NEW POWER DISTRIBUTION EQUIPMENT.
- EC'S WORK INCLUDES ADDING NEW ENGRAVED PLASTIC NAMEPLATES TO ALL OF THE NEW AND POWER EQUIPMENT. ALL NAMEPLATES SHALL HAVE NAME, VOLTAGE, PHASE, WIRE, FREQUENCY AND POWER SUPPLY SOURCE INFORMATION (NAME AND LOCATION).
- PRIOR THE INSTALLATION OF ANY BREAKERS, EC SHALL FIELD MEASURE THE EXISTING PANELBOARD'S OPERATING LOADS IN ORDER TO VERIFY EXISTING CAPACITIES. EC SHALL PROVIDE PANELBOARD AMPERE READINGS TO THE ENGINEER FOR EVALUATION. PROVIDE LOADINGS IN AMPERES ON EVERY POWER PHASE.
- EC IS TO DE-ENERGIZE ANY PANELBOARD AND BRANCH CIRCUITS PRIOR TO INSTALL OR MODIFY ANY ELECTRICAL EQUIPMENT. WORKING WITH EXPOSED LIVE UNGROUNDED CONDUCTORS WILL NOT BE ALLOWED.
- ALL POWER SHUTDOWNS SHALL BE MINIMIZED. EC SHALL PROVIDE A PROPOSED ELECTRICAL CONSTRUCTION SCHEDULE WHICH CLEARLY INDICATES ALL MILESTONES AND SHUTDOWN DURATIONS IN ORDER FOR THE SCHOOL TO REVIEW/APPROVE. NOTE, ANY POWER INTERRUPTIONS SHOULD BE SCHEDULED WITH THE ELECTRIC UTILITY COMPANY (FOR SWITCHBOARD WORK). EC MUST ASSUME ALL POWER OUTAGES WORK MUST BE COMPLETED ON THE WEEKENDS (IE- PREMIUM LABOR OVERTIME).
- PRIOR TO DE-ENERGIZING ANY PANELBOARDS, BRANCH CIRCUITS OR OTHER ELECTRICAL EQUIPMENT, EC SHALL FIELD SURVEY TO VERIFY NO CRITICAL EQUIPMENT, LIGHTING, RECEPTACLES, ETC WILL BE ADVERSELY AFFECTED.

120/208 VOLT 3 PH 4W 60 HZ
PANELBOARD "LVP-#" FED FROM

PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: LMR
CHECKED BY:
APPROVED BY:
SCALE: NOT TO SCALE

STATUS:
 SCHEMATIC DESIGN
 REVIEW
 DESIGN DEVELOPMENT
 FINAL REVIEW
 BIDDING
 PERMIT
 CONSTRUCTION
 NOT FOR CONSTRUCTION
 AS-BUILT

DATE: 8/15/17
REVISIONS:
△ _____ △ _____
△ _____ △ _____
△ _____ △ _____
△ _____ △ _____

DRAWING:
ELECTRICAL ONE LINE DIAGRAM & SCHEDULES "I"

E2.01

NEW DISTRIBUTION PANELBOARD "MDPB" SCHEDULE							
120/208 V - 800 A - 3 PH - 4 W - 63 INCHES BRK SPACE - 25KAIC SURFACE MOUNTED : MAIN LUGS ONLY							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	PANELBOARD "GNDFL1" * * *	6.4	100AF-60AT-3P	2	PANELBOARD "1STFL1" * * *	0.6	100AF-60AT-3P
3	PANELBOARD "GNDFL2" * * *	0.1	100AF-60AT-3P	4	PANELBOARD "1STFL2" * * *	0.8	100AF-60AT-3P
5	PANELBOARD "2NDFL1" * * *	1.4	100AF-60AT-3P	6	PANELBOARD "2NDFL2" * * *	0.3	100AF-60AT-3P
7	PANELBOARD "2NDFL4" * * *	80.7	400AF-300AT-3P	8	PANELBOARD "2NDFL3" * * *	103.7	400AF-400AT-3P
9	SPACE * * *		250AF-200AT-3P	10	SPACE * * *		3P
11	SPACE * * *		3P	12	SPACE * * *		3P

CONNECTED LOAD "KVA" = 194.1

PANELBOARD "MDPB" SCHEDULE NOTES -

- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "1STFL1" SCHEDULE							
120/208 V - 100 A - 3 PH - 4 W - 30P - 10KAIC FLUSH MOUNTED : 100AF/60AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	FCU-101 TO 106 * * *	0.3	20A-2P	2	FCU-108 TO 112 * * *	0.2	20A-2P
5	FCU-131 TO 134 * * *	0.2	20A-2P	6	SPACE * * *		20A-2P
9	SPACE * * *		20A-2P	10	SPACE * * *		20A-2P
11	SPACE * * *		20A-2P	12	SPACE * * *		20A-2P
13	SPACE * * *		20A-2P	14	SPACE * * *		20A-2P
15	SPACE * * *		20A-2P	16	SPACE * * *		20A-2P
17	SPACE * * *		20A-2P	18	SPACE * * *		20A-2P
19	SPACE * * *		20A-2P	20	SPACE * * *		20A-2P
21	SPACE * * *		1P	22	SPACE * * *		1P
23	SPACE * * *		1P	24	SPACE * * *		1P
25	SPACE * * *		1P	26	SPACE * * *		1P
27	SPACE * * *		1P	28	SPACE * * *		1P
29	SPACE * * *		1P	30	SPACE * * *		1P

CONNECTED LOAD "KVA" = 0.6

PANELBOARD "1STFL1" SCHEDULE NOTES -

- PANELBOARD CIRCUITS ARE NOTED AS "D".
- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "2NDFL2" SCHEDULE							
120/208 V - 100 A - 3 PH - 4 W - 30P - 10KAIC FLUSH MOUNTED : 100AF/60AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	FCU-201 TO 205 * * *	0.2	20A-2P	2	FCU-206, 207 * * *	0.1	20A-2P
5	SPACE * * *		20A-2P	6	SPACE * * *		20A-2P
7	SPACE * * *		20A-2P	8	SPACE * * *		20A-2P
9	SPACE * * *		20A-2P	10	SPACE * * *		20A-2P
11	SPACE * * *		20A-2P	12	SPACE * * *		20A-2P
13	SPACE * * *		20A-2P	14	SPACE * * *		20A-2P
15	SPACE * * *		20A-2P	16	SPACE * * *		20A-2P
17	SPACE * * *		20A-2P	18	SPACE * * *		20A-2P
19	SPACE * * *		20A-2P	20	SPACE * * *		20A-2P
21	SPACE * * *		1P	22	SPACE * * *		1P
23	SPACE * * *		1P	24	SPACE * * *		1P
25	SPACE * * *		1P	26	SPACE * * *		1P
27	SPACE * * *		1P	28	SPACE * * *		1P
29	SPACE * * *		1P	30	SPACE * * *		1P

CONNECTED LOAD "KVA" = 0.3

PANELBOARD "2NDFL2" SCHEDULE NOTES -

- PANELBOARD CIRCUITS ARE NOTED AS "H".
- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "GNDFL1" SCHEDULE							
120/208 V - 100 A - 3 PH - 4 W - 30P - 10KAIC FLUSH MOUNTED : 100AF/60AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	FCU-B05 & B06 * * *	0.1	20A-2P	2	FCU-117 TO 120 * * *	0.2	20A-2P
5	FCU-121 & 122 * * *	0.6	20A-2P	6	FCU-113 TO 116 * * *	0.2	20A-2P
9	FCU-B01 TO B04A & B04B * * *	0.5	20A-2P	10	SPACE * * *		20A-2P
11	SPACE * * *		20A-2P	12	SPACE * * *		20A-2P
13	EDH-1 * * *	5.0	30A-2P	14	SPACE * * *		20A-2P
15	SPACE * * *		20A-2P	16	SPACE * * *		20A-2P
17	SPACE * * *		20A-2P	18	SPACE * * *		20A-2P
19	SPACE * * *		20A-2P	20	SPACE * * *		20A-2P
21	SPACE * * *		1P	22	SPACE * * *		1P
23	SPACE * * *		1P	24	SPACE * * *		1P
25	SPACE * * *		1P	26	SPACE * * *		1P
27	SPACE * * *		1P	28	SPACE * * *		1P
29	SPACE * * *		1P	30	SPACE * * *		1P

CONNECTED LOAD "KVA" = 6.4

PANELBOARD "GNDFL1" SCHEDULE NOTES -

- PANELBOARD CIRCUITS ARE NOTED AS "A".
- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "1STFL2" SCHEDULE							
120/208 V - 100 A - 3 PH - 4 W - 30P - 10KAIC FLUSH MOUNTED : 100AF/60AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	FCU-123 TO 127 * * *	0.3	20A-2P	2	FCU-128 & 129 * * *	0.1	20A-2P
5	HVAC CTRL PNL * * *	0.4	20A-2P	6	SPACE * * *		20A-2P
7	SPACE * * *		20A-2P	8	SPACE * * *		20A-2P
9	SPACE * * *		20A-2P	10	SPACE * * *		20A-2P
11	SPACE * * *		20A-2P	12	SPACE * * *		20A-2P
13	SPACE * * *		20A-2P	14	SPACE * * *		20A-2P
15	SPACE * * *		20A-2P	16	SPACE * * *		20A-2P
17	SPACE * * *		20A-2P	18	SPACE * * *		20A-2P
19	SPACE * * *		20A-2P	20	SPACE * * *		20A-2P
21	SPACE * * *		1P	22	SPACE * * *		1P
23	SPACE * * *		1P	24	SPACE * * *		1P
25	SPACE * * *		1P	26	SPACE * * *		1P
27	SPACE * * *		1P	28	SPACE * * *		1P
29	SPACE * * *		1P	30	SPACE * * *		1P

CONNECTED LOAD "KVA" = 0.8

PANELBOARD "1STFL2" SCHEDULE NOTES -

- PANELBOARD CIRCUITS ARE NOTED AS "F".
- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "2NDFL3" SCHEDULE							
120/208 V - 400 A - 3 PH - 4 W - 42P - 22KAIC FLUSH MOUNTED : 400AF/400AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	RAC-4 (MODULE 1) * * *	12.0	60A-3P	2	RAC-3 (MODULE 1) * * *	12.0	60A-3P
5	SPACE * * *		60A-3P	6	SPACE * * *		60A-3P
7	RAC-4 (MODULE 2) * * *	12.0	60A-3P	8	RAC-3 (MODULE 2) * * *	9.4	50A-3P
9	SPACE * * *		60A-3P	10	SPACE * * *		60A-3P
11	SPACE * * *		60A-3P	12	SPACE * * *		60A-3P
13	RAC-4 (MODULE 3) * * *	12.0	60A-3P	14	RTU-2 * * *	28.3	100A-3P
15	SPACE * * *		60A-3P	16	SPACE * * *		100A-3P
17	SPACE * * *		60A-3P	18	SPACE * * *		100A-3P
19	ROOF RECEPT * * *	0.8	20A-2P	20	RTU-1 * * *	17.0	60A-3P
21	SPACE * * *		20A-2P	22	SPACE * * *		60A-3P
23	SPACE * * *		20A-2P	24	SPACE * * *		60A-3P
25	SPACE * * *		50A-2P	26	SPACE * * *		50A-2P
27	SPACE * * *		3P	28	SPACE * * *		3P
29	SPACE * * *		3P	30	SPACE * * *		3P
31	SPACE * * *		1P	32	SPACE * * *		1P
33	SPACE * * *		1P	34	SPACE * * *		1P
35	SPACE * * *		1P	36	SPACE * * *		1P
37	SPACE * * *		1P	38	SPACE * * *		1P
39	SPACE * * *		1P	40	SPACE * * *		1P
41	SPACE * * *		1P	42	SPACE * * *		1P

CONNECTED LOAD "KVA" = 103.7

PANELBOARD "2NDFL3" SCHEDULE NOTES -

- PANELBOARD CIRCUITS ARE NOTED AS "J".
- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "GNDFL2" SCHEDULE							
120/208 V - 100 A - 3 PH - 4 W - 30P - 10KAIC FLUSH MOUNTED : 100AF/60AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	SPARE * * *		20A-2P	2	FCU-B07 TO B09 * * *	0.1	20A-2P
3	SPACE * * *		20A-2P	4	SPACE * * *		20A-2P
5	SPACE * * *		20A-2P	6	SPACE * * *		20A-2P
7	SPACE * * *		20A-2P	8	SPACE * * *		20A-2P
9	SPACE * * *		20A-2P	10	SPACE * * *		20A-2P
11	SPACE * * *		20A-2P	12	SPACE * * *		20A-2P
13	SPACE * * *		20A-2P	14	SPACE * * *		20A-2P
15	SPACE * * *		20A-2P	16	SPACE * * *		20A-2P
17	SPACE * * *		20A-2P	18	SPACE * * *		20A-2P
19	SPACE * * *		20A-2P	20	SPACE * * *		20A-2P
21	SPACE * * *		1P	22	SPACE * * *		1P
23	SPACE * * *		1P	24	SPACE * * *		1P
25	SPACE * * *		1P	26	SPACE * * *		1P
27	SPACE * * *		1P	28	SPACE * * *		1P
29	SPACE * * *		1P	30	SPACE * * *		1P

CONNECTED LOAD "KVA" = 0.1

PANELBOARD "GNDFL2" SCHEDULE NOTES -

- PANELBOARD CIRCUITS ARE NOTED AS "B".
- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "2NDFL1" SCHEDULE							
120/208 V - 100 A - 3 PH - 4 W - 30P - 10KAIC FLUSH MOUNTED : 100AF/60AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	FCU-208-212 * * *	0.3	20A-2P	2	FCU-213, 214 * * *	1.0	20A-2P
3	SPACE * * *		20A-2P	4	218, 219 * * *		20A-2P
5	FCU-215, 216, 217 * * *	0.1	20A-2P	6	SPACE * * *		20A-2P
7	SPACE * * *		20A-2P	8	SPACE * * *		20A-2P
9	SPACE * * *		20A-2P	10	SPACE * * *		20A-2P
11	SPACE * * *		20A-2P	12	SPACE * * *		20A-2P
13	SPACE * * *		20A-2P	14	SPACE * * *		20A-2P
15	SPACE * * *		20A-2P	16	SPACE * * *		20A-2P
17	SPACE * * *		20A-2P	18	SPACE * * *		20A-2P
19	SPACE * * *		20A-2P	20	SPACE * * *		20A-2P
21	SPACE * * *		1P	22	SPACE * * *		1P
23	SPACE * * *		1P	24	SPACE * * *		1P
25	SPACE * * *		1P	26	SPACE * * *		1P
27	SPACE * * *		1P	28	SPACE * * *		1P
29	SPACE * * *		1P	30	SPACE * * *		1P

CONNECTED LOAD "KVA" = 1.4

PANELBOARD "2NDFL1" SCHEDULE NOTES -

- PANELBOARD CIRCUITS ARE NOTED AS "G".
- PANELBOARD SHALL HAVE GROUND BUS, SIDE PIANO HINGE, ENGRAVED NAMEPLATE, TYPED CIRCUITS DIRECTORY AND NEC WARNING LABELS FOR ELECTRICAL SHOCK AND OSHA ARC FLASH WARNING LABELS.

NEW PANELBOARD "2NDFL4" SCHEDULE							
120/208 V - 400 A - 3 PH - 4 W - 42P - 22KAIC FLUSH MOUNTED : 400AF/300AT MAIN CIRCUIT BREAKER							
POLE NO.	LOAD	KVA	CB	POLE NO.	LOAD	KVA	CB
1	RTU-3 * * *	33.2	110A-3P	2	RAC-1 (MODULE 1) * * *	12.0	60A-3P
3	SPACE * * *		110A-3P	4	SPACE * * *		60A-3P
5	SPACE * * *		60A-3P	6	SPACE * * *		60A-3P
7	RAC-2 (MODULE 1) * * *	6.8	35A-3P	8	RAC-1 (MODULE 2) * * *	12.0	60A-3P
9	SPACE * * *		35A-3P	10	SPACE * * *		60A-3P
11	SPACE * * *		35A-3P	12	SPACE * * *		60A-3P
13	RAC-2 (MODULE 2) * * *	9.4	50A-3P	14	ERV-1 * * *	4.1	15A-3P
15	SPACE * * *		50A-3P	16	SPACE * * *		15A-3P
17	SPACE * * *		50A-3P	18	SPACE * * *		15A-3P
19	ROOF RECEPT * * *	0.8	20A-2P	20	RAC-5 * * *	2.3	15A-2P
21	SPACE * * *		20A-2P	22	SPACE * * *		15A-2P
23	SPACE * * *		20A-2P	24	SPACE * * *		50A-3P
25	SPACE * * *		50A-2P	26	SPACE * * *		3P
27	SPACE * * *		3P	28	SPACE * * *		3P
29	SPACE * * *		3				

CONDUIT AND WIRE SCHEDULE						
CONDUIT NUMBER	CONDUIT SIZE	NO. OF WIRES	WIRE SIZE (#/MCM)	FROM	TO	COMMENTS
C-1	2.5	4	300 MCM 1/0	EXISTING 120/208V MAIN SWITCHBOARD	NEW MAIN FUSED DISCONNECT	POWER GROUND (3 SETS)
C-2	2.5	4	300 MCM 1/0	NEW MAIN FUSED DISCONNECT	NEW 120/208V DISTR. PANELBOARD "MDPB"	POWER GROUND (3 SETS)
C-3	1.0"	4	6	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "1STFL1"	POWER GROUND
C-4	1.0"	4	6	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "GNDFL2"	POWER GROUND
C-5	1.5"	4	4	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "1STFL1"	POWER GROUND
C-6	1.5"	4	4	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "1STFL2"	POWER GROUND
C-7	1.5"	4	4	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "2NDFL1"	POWER GROUND
C-8	1.5"	4	4	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "2NDFL2"	POWER GROUND
C-9	2.5"	4	4/0	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "2NDFL3"	POWER GROUND (2 SETS)
C-10	2.5"	4	4/0	NEW 120/208V DISTR. PANELBOARD "MDPB"	NEW 120/208V PNLBD "2NDFL4"	POWER GROUND (2 SETS)
C-11	0.75"	2	12	NEW 120/208V PNLBD "GNDFL1"	NEW HVAC FAN COIL UNIT	POWER GROUND
C-12	0.75"	2	12	NEW 120/208V PNLBD "GNDFL2"	NEW HVAC FAN COIL UNIT	POWER GROUND
C-13	0.75"	2	12	NEW 120/208V PNLBD "1STFL1"	NEW HVAC FAN COIL UNIT	POWER GROUND
C-14	0.75"	2	12	NEW 120/208V PNLBD "1STFL2"	NEW HVAC FAN COIL UNIT	POWER GROUND
C-15	0.75"	2	12	NEW 120/208V PNLBD "2NDFL1"	NEW HVAC FAN COIL UNIT	POWER GROUND
C-16	0.75"	2	12	NEW 120/208V PNLBD "2NDFL2"	NEW HVAC FAN COIL UNIT	POWER GROUND
C-17	1.25"	3	6	NEW 120/208V PNLBD "2NDFL3"	HVAC RTU-1	POWER GROUND
C-18	1.5"	3	2	NEW 120/208V PNLBD "2NDFL3"	HVAC RTU-2	POWER GROUND
C-19	1.25"	3	6	NEW 120/208V PNLBD "2NDFL3"	HVAC RAC MODULE	POWER GROUND
C-20	1.5"	3	2	NEW 120/208V PNLBD "2NDFL4"	HVAC RTU-3	POWER GROUND
C-21	1.25"	3	6	NEW 120/208V PNLBD "2NDFL4"	HVAC RAC MODULE	POWER GROUND
C-22	1.0"	3	8	NEW 120/208V PNLBD "2NDFL4"	HVAC RAC MODULE	POWER GROUND
C-23	0.75"	3	12	NEW 120/208V PNLBD "2NDFL4"	HVAC RAC MODULE	POWER GROUND
C-24	0.75"	3	12	NEW 120/208V PNLBD "2NDFL4"	HVAC ERV UNIT	POWER GROUND
C-25	0.75"	2	10	NEW HVAC OUTDOOR UNIT	NEW HVAC INDOOR UNIT	POWER GROUND CONTROL
C-26	0.75"	2	10	NEW 120/208V PNLBD "GNDFL1"	NEW HVAC DUCT HEATER	POWER GROUND

CONDUIT & WIRE SCHEDULE NOTES

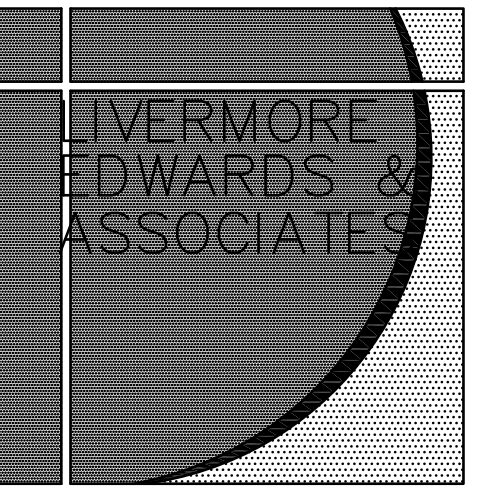
1) EC SHALL COORDINATE ALL FIELD WIRING WITH THE "AS SUPPLIED" EQUIPMENT PRIOR TO ANY MATERIAL RELEASE AND/OR ROUGH WIRING.

EQUIPMENT CONNECTION SCHEDULE										
EQUIPMENT TAG	VOLTAGE / PHASE	(HP)	(FLA)	OCP	DISCONNECTING MEANS	NEMA RATING	WIRE & CONDUIT	CIRCUIT NUMBER		
FAN COIL UNITS										
FCU-B01	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A9,11		
FCU-B02	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A9,11		
FCU-B03	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A9,11		
FCU-B04A	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A9,11		
FCU-B04B	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A9,11		
FCU-B05	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A1,3		
FCU-B06	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A1,3		
FCU-B07	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-12	B2,4		
FCU-B08	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-12	B2,4		
FCU-B09	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-12	B2,4		
FCU-101	208/1	-	0.3	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D1,3		
FCU-102	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D1,3		
FCU-103	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D1,3		
FCU-104	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D1,3		
FCU-105	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D1,3		
FCU-106	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D1,3		
FCU-107	208/1	-	0.3	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-25	RAC5		
FCU-108	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D2,4		
FCU-109	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D2,4		
FCU-110	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D2,4		
FCU-111	208/1	-	0.3	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D2,4		
FCU-112	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D2,4		
FCU-113	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A6,8		
FCU-114	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A6,8		
FCU-115	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A6,8		
FCU-116	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A6,8		
FCU-117	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A2,4		
FCU-118	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A2,4		
FCU-119	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A2,4		
FCU-120	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A2,4		
FCU-121	208/1	-	2.0	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A5,7		
FCU-122	208/1	-	2.0	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-11	A5,7		
FCU-123	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F1,3		
FCU-124	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F1,3		
FCU-125	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F1,3		
FCU-126	208/1	-	0.3	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F1,3		
FCU-127	208/1	-	0.3	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F1,3		
FCU-128	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F1,3		
FCU-129	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F2,4		
FCU-130	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-14	F2,4		
FCU-131	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D5,7		
FCU-132	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D5,7		
FCU-133	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D5,7		
FCU-134	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-13	D5,7		
FCU-201	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-16	H1,3		
FCU-202	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-16	H1,3		
FCU-203	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-16	H1,3		
FCU-204	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-16	H1,3		
FCU-205	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-16	H1,3		
FCU-206	208/1	-	0.5	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-16	H2,4		
FCU-207	208/1	-	0.5	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-16	H2,4		
FCU-208	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G1,3		
FCU-209	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G1,3		
FCU-210	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G1,3		
FCU-211	208/1	-	0.2	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G1,3		
FCU-212	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G1,3		
FCU-213	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G2,4		
FCU-214	208/1	-	0.3	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G2,4		
FCU-215	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G5,7		
FCU-216	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G5,7		
FCU-217	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G5,7		
FCU-218	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G2,4		
FCU-219	208/1	-	0.4	15	240V, 30A, 2P TOGGLE DISC SWITCH	N1	C-15	G2,4		
ROOFTOP UNIT										
RTU-1	208/3	-	47.3	60	240V, 60A, 3P, HD W/ 60A FUSE	N3R	C-17	J20,22,24		
RTU-2	208/3	-	78.6	100	240V, 100A, 3P, HD W/ 100A FUSE	N3R	C-18	J14,16,18		
RTU-3	208/3	-	92.1	110	240V, 200A, 3P, HD W/ 110A FUSE	N3R	C-20	K1,3,5		
ENERGY RECOVERY UNIT										
ERV-1	208/3	(2)	1.5	15	240V, 30A, 3P, HD W/ 15A FUSE	N3R	C-24	K14,16,18		
ELECTRICAL DUCT HEATER										
EDH-1	208/1	-	24.0	30	240V, 30A, 2P, HD W/ 30A FUSE	N1	C-26	A13,15		
REMOTE AIR COOLED CONDENSER										
RAC-1 (MODULE #1)	208/3	-	33.4	60	240V, 60A, 3P, HD W/ 60A FUSE	N3R	C-21	K2,4,6		
RAC-1 (MODULE #2)	208/3	-	33.4	60	240V, 60A, 3P, HD W/ 60A FUSE	N3R	C-21	K8,10,12		
RAC-2 (MODULE #1)	208/3	-	18.9	35	240V, 60A, 3P, HD W/ 35A FUSE	N3R	C-22	K7,9,11		
RAC-2 (MODULE #2)	208/3	-	26.1	50	240V, 60A, 3P, HD W/ 50A FUSE	N3R	C-21	K13,15,17		
RAC-3 (MODULE #1)	208/3	-	33.4	60	240V, 60A, 3P, HD W/ 60A FUSE	N3R	C-19	J2,4,6		
RAC-3 (MODULE #2)	208/3	-	26.1	50	240V, 60A, 3P, HD W/ 50A FUSE	N3R	C-19	J8,10,12		
RAC-4 (MODULE #1)	208/3	-	33.4	60	240V, 60A, 3P, HD W/ 60A FUSE	N3R	C-19	J1,3,5		
RAC-4 (MODULE #2)	208/3	-	33.4	60	240V, 60A, 3P, HD W/ 60A FUSE	N3R	C-19	J7,9,11		
RAC-4 (MODULE #3)	208/3	-	33.4	60	240V, 60A, 3P, HD W/ 60A FUSE	N3R	C-19	J13,15,17		
RAC-5	208/1	-	2.0	15	240V, 30A, 2P, HD W/ 15A FUSE	N3R	C-23	K20,22		

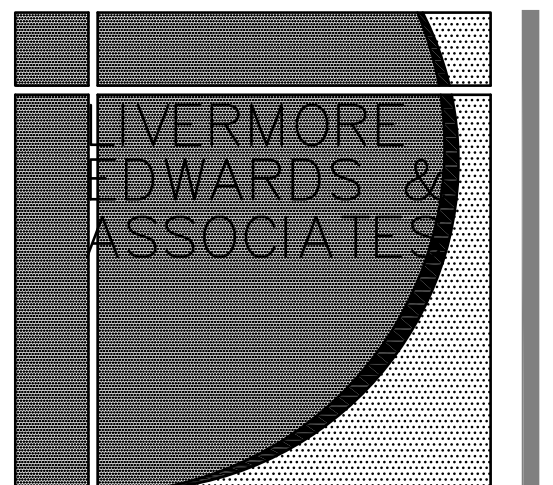
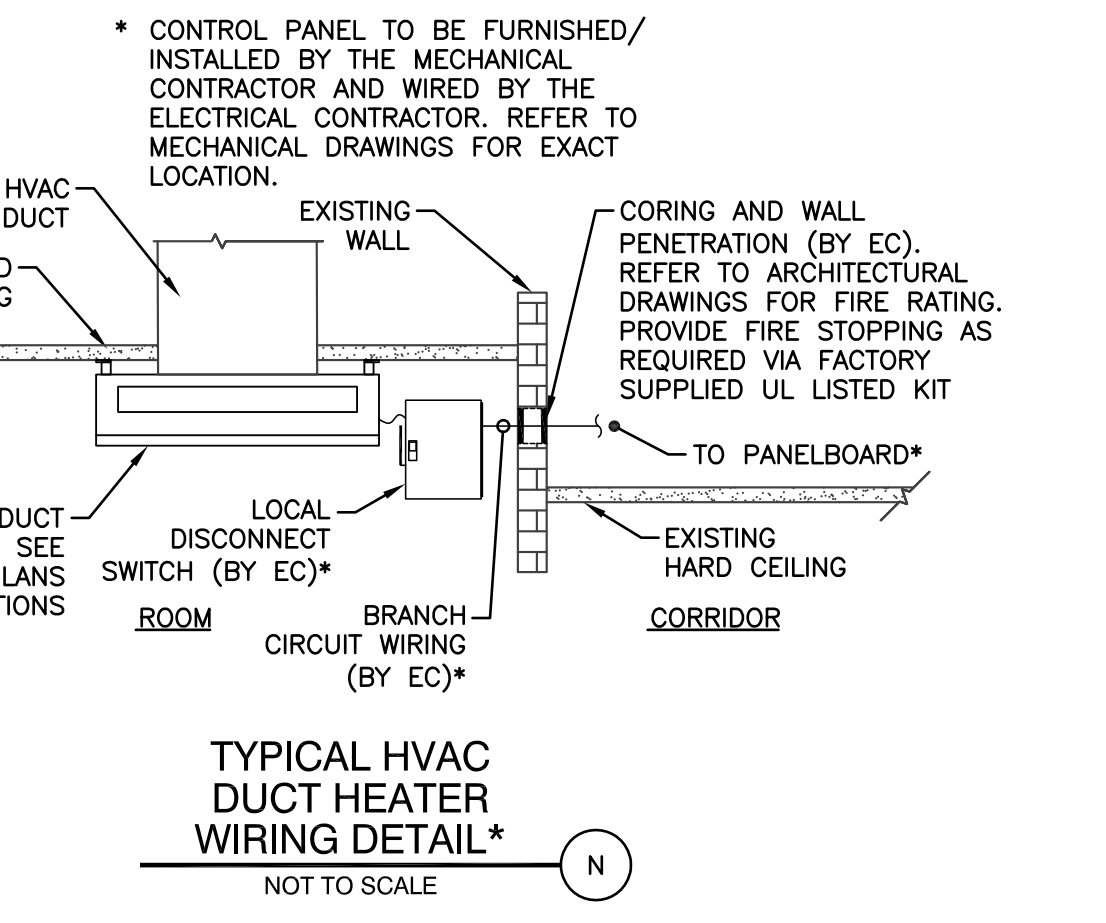
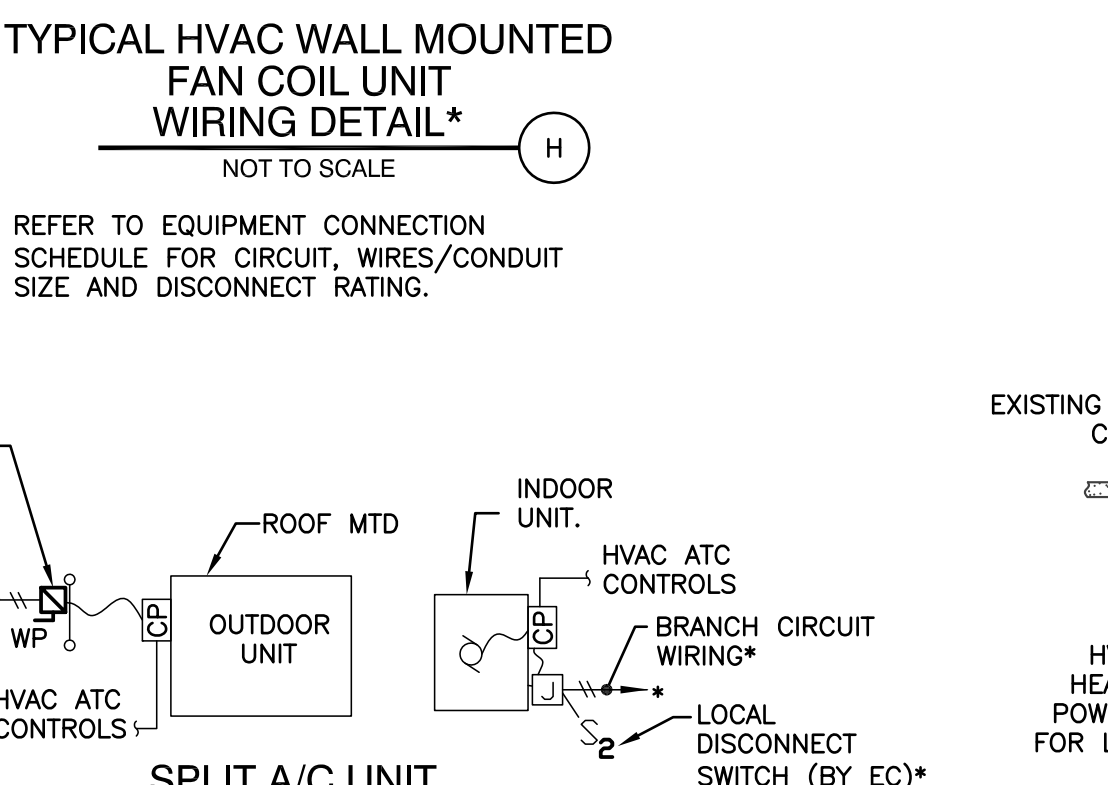
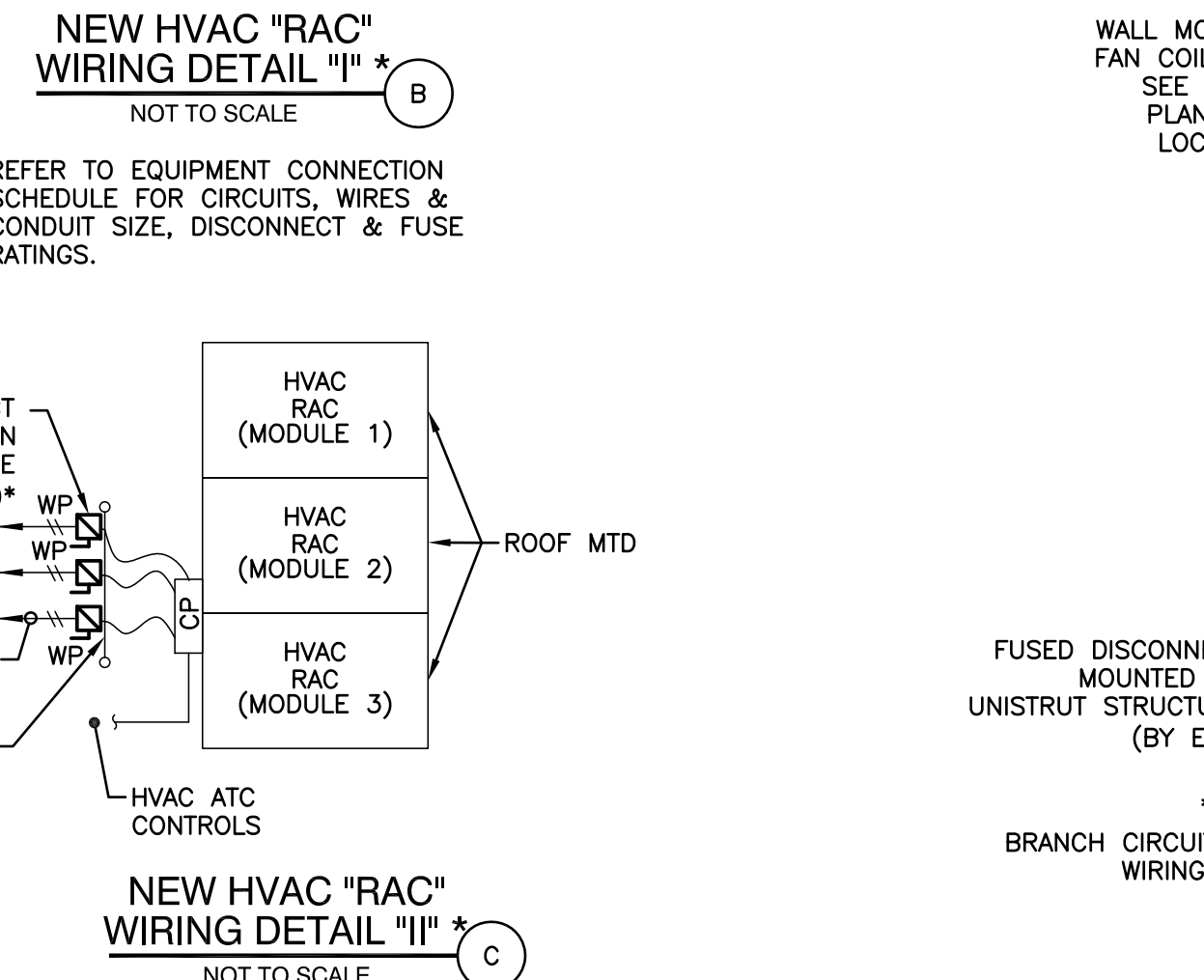
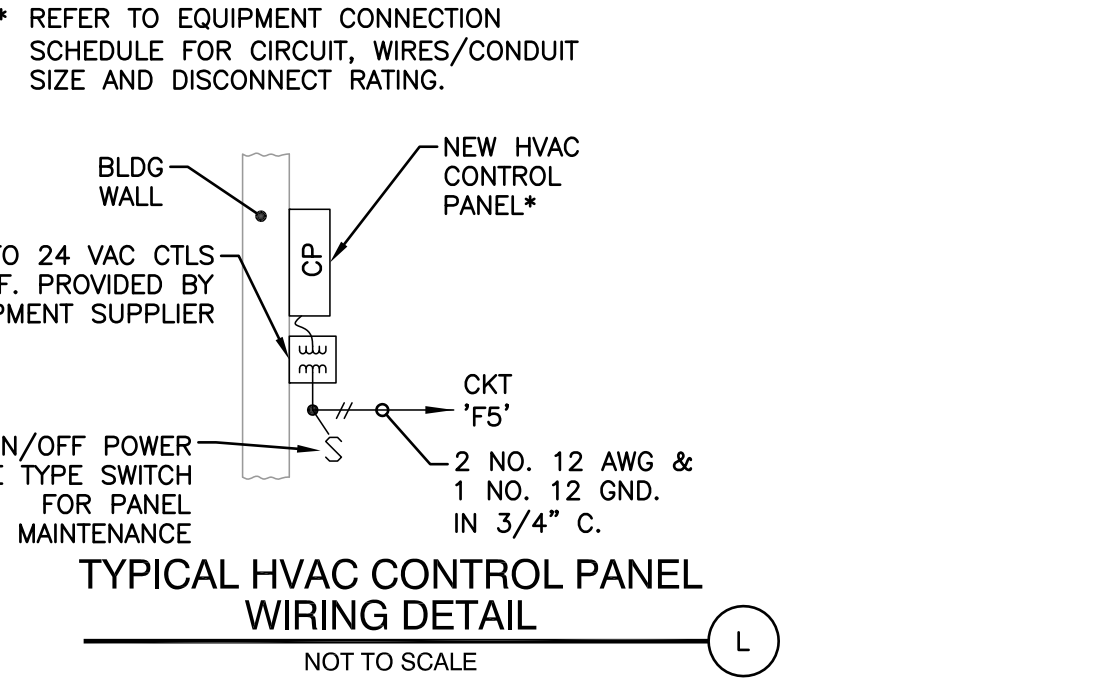
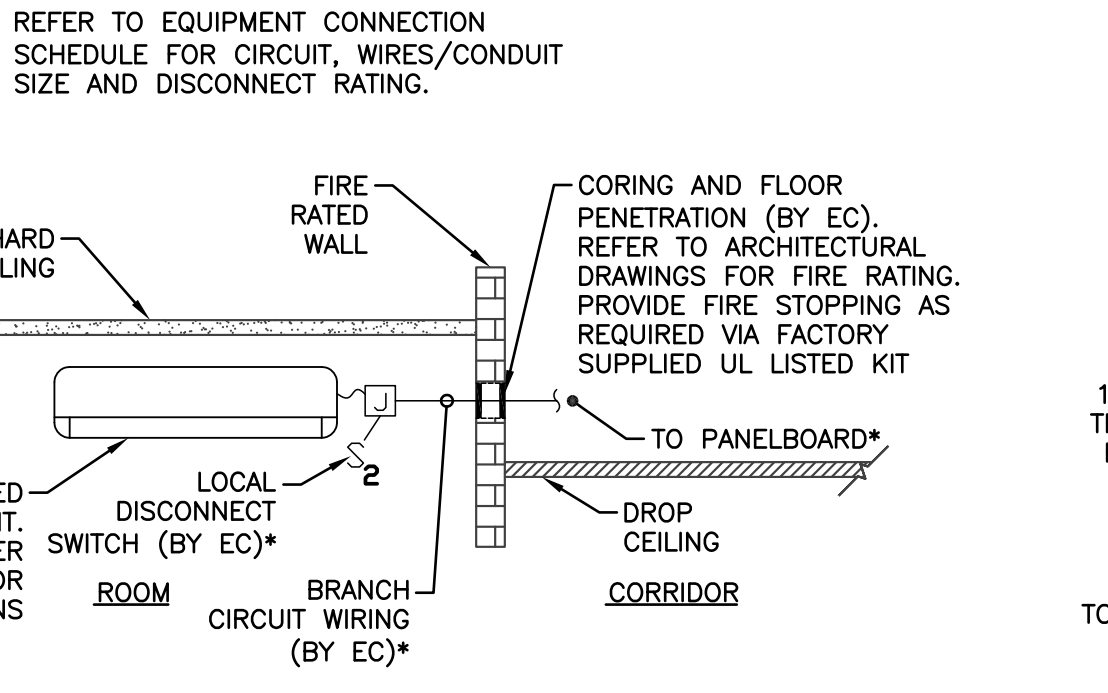
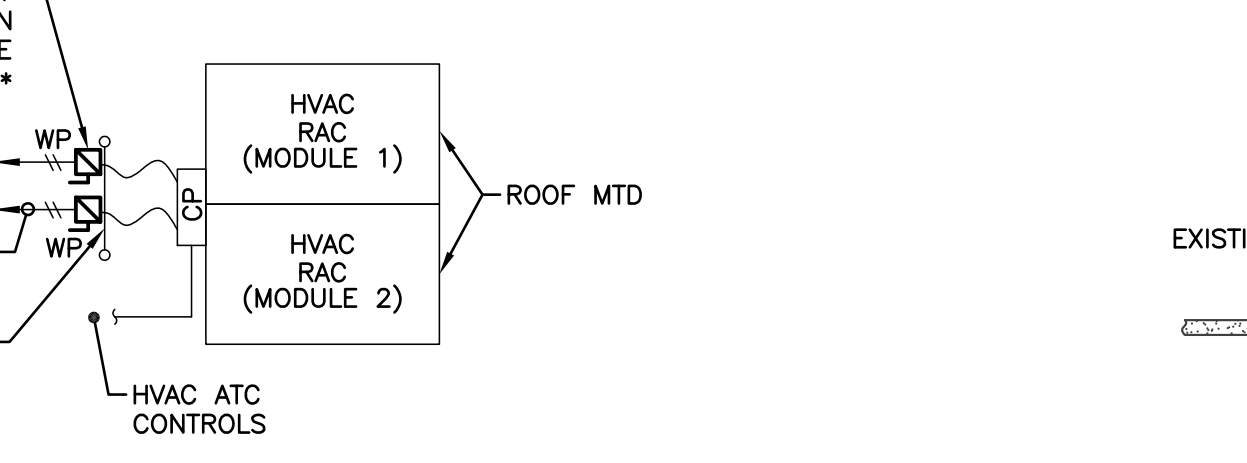
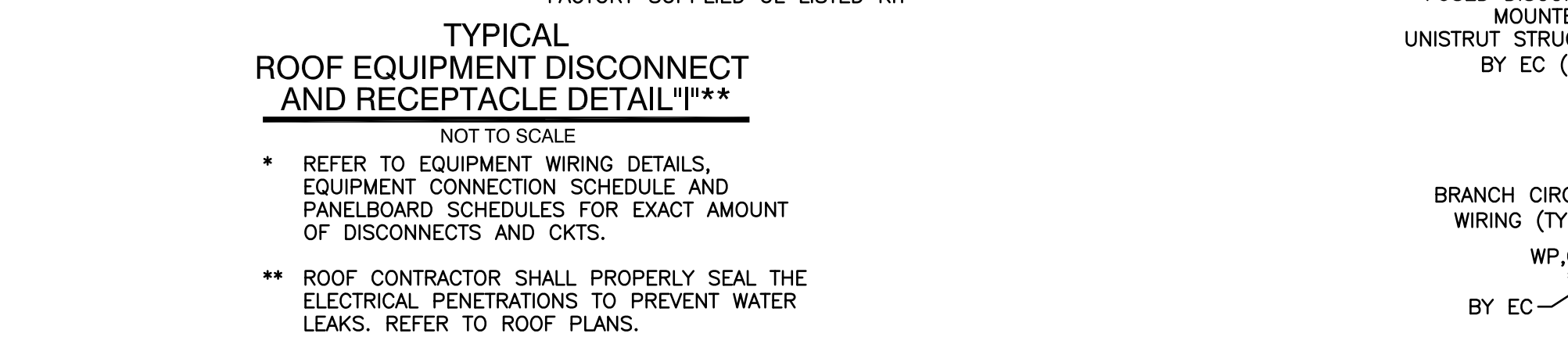
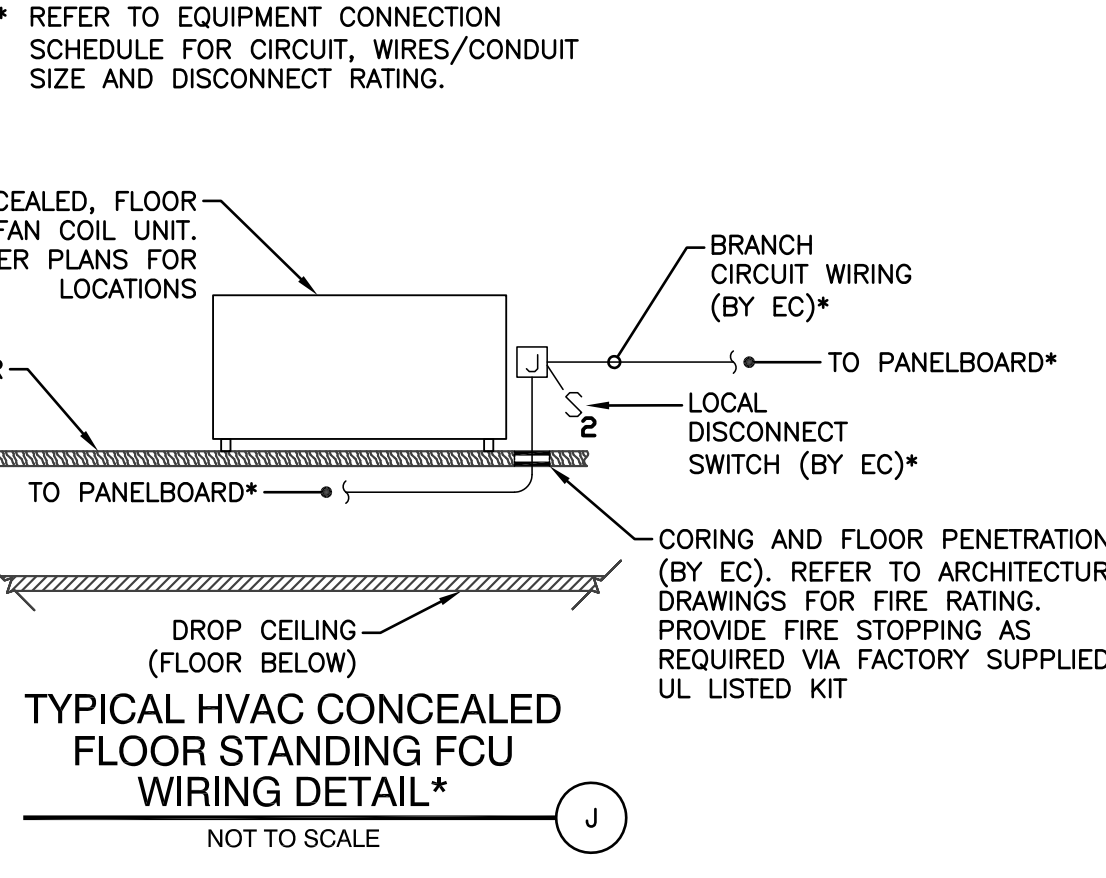
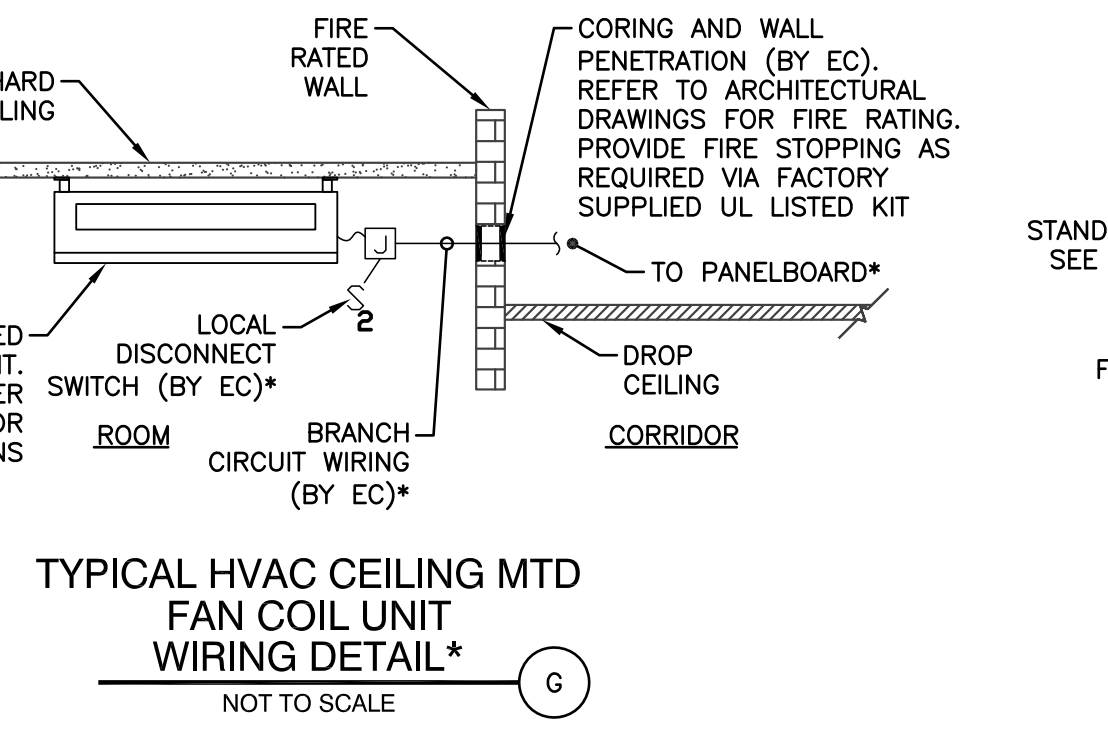
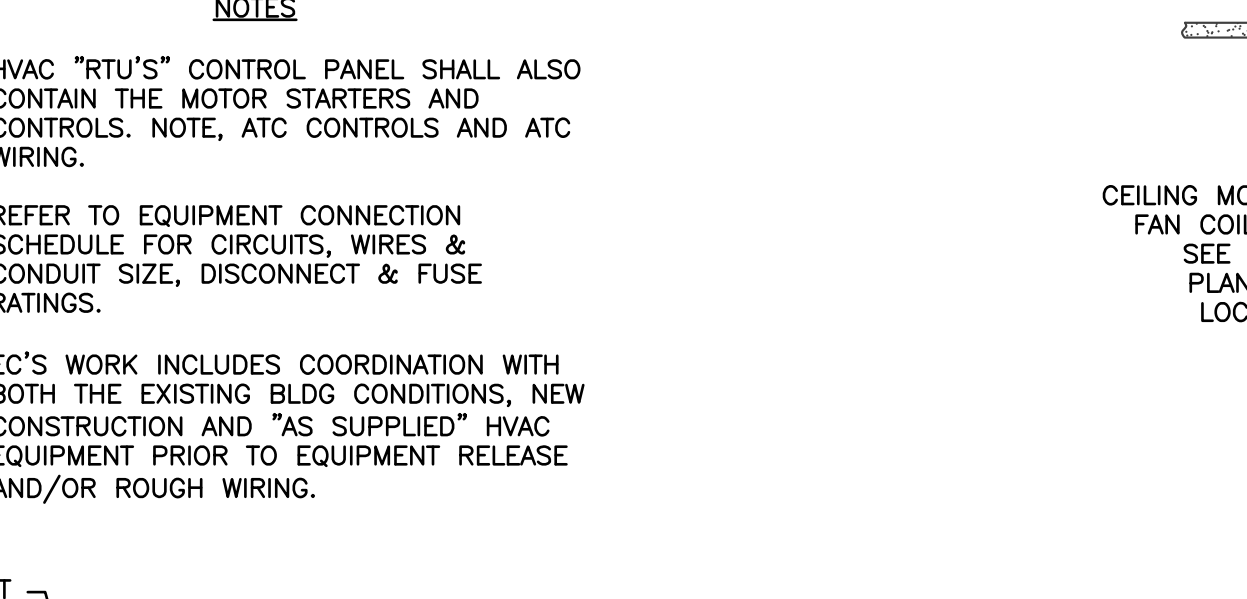
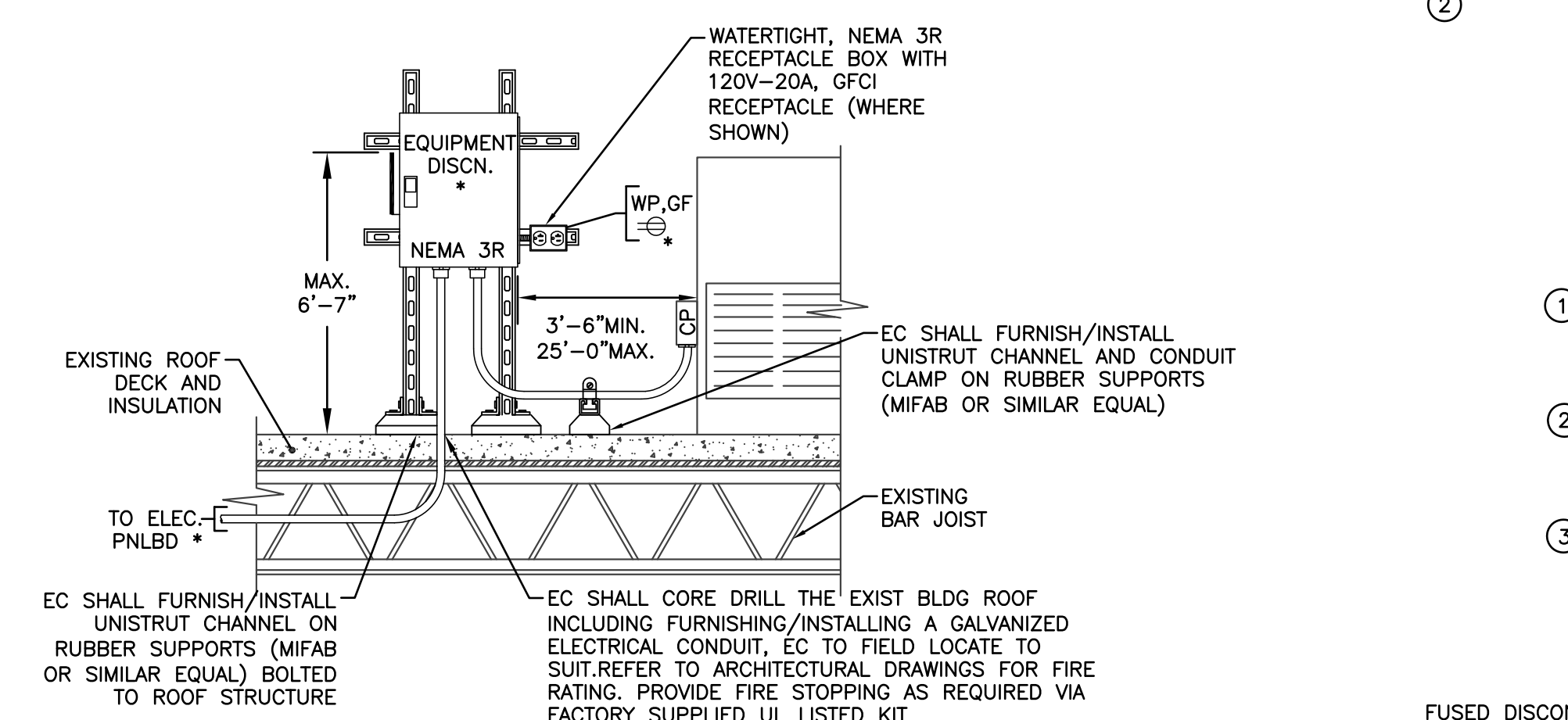
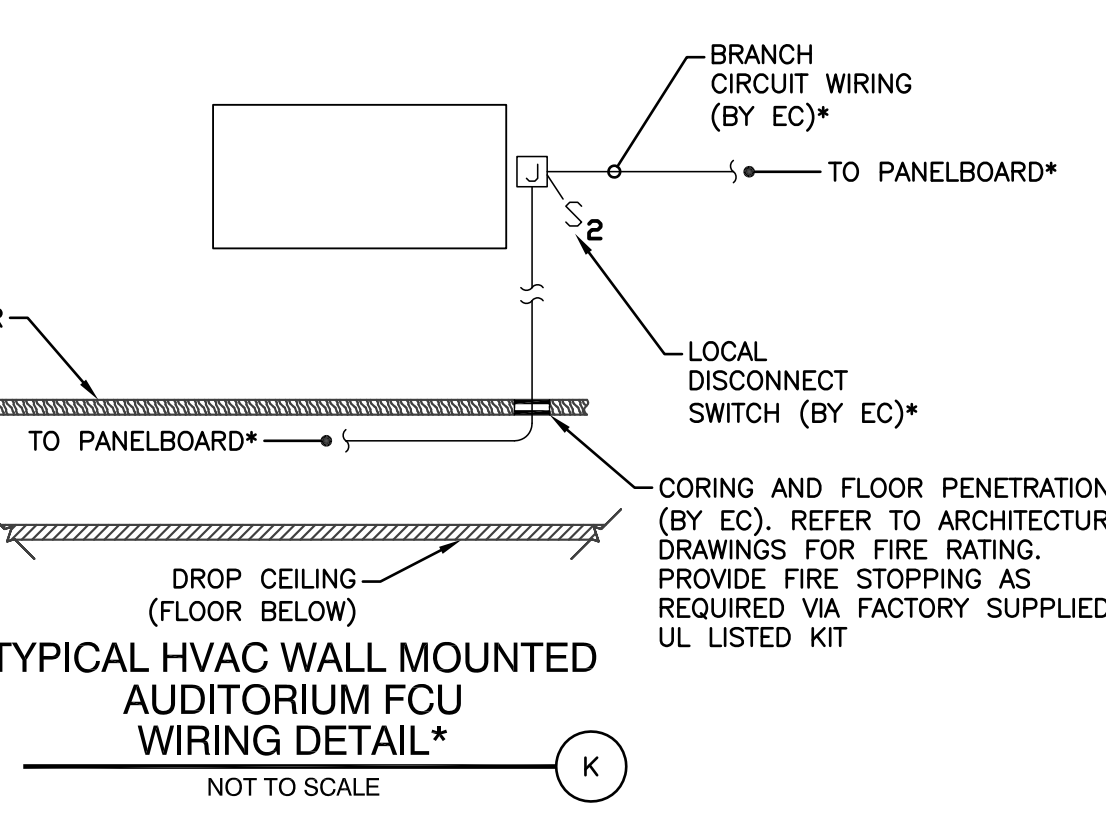
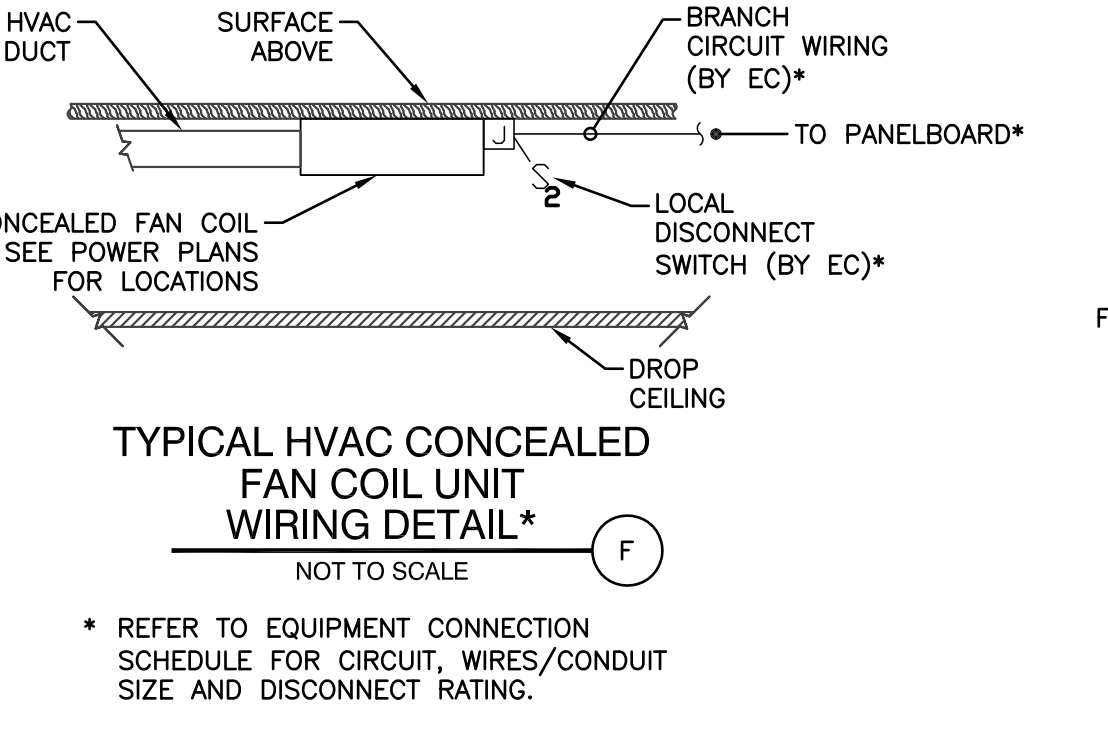
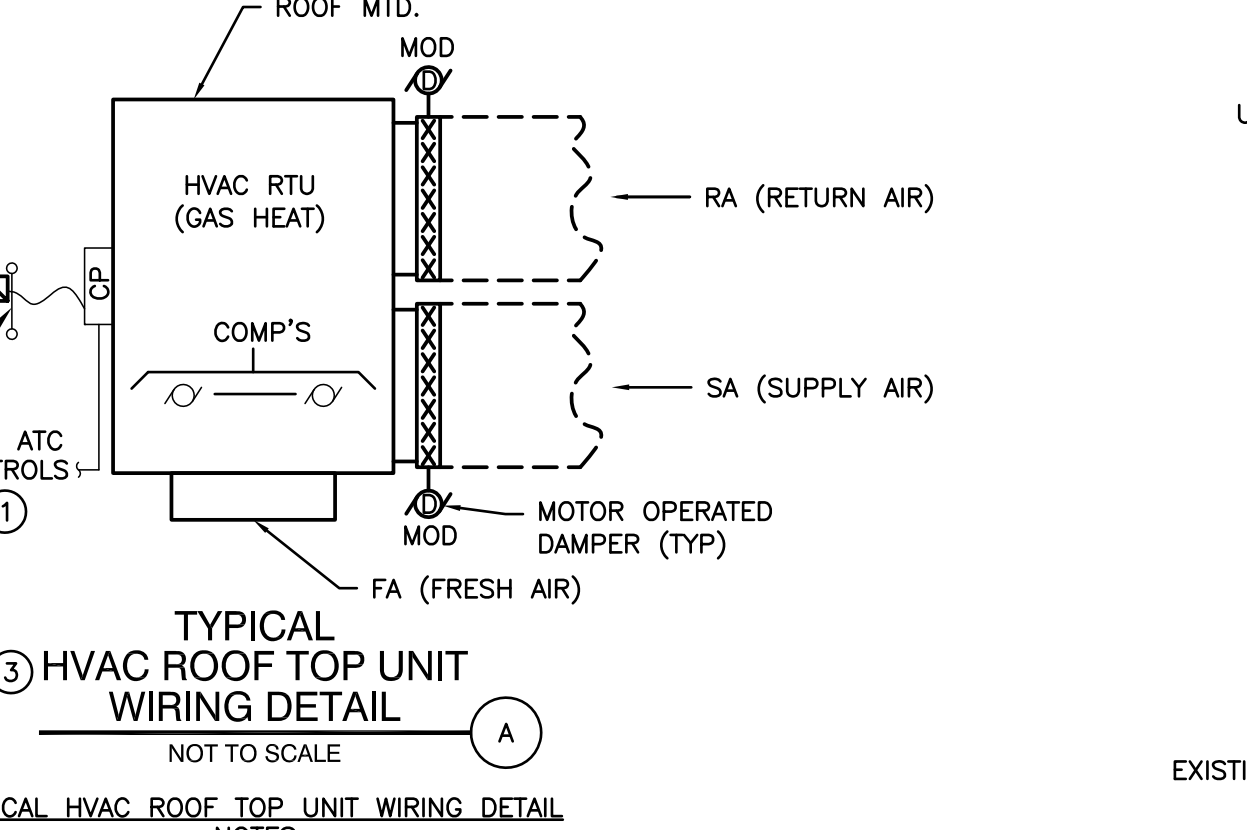
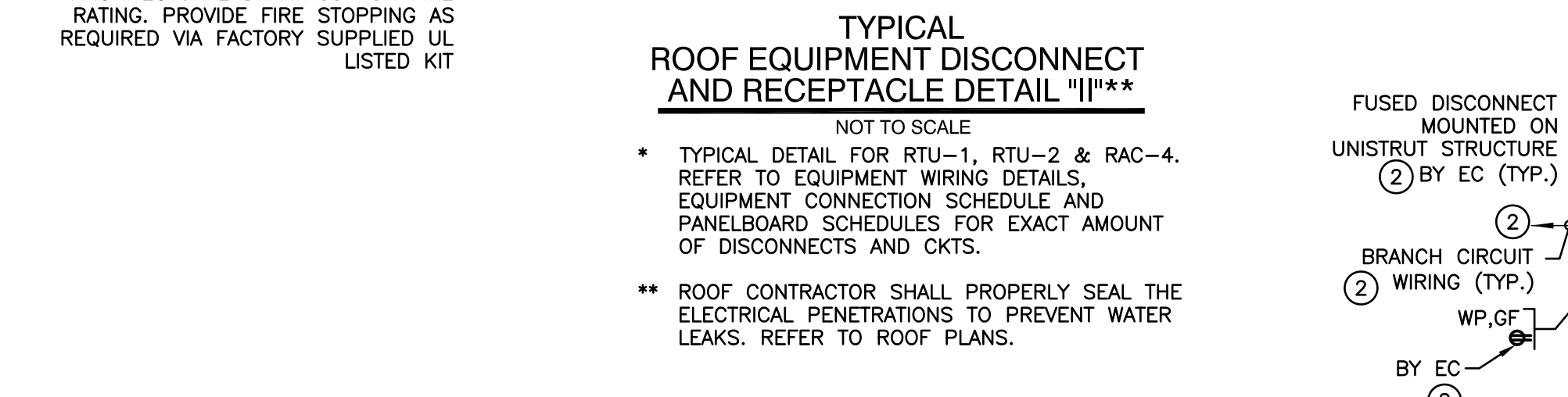
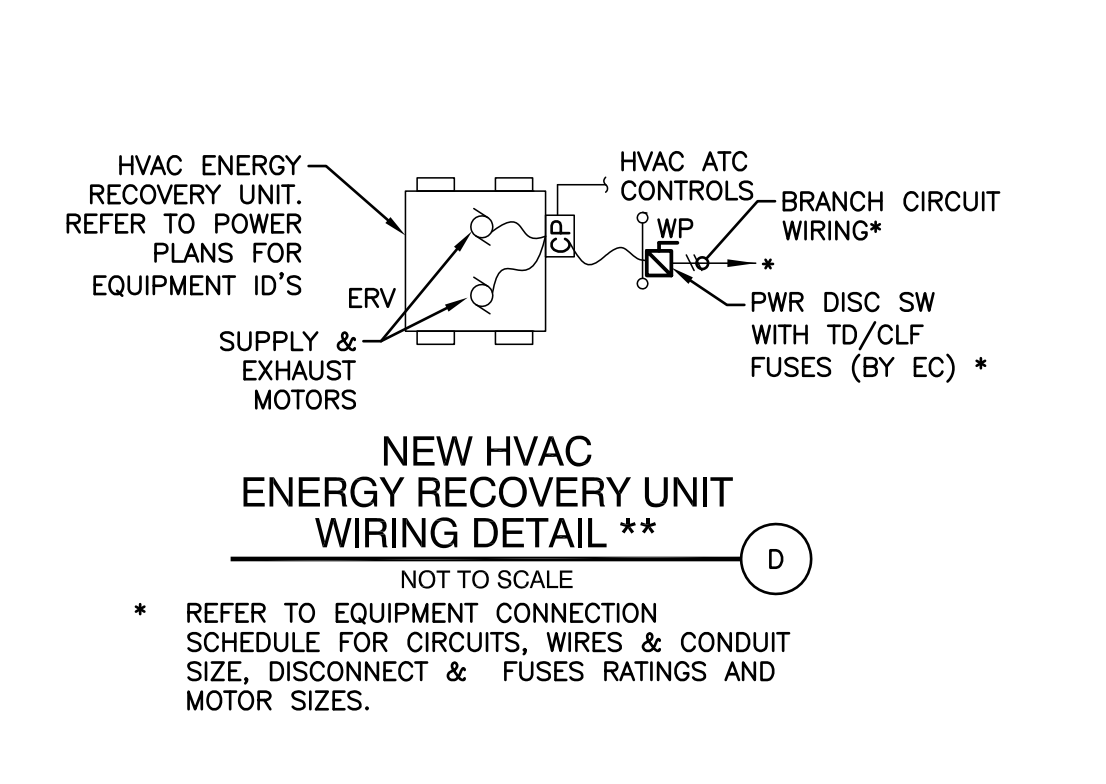
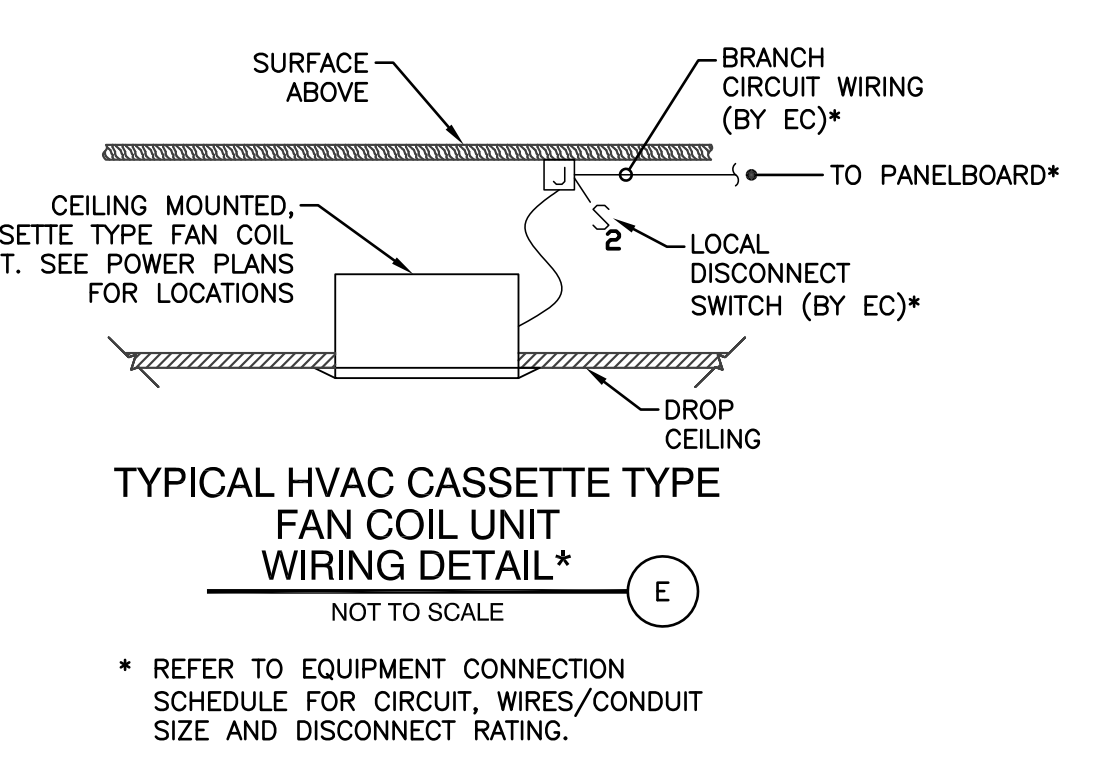
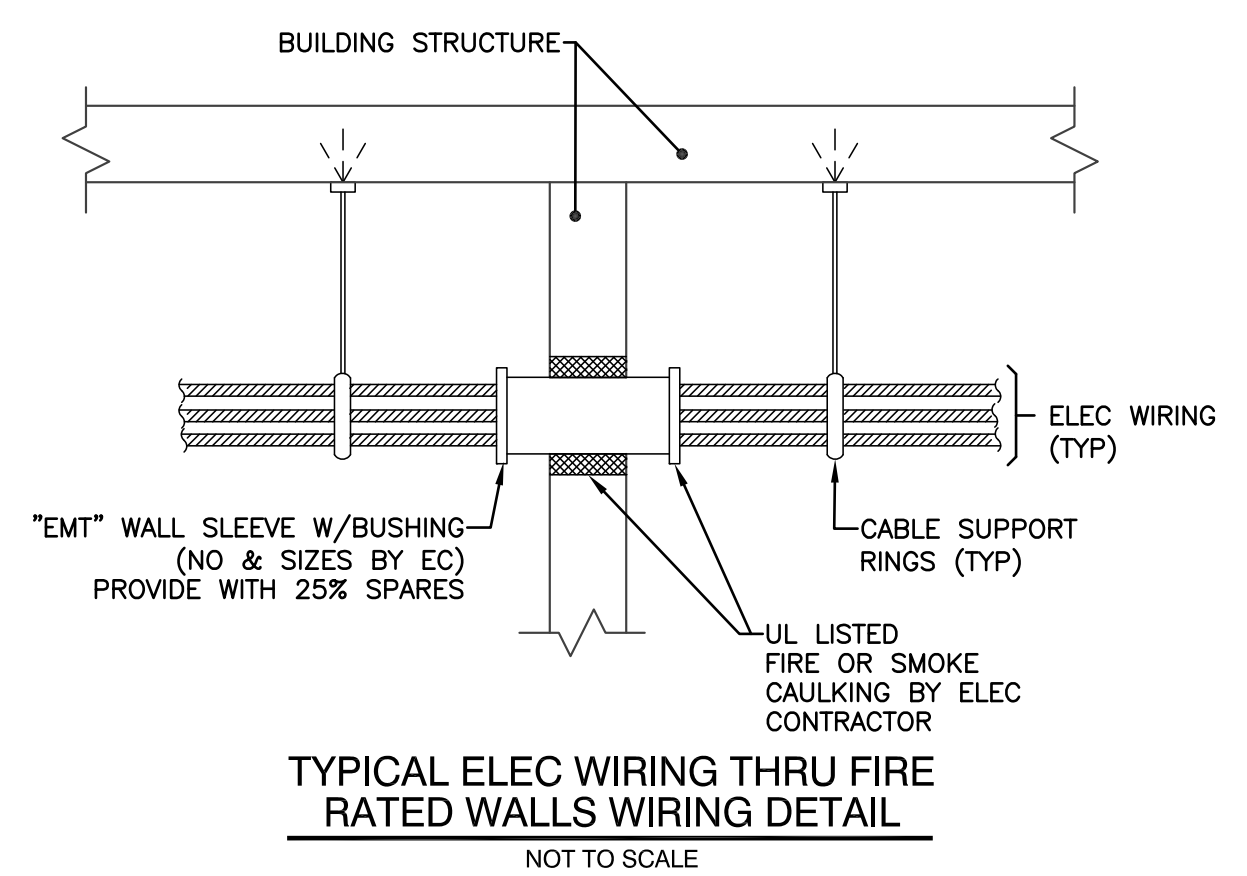
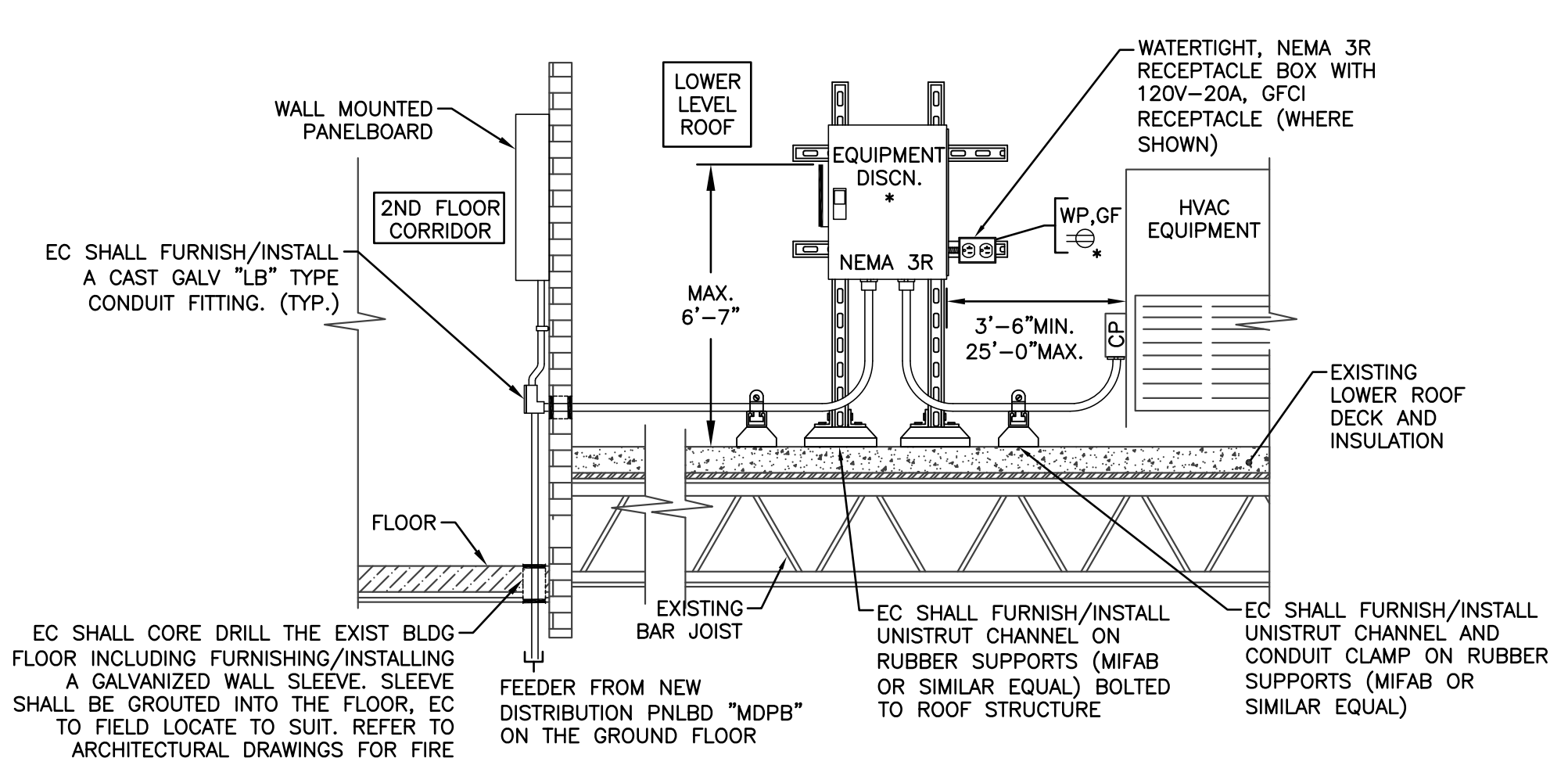
EQUIPMENT CONNECTION SCHEDULE NOTES:

1) VERIFY ELECTRICAL REQUIREMENTS WITH MECHANICAL / PLUMBING EQUIPMENT SUBMITTALS PRIOR TO ANY MATERIAL RELEASE AND/OR ROUGH WIRING.

PANELBOARDS BRANCH CIRCUITS		
CKT NO	FED BY	PANELBOARD
"A"	NEW 120/208V PANELBOARD	"GNDFL1"
"B"	NEW 120/208V PANELBOARD	"GNDFL2"
"C"	NOT USED	
"D"	NEW 120/208V PANELBOARD	"1STFL1"
"E"	NEW 120/208V PANELBOARD	"1STFL2"
"F"	NEW 120/208V PANELBOARD	"2NDFL1"
"H"	NEW 120/208V PANELBOARD	"2NDFL2"
"J"	NEW 120/208V PANELBOARD	"2NDFL3"
"K"	NEW 120/208V PANELBOARD	"2NDFL4"



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PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: LMR
CHECKED BY:
APPROVED BY:
SCALE: NOT TO SCALE

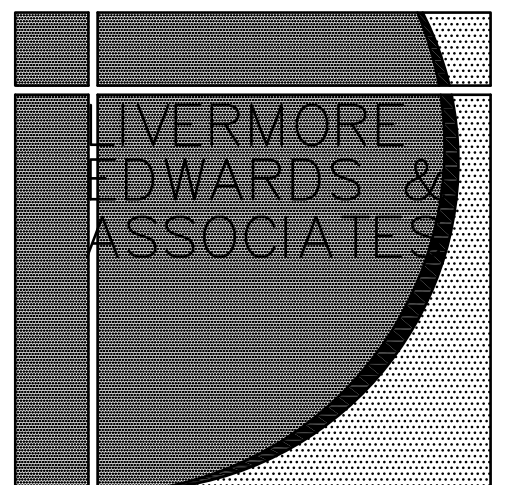
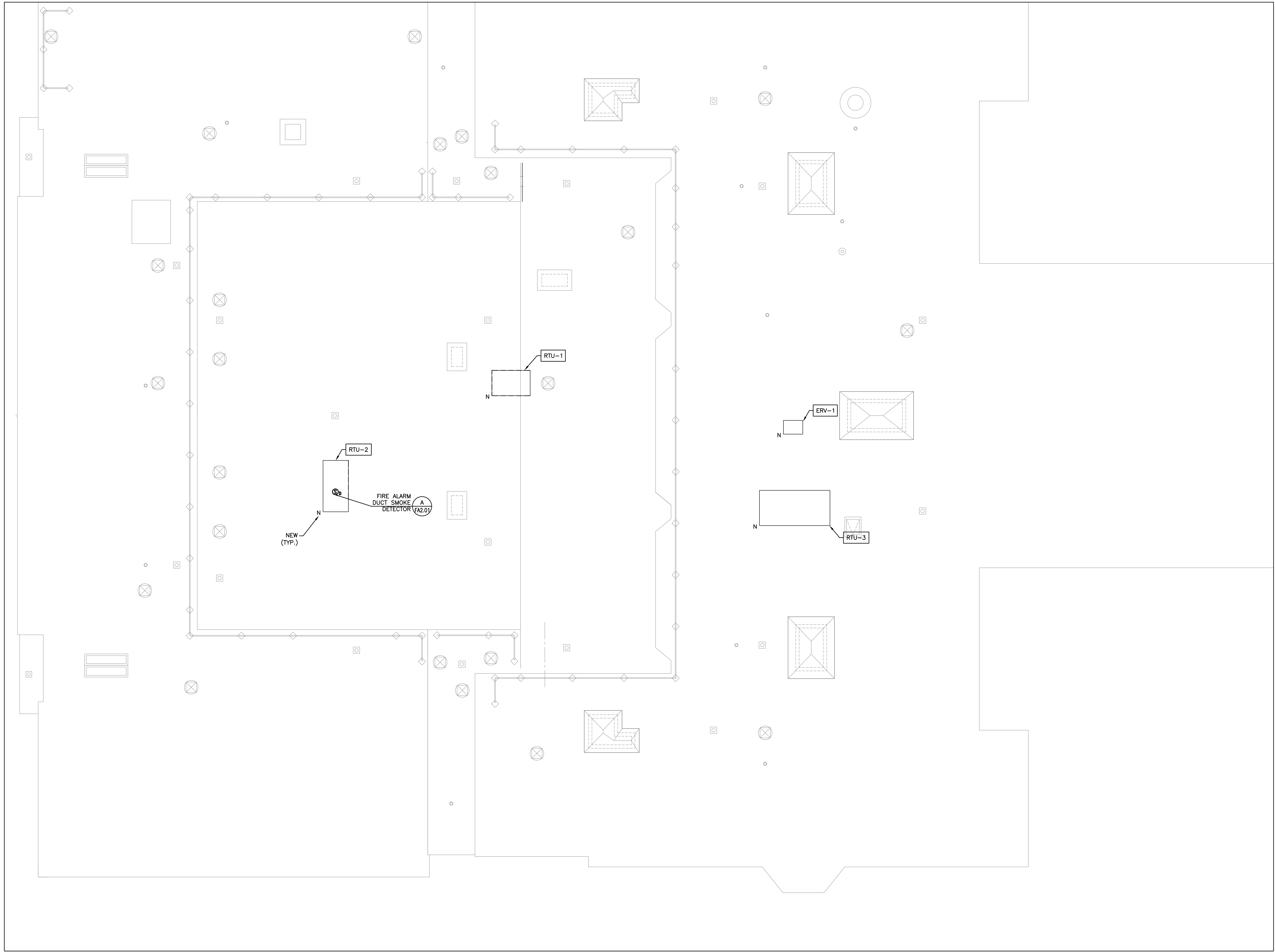
STATUS:
 SCHEMATIC DESIGN
 REVIEW
 DESIGN DEVELOPMENT
 FINAL REVIEW
 BIDDING
 PERMIT
 CONSTRUCTION
 NOT FOR CONSTRUCTION
 AS-BUILT

DATE: 8/15/17

REVISIONS:
△
△
△
△

DRAWING: **ELECTRICAL DETAILS**

E3.01



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PROJECT:
Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
 WALTHAM, MA

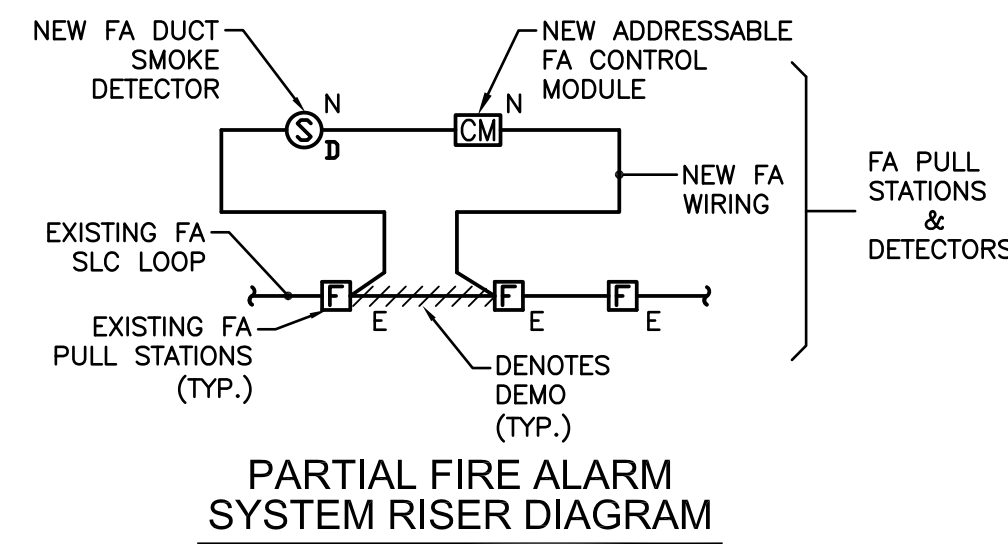
PROJECT #: SED 16076
 DRAWN BY: LMR
 CHECKED BY:
 APPROVED BY:
 SCALE: 1/8" = 1' - 0"

- STATUS:
- SCHEMATIC DESIGN
 - REVIEW
 - DESIGN DEVELOPMENT
 - FINAL REVIEW
 - BIDDING
 - PERMIT
 - CONSTRUCTION
 - NOT FOR CONSTRUCTION
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DATE: 8/15/17
 REVISIONS:
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DRAWING:
FIRE ALARM PROPOSED PLAN ROOF

FA1.11



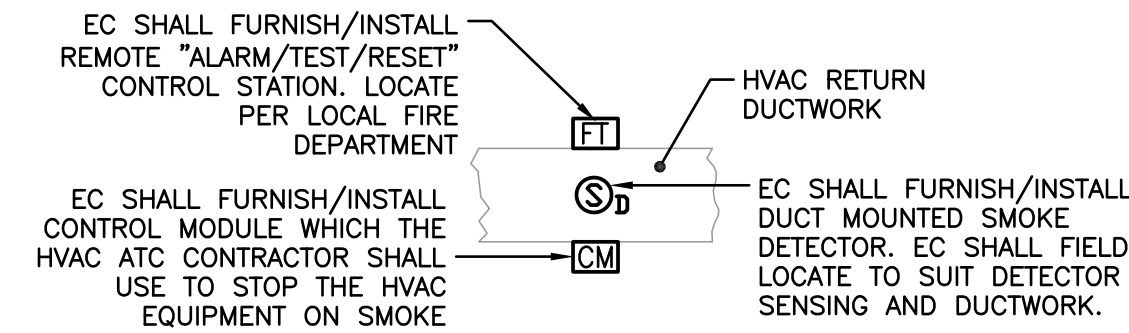
PARTIAL FIRE ALARM SYSTEM RISER DIAGRAM
NOT TO SCALE

ELECTRICAL FIRE ALARM RISER DIAGRAM NOTES

- THE EXISTING FA SYSTEM WAS MANUFACTURED BY FIRE-LITE. ELECTRICAL CONTRACTOR (EC) SHALL CONTACT THE LOCAL FIRE-LITE FA EQUIPMENT SUPPLIER IN ORDER TO SOLICIT NEW FIRE-LITE FIELD DEVICES. EC SHALL ALSO CONTACT THE BUILDING'S FA O&M CONTRACTOR IN ORDER TO SOLICIT COSTS FOR ALL FA FINAL FIELD CONNECTIONS AND TESTING INCLUDING SYSTEM RECERTIFICATION. THE REVISED FA SYSTEM SHALL BE 100% TESTED BY FA O&M CONTRACTOR WITH ASSISTANCE FROM THE CONTRACTOR/FA SUPPLIER PRIOR TO UL TESTING BY AN INDEPENDENT FA TESTING FIRM AS REQUIRED BY CITY OF WALTHAM'S FIRE DEPARTMENT. WHEN THE FA UL TESTING IS COMPLETED, THE FA TESTING SHALL BE WITNESSED BY THE FIRE DEPARTMENT. EC/SUPPLIER'S WORK INCLUDES A WRITTEN RECERTIFICATION OF THE REVISED/NEW FA SYSTEM VIA THE NFPA TESTING FORMS. ALL OF THE FA SYSTEM COSTS SHALL BE PAID BY THE EC INCLUDING BUT NOT LIMITED TO HARDWARE, SOFTWARE, WIRING, FIELD TESTING, REVISED DOCUMENTATION, ETC.
- THE NEW/REVISED FIRE ALARM SYSTEM (E - EQUIP AND WIRING) MUST BE REVIEWED AND APPROVED BY THE CITY FIRE DEPARTMENT PRIOR TO RELEASE AND INSTALLATION. EC'S FA WORK INCLUDES ALL COORDINATION WITH THE FIRE DEPARTMENT INCLUDING BUT NOT LIMITED TO FA PERMITS, DWGS REVIEW, FIELD TESTING, ETC.
- FOR THE NEW HVAC AIR RETURN SYSTEMS RATED FOR MORE THAN 2000 CFM, NEW FIRE-LITE FA DUCT SMOKE DETECTORS AND ASSOCIATED WIRING SHALL BE FURNISHED/INSTALLED BY THE EC. THE DESIGN INTENT IS TO REVISE THE NEAREST FA ADDRESSABLE LOOP CIRCUIT.
- THE FA INTERCONNECTION WIRING DIAGRAMS WHICH ARE SUPPLIED BY THE FA EQUIPMENT SUPPLIER MUST BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ANY FA ROUGH WIRING. NOTE, THE DIAGRAM MUST INCLUDE WIRE IDS AND TERMINAL NUMBERS INCLUDING WIRE TYPE/SIZE/NUMBER INFORMATION.
- EC SHALL FURNISH AND INSTALL NEW FA CLASS "A" WIRING WHICH IS IN STRICT ACCORDANCE WITH THE CITY FIRE DEPT AND WHICH IS COMPLIANT WITH THE FA MANUFACTURER'S TECHNICAL RECOMMENDATIONS. ALL FA WIRING SHALL HAVE COMPUTERIZED ALPHANUMERIC WIRE MARKER TAGS AS RECOMMENDED BY THE BLDG FA O&M CONTRACTOR AND/OR FA SUPPLIER.
- FA WIRING INSTALLED EXPOSED (W/O HUNG CEILINGS) SHALL BE INSTALLED IN "EMT" RACEWAYS FOR MECHANICAL PROTECTION. ALL OTHER FIRE ALARM WIRING SHALL BE EITHER TYPE "MC" FA CABLING OR BE TYPE "LOW ENERGY" PLENUM RATED FA WIRE ALARM WIRING. ALL FA WIRING SHALL BE BUNDLED AND "J" HOOK SUPPORTED DOWN THE CORRIDOR WHICH BRANCHES OFF AS REQUIRED. IN ADDITION, ALL FA WIRING SHALL BE SEGREGATED FROM ALL OTHER WIRING BY AT LEAST 12" OF SEPARATION.
- EC'S WORK INCLUDES COMPLETE DOCUMENTATION OF ANY REVISED OR NEW FA WIRING FOR BOTH POINT TO POINT INTERCONNECTION AND BUILDING PLAN WIRING DIAGRAMS. THE EC SHALL SUBCONTRACT WITH THE BLDG FA O&M CONTRACTOR IN ORDER TO UPDATE THE EXISTING BUILDING'S FA SYSTEM RECORD DWGS. IF REQUESTED THE ARCHITECT SHALL PROVIDE ELECTRONIC FILES OF THE PROJECT SPACE FOR THESE AS-BUILT DWGS.
- THE EC SHALL PROGRAM THE FA PANELS TO ACCOMMODATE THE NEW FA FIELD DEVICES. THE BLDG FA O&M CONTRACTOR SHALL PROVIDE FINAL CONNECTIONS, FIELD TESTING, ETC. IN ORDER FOR THE REVISED/NEW FA SYSTEM TO BE REACCEPTED BY THE CITY FIRE DEPARTMENT. ALL COSTS FOR THE BLDG FA O&M CONTRACTOR SHALL BE PAID BY THE EC. NOTE, EC'S WORK ALSO INCLUDES CITY FIRE ALARM PERMIT, SUBMITTAL OF THE FA DRAWINGS, MEETINGS WITH CITY FIRE DEPT AND FIELD TESTING BY CITY FIRE DEPARTMENT. NOTE, ALL FA TESTERS SHALL BE UL LICENSED AND ACCEPTABLE BY THE CITY FIRE DEPARTMENT.

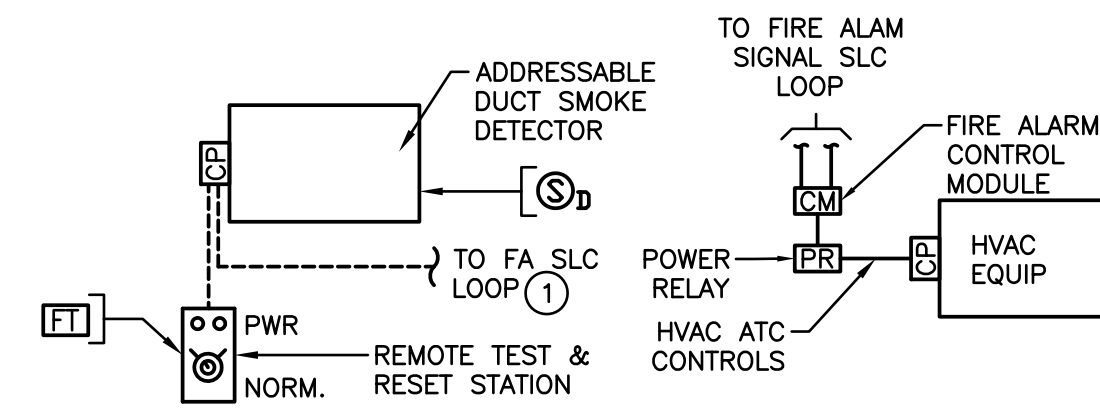
FIRE ALARM SYSTEM NOTES

- EC'S WORK INCLUDES COMPLETE DOCUMENTATION OF THE EXISTING AND NEW FA EQUIPMENT AND AFFECTED WIRING. THE EC SHALL SUB-CONTRACT WITH THE BLDG FA O&M CONTRACTOR IN ORDER TO REVISE (AS REQ'D) THE EXISTING FA EQUIPMENT (I.E. - FA CONTROL PANELS) AND ASSOCIATED WIRING VIA NEW/REVISED FA SHOP DWGS. THE FA WORK ALSO INCLUDES UPDATING THE EXISTING BUILDING'S FA SYSTEM DOCUMENTATION TO INCLUDE THE NEW FA DEVICES. IF REQUESTED, THE ARCHITECT SHALL PROVIDE ELECTRONIC FILES OF THE PROJECT SPACE FOR THESE AS-BUILT BLDG FA PLANS DRAWINGS.
- THE REVISED FA EQUIPMENT AND INTERCONNECTION FIELD WIRING DIAGRAMS MUST BE SUBMITTED AND REVIEWED/APPROVED BY THE ENGINEER PRIOR TO ANY FA ROUGH WIRING. THE DIAGRAM MUST CLEARLY INDICATE ALL FA WIRING (I.E. - TYPE, SIZES, NUMBERS, TERMINATIONS, TAGGING, ETC.) IN ORDER TO PROVIDE A FULLY DOCUMENTED FA SYSTEM.
- EC SHALL FURNISH AND INSTALL NEW FA WIRING WHICH MATCHES THE EXISTING WIRING (I.E. - TYPE, NUMBER, SIZE, ETC.) AND WHICH IS COMPLIANT WITH THE FA MANUFACTURER'S TECHNICAL RECOMMENDATIONS. ALL FA WIRING INSTALLED SHALL HAVE COMPUTERIZED ALPHA-NUMERIC WIRE MARKER TAGS AS RECOMMENDED BY THE BLDG FA O&M CONTRACTOR. EC SHALL INSTALL ALL FIRE ALARM WIRING IN "EMT" RACEWAYS IN BUILDING AREAS WITHOUT HUNG CEILINGS OR WHEN THE WIRING IS INSTALLED EXPOSED. ALL F/A WIRING INSTALLED ABOVE HUNG CEILINGS SHALL BE INSTALLED EXPOSED WITH ALL CABLES BUNDLED, TIE WRAPPED AND SUPPORTED WITH CABLE RINGS. ALL FA CABLING SHALL BE SEGREGATED FROM ALL OTHER WIRING BY AT LEAST 12 INCHES. EC SHALL FURNISH AND INSTALL "EMT" SLEEVES FOR ALL F/A CABLES WHICH PASS THROUGH WALLS OR CEILINGS. ALL F/A DEVICES SHALL BE INSTALLED IN OUTLET BOXES WITH "EMT" SLEEVES TO ABOVE THE HUNG CEILINGS.
- NEW WIRING FROM THE EXISTING FA CONTROL PANEL TO THE NEW FIRE ALARM FIELD DEVICES FOR THIS SPACE SHALL INCLUDE DETECTION WIRING, SIGNAL WIRING AND AUXILIARY 24VDC POWER WIRING (AS REQUIRED).
- ALL FA WIRING TYPES, SIZES, NUMBERS, COLORS, ETC SHALL BE SUPPLIED AND INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS PLUS THE APPLICABLE STATE OF MASSACHUSETTS CODES.
- THE EC SHALL FURNISH, INSTALL AND WIRE THE PROPOSED FA DEVICES WHICH ARE FULLY COMPATIBLE WITH THE EXISTING FA SYSTEM. BLDG FA O&M CONTRACTOR SHALL PROVIDE FINAL CONNECTIONS, FIELD TESTING, ETC. IN ORDER FOR THE REVISED FA SYSTEM TO BE RE-ACCEPTED BY THE MUNICIPAL FIRE DEPARTMENT. ALL COSTS FOR THE FACILITY'S FA O&M CONTRACTOR SHALL BE PAID BY THE PROJECT ELECTRICAL CONTRACTOR. NOTE, EC'S WORK ALSO INCLUDES MUNICIPAL FIRE ALARM PERMIT, SUBMITTAL OF THE FA DRAWINGS, MEETINGS WITH MUNICIPAL FIRE DEPT. AND FIELD TESTING WITH MUNICIPAL FIRE DEPT.
- EC'S WORK INCLUDES AS A MINIMUM FA PERMIT, REVIEWS/APPROVALS BY THE MUNICIPAL FIRE DEPT., NEW EQUIPMENT, NEW WIRING, FACP RE-PROGRAMMING, FIELD TESTING, ETC.
- FOR THE NUMBER OF FIRE ALARM DETECTORS, REFER TO THE BUILDING FIRE ALARM PLAN.



TYPICAL HVAC RETURN > 2000 CFM HVAC EQUIPMENT FA WIRING *
NOT TO SCALE

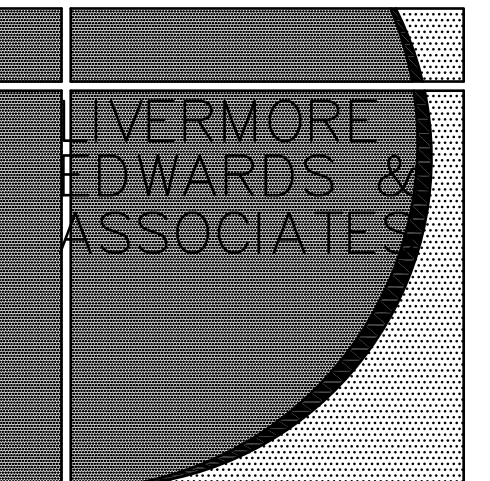
* TYP FOR RTU-2. NOTE, THE RETURN AIR SYSTEM FOR NEW HVAC RTU-1, RTU-3 AND ERV-1 ARE RATED FOR LESS THAN 2000 CFM.



DUCT SMOKE DETECTOR WIRING DETAIL
NOT TO SCALE

DUCT SMOKE DETECTOR WIRING DETAIL NOTES

- UPON ACTIVATION, SMOKE DUCT DETECTOR SHALL SEND A SUPERVISORY SIGNAL TO THE FIRE ALARM CONTROL PANEL AND SHUT DOWN LOCAL HVAC UNIT VIA FA CONTROL MODULE AND CONTROL RELAY.
- EC SHALL FURNISH/INSTALL ADDRESSABLE FIRE ALARM SMOKE DETECTOR (DUCT MTD) INCLUDING REMOTE FA TEST-ALARM-RESET CONTROL STATION, CONTROL MODULE AND CONTROL RELAY. EC SHALL LOCATE "FT" PER MA FIRE DEPT.



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PROJECT:

Waltham Community Cultural Center HVAC Improvements

510 MOODY STREET
WALTHAM, MA

PROJECT #: SED 16076
DRAWN BY: LMR
CHECKED BY:
APPROVED BY:
SCALE: NOT TO SCALE

STATUS:

- SCHEMATIC DESIGN
- REVIEW
- DESIGN DEVELOPMENT
- FINAL REVIEW
- BIDDING
- PERMIT
- CONSTRUCTION
- NOT FOR CONSTRUCTION
- AS-BUILT

DATE: 8/15/17

REVISIONS:

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△	△
△	△
△	△

DRAWING:

FIRE ALARM RISER, DETAILS AND NOTES

FA2.01

- G. Circuitry for miscellaneous systems indicated without notation as to location and routing shall be run as per the requirements and notations governing the adjacent light and power circuitry.

3.12 INSTALLING CIRCUITRY

- A. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four right angle bends or the equivalent thereof.
- B. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying "going" current are not separated from conductors of the same feeder or circuitry carrying "return" current by any ferrous or other metal. Where not within raceways, all "going" and "return" current conductors of one feeder or circuit shall be laced together so as to minimize induction heating of adjacent metal components.
- C. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suite the water condition encountered in the field.

END OF SECTION

END