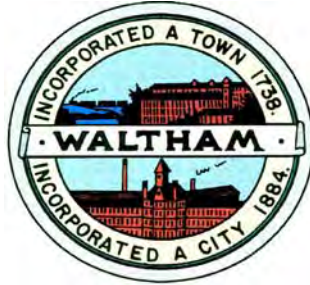


The City of Waltham



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

**CONSTRUCTION OF A VAULT and ARCHIVAL SPACES AT THE
FORMER BRIGHT SCHOOL, PHASE II**

The GENERAL BID is due: **Wednesday August 29, 2012 at 10:00 am**

The FILED SUB BIDS are due: **Wednesday August 22, 2012 at 10:00 am**

PRE BID Meeting and Briefing on Site: **Wednesday August 15, 2012 at 10:00 am**
At 260 Grove Street, Waltham

**SECTION 00050
CITY OF WALTHAM
MASSACHUSETTS**

NOTICE TO BIDDERS, INCLUDING SUB-BIDDERS

**CONSTRUCTION OF A VAULT and ARCHIVAL SPACES AT THE FORMER BRIGHT SCHOOL, PHASE II
260 GROVE STREET, WALTHAM, MASSACHUSETTS**

The City of Waltham, Massachusetts invites sealed bids from Contractors for the Construction of A Vault and Archival Spaces at the Former Bright School, Phase II, 260 Grove Street, Waltham, Massachusetts. The work includes Interior renovations of former classrooms into a Vault, Archives and Record Storage spaces. Work also includes but is not limited to: interior walls and finishes, accessories, fire protection, HVAC, and electrical.

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 **SUB-BIDS** for categories of "Resilient Flooring", "Painting", "HVAC" and "Electrical", will be accepted at the Purchasing Department, Waltham City Hall, 610 Main Street, Waltham, MA 02452 until **10:00 AM on August 22, 2012**, at which place and time they shall be publicly opened, read aloud and recorded for presentation to the Awarding Authority.

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 on August 29, 2012**, at which place and time they shall be publicly opened, read aloud and recorded for presentation to the Awarding Authority.

A **PRE-BID CONFERENCE** will be held for all interested parties at **10:00 AM on August 15, 2012** at the site at the **Bright School at 260 Grove Street, Waltham, MA**. Attendance at this pre-bid conference is strongly recommended for parties submitting a bid. It will be the only opportunity to visit the site prior to the bid opening.

Each general bid, and each sub-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. Bid deposits will be dealt with as provided in Massachusetts General Laws, Chapter 149, Section 44B.

To be given consideration, all general bids and all sub-bids must be accompanied by a copy of the Bidder's Certificate of Eligibility (DCPO Form CQ7) and an Update Statement (DCPO Form CQ3). The General Bidder must be certified eligible in the General Building category and the filed sub-bidders must be certified in their respective categories.

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 attached to and is made a part of the Contract.

**NOTICE TO BIDDERS, INCLUDING SUB-BIDDERS
00050 - 1**

Bidders' selection procedures and contract award shall be in conformity with applicable statutes of the Commonwealth of Massachusetts.

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 \$500,000 per occurrence and \$1,000,000 in the aggregate and Worker's Compensation Insurance as prescribed by law.

In accordance with M.G.L.Ch 149 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 00100 - 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 8:30 P.M. on August 1, 2012.
- B. **Pre-bid** walkthrough on **Wednesday, August 15, 2012, at 10:00 AM** at the Bright School, Waltham, MA.
- C. Questions and requests for interpretations may be submitted in writing by the Filed Sub-Bidders via e-mail ONLY to Jpedulla@city.waltham.ma.us up to and including: August 16, 2012, 4:00 P.M., and by General Bidders up to and including: August 27, 2012, 12:00 noon
- D. Addenda will be issued with interpretations as determined by the Purchasing Department only via e-mail and posting on the web site.
- E. File Sub-Bids Deadline: **10:00 A.M. on August 22, 2012**, in the Purchasing Department, City Hall, 610 Main Street, Waltham, MA 02452, Attn: J. Pedulla, CPO, where the bids will be publicly opened and read.
- F. General Bids Deadline: **10:00 A.M. on August 29, 2012**, 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 149, Sections 44A-44L inclusive, 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.

**INSTRUCTION TO BIDDERS
00100 - 1**

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 shall visit the site of the proposed work and fully acquaint himself with conditions as they exist, and shall 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

INSTRUCTION TO BIDDERS
00100 - 2

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:
 Construction of a Vault and Archival Spaces, Phase II

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 Section 44B-44L inclusive, as amended or inserted, of Chapter 149 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 in accordance with Section 44F, 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

INSTRUCTION TO BIDDERS
00100 - 3

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 **Wednesday, August 15, 2012, at 10:00 AM.** at the Bright School 260 Grove Street, Waltham, MA. Interested parties are encouraged to attend given that this will be the only time the building is open 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 Substantially Complete in **180 calendar days** after the date of the Notice-to-Proceed.

1.18 LATE FEES

- A. If the work is not Substantially Complete as specified in 1.17, the Contractor shall be charged a maximum of Five Hundred Dollars (\$500.00) per day to pay for consulting and testing fees required to manage and arrange for the completion of the project. Late fees will be deducted from the Contract via Change Order.

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 Planning Department at 119 School Street, Waltham.

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 Commissioner of Labor and Industries, pursuant to the provision of Chapter 149, Section 26 to 27D inclusive, of the Massachusetts General Laws. The Prevailing wage Schedule 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 STAGING

- A. The General Contractor shall provide all the vertical access (which includes staging, vertical lifts, etc.) for the work of the Contract for the General Bidder and his/her non File Sub-bid subcontractor. **Exception:** ALL File Sub-Bidders shall provide ALL their own staging, vertical access, and hoisting necessary to perform their own work.

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 \$ 500,000 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 Contractor's equipment with a provision for Waiver of Subrogation against the Owner.

INSTRUCTION TO BIDDERS
00100 - 7

- 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 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 BUILDING PERMIT FEES

- A. Building permit fees will be waived for this project. However, the general Contractor is expected to obtain all proper permits as required by City Ordinances

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 even if they do not pertain to your trade.

Signature of Individual or Corporate Name

By:

(Signature of Corporate Officer if applicable)

Title: _____

Social Security Number or Federal Identification Number: _____

END OF SECTION

**INSTRUCTION TO BIDDERS
00100 - 8**

SECTION 00300

FORM FOR GENERAL BID

**CONSTRUCTION OF A VAULT and ARCHIVAL SPACES, PHASE II
WALTHAM, MASSACHUSETTS**

General Bid Opening Date: 10:00 am, August 29, 2012

Joseph Pedulla, CPO
City of Waltham
610 Main Street
Waltham, MA 02452

A. Basic Price

The undersigned:

(Please type or print the business name of the bidding firm)

having visited the site of the above project and having familiarized myself with the local conditions affecting the cost of the work and with the contract documents, including Amendments and Addenda No's. ____, ____, ____, ____, ____ hereby proposes to furnish all labor (including Sub Bids), materials, tools, equipment, insurance, permits and taxes, and to do and lawfully perform all things as provided in the specifications, all in accordance with the contract documents, for the sum of:

TOTAL Bid (in words) _____ **Dollars, \$** _____

B. 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. \$ _____

Item 2. Sub Bids as follows:

Sub-Trade	Number of Sub-Bidder	Amount	Bonds required indicated by "Yes" or "No"
<u>Resilient Floors</u>	_____	\$ _____	_____
<u>Painting</u>	_____	\$ _____	_____
<u>HVAC</u>	_____	\$ _____	_____
<u>Plumbing</u>	_____	\$ _____	_____

Total of Items 2 = \$ _____

C. Price for Alternates:

1. Alternate 1, Additional Work in Two Record Rooms \$ _____

2. Alternate 2, Additional Painting of Sprinkler Pipes \$ _____

D. The undersigned agrees that, if s/he is selected as General Contractor, s/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 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 the contract price, the premiums for which are to be paid by the General Contractor and are included in the contract price.

E. The undersigned certifies that s/he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work and that s/he will comply fully with all laws and regulations applicable to awards made subject to section forty-four A.

F. The undersigned as Bidder certifies that if this proposal is accepted, s/he will furnish to the City of Waltham with the invoice for the material or equipment supplied two copies of any and all Material Safety Data Sheets applicable to such material or equipment, as required by M.G.L. Chapter 111F, so called "Right to Know Law".

G. The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. The word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity.

H. Substantial Completion

1. The work of the Contract shall be Substantially Completed in one hundred and eighty (180) calendar days.

I. 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.

**FORM FOR GENERAL BID
00300 - 3**

SECTION 00310 - FORM FOR SUB-BID

INSERT TRADE

**CONSTRUCTION OF A VAULT and ARCHIVAL SPACES, PHASE II
WALTHAM, MASSACHUSETTS**

Sub-Bid Opening Date: 10:00 am, August 22, 2012

To all General Bidders except those hereinafter expressly excluded:

A. The undersigned:

(Please type or print the business name of the bidding firm)

proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified in Section No's. _____ of the specifications and in any plans specified in such section, prepared by CBI Consulting for Renovation of the Hardy School Elderly Housing, Waltham, Massachusetts, for the contract sum of

Base Bid (in words) _____ dollars (\$ _____).

B. This sub-bid includes addenda number _____, _____, _____, _____, _____, _____

C. This sub-bid

May be used by any general bidder except:

May only be used by the following general bidders:

(To exclude general bidders, insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded.)

D. The undersigned agrees that, if he is selected as sub-bidder, he 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, 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.

E. The names of all persons, firms and corporations performing such class of work or part thereof for which the section of the specifications for the sub-trade require a listing in this paragraph (including the undersigned if customarily furnished by persons on his own payroll and in the

**FORM FOR SUB BID
00310 - 1**

absence of a contrary provision in the specifications), the name of each such class of work, or part thereof, and the bid price for each such class of work or part thereof are:

<u>NAME</u>	<u>CLASS OF WORK</u>	<u>BID PRICE</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

(Do not give bid price for any class or part thereof furnished by undersigned.)

F. The undersigned agrees that the above list of bids to the undersigned represents a bona fide bid based on hereinbefore described plans, specifications, and addenda, and that, if the undersigned is awarded the contract, s/he will be used for the work indicated at the amounts stated, if satisfactory to the Awarding Authority.

G. 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 he, by those documents, assumes toward the Owner.

H. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all requirements of the plans and specifications:

1. Have been in business under present business name _____ years.
2. Have ever failed to complete any work awarded? _____
3. List three or more recent buildings with names of General Contractor and Architect on which you served as subcontractor for work of similar character as required for the above named buildings:

<u>BUILDING</u>	<u>ARCHITECT</u>	<u>GENERAL CONTRACTOR</u>	<u>AMOUNT OF CONTRACT</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

4. Bank Reference: _____

**FORM FOR SUB BID
00310 - 2**

- I. 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 and that he will comply fully with the laws and regulations applicable to awards of subcontractors subject to section 44 F of M.G.L. 149.
- J. The undersigned further agrees that, if the undersigned fails to perform his agreement to execute a subcontract with the General Contractor and furnish a performance and payment bond if requested to do so in the general bid by the general bidder, the bid deposit accompanying the copy of this bid filed with the Award Authority shall become and be the property of the Awarding Authority as liquidated damages. The undersigned understands that, if he so executes a subcontract with the General Contractor and furnishes a performance and payment bond, if requested to do so, the bid deposit will be returned within five (5) days after execution of the general contract.
- K. The undersigned represents that this proposal is made in good faith without fraud, collusion or connection of any kind with any other bidder for the same work, that the undersigned is competing solely on his own behalf without connection with, or obligation to, any undisclosed person or corporation, that no other person or corporation has any interest in the profits of the contract, that the undersigned has read the form of contract attached hereto and is fully informed in regard to all provisions thereof and to the plans and specifications therein referred to, and that the undersigned has visited the premises described in said form of contract and made his own examination of the place where the work is to be done and of all conditions pertaining to the work and has made his own estimate and from such examination and estimate makes this proposal.
- L. The Federal Social Security Identification Number of the sub-bidder (the number used on Employer’s Quarterly Federal Tax Return, US Treasury Department Form 941) is:

- M. 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.

DATE _____

Sub Bidder _____
(Company Name)

By: _____
Signature of Authorized Representative

Title: _____
(Affix Seal)

Business Address: _____

City and State: _____

Telephone No. _____

FORM FOR SUB BID
00310 - 3

Compliance

These documents must be signed and returned with your bid

Compliance

The compliance documents in this section must be completed, signed and returned **with your bid package.**

Purchasing Department

City of Waltham
610 Main Street
Waltham, MA 02452

Failure to submit the completed documents will cause the disqualification of the proposal.

Section Index

Check when Complete

- Non-collusion form and Tax Compliance form..... _____
- Corporation Identification Form..... _____
- Certificate of Vote Authorization..... _____
- Certificate of Insurance (showing all limits of WC &GL)..... _____
- Three (3) References..... _____
- 5% Bid Bond or Certified Check>..... _____
- Debarment Certificate _____
- Prevailing Wage Certificate..... _____
- Right-to-know Law..... _____
- OSHA 10 Certificate for all Assigned Employees (MGL ch30, §39M and Ch 149) _____

Before the commencement of the Job, the contractor must provide to the above office:

- Performance Bond for 100% of the contract value and naming the City of Waltham
(Letter must be included with your response)

Your Company's Name: _____

Service or Product Bid _____

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.

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.

CERTIFICATE OF VOTE OF AUTHORIZATION

Date:

I _____, Clerk of _____ hereby certify that at a meeting of the Board of Directors of said Corporation duly held on the _____ day of _____ at which time a quorum was present and voting throughout, the following vote was duly passed and is now in full force and effect:

VOTED: That _____ (*name*) is hereby authorized, directed and empowered for the name and on behalf of this Corporation to sign, seal with the corporate seal, execute, acknowledge and deliver all contracts and other obligations of this Corporation; the execution of any such contract to be valid and binding upon this Corporation for all purposes, and that this vote shall remain in full force and effect unless and until the same has been altered, amended or revoked by a subsequent vote of such directors and a certificate of such later vote attested by the Clerk of this Corporation.

I further certify that _____ is duly elected/appointed _____ of said corporation

SIGNED:

(Corporate Seal)

Clerk of the Corporation:

Print Name: _____

COMMONWEALTH OF MASSACHUSETTS

County of _____

Date:

Then personally appeared the above named and acknowledged the foregoing instrument to be their free act and deed before me, _____

Notary Public;

My Commission expires: _____

CORPORATION IDENTIFICATION

The bidder for the information of the Awarding Authority furnishes the following information.

If a Corporation:

Incorporated in what state _____

President _____

Treasurer _____

Secretary _____

Federal ID Number _____

If a foreign (out of State) Corporation – Are you registered to do business in Massachusetts?

Yes _____, No _____

If you are selected for this work you are required under M.G.L.ch. 30S, 39L to obtain from the Secretary of State, Foreign Corp. Section, State House, Boston, a certificate stating that you Corporation is registered, and furnish said certificate to the Awarding Authority prior to the award.

If a Partnership: (Name all partners)

Name of partner _____

Residence _____

Name of partner _____

Residence _____

If an Individual:

Name _____

Residence _____

If an Individual doing business under a firm's name:

Name of Firm _____

Name of Individual _____

Business Address _____

Residence _____

Date _____

Name of Bidder _____

By _____

Signature _____

Title _____

Business Address _____ (POST OFFICE BOX NUMBER NOT ACCEPTABLE)

State Telephone Number _____ Today's Date _____

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.

**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

_____, 200_____

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 _____

RIGHT TO KNOW LAW

Any vendor who receives an order or orders resulting from this invitation agrees to submit a Material Safety Data Sheet (MSDS) for each toxic or hazardous substance or mixture containing such substance, pursuant to M.G.L. c. 111F, §§8,9 and 10 and the regulations contained in 441 CMR 21.06 when deliveries are made. The vendor agrees to deliver all containers properly labeled pursuant to M.G.L. c. 111F §7 and regulations contained in 441 CMR 21.05. Failure to furnish MSDS and/or labels on each container may result in civil or criminal penalties, including bid debarment and action to prevent the vendor from selling said substances, or mixtures containing said substances within the Commonwealth. All vendors furnishing substances or mixtures subject to Chapter 111F or M.G.L. are cautioned to obtain and read the laws, rules and regulations referenced above. Copies may be obtained from the State House Bookstore, Secretary of State, State House, Room 117, Boston, MA (617) 727-2834.

Authorized Signature Indicating Compliance with the Right-to-know laws:

Signature Date

Print Name

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.

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 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.

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01.11.00 SUMMARY OF WORK

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the Work of this Section.

2.0 DESCRIPTION OF WORK

- 2.1 The name of the Project is: **Archival Vault at the Bright School Phase 2**, 260 Grove Street, Waltham, Massachusetts.
- 2.2 The Work required under the Contract consists of providing all labor and materials in accordance with the Contract Documents and all equipment, accessories, and related devices required to execute the intentions of the Contract Documents.
- 2.3 **ABBREVIATED SUMMARY:** The Project consists of interior renovations to existing spaces, including new acoustic ceilings and lights, new flooring, paint, new doors, renovations to an existing toilet room, and a new archival storage vault within an existing structure, including but not limited to the following:
- A. Concrete foundations and slab.
 - B. Masonry in-fill.
 - C. Fire-rated modular vault.
 - D. Clean agent fire suppression system for vault and archival storage area.
 - E. HVAC systems for vault.
 - F. Electrical systems for vault.
 - G. Finishes for vault.
 - H. Demolition of selected building components.
 - I. Finishes for selected first floor spaces, basement and first floor corridors, and one stairway.
 - J. Finishes for additional selected first floor spaces (Alternate #1).
 - K. Lighting for selected first floor spaces, basement and first floor corridors.
 - L. Lighting for additional selected first floor spaces (Alternate #1).
 - M. Wood interior doors and frames.
 - N. New partition, finishes, and lighting for unisex HP toilet.
 - O. Plumbing fixtures and piping connections for unisex HP toilet.
 - P. Fire suppression system for entire structure.

- 2.4 **LIMIT OF CONSTRUCTION:** Work of this Contract includes, without limitation, all work outside the Project site, property lines, construction limit lines as shown on the Drawings to the extent that such work is required for the proper performance and completion of the Work in this Contract, including restoration to its original condition of all work damaged or destroyed by work in areas outside the Project site.
- 2.5 **UTILITIES:** Work of this Contract includes, without limitation, full coordination and cooperation with local utility companies. The Contractor shall be responsible for the full coordination of all utility services including, but not limited to, natural gas, electrical, water, sewer, telephone, cable television, and other utilities. The Contractor shall provide all work required by utility companies in support of the provision, relocation, and installation of utilities, including that which is expressly and not expressly specified in the Contract Documents. The Contractor shall pay all charges and fees related to temporary and permanent utility services assessed by the utility companies.
- 2.6 **COORDINATION**
- A. Work of this Contract includes coordination with the Owner's work and work under separate contracts as described in Section 01.31.00.
- B. The General Contractor is ultimately responsible for all coordination with subcontractors and shall ensure that all subcontractors have access to and are familiar with all Drawings and Specifications. Subcontractors are responsible for being familiar with the work of other trades, as shown on all the Drawings and as specified in all Specifications sections, and for coordinating their work with the work of other trades.
- 2.7 **SPECIFICATIONS**
- A. The Specifications are written and organized in general conformance with Construction Specifications Institute Masterformat System. The organization of Specifications Sections is not intended to define the scope or limit of work for individual trades or sub-contractors. The General Contractor is solely responsible for the allocation of responsibilities amongst his sub-contractors.
- B. The intent of the Specifications is to establish minimum performance standards. Designation of a particular material, product, or system as "acceptable" does not imply that no modifications, alterations, or customizations are required to meet the specified performance criteria or design intent.
- 2.8 **DRAWINGS:** The Drawings show design intent only. The Contractor is responsible for methods, procedures, and sequencing of construction to achieve the design intent.

3.0 TIME OF COMPLETION

- 3.1 The Work shall commence at the time stated in the Notice to Proceed and shall be completed within 180 consecutive calendar days thereafter.

END OF SECTION

**SECTION 01.23.00
ALTERNATES**

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the Work of this Section.

2.0 SCHEDULE OF ALTERNATES

2.1 *Alternate #1:* Renovate finishes in two additional records viewing and storage rooms on the first floor and provide and install new lighting in two of the three first floor records viewing and storage rooms, as shown on the drawings.

A. Sections affected by this alternate include, but are not limited to:

1. Selective Demolition (Section 02.41.19).
2. Sheet Carpeting (Section 09.68.16)
3. Acoustical Tile Ceilings (Section 09.51.23)
4. Painting (Section 09.90.00)
5. Electrical (Section 26.00.00)

2.2 *Alternate #2:* Paint all exposed sprinkler piping not painted in alternate #1 or base bid, as shown on the drawings.

A. Sections affected by this alternate include, but are not limited to:

1. Painting (Section 09.90.00)

3.0 SELECTION OF ALTERNATES: The Owner reserves the right to select or reject Alternates.

END OF SECTION

**SECTION 01.31.00
COORDINATION**

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the work of this Section.

2.0 OWNER'S WORK

2.1 EXTENT: The Owner shall be responsible for:

- A. Relocation of movable equipment and furnishings, except those specifically shown on the drawings.
- B. Owner shall be responsible for hazardous materials abatement.

2.2 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall coordinate his Work with that of the Owner. The Contractor shall advise the Owner, in advance, of his schedule and notify the Owner with adequate time to allow completion of the Owner's work. Failure to do so shall not delay the progress of Work and shall imply acceptance of conditions by the Contractor.
- B. *Protection:* The Contractor shall adequately protect furnishings, landscaping, and equipment left in place or temporarily stored by the Owner.

3.0 WORK UNDER SEPARATE CONTRACT

3.1 EXTENT: The Owner reserves the right to perform work under separate contract.

- A. *Storage Shelving:* The Owner may use a separate contractor to provide a high density, mobile storage shelving system within the vault.

3.2 CONTRACTOR'S RESPONSIBILITIES

- A. *General:* The Contractor shall coordinate his Work with that of contractors under separate contract. He shall provide full access to the site and building and shall not interfere with the work of contractors under separate contract.
- B. *Storage Shelving:* In the case that the Owner opts to engage a storage shelving contractor, the shelving contractor shall provide floor rails and raised wood subflooring and underlayment to accommodate floor rails. The Contractor shall provide and install finish flooring and coordinate subflooring and underlayment requirements with shelving contractor.

END OF SECTION

**SECTION 01.32.00
PROJECT PROCEDURES**

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the Work of this Section.

2.0 EXISTING PROPERTY: The Contractor's attention is called to the fact that the existing building is located in a residential neighborhood. The Contractor shall take care to avoid generating dust and noise that impact nearby adjacent properties and generally creating a nuisance. The Contractor shall coordinate all parking and areas needed for construction purposes with the Owner.

3.0 SCHEDULING OF WORK

3.1 The Work must be completed in a continuous uninterrupted operation. The Contractor must use sufficient personnel and adequate equipment to complete all the necessary work requirements within the Contract Time.

3.2 **PROJECT SCHEDULE:** Before beginning Work, the Contractor shall submit a detailed schedule depicting the planned progress of work, including critical paths between trades. Schedule shall be updated as construction proceeds. Failure to submit a project schedule may result in rejection of requests for payment.

4.0 PROJECT MANAGEMENT

4.1 The Contractor must retain on the Work during its progress a competent full time representative, satisfactory to the Owner. This representative shall not be changed, except with the consent of the Owner. The representative shall be in full charge of the work and all instructions given to this person by the Architect shall be binding.

4.2 The Contractor must supply to the Owner the home telephone number of a responsible person who may be contacted during non-work hours for emergencies on the Project.

5.0 EXISTING SERVICES AND UTILITIES: The Contractor shall notify the Owner a minimum of 72 hours prior to any disruption of utility services.

6.0 PROTECTION OF PERSONS & PROPERTIES

6.1 Existing construction, properties, equipment, etc. to remain, shall be protected to maintain their pre-existing conditions. Action required to restore items to their pre-existing conditions shall be provided by the Contractor before Final Payment and at no additional cost to the Owner. For items which cannot be restored to their pre-existing condition, a reasonable amount will be deducted from the Contract Sum to pay for replacement.

6.2 Any damage to buildings, roads, (public and private), bituminous concrete areas, fences, lawn areas, trees, shrubbery, poles, underground utilities, etc. shall be made good by and at the Contractor's own expense, all to the satisfaction of the Owner.

6.3 The Contractor shall patch, repair and/or replace all adjacent materials and surfaces damaged after the installation of new work at no expense to the Owner. All repair and replacement work shall match the existing in kind and appearance.

7.0 TEMPORARY PROTECTION

7.1 The Contractor shall:

- A. Protect buildings and materials at all times from rain water, ground water, backing-up, or leakage of sewers, drains, or other piping, or from water damage of any origin. Provide all pumps, piping, coverings, and other materials and equipment as required by job conditions to accomplish this requirement.
 - B. In addition to the weather protection during the months of November to March specified elsewhere, provide temporary watertight enclosures for openings in exterior walls when and as required to protect the Work from damage by inclement weather. Temporary enclosures shall be provided with adequate means of ventilation to prevent accumulation of moisture in the buildings.
 - C. Provide temporary wood doors for exterior entrances and elsewhere as required. Permanent door enclosures shall not be used as temporary enclosures.
 - D. Protect sills, jambs, and heads of openings through which materials are handled.
 - E. Protect decks and slabs to receive work by other trades from any soiling which will prevent proper adhesion of subsequent Work. Decks and slabs shall be left clean and free of blemishes at the time other trades begin the application of their work.
 - F. Protect concrete slabs to remain exposed and finished floors against mechanical damage, plaster droppings, oil, grease, paint, or other material which will stain the floor finish. Install and maintain adequate strips of building paper or other protection on finished floors in rooms where future Work will be done by other trades.
 - G. Protect all surfaces to receive work by other trades from any soiling which will prevent proper execution of subsequent work.
- 7.2 Waterproofed surfaces shall not be subjected to traffic nor shall they be used for storage of materials. Where some activity must take place in order to carry out the Work, adequate protection must be provided.
- 7.3 After the installation of the Work by any Subcontractor is completed, the Contractor shall be responsible for its protection and for repairing, replacing, or cleaning any such Work which has been damaged by other trades or by any other cause, so that all Work is in first class condition at the time of Substantial Completion.

8.0 SAFETY

- 8.1 The project site shall be maintained in a safe and orderly state. Required exitways shall be kept clear and unobstructed at all times. Ensure egress routes are clear at all times. If existing egress routes are disrupted, submit alternative plans for egress for approval by state building inspector, the Authority, and the Architect.
- 8.2 The Contractor shall, at all times, leave an unobstructed way along walks and roadways, and shall maintain barriers and lights for the protection of all persons and property in all locations where materials are stored or work is in progress.
- 8.3 Where excavation is involved, the Contractor shall be responsible for providing continuous watchmen services as necessary, to insure adequate protection of the general public.

9.0 SECURITY

- 9.1 The Contractor shall be responsible for providing all security precautions necessary to protect the Contractor's and Owner's interests.
- 9.2 All personnel on site shall be subject to criminal background checks as required by the Owner.

10.0 NOISE AND DUST CONTROL

- 10.1 The Contractor shall take special measures to protect visitors, neighbors, and the general public from noise, dust, and other disturbances by:
 - A. Keeping common pedestrian and vehicular circulation areas clean and unobstructed.
 - B. Sealing dust and fumes from contaminating occupied areas.

11.0 FIRE PROTECTION

- 11.1 The Contractor shall take necessary precautions to insure against fire during construction. The Contractor shall be responsible to ensure that the area within contract limits is kept orderly and clean and that combustible rubbish and construction debris is promptly removed from the site.
- 11.2 Installation of equipment suitable for fire protection shall be done as soon as possible after commencement of the Work. The Contractor's attention is directed to the requirements of the Commonwealth of Massachusetts, Department of Labor and Industries Regulation 454 CMR.

12.0 WEATHER PROTECTION

- 12.1 The Contractor shall provide Weather Protection as required by Specification Section 01.50.00 Temporary Facilities and any other specific requirements of the Contract Documents.
- 12.2 Should high wind warnings be issued by the U.S. Weather Bureau, the Contractor shall take every precaution to minimize danger to persons, to the Work, and to the adjacent property.

13.0 CLEANING DURING CONSTRUCTION

- 13.1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - A. *Pollution:* Do not burn or bury rubbish and waste materials on the site. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains. Do not dispose of wastes into streams or waterways.
 - B. *Dust:* Wet down dry materials and rubbish to lay dust and prevent blowing dust. Do not allow materials and rubbish to drop free or be thrown from upper floors, but remove by use of a material hoist or rubbish chutes.
 - C. Maintain the site free from accumulations of waste, debris, and rubbish. Provide on-site containers for collection of waste materials and rubbish. Remove and legally dispose waste materials and rubbish from site. Disposal of materials shall be in compliance with all applicable laws, ordinances, codes, and by-laws.

- D. Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until Substantial Completion. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

14.0 PROJECT MEETINGS: Project meetings shall be held to aid coordination and planning of construction progress. The Contractor, the Architect, and the Owner shall mutually agree on a schedule of regular project meetings. The Owner and the Architect reserve the right to require special meetings at which the attendance of the Contractor and affected sub-contractors is required.

END OF SECTION

SECTION 01.33.00 SUBMITTALS

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the Work of this Section.

2.0 COPIES AND DISTRIBUTION

- 2.1 **COPIES:** Electronic files for all submittals requiring action by the Architect are preferred. If hard copies are submitted, a minimum of 7 prints shall be submitted.
- 2.2 **SCHEDULING:** The Contractor is responsible for the scheduling of all submittals to allow for adequate time for review and approval; fabrication; and installation. Allow a minimum of 10 working days for the Architect's review and approval of each submission. Failure to plan for the review process shall not relieve the Contractor of his responsibilities to meet the Contract Time.
- 2.3 **PREPARATION:** Each submittal shall be identified with the Contractor's name, manufacturer's name, Project name, date, and reference numbers of relevant Specifications sections and Drawings. The Contractor shall modify and customize all submittals to show all dimensions and coordination with adjacent work and field conditions. Clearly note and describe all qualifications to and deviations from the Contract Documents. The Contractor shall stamp, date, and sign each submittal to attest to his review and approval before submitting it to the Architect. Submittals not prepared in accordance with these requirements shall be returned without action to the Contractor.
- 2.4 **DISTRIBUTION:** Submittals which are marked "Approved" or "Approved as Noted" by the Architect, following the guidelines stipulated below in subparagraph 4.2 will be returned to the Contractor for distribution, with 2 copies retained by the Architect. Contractor shall distribute copies to subcontractors and all other parties requiring the information contained in the submittal.

3.0 REQUIRED SUBMITTALS

- 3.1 **SCHEDULE OF VALUES:** A Schedule of Values distinguishing the values of labor and materials for each trade component shall be submitted to the Architect prior to the first request for payment.
 - A. The total value for General Conditions, including costs for bonds and insurance, shall total a minimum of 10% of the total contract amount.
 - B. No values shall be assigned to the preparation of shop drawings.
- 3.2 **ESTIMATED PAYMENT SCHEDULE:** A schedule of anticipated monthly payment requests shall be submitted to the Architect prior to the first request for payment.
- 3.3 **PRODUCT DATA:** Manufacturer's printed literature, when required by the Specifications, shall be submitted to the Architect for review. One approved copy shall be included in the Maintenance Manual in accordance with Section 01.77.00.
- 3.4 **SHOP DRAWINGS:** Submit accurate, detailed, large scaled drawings prepared specifically for this Project. Drawings shall show adjacent conditions, related work, accurate field dimensions, materials, products, and any required special coordination.
- 3.5 **SAMPLES,** when required by the Specifications, shall be submitted to the Architect for review. In-place samples shall be in accordance with the Specifications.

- 3.6 WARRANTIES: Warranties and certifications, as required by the Specifications, shall be submitted to the Owner through the Architect. Warranties shall become effective upon Substantial Completion.

4.0 ARCHITECT'S ACTION ON SUBMITTALS

- 4.1 The Architect will review product data and samples for conformity to the design intent of the Contract Documents. Approval by the Architect shall not relieve the Contractor of his responsibilities to fulfill all the requirements of the Contract.
- 4.2 The Architect's action will have the following meanings:
- A. *Approved*: Work covered by the submittal may proceed. Approval by the Architect does not relieve the Contractor of responsibilities to comply with the requirements of the Contract Documents without limitation.
 - B. *Approved as Noted*: Work covered by the submittal may proceed provided it complies with the Architect's notes. A re-submission of the submittal is not required. Neither approval by the Architect and nor the Architect's notes relieve the Contractor of responsibilities to comply with the requirements of the Contract Documents without limitation.
 - C. *Revise and Resubmit*: Make changes to the submittal as noted and resubmit to the Architect for review before work covered by the submittal can proceed.
 - D. *Disapproved*: Prepare a new submittal and resubmit to the Architect for review before work covered by the submittal can proceed.
- 4.3 Submittals not requiring action by the Architect shall be retained for information only.

5.0 REQUESTS FOR SUBSTITUTIONS

- 5.1 Requests for product substitutions shall be submitted for review and approval prior to the commencement of Work. Clearly identify the product to be replaced by the substitute.
- 5.2 Product substitutions are not allowed except with evidence provided by the Contractor of one of the following conditions.
- A. The product substitution is allowed under an "or equal" clause in the Specifications.
 - B. The specified product is not produced or cannot be produced in time to meet the Contract Time.
 - C. The specified product is not acceptable to authorities having jurisdiction.
 - D. There is substantial advantage to the Owner in terms of cost, time, or value with the use of the substitute product.
- 5.3 The Architect shall be the sole judge of whether a proposed substitution is comparable to the product specified and meets the requirements specified.

6.0 REQUESTS FOR PAYMENT

- 6.1 Submit 4 originals of each request for payment on MSP SB1 form. Provide complete documentation to substantiate requests.

- 6.2 Before the first request for payment can be approved, the following items, some of which are stipulated in other Sections, must be submitted:
- A. Schedule of Values.
 - B. Estimated Payment Schedule.
 - C. Project Schedule.
 - D. List of Contractor's key project personnel.
 - E. Contractor's Certificate of Insurance.
 - F. Performance and Payment Bonds.

END OF SECTION

**SECTION 01.41.00
REGULATORY REQUIREMENTS**

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the Work of this Section.

2.0 GENERAL REGULATORY REQUIREMENTS

- 2.1 All Work shall comply with all codes, standards, and requirements of all federal, state, and local authorities having jurisdiction over this Project. The Contractor shall be responsible for providing evidence of compliance when required to do so.
- 2.2 When a specific code or standard is referenced in the Contract Documents, the Contractor shall be responsible for understanding general and specific requirements of that code or standard. Except as specified otherwise, comply with current industry standards in effect as of the date of the Owner/Contractor Agreement. The Contractor shall verify that materials and workmanship used meets or exceeds the requirements of the code or standard referenced by the Contract Documents.
- 2.3 When a discrepancy exists between an applicable code or standard and the requirements of the Contract Documents, the more restrictive requirement or higher quality material or workmanship is required.

END OF SECTION

**SECTION 01.50.00
TEMPORARY FACILITIES**

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the Work of this Section.

2.0 WEATHER PROTECTION

2.1 The Contractor shall provide temporary enclosures and heat to permit work to be carried on during the months of November through March. These specifications are not to be construed as requiring enclosures or heat for operations that are not economically feasible in the opinion of the Owner. Without limitation this includes such items as excavation, pile driving, steel erection, erection of certain exterior wall panels, roofing, and similar operations.

2.2 "Weather Protection" means the temporary protection of that Work adversely affected by moisture, wind, and cold by covering, enclosing, and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Owner and consistent with the construction schedule to permit the continuous progress of all Work necessary to maintain an orderly and efficient sequence of construction operations. The Contractor shall furnish and install "Weather Protection" material and be responsible for all costs, including heating required to maintain a minimum of 40° F at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials, or the applicable conditions set forth in the Contract Articles with added regard to performance obligations of the Contractor.

2.3 The Contractor shall assume the entire responsibility for weather protection during construction (until Substantial Completion), and shall be liable for any damage to any Work caused by failure to supply proper weather protection and proper ventilation.

2.4 It is to be specifically understood that the Contractor shall do no work under any conditions deemed unsuitable by the Contractor to the perfect execution of the Work. This provision shall not constitute any waiver, release, or lessening of the Contractor's obligation to bring the Work to Substantial Completion within the period of time set forth in the Contract Documents.

3.0 TEMPORARY OFFICE: The Owner shall provide a suitable space in the existing building for use by the Contractor as an office.

4.0 TEMPORARY TELEPHONE: The Contractor shall provide telephone services for use by the Contractor's personnel. The Contractor shall pay for the cost for installation and removal of temporary telephone service. Owner's telephones shall not be used.

5.0 TEMPORARY TOILETS: The Contractor may use existing toilet facilities provided the Contractor is responsible for daily cleaning.

6.0 TEMPORARY WATER

6.1 The Contractor can use the on-site water supply, providing temporary water connections and paying costs thereby incurred. This includes the furnishing, installing, and removing of equipment and piping to provide water for the execution of the Work.

6.2 The Contractor shall pay the cost of water consumed by trades until Substantial Completion.

6.3 The Contractor shall provide an adequate supply of cool drinking water with individual drinking cups for the personnel on the job.

7.0 TEMPORARY HEAT

- 7.1 The Contractor shall provide minimum temperatures as specified for storage of materials and for construction activities.
- 7.2 The Contractor shall pay the costs of all fuel and electricity required for temporary heating until Substantial Completion.
- 7.3 The Contractor may, with the approval of the Owner, utilize the existing heating system for temporary heat, providing the Contractor complies with all provisions stated elsewhere in the Contract Documents and the following.
 - A. The Contractor shall furnish and pay the costs of any materials and equipment which are not part of the permanent heating system and which may be required to operate the permanent heating system on a temporary basis.
 - B. The heating Subcontractor shall be in charge of and provide all labor required for the attendance, operation and final restoration of the permanent heating system and for temporary heating purposes during working hours. The Contractor shall check the heating system a minimum of twice daily, when no work is being performed at the site.
 - C. The Contractor shall reimburse the heating Subcontractor for costs incurred in providing temporary heating until Substantial Completion.
- 7.4 Installation of weather protection and heating devices shall comply with all safety regulations including provisions for adequate ventilation and fire protection devices.
- 7.5 The Contractor shall provide thermometers at places designated by the Architect in order to determine if specified temperatures are being maintained.
- 7.6 The Contractor shall provide minimum temperatures as specified for storage of materials and for construction activities.
- 7.7 The Contractor shall pay the costs of all fuel and electricity required for temporary heating until Substantial Completion.
- 7.8 Unit heaters, if used, shall be of the smokeless type and be installed and operated in such a way that finished work will not be damaged. "Salamanders" shall not be used.

8.0 TEMPORARY ELECTRICITY: The Contractor may use electricity available at the site. Contractor shall provide proper adapters, extension cords, etc. for connection to existing power. All temporary electrical work shall be in conformance with codes and requirements of the power company.

9.0 TEMPORARY CONSTRUCTION FENCE: The Contractor shall be responsible for providing and maintaining temporary fencing or barricades around the construction as may be necessary to assure the safety of all persons authorized or unauthorized. Such protective measures shall be located and constructed as required by local, state, and federal ordinances, laws, codes, or regulations.

10.0 TEMPORARY STRUCTURES AND MATERIAL HANDLING

- 10.1 The Contractor shall provide such storage sheds, temporary buildings, or trailers as required for the performance of the Contract. Subcontractors shall provide their own temporary buildings and trailers.

10.2 Materials shall be handled, stored, installed, cleaned, and protected in accordance with the best practice in the industry and, except where otherwise specified in the Contract Documents, in accordance with manufacturer's specifications and directions.

11.0 TEMPORARY STAGING, STAIRS, CHUTES

11.1 The Contractor shall furnish, install, maintain in safe condition, and remove all scaffolds, staging, and planking over 8 ft. in height, as required for the use of all trades for proper execution of the Work.

11.2 The Contractor shall furnish, install, maintain in safe condition, and remove all temporary ramps, stairs, ladders, and similar items as required for the use of all trades for the proper execution of the Work.

11.3 The Contractor shall furnish, install, maintain, and remove covered chutes from openings in the exterior walls of upper floors. Such shall be in convenient locations and permit disposal of rubbish directly into trucks or disposal units. Debris shall not be allowed to fall freely from upper levels of the building. Materials shall not be dropped from open windows.

12.0 HOISTING FACILITIES: The Contractor shall provide, operate, and remove material hoists, cranes, and other hoisting as required for the performance of the Work by all trades.

13.0 PROJECT SIGN: The Contractor shall provide, and install where directed by the Architect, a project sign. The sign shall be plywood, MDO Exterior APA, 25 SF, supported on two 4 in. by 4 in. posts, with adequate bracing. Paint all surfaces with sign paint and provide lettering of size and type as directed by the Architect. The text and graphics for the sign shall be provided to the Contractor.

END OF SECTION

**SECTION 01.77.00
CONTRACT CLOSEOUT**

1.0 RELATED DOCUMENTS: All Contract Documents, including General and Supplementary Conditions, apply to the Work of this Section.

2.0 SUBSTANTIAL COMPLETION

2.1 The Project shall be considered in Substantial Completion when there is less than one percent of the Contract remaining to be completed. The following items must be completed before the Architect makes his inspection for Substantial Completion.

- A. Submission of Contractor's Punch List of incomplete items.
- B. Submission of all warranties and similar documents.
- C. Submission of Record Documents.
- D. Submission of Maintenance Manual.
- E. Record of compliance with labor wage rates is up to date.
- F. Replacement of all broken glass and repair of damaged items (existing and new) and finishes.
- G. Delivery of maintenance stocks of materials where specified.
- H. Clean-up of work.

3.0 CONTRACTOR'S PUNCH LIST

- 3.1 Prior to requesting Substantial Completion, the Contractor shall make a thorough inspection of the Work. During this inspection the Contractor shall prepare a comprehensive list of all items remaining to be completed or corrected. This list shall include all remaining Contractor items to be provided under the Contract Documents. After reviewing the Contractor's list, the Architect may amend the list with additional items that are not acceptable or incomplete.
- 3.2 The Contractor shall not be relieved of the responsibility to provide Contract items left off of the punch list.

4.0 RECORD DRAWINGS

- 4.1 Consult the individual sections of the Specifications for the specific requirements of those sections. In cases of inconsistency the more stringent requirement, as directed by the Architect, shall be required.
- 4.2 From the sets of Contract Drawings furnished by the Owner, the Contractor shall reserve one set for record purposes. From this set, the Contractor shall detach and furnish, at no charge to the Mechanical and Electrical Subcontractors the drawings of their portion of the Work for the same purpose.
- 4.3 The Contractor and the above Subcontractors shall keep their marked up As-Built set on the site at all times and note on it in colored ink or pencil, neatly and accurately, at the end of each working day, the exact location of their work as actually installed. This shall include the location and dimensions of underground and concealed Work, and any architectural, mechanical, or electrical variations from the Contract Drawings. All changes, including those

issued by Addendum, Change Order, or instructions by the Architect shall be recorded. Marked up As-Built drawings shall be prepared for the entire project and include all Work, including but not limited to:

- A. The location of all internal utilities and appurtenances, concealed by finish materials, including but not limited to valves, coils, dampers, vents, cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps, and maintenance devices.
 - B. The location of these items shall be shown by offsets to structure and drawing grid lines. The tolerance for the actual location of these items on the marked up As-Built Drawings shall be plus or minus two (2) inches.
 - C. Each item shall be referenced by showing a tag number, areas served, and function on the marked up As-Built drawing
- 4.4 The Architect may periodically inspect the marked up As-Built drawings at the site. The proper and current maintenance of the information required on these drawings shall be a condition precedent to approval of the monthly applications for payment.
- 4.5 At Substantial Completion the Contractor shall submit the complete set of marked up As-Built drawings to the Architect. The Contractor shall check all marked up As-Built drawings prepared by subcontractors and certify in writing on the title sheet of the drawings that they are complete and correct, prior to submission to the Architect.
- 4.6 Submission of accurate marked up As-Built drawings and their approval by the Architect shall be a condition precedent to final payment.

5.0 OPERATING AND MAINTENANCE INSTRUCTIONS

- 5.1 Consult the individual sections of the specifications for the specific requirements for those sections and for further details and descriptions of the requirements
- 5.2 Prior to final payment and completion the Contractor shall provide all Operating Manuals and Maintenance Instructions as required by the Contract Documents.

5.3 OPERATING INSTRUCTIONS AND MANUALS

- A. Installers, and suppliers shall furnish to the Contractor two sets of operating and maintenance instructions of all manually operated equipment furnished and installed by them.
- B. The Contractor shall collect all of the above instructions, bind them into two complete sets, and submit them to the Architect who will deliver them to the Owner.
- C. Submission of operating and maintenance instructions shall be a condition precedent to final payment.

5.4 INSTRUCTION OF OWNER'S PERSONNEL

- A. Where specified in the individual sections of the specifications, the Contractor and Subcontractor shall instruct the Owner's personnel at the site, in the use and maintenance of equipment installed under the Contract.
- B. Submission to the Architect of a certificate of compliance to this requirement, signed by the Contractor and the Owner's Representative, shall be a condition precedent to final payment.

6.0 FINAL CLEANING

- 6.1 Prior to submitting a request to the Architect to certify Substantial Completion of the Work, the Contractor shall inspect all interior and exterior spaces and verify that all waste materials, rubbish, tools, equipment, machinery, and surplus materials have been removed, and that all sight-exposed surfaces are clean. Leave the Project clean and ready for occupancy. Cleaning shall include all surfaces, interior and exterior, which the Contractor has had access to. Employ experienced workmen or professional cleaners for final cleaning. Unless otherwise specified under other sections of the Specifications, the Contractor shall perform final cleaning operations as herein specified prior to final inspection.
- A. All broken or defective glass caused by the Contractor's Work shall be replaced at the expense of the Contractor. Clean and polish all new and existing glass and plastic glazing (if any) in construction area, on both sides. Clean plastic glazing in accordance with the manufacturer's directions. This cleaning shall be completed by qualified window cleaners at the expense of the Contractor just prior to acceptance of the Work.
 - B. Repair, patch, and touch up marred surfaces to the specified finish, to match adjacent surfaces.
 - C. Remove grease, mastic, adhesive, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior surfaces. This includes cleaning of the Work of all finishing trades where needed, whether or not cleaning by such trades is included in their respective specifications.
 - D. In cleaning items with manufacturer's finish or items previously finished by a Subcontractor, care shall be taken not to damage such manufacturer's or Subcontractor's finish. In cleaning glass and finish surfaces, care shall be taken not to use detergents or other cleaning agents which may stain adjoining finish surfaces. Any damage to finishes caused by cleaning operations shall be repaired at the Contractor's expense. Polish glossy surfaces to a clear shine.
 - E. Do the final cleaning of resilient floors as specified under the respective section of the Specifications.
 - F. Leave all architectural metals, hardware, and fixtures in undamaged, polished conditions.
 - G. Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and decayable materials.
 - H. Broom clean exposed concrete surfaces and paved surfaces. Rake clean other surfaces of grounds.
 - I. Ventilating systems - Replace filters and clean ducts, blowers, and coils if units were operated during construction.
- 6.2 Use only cleaning materials recommended by the manufacturer of the surface to be cleaned. Use cleaning materials which will not create a hazard to health or property and which will not damage surfaces.

7.0 FINAL ACCEPTANCE

- 7.1 OCCUPANCY PERMIT: The Contractor shall coordinate the efforts of all Subcontractors and obtain the Occupancy Permit from the local Building Department. The Owner shall pay any Building Department fee associated with the Occupancy Permit.

- 7.2 FINAL PAYMENT shall be made only upon the completion of the following items:
- A. Requirements for Substantial Completion and satisfactory inspection by the Architect.
 - B. Submission of a certified copy of the final Punch List verifying that the Contractor has completed all items on the List.
 - C. Final cleaning of the premises.
- 7.3 FINAL CLEANING: The premises shall be restored to pre-existing conditions. All areas shall be clean and free from dirt, dust, and debris.

**END OF SECTION
AND DIVISION 01**

DIVISION 02 - EXISTING CONDITIONS

SECTION 02.41.19 SELECTIVE DEMOLITION

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to selectively demolish existing construction as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Sawcutting, demolition, and removal of existing concrete basement slab.
2. Sawcutting, demolition, and removal of existing concrete base where new openings are formed.
3. Partial demolition of interior masonry walls for bearing of new beams.
4. Demolition and removal of existing doors and frames.
5. Demolition and removal of existing wall construction to permit framing of new door openings.
6. Demolition and removal of existing windows.
7. Demolition and removal of toilet partitions and accessories.
8. Demolition and removal of closet partitions, doors and accessories.
9. Cutting and coring for other trades.
10. Removal of demolished materials from the site.
11. Removal and disposal of materials disconnected and demolished by other trades.
12. Cleaning of spaces and surfaces after demolition.

C. *Intent*: The intent of the demolition Work is to safely remove and properly dispose of all existing construction, both expressly shown and not expressly shown on the Drawings, as required to complete new construction.

D. *Alternates*: Alternate #1 affects the Work of this Section. Closely examine the Contract Documents to determine the full extent that alternates affect the Work of this Section.

1. Alternate #1: Remove and dispose of light fixtures disconnected and demolished by electrical subcontractor in two rooms. Demolish and remove existing acoustical ceiling tiles in one room. Detach and salvage shelving units from one additional room.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the Work of this Section include, but are not limited to:

1. Cast-in-Place Concrete (Section 03.30.00).
2. Unit Masonry (Section 04.20.00).
3. Structural Steel (Section 05.12.00)

1.4 SUBMITTALS

A. *Permits and Certificates*

1. Permits and notices authorizing building demolition.
2. Certificates of severance of utility services.
3. Permit of transport and legal disposal of debris.

B. *Schedule*: Submit proposed methods and schedule of demolition prior to the start of Work. Include the coordination for shut-off, capping, and continuation of utility services as required.

1.5 EXISTING CONDITIONS

A. *Existing Structure*: The Owner and Architect assume no responsibility nor make any claim regarding the condition or structural adequacy of existing construction to be demolished.

B. *Existing Uses*: The property is located in a residential neighborhood. The Contractor shall take care not to disrupt other uses of the property and shall protect the construction site from other users. The Contractor shall take care to avoid generating dust and noise that impact nearby uses and generally creating a nuisance.

C. *Hazardous Materials*: Inspections and testing of asbestos containing materials have been conducted and remediation will be completed under separate contract. General demolition work shall begin only after asbestos abatement completion has been cleared.

1.6 PROJECT CONDITIONS

A. *Public Safety*: Ensure the safe passage of persons and traffic on and around the Project site, the Owner's property, adjacent properties, and public ways.

B. *Explosives*: Do not bring explosives to the site or use explosives.

C. *Damages*: Report all damages immediately. Promptly repair damages caused by demolition operations at no cost to the Owner.

2.0 PART 2: PRODUCTS

2.1 PROTECTIONS: Provide miscellaneous protections including, but not limited to dust barriers, plywood panels, and moisture barriers.

2.2 SHORING: Provide temporary shoring and bracing of adequate size and proper configuration to maintain the integrity of existing building.

3.0 PART 3: EXECUTION

3.1 INSPECTION: Inspect and verify all existing conditions before beginning Work.

3.2 PROTECTION

A. Ensure safety of persons and property at all times. Provide temporary shoring and bracing as required. Protect openings. Maintain weathertightness.

B. Protect against damage to existing construction to remain.

- C. Ensure egress routes are clear at all times. If existing egress routes are disrupted, submit alternative plans for egress for approval by local building inspector, the Owner, and the Architect.

3.3 DEMOLITION

A. *General*

1. Demolish all existing construction designated to be demolished or removed and remove from site, unless material is noted to be salvaged.
 2. Demolish and remove all existing construction required for the proper completion of new work, not expressly indicated on the Drawings. Identify and remove all construction which is unsuitable for re-use. Notify the Architect and obtain approval before removing construction which is not indicated on the Drawings.
 3. Use demolition methods within the limitations of governing regulations.
 4. Use demolition methods which will ensure existing construction to remain is not damaged. Use saws and drills to ensure neat, accurately formed joints and holes.
 5. Remove all debris from site and dispose of legally.
 6. Ensure structure and construction is adequately and properly shored and supported before, during, and after demolition.
- B. *Pollution Controls*: Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.
- C. *Interior Construction*: Remove existing walls, doors and frames, finish flooring, and other interior construction using methods and tools which will minimize the amount of patching of walls and floors to remain.
- D. *Concrete Ground Slabs*: Limit removal of concrete slab sections to the minimum amount required for completion of new Work. The structural integrity of slabs shall not be compromised. Removal and interruption of existing slab reinforcing shall only be performed with approval by the Architect. Should removal of slab reinforcing be approved, remove additional concrete as required to permit proper overlapping of new reinforcing. Avoid disruption and puncturing of existing vapor retarders under slabs. Should removal of sections of vapor retarders be necessary, remove additional concrete as required to permit overlapping and sealing of new vapor retarder.
- E. *Lead Containing Items*: Assume all paint contains hazardous levels of lead until test results show otherwise. Remove all paint scrapings and painted materials in strict compliance with OSHA and all applicable environmental regulations governing lead removal. Demolished painted metal items exhibiting no flaking or scaling paint shall be recycled in the metal salvage market. Paint scrapings and painted non-metal items shall be tested for EP toxicity in accordance with 310 CMR 30. Materials found to exceed the allowable toxicity limit of 5.0 milligrams/liter shall be disposed of as hazardous waste in strict compliance with 310 CMR 30 and U.S. Department of Transportation regulations 49CFR Parts 170 through 179 inclusive.
- F. Assume all existing light ballasts contain polychlorinated biphenyl (PCB). Assume all existing lamps and thermostats contain mercury. Remove, containerize, and dispose of in

accordance with all applicable state and federal regulations. The disposal of these materials shall be to a TSCA licensed facility.

3.4 SALVAGED ITEMS

- A. Detach existing shelving units from walls where indicated on the drawings. Clean, protect, and temporarily store as directed by the Owner.
- B. Remove existing wood folding partition panels. Clean, protect, and temporarily store as directed by the Owner.
- C. Remove existing wood doors with glass panels where indicated on the drawings. Clean, protect, and temporarily store for reinstallation in new wood frame in new locations.

3.5 CLEANING AND PROTECTION

- A. *General Cleaning*: Remove protections and clean surfaces exhibiting dust and dirt from demolition activities.

**END OF SECTION
AND DIVISION 02**

DIVISION 03 - CONCRETE
SECTION 03.30.00
CAST-IN-PLACE CONCRETE

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division1), and Drawings, apply to the Work of this Section.

1.2 DESCRIPTION OF WORK

A. The work of this Section consists of all plain and reinforced concrete work as shown on the Drawings and as specified herein, and includes, but is not limited to the following:

1. Furnishing, placing, curing and finishing of all plain and reinforced concrete work for the building.
2. Furnishing, erection and removal of formwork and bracing.
3. Furnishing and placing of reinforcing steel and related accessories.
4. Furnishing and installation of vapor retarder.
5. Furnishing and installation of waterstop.
6. Furnishing and installation of joint fillers.
7. Coordination with all other trades for location of all pipe sleeves, duct openings, keys, chases, electrical boxes and conduits, anchors, inserts, fastenings and other devices required by other trades.
8. Coordination with the modular fire vault manufacturer for location of all anchors, bolts, inserts, etc. as required.
9. Hardening of exposed concrete floors.
10. Patching existing concrete surfaces disturbed by the work of this contract.
11. Grouting of vault column bearing plates.

1.3 RELATED WORK

A. Related work shall be performed under the following Sections:

1. Section 31.23.00 EARTHWORK.
2. Section 04.20.00 UNIT MASONRY.
3. Section 06.10.00 ROUGH CARPENTRY.
4. Section 07.11.00 DAMPROOFING.
6. Section 13.27.16 MODULAR FIRE VAULT.

1.4 REFERENCES (LATEST EDITIONS)

- A. ASTM listed standards by the American Society for Testing and Materials.
- B. ACI listed standards by the American Concrete Institute.
- C. In case of conflict between the References and the Project Specification, the Project Specification shall govern. In the case of conflict between References, the more stringent shall govern.
- D. When compliance with any such References is specified herein for materials or a manufactured or fabricated product, the Contractor, if requested, shall furnish an affidavit from the manufacturer or fabricator certifying that the materials or product delivered to the job meets the requirements specified. However, such certification

shall not relieve the Contractor from the responsibility of complying with any added requirements specified herein.

1.5 SUBMITTALS

- A. Submit Complete Shop Drawings and Data, in accordance with the provisions of SECTION 01.33.00 – SUBMITTALS.
- B. Provide Submittals for fabricating and placing reinforcing steel. Show all required information for cutting, bending and placing reinforcing bars and show all accessories and support bars on placing drawings. Indicate suitable marks for placing bars.
- C. Provide concrete Mix Data as specified in Paragraph 2.2B.
- D. Provide manufacturer's Data for other products.
- E. Fabrication of any material or performing of any work prior to the final approval of the Submittals will be entirely at the risk of the Contractor.
- F. The Contractor is responsible for furnishing and installing materials called for in Contract Documents, even though these materials may have been omitted from approved Submittals.
- G. Reproduction of structural plans, sections and details, and any like information by reprographic or electronic methods for use as Shop and Coordination Drawings is subject to the following conditions:
 - 1. The entity producing the Shop and Coordination Drawings (The "User") agrees to accept the reproduced information from Foley and Buhl Engineering, Inc. without any warranties, guarantees and/or representations of any nature whatsoever regarding the correctness, dimensional and/or quantitative accuracy and/or completeness of any such information contained therein.
 - 2. The User further agrees that such information shall be used as reference material only for the production of Shop and Coordination Drawings for the referenced project to which this Specification applies and only for that project.
 - 3. The User further agrees to release, indemnify, hold harmless and defend Foley and Buhl Engineering, Inc. with respect to any claims, costs (including the cost of litigation), losses, damages and/or liabilities which arise from (or relate to) the use, misuse, modification, interpretation, misinterpretation and/or misrepresentation of the reproduced information.

1.6 QUALITY ASSURANCE

- A. All materials, measuring, mixing, transportation, placing and curing shall be subject to inspection by the Architect or by the Testing Agency. However, such inspection, wherever conducted, shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements, nor shall inspector's acceptance of material or workmanship prevent later rejection of same by the Owner or Architect if defects are discovered.
- B. A qualified Testing Agency for testing and inspection will be selected by the Owner and shall be paid directly by the Owner.

- C. The Contractor shall retain the services of a qualified testing agency, approved by the Architect, to test aggregate and to prepare or review mix designs for each strength of concrete specified, and shall submit mix designs and test results to the Architect for approval. The costs of all such preliminary services shall be borne by the Contractor.
- D. Advise the Testing Agency of intent to place concrete by notification at least 24 hours prior to the time of placement.
- E. Concrete will be sampled and tested for quality control as follows:
 - 1. Sampling fresh concrete: ASTM C 172
 - 2. Compression test specimens: ASTM C 31
 - 3. Slump: ASTM C 143
 - 4. Air content: ASTM C 231
 - 5. Compressive strength: ASTM C 39
- F. All reinforcing shall be inspected by the testing agency for grade, size, spacing, position, cleanliness, cover and support.
- G. Cooperate with the Testing Agency's work and provide help as required for taking and storing samples. Provide storage facilities for concrete cylinders at the site. Facilities must protect cylinders from effects of low or high temperatures in cold or hot weather, respectively. Compression tests shall consist of four (4) cylinders for each test made, cured and tested by the laboratory during the progress of the job. At least one (1) test shall be made for each strength of concrete up to 50 cubic yards pour, and at least one (1) test per strength for each 50 cubic yards thereafter, unless otherwise directed by the Architect. Concrete for each set of cylinders shall be from one (1) sample representative of the entire batch. All cylinders shall be standard 6" X 12".
- H. When tests of control specimens fall below required strength, the Architect may require core specimens taken from the concrete in question and tested in accordance with ASTM C 42. If these specimens do not meet strength requirements, Architect will have right to require additional curing, load tests, strengthening or removal and replacement of those parts of structure which are unacceptable, and in addition, removal of such sound portions of structure as necessary to ensure safety, appearance, and durability of the structure. Additional testing, load tests, strengthening or removal and replacement of parts of structure shall be at the Contractor's expense.
- I. Accept as final, results of tests made by the Testing Agency organization engaged by the Owner.
- J. Testing required because of changes requested by the Contractor in materials, sources of materials or mix proportions, and extra testing of concrete or materials because of failure to meet the Specification requirements shall be at the Contractor's expense.
- K. A final report shall be issued by the testing agency following the completion of work in this Section.

1.7 NOTIFICATION OF RELATED TRADES

- A. Notify all other trades responsible for installing chases, inserts, sleeves, anchors, louvers, etc. when ready for such installation, and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation.
- B. Leave openings in walls for pipes, ducts, etc. for mechanical/electrical/plumbing work, as shown on Drawings or required by layout of mechanical/electrical/plumbing systems.

2.0 PART 2: PRODUCTS

2.1 MATERIALS

- A. Cement
 - 1. Portland Cement - ASTM C 150, Type II.
- B. Natural Aggregate
 - 1. Coarse Aggregate: Shall be hard, durable, uncoated crushed stone or gravel conforming to ASTM C 33. Coarse aggregate shall pass through 3/4" sieve except 3/8" at toppings less than 3" thick.
 - 2. Fine Aggregate: Shall be sand, clean, hard, durable, uncoated grains, free from silt, loam and clay, to meet ASTM C 33.
- C. Water
 - 1. Water shall be from the local municipal supply.
- D. Admixtures
 - 1. Water-reducing Agent shall conform to ASTM C 494, Type A. Water-reducing agent shall be compatible with air-entraining agent.
 - 2. Air-entraining Agent shall conform to ASTM C 260.
 - 3. Calcium Chloride or admixtures containing more than 0.1% Chloride ions are not permitted.
- E. Concrete Reinforcement
 - 1. Reinforcing steel shall conform to ASTM A 615 deformed bars, Grade 60.
 - 2. Welded wire fabric shall conform to ASTM A 185 in flat sheets.
 - 3. Bar supports, metal accessories and other devices necessary for proper assembly of concrete reinforcing shall be of standardized factory-made wire bar supports. Wire for tying shall be ASTM A 82, 18-gauge black annealed wire.
- F. Formwork
 - 1. Forms for concrete surfaces not exposed to view in finished work shall be made of wood, metal, or other material subject to approval of Architect.

2. Form release agent shall be of a non-staining type, specifically manufactured for concrete forms.
 3. Form Ties shall be factory-fabricated, removable or snap back of approved design. Wire shall be at least 1-1/2" back from exterior surfaces and 1" from interior surfaces.
- G. Waterstop: Provide waterstop consisting of sodium bentonite and butyl rubber compound formed into uniform coils.
1. Certification: Bentonite waterstop shall be certified by NSF International to conform to the requirements of NSF Standard 61 – Drinking Water System Components – Health Effects.
 2. Size: 1" x 3/4" in cross section.
 3. Acceptable Product: Waterstop RX-110 manufactured by CETCO or equal.
 4. Adhesive: Provide multipurpose UV stable single component polyether moisture cure sealant/adhesive, compatible with waterstop.
- H. Surface Conditioners
1. Floor Hardener shall conform to "Surfhard" by Euclid Chemical Company, Inc., "Hornolith" by W.R. Grace Company, "Chem Hard" by L & M Construction Chemicals or equal approved by the Architect.
- I. Other Materials:
1. Joint filler where used with caulking or sealants, shall be cork type, non-extruding, self-expanding filler strips conforming to ASTM D 1752, III. Where no sealant or caulking is required, strips may be non-extruding bituminous type in accordance with ASTM D 1751.
 2. Vapor Retarder: "15 mil polyolefin sheet membrane in conformance with Class A requirements of ASTM E 1745; provide one of the following products: Stego Industries, LLC, "Stego Wrap 15-mil Class A", Reef Industries, Inc., "Griffolyn 15 Mil Green" or W.R. Meadows "Perminator 15 mil Underslab Vapor-Mat".
 3. Waterproof Kraft Paper shall be in accordance with ASTM C 171.
 4. Non-Shrink Grout (5000 psi): Shall be "Set Grout" by Master Builders, "Sono Grout" by Sonneborn Contech, Inc., "Five Star Grout" by U.S. Grout Corporation or equal approved by the Architect.

2.2 CONCRETE MIXES

A. Strength, cement and water requirements:

Design Compressive Strength, f'c	Min. Cement* Factor	Sacks/yd ³ lbs/yd ³	Max. Water Cement Ratio	Gal/sack Gal by wt.
4000	6.5	611	5.5	0.50

*Fly Ash may be used in all concrete except exterior walks and retaining walls. Amount shall be approximately 20% of the total cement content.

- B. All concrete shall be proportioned in accordance with ACI Standard 211.1, "Recommended Practice for Selecting Proportion for Normal and Heavyweight Concrete" and comply with the requirements of ACI 301 "Specifications for Structural Concrete" Chapter 3, Method 1 (trial batches) or 2 (field experience).
- C. Air-entraining and water-reducing agents shall be used in all concrete, in strict accordance with the manufacturer's printed instructions. Total air entrained in freshly mixed concrete shall be 5.0% plus or minus 1.0% of volume of concrete with required strengths maintained, except that all interior slabs subject to abrasion shall have a maximum air content of 3%.
- D. Water-Cement Ratio - All concrete subjected to freezing and thawing shall have a maximum water-cement ratio of 0.50. This is the total water in mix at time of placement, including free water of aggregates and liquid admixtures.
- E. Slump of concrete: 4 inches
- F. Premix admixtures in solution form and dispense as recommended by the manufacturer. Include the water in the solution in the design water content of the mixtures.

3.0 PART 3: EXECUTION

3.1 STORAGE

- A. All materials shall be stored to prevent damage from the elements and other causes.
- B. Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Any materials which have deteriorated, or which have been damaged, shall not be used for concrete.
- C. Store reinforcing steel on wood skids to protect it from earth and damage from trucking or other construction operations. Reinforcement shall be free from loose mill scale, rust, release agent, concrete splatter and other extraneous coatings at the time it is embedded in the concrete.
- D. All forms shall be stored in a neat manner and orderly fashion, protected from the weather and abuse.
- E. Materials which are judged not acceptable for this project shall not be stored on the site, but shall be immediately removed from the site.

3.2 FORMING

- A. Acceptable tolerances shall be as specified in ACI 347 "Recommended Practice for Concrete Formwork".
- B. Forms shall be constructed to conform to shapes, lines, and dimensions shown, plumb and straight, and shall be maintained sufficiently rigid to prevent deformation under load. Forms shall be sufficiently tight to prevent the leakage of grout. Securely brace and shore forms to prevent displacement and to safely support the construction loads.
- C. Treat forms with a form release agent applied according to the manufacturer's instructions, by roller, brush or spray to produce a uniform thin film without bubbles

or streaks. Apply the release agent in two coats for the first use of the form and in one coat for each additional use.

3.3 MIXING PROCESS

- A. Ready-mixed concrete shall be mixed and transported in accordance with "Specification for Ready-Mixed Concrete" ASTM C 94, Alt. #3 and ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".

3.4 REINFORCING

- A. Reinforcing shall be securely tied and supported to maintain proper spacing and cover during placing operations. Reinforcing for slabs on grade shall be supported by continuous slab bolsters with soil bearing plates; support by bricks is prohibited. Take particular care to bend tie wire ends away from faces of beams and walls. In no case shall ends of tie wires project towards or touch formwork.

3.5 EMBEDDED ITEMS

- A. Coordinate the installation of all embedded items required by other trades. Such items normally are to be in place prior to the placing of reinforcing steel.
- B. No conduit shall be placed in slabs on grade.

3.6 JOINTS

- A. Provide construction joints as shown on the drawings.
- B. Construction joints shall be formed with keyed bulkheads. Reinforcement shall continue through the joint, and additional reinforcement shall be placed as indicated on the Drawings.
- C. Provide control joints as shown on the drawings.
- D. Control joints shall be formed by saw cut. Reinforcement shall continue through the joint, unless otherwise noted on the Drawings.

3.7 PLACING

- A. Notify Architect at least 24 hours prior to each placement.
- B. Do not place concrete until soil bearing material, reinforcing steel, inserts, sleeves and other work to be built into the concrete have been inspected and approved by the Architect and all trades concerned.
- C. In hot weather, all concreting shall be done in accordance with ACI 305, "Recommended Practice for Hot Weather Concreting".
 - 1. When temperature rises above 70 degrees F, all surfaces of concrete shall be protected against rapid drying.
 - 2. Concrete delivered to the forms shall have a temperature not over 90 degrees F.
 - 3. The temperature of the forms shall not be over 90 degrees F.

- D. In cold weather, all concreting shall be done in accordance with ACI 306, "Recommended Practice for Cold Weather Concreting".
1. When the average daily temperature falls below 40 degrees F, all surfaces of concrete shall be maintained at a temperature of at least 50 degrees F and not over 90 degrees F for seven (7) days.
 2. Concrete delivered to the forms shall have a temperature of at least 60 degrees F and not over 90 degrees F.
 3. The temperature of the forms including gravel base, shall be at least 40 degrees F.
 4. The Contractor shall maintain a record of temperature of the concrete at the most exposed surfaces of each placement at the beginning and at the end of each day of the curing period, which shall be available to the Architect.
- E. Conveying - Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is retained.
- F. Depositing - Delivery and placement of concrete shall be programmed so that the time lapse between batching and placement shall not exceed 1-1/2 hours. Concrete shall not be allowed a free fall of over 4 feet. Concrete shall be deposited as nearly as practicable in its final position, to avoid segregation due to rehandling or flowing.
- G. Concrete shall be deposited continuously, in horizontal layers of such thickness (not deeper than 18 inches) that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. Placing shall be carried out at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited.
- H. Concrete shall be consolidated with the aid of mechanical vibrators in conformance with ACI "Recommended Practice for Consolidation of Concrete" to produce a dense, homogeneous mass without voids or pockets. Vibrators should be placed in concrete rapidly so as to penetrate approximately 3 to 4 inches into the previous lift, to blend the two layers. Vibrating techniques must assure that when the course aggregate reaches the form, it stops and the matrix fills the voids.

3.8 FINISHING OF CONCRETE SURFACES

- A. The intent of this Specification is to secure for the job, materials and workmanship of such quality that only nominal finishing will be required to produce concrete surfaces equal to the best obtainable with the concrete and forming materials specified. Surfaces which reveal, upon removal of forms, imperfections of such magnitude as to seriously impair the appearance of the structure, in the opinion of the Architect, shall be deemed cause for rejection, and concrete members containing such imperfections shall be entirely removed and replaced without damage to adjacent materials or extra expense to the Owner. Lesser imperfections of concrete surfaces shall be patched and finished in accordance with the following procedures:

1. Finishing Concrete Surfaces Not Exposed to View: At surfaces to receive dampproofing coatings, chip off fins and other projections and trowel patch all voids, honeycombs and air pockets exceeding 1/2" in any dimension. Pull tie-rods and patch voids formed by tie-rod cones flush with adjacent surfaces. At other concealed surfaces, patching, if any, shall be as directed by the Architect and shall, in general, be only such as is required to assure or protect the structural integrity of concrete or reinforcing.

3.9 FLOOR AND OTHER FLATWORK FINISHES

- A. Concrete for finish floor slabs shall be poured as dry as practicable within allowable slump range. Except when otherwise indicated or specified, concrete finish floor slabs shall be monolithically finished at required elevation by screeding, floating, and troweling to provide smooth, even, non-porous finish, free of trowel marks. Do not begin finish troweling until concrete has hardened sufficiently to prevent excess fines from working to the surface. After troweling is complete and slabs have set sufficiently to ring the trowel, the surfaces of all slabs exposed in the finished work shall be given a second steel-troweling to a burnished finish. Coordinate floor finish and levelness requirements with the Architect and modular fire vault manufacturer.
- B. Slab thickness indicated on Drawings is a minimum.
- C. Finish surface shall not vary more than 1/8" when measured by a 10-0" straight edge. Leveling of the slab by the Contractor to this tolerance for resilient flooring will be allowed by the use of latex type underlayment as approved by the Architect.
- D. No dry cement or mixture of sand and cement shall be applied to surface of any concrete slab to absorb moisture.
- E. Protect floors from damage until completion of job.

3.10 CURING AND PROTECTION

- A. Protect newly placed concrete against low and high temperature effects and against rapid loss of moisture. Cure all concrete for at least seven days at a temperature of at least 50 degrees F by curing methods approved by the Architect.
- B. Vertical or near vertical surfaces may be cured by maintaining wood forms continuously wet during curing period, by wrapping with continuous .006" polyethylene with taped joints or as approved by the Architect.
- C. Floor surfaces, after hardening sufficiently to prevent damage, and normally within several hours after final troweling, shall be treated with reinforced waterproof kraft paper with taped lapped seams.

3.11 FORM REMOVAL

- A. Forms shall be removed without damage to concrete. The contractor shall be responsible for the safety of the construction during and after form removal. No act of the Architect shall relieve him of this responsibility.
- B. Protect corners from damage after form removal by boxing, corner boards or other means approved by the Architect.
- C. Formwork for parts not supporting the weight of concrete may be removed as soon as the concrete has reached 30% of its specified 28-day strength, but not before 36 hours, provided it is properly cured and protected.

3.12 VAPOR RETARDER

- A. Apply vapor retarder under all interior slabs-on-grade after insuring that gravel sub base is level and well compacted.
- B. Lap all joints to a minimum width of 12 inches. Trim vapor barrier to fit neatly around column bases.
- C. Do not damage the vapor barrier at any time; repair any accidental punctures with a patch of the same material extending a minimum of 12 inches in all directions.

3.13 WATERSTOP

- A. Provide continuous waterstop between existing and new concrete. Strictly follow manufacturer's instructions and guidelines.
 - 1. Preparation: Remove dirt, debris, oil, grease, cement laitance, or other foreign matter which will impair or negatively affect the installation of the waterstop. Protect adjacent material surfaces from damage or contamination from installation operations.
 - 2. Installation: Apply continuous bead of adhesive/sealant to dry, smooth concrete surface maintaining a minimum 3" depth within the concrete joint. Firmly press the entire length of waterstop into adhesive. Maintain 3" minimum concrete cover over length of waterstop. Place waterstop in maximum practical lengths to minimize joints. Tightly butt ends together to form continuous waterstop. Do not overlap ends.
 - 3. Protection: Protect installed waterstop from pre-hydration prior to concrete placement and product encapsulation. Replace any waterstop material that exhibits significant expansion prior to concrete encapsulation.

3.14 CUTTING OF HOLES

- A. Cut holes required by other trades in any cast-in-place concrete which did not receive sleeves. Use a core drilling process or sawing process, which produces clean sharp edges and the minimum hole size which accommodates the piping, conduit, or equipment requiring the opening.
- B. Obtain approval of Architect before cutting any holes for any trades.

3.15 FLOOR HARDENING

- A. All interior concrete floors remaining exposed in the finished work shall be treated with a chemical hardener in a three-coat application, not sooner than 28 days after pouring of slab, in accordance with manufacturer's specifications.

3.16 NON-SHRINK GROUT

- A. Grout solid all beam bearing plates in accordance with manufacturer's recommendations.

**END OF SECTION
AND DIVISION 03**

DIVISION 04 - MASONRY

SECTION 04.20.00 UNIT MASONRY

1.0 PART 1: GENERAL

- 1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 **DESCRIPTION OF WORK**
- A. The Work of this Section includes the furnishing of all materials, labor, tools, and equipment required to complete brick and concrete masonry walls as shown on the Drawings and as specified.
- B. The Work of this Section includes, but is not limited to:
1. Exterior masonry in-fill walls.
 2. Enlarging existing masonry opening.
- 1.3 **RELATED WORK**
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- B. Other Specifications which directly relate to the Work of this Section include, but are not limited to:
1. Selective Demolition (Section 02.41.19).
 2. Miscellaneous Metals (Section 05.50.00).
 3. Dampproofing (Section 07.11.00).
- 1.4 **QUALITY ASSURANCE**
- A. *Contractor:* Contractor shall have at least five years experience in the Work required by this Section and shall employ skilled and experienced personnel and shall be able to demonstrate a consistent record in the performance of successful brick masonry work of similar type and scale.
- B. *Source:* For each type of material required for the Work of this Section, provide primary materials which are the products of one manufacturer to ensure uniformity of final color and appearance.
- 1.5 **SUBMITTALS**
- A. *Product Data:* Submit manufacturer's product data, installation instructions, use limitations, and recommendations for each material used.
- B. *Samples:* Submit the following samples:
1. Color Selection: Samples of mortar and exterior brick for color and texture selection, showing the full range of color and finish variations expected.
 2. Verification: Submit representative samples of mortar and bricks that are to be used

in the finished work, showing the full range of color and finish variations expected.

3. In-place: Prepare 4 square feet sample wall area with approved mortar and brick for review and approval before work begins.

1.6 DELIVERY, STORAGE, AND HANDLING: Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturers' instructions and recommendations. Protect from damage, deleterious effects of environmental conditions, and contamination by foreign materials. Store masonry units off the ground and protected from the weather.

1.7 PROJECT CONDITIONS

- A. *Cold Weather*: Strictly comply with recommendations of the Brick Institute of America Technical Note No. 1a, *Cold Weather Masonry Construction, Construction and Protection Recommendations* and the Portland Cement Association. Perform masonry Work only when temperatures are expected to remain above 40° F throughout the process and for at least seven days following. Comply with manufacturers' recommendations for weather conditions if more restrictive than those specified.
- B. *Hot Weather*: Use mortar within 1½ hours after mixing. Discard mortar over 1½ hours old and all stiffened mortar.

2.0 PART 2: PRODUCTS

2.1 CONCRETE MASONRY UNIT (CMU)

- A. Provide hollow fire-rated, load-bearing concrete masonry units conforming to ASTM C90, Type I, moisture controlled units and solid load-bearing units conforming to ASTM C145, with the following characteristics:
 1. Thickness: Nominally 6".
 2. Face Dimensions: Nominally 8"X16".
 3. Finish: Smooth face.
 4. Color: Color of CMU will be selected from manufacturer's standard range of colors.

2.2 BRICK MASONRY: Brick shall match in color, size, texture, and type of existing brick as approved by the Architect.

2.3 MORTAR AND GROUT MATERIALS

- A. *Portland Cement*: Comply with ASTM C 150, Type 1. Use cement which exhibits no efflorescence when tested in conformance with standard efflorescence test, ASTM C67.
- B. *Mortar Aggregate*: Comply with ASTM C144, well graded, sharp, bagged mason's mortar sand, screened to remove coarsest particles.
- C. *Grout Aggregate*: Comply with ASTM C404.
- D. *Lime*: Comply with ASTM C207, hydrated, type S.
- E. *Pigment*: Provide inorganic oxide masonry pigments as manufactured by Davis Colors, Solomon Grind Chem, or Lander-Segal.

2.4 MORTAR MIX

- A. *CMU Walls*: Provide Type M mortar with minimum compressive strength of 1,800 psi at 28 days. Color and strength of mortar shall match exactly color and strength of mortar of existing building.
 - B. *Brick Walls*: Provide Type S mortar with minimum compressive strength of 1,800 psi at 28 days. Color of mortar shall match exactly color of existing mortar.
- 2.5 GROUT MIX: Provide grout complying with ASTM C476 with minimum compressive strength of 3,500 psi at 28 days.
- 2.6 REINFORCEMENT: Provide ASTM A615, Grade 60, deformed bars for vertical reinforcement and for reinforcing bond beams.
- ## 2.7 FLASHING
- A. *Exposed Flashings*: Provide minimum 16 ounce ASTM B101 Type 1, Class A cold rolled copper with 1.92 ounces/sq. ft. lead coating on both sides.
 - B. *Concealed Flashings*: Provide minimum 40 mils thick, self-adhering, composite bituminous sheet flashing.
- 2.8 SEALANT: Provide one part silicone joint sealant conforming to ASTM C920, Type S, Grade NS, Class 35 and ASTM C510. Provide backer rod and primer which is compatible with sealant. Sealant shall be tack-free within 6 hours. Color shall be selected by the Architect.
- 2.9 MISCELLANEOUS: Provide accessory materials including, but not limited to galvanized masonry ties. Provide adjustable unit ties in cavity wall construction.

3.0 PART 3: EXECUTION

3.1 PREPARATION

- A. *Inspection*: The Installer shall inspect all existing conditions, construction, and other related work before beginning Work. The Installer shall notify the General Contractor in writing of deficient conditions. Beginning Work shall mean the Installer accepts existing construction, conditions, and other related work.
- B. *Protection*: Prevent mortar, cleaning agents, repair compounds, and water repellent coatings from staining surrounding masonry. Prevent contact with non-masonry surfaces that can be damaged by such contact.
- C. *Shoring*: Provide temporary shoring and bracing as needed to properly and safely support and brace masonry Work until work is ready to accept loads.
- D. *Curing*: Cure mortar in damp condition for no less than 72 hours.

3.2 GENERAL

- A. *Installation Standards*: Strictly comply with standards and recommendations of industry organizations and manufacturer's instructions and recommendations except where more restrictive requirements are specified.
- B. *Lay-out*: Lay out walls in advance for accurate spacing, uniform joint width, and accurate bonding pattern. Avoid the use of less than half sized units. Match exactly pattern,

coursing, joint width, and appearance of original work so that the limits of new work cannot be distinguished.

- C. *Laying*: Lay masonry plumb and level with full bed and head joints. For single wythe walls, make the most public side of wall the truest plane.
- D. *Rebars*: Set vertical reinforcements into grout filled cells.
- E. *Sawing and Cutting*: Cut masonry units with power saw designated for cutting masonry with sharp, unchipped edges. Cut masonry to form custom shapes where manufacturer cannot provide appropriate special shape.
- F. *Joints*: Joint width shall be between $\frac{1}{4}$ " and $\frac{3}{8}$ ". Adjust bed joint widths to fit CMU wall between slabs and beams. Tool joints flush with face of CMU wall.
- G. *Lintels*: Install steel lintels specified in other Sections.
 - 1. Bearing: Bearing shall be equal to span length/12 + 1", but in no case less than 6" of uniform bearing at each end.
 - 2. CMU: Provide masonry lintels for openings less than 8'-0" wide. Install steel lintels for openings 8'-0" wide or more.
- H. *Tolerances*: New walls shall meet the following installed tolerances.
 - 1. Variation from True Plumb, Level, & Line: $\pm\frac{1}{8}$ " in 20'-0".
 - 2. Variation from True Wall Thickness: $\pm\frac{1}{8}$ ".
 - 3. Variation from True Plane of Adjacent Surfaces: $\pm\frac{1}{16}$ ".

3.3 EXTERIOR WALLS

- A. *Tooling*: Tool joints to shed water, match joint profiles as selected.
- B. *Flashing*: Prepare masonry surfaces to receive flashings smooth and free of projections. Do not allow water to fall into cavity walls. Direct water to the exterior through weeps.
- C. *Weep Holes*: Provide weeps immediately above all flashings, ledges, and obstructions to the downward flow of water. Position weeps uniformly and symmetrically on either side of the center line of masonry opening. Form weeps by leaving head joints fully open in stretchers. Space weeps not more than 24" on center.

3.4 REPAIR, CLEANING, AND PROTECTION

- A. *Repair*: Repair minor damage to eliminate all evidence of repair. Remove and replace Work that cannot be successfully repaired.
- B. *Cleaning*: Clean excess mortar from brick and CMU surfaces before it sets using bristle brushes or rubbing with burlap or clean sand. Clean exterior masonry surfaces using low pressure water and brush methods recommended by the Brick Institute of America. Remove and replace Work that cannot be successfully cleaned.

**END OF SECTION
AND DIVISION 04**

DIVISION 05 - METALS

SECTION 05.12.00 STRUCTURAL STEEL FRAMING

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division1), and Drawings, apply to the Work of this Section.
- 1.2 DESCRIPTION OF WORK
- A. The work of this Section consists of furnishing and erecting all structural steel work and Architecturally Exposed Structural Steel work (AESS) as shown on the Drawings and as specified herein and includes, but is not limited to, the following:
1. Bearing plates.
 2. Beams with anchors and connections.
 3. Channels, angles, plates, frames, anchors, etc.
 4. Shop paint and field touch-up paint after erection.
- 1.3 RELATED WORK
- A. Related work shall be performed under the following Sections:
1. Section 03.30.00 CAST-IN-PLACE CONCRETE.
 2. Section 04.20.00 UNIT MASONRY.
- 1.4 REFERENCES (LATEST EDITIONS)
- A. "Code of Standard Practice for Steel Buildings and Bridges - 2005" and "Specifications for the Design, Fabrication and Erection of Structural Steel Buildings - 2005" by the American Institute of Steel Construction.
- B. The second sentence in paragraph 4.2.1 of the "Code of Standard Practice for Steel Buildings and Bridges" is deleted under the provisions of this Specification.
- C. The "Seismic Provisions for Structural Steel Buildings" by the American Institute of Steel Construction, Inc.
- D. The "Connections Manual of Steel Construction" by the American Institute of Steel Construction, Inc.
- E. The "Specifications for Structural Joints Using High-Strength Bolts – 2009" by the Research Council on Structural Connections (RCSC).
- F. "Structural Welding Code – Steel - 2008" by the American Welding Society.
- G. ASTM listed standards by the American Society for Testing and Materials.
- H. SSPC listed standards by the Steel Structures Painting Council.

- I. In case of conflict between the References and the Project Specification, the Project Specification shall govern. In the case of conflict between References, the more stringent shall govern.
- J. When compliance with any such References is specified herein for materials or a manufactured or fabricated product, the Contractor, if requested, shall furnish an affidavit from the manufacturer or fabricator certifying that the materials or product delivered to the job meets the requirements specified. However, such certification shall not relieve the Contractor from the responsibility of complying with any added requirements specified herein.

1.5 SUBMITTALS

- A. Submit complete Shop Drawings in accordance with the provisions of Section 01.33.00 – SUBMITTALS. One set of printed shop drawings shall be delivered to the Structural Engineer within 24 hours of submitting the electronic version of those shop drawings.
- B. Prior to preparation of Shop Drawings, the fabricator shall submit typical details and calculations of all structural steel and Architecturally Exposed Structural Steel connection types including, but not limited to, moment connections, beam to column and beam to girder connections, arch connections, column splices, beam splices, bracing connections, hanger connections, etc., for approval by the Architect and Structural Engineer. Design of all connections is to be provided by the fabricator, under the supervision of a registered, professional structural engineer, registered in the state that the project is located in.
- D. Prior to submission of Shop Drawings, the Contractor shall verify all dimensions, site conditions, etc., relating to existing conditions. Any discrepancies which affect the structural design or details shall be brought to the attention of the Architect and Structural Engineer.
- E. No variance from design sizes and details will be permitted on submitted Shop Drawings, but requests for modification of connection type or details to better suit their shop practice, or for any other reasons, will be considered by the Architect and Structural Engineer.
- F. Shop Drawings shall include all information required for fabrication of the component parts of the structure. Erection drawings shall clearly indicate all AESS members. They shall indicate size and weight of members, surface preparation, type and location of shop and field connections, the type, size and extent of all welds. Identify grinding, finish and profile of welds. The welding symbols used on the Shop Drawings shall be as adopted by the American Welding Society. Identify type, size finish and length of bolts, distinguishing between shop and field bolts.
- G. Approval of Shop Drawings shall be for size and arrangement of principal and auxiliary members and for strength of connections. Any errors in dimensions shown on the Shop Drawings shall be the responsibility of the Contractor.
- H. Fabrication of any material or performing of any work prior to the final approval of the Shop Drawings will be entirely at the risk of the Contractor.

- I. Reproduction of structural plans, sections and details, and any like information by reprographic or electronic methods for use as Shop and Coordination Drawings is subject to the following conditions:
 - 1. The entity producing the Shop and Coordination Drawings (The "User") agrees to accept the reproduced information from Foley Buhl Roberts & Associates, Inc. without any warranties, guarantees and/or representations of any nature whatsoever regarding the correctness, dimensional and/or quantitative accuracy and/or completeness of any such information contained therein.
 - 2. The User further agrees that such information shall be used as reference material only for the production of Shop and Coordination Drawings for the referenced project to which this Specification applies and only for that project.
 - 3. The User further agrees to release, indemnify, hold harmless and defend Foley Buhl Roberts & Associates, Inc. with respect to any claims, costs (including the cost of litigation), losses, damages and/or liabilities which arise from (or relate to) the use, misuse, modification, interpretation, misinterpretation and/or misrepresentation of the reproduced information.
- J. Reports: Submit certified copies of mill test reports for all structural steel furnished.

1.6 QUALITY ASSURANCE

- A. Qualifications: The steel fabricator and erector conducting the work of this Section shall be experienced in fabricating structural steel similar to that required for this project.
- B. All materials and workmanship under this Section shall be subject to inspection in the mill, shop or field by the Architect, or by qualified inspectors selected by the Architect and paid directly by the Owner.
- C. However, such inspection, wherever conducted, shall not relieve Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements, nor shall inspector's acceptance of materials or workmanship prevent later rejection of same by the Owner or Architect if defects are discovered.
- D. Inspection of welding work shall consist of non-destructive spot testing done by visual, magnetic particle, radiographic or ultrasonic methods, whichever is most effective for joint to be tested.
- E. Inspection of bolting work shall be in accordance with "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" by the American Institute of Steel Construction, latest edition. All bolting shall be visually inspected as directed by the Architect and Structural Engineer.
- F. The Contractor shall give proper notice to inspection agencies designated by the Architect and shall allow access and full facilities as required for this inspection.

- G. A final report shall be issued by the testing agency following the completion of work in this Section stating that all deficiencies have been corrected.

2.0 PART 2: PRODUCTS

2.1 MATERIALS

- A. Structural steel W and WT shapes shall comply with the requirements of ASTM A 992 or A 588 - Grade B (50 ksi minimum yield) for Structural Steel. Structural steel plates and shapes other than W and WT shapes shall comply with ASTM A 36 (36 ksi minimum yield). Square and rectangular steel tubing shall comply with ASTM A 500 - Grade B (46 ksi minimum yield). Round steel tubing shall comply with ASTM A 500 - Grade B (42 ksi minimum yield).
- B. Bolts, nuts and washers shall comply with the requirements of ASTM A 325. Bolts shall be A 325N with washer.
- C. Expansion bolts shall be Hilti Kwik Bolt TZ Expansion Anchors or an approved equal.
- D. Epoxy injection anchor bolts shall be Hilti HIT Adhesive Anchors or an approved equal.

2.2 FABRICATION

- A. All structural steel shall be fabricated in accordance with References, approved Shop Drawings, and as hereinafter specified.
- B. The design of members and connections for any portions of the structure not indicated on the Drawings shall be completed by the fabricator. Unless otherwise noted on the drawings, connections shall be capable of supporting the maximum uniform load of the member for the span shown and the material specified. All connection design shall be subject to approval by the Architect and Structural Engineer.
- C. Welding, as indicated on the Drawings, shall be in accordance with References and shall be done only by experienced welders who have been qualified by tests as prescribed in AWS "Standard Qualifications Procedure" for the type of work required.
- D. All shop connections shall be welded or bolted.
- E. Weld and joint details shall comply with requirements of the "Structural Welding Code - Steel" by the American Welding Society.
- F. Bolting shall comply with the requirements of AISC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts".
- G. All field connections shall be bolted, except where welding is indicated on the Drawings. All field bolts shall be alternate design type tension control with twist off elements.

- H. Diameter of holes in bolted parts shall be 1/16" greater than the nominal diameter of the bolt. No unfair holes will be accepted, and enlargement of holes shall not be accomplished by burning. Burrs resulting from drilling or punching shall be ground to the surface of the material. Shearing and punching shall be done cleanly so as not to deform or mar adjacent surfaces.
- I. Provide holes and connections as required for site assembly of steel work. Holes shall be drilled or punched and reamed in the shop. Show sizes and locations of all such holes on the Shop Drawings.
- J. Provide angles, bars, etc. as necessary for deck support at columns where members do not frame in from all four sides and where connections interfere with the support of metal decking.
- K. Provide angles, channels, etc. around all openings in roof deck at drains, fans, etc. as shown in drawings. Coordinate size, number, and location with architectural, mechanical, electrical, and plumbing trades.
- L. In general, beam to beam, and beam to column connections shall be double angle type connections, unless otherwise shown on the Drawings.

2.3 SURFACE PREPARATION AND PROTECTIVE COATINGS

- A. All structural steel shall be cleaned of all scale, rust, grease and other foreign matter.
- B. Surface preparation for structural steel shall be in accordance with "Steel Structures Painting Council Surface Preparation No. 3, Power Tool Cleaning".
- C. Primer for structural steel that shall be "TNEMEC" Series 10-09 (gray) Primer, or equivalent as approved by the Architect.
- D. Omit the primer at the following locations:
 - 1. Surfaces to be field welded.
- E. Primer paint shall be applied in accordance with manufacturer's directions to ensure no running or sagging.

3.0 PART 3: EXECUTION

3.1 STORAGE AND HANDLING

- A. Care and protection shall be given to all structural steel during handling and storage. If items are to be stored prior to installation, they shall not be placed in contact with the ground. Care shall be taken to avoid abrasions and other damage.

3.2 ERECTION

- A. All structural steel shall be anchored and erected in accordance with References, approved Shop Drawings, and as hereinafter specified.

- B. All work shall be accurately set to established lines and elevations and rigidly fastened in place with suitable attachments to the construction of the building.
- C. Temporary bracing, guying, and support shall be provided to keep the structure safe and aligned at all times during construction, and to prevent danger to persons and property. Check all temporary loads and stay within safe capacity of all building components.
- D. Except as otherwise indicated on the Drawings, all field connections shall be bolted in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts". All bolts shall be fully tensioned. Use not less than one (1) washer placed under the turning part of the assembly. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.
- E. The initial installations of expansion bolts and epoxy injection anchor bolts, shall be witnessed by the manufacturer's representative and load tests shall be performed to test their adequacy.
- F. Do not cut or alter any member in the field without Architect's written approval for each specific condition.
- G. Welding, as indicated on the Drawings, shall be in accordance with References and shall be done only by experienced welders who have been qualified by tests as prescribed in AWS "Standard Qualifications Procedure" for the type of work required.
- H. After erection, all structural steel members and connections shall be touched up with the appropriate primer.

3.3 TOLERANCES

- A. Individual structural steel members shall be plumbed, leveled, and aligned in accordance with the requirements of Chapter 7 of the "Code of Standard Practice for Steel Buildings and Bridges".

END OF SECTION

**SECTION 05.50.00
MISCELLANEOUS METALS**

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 DESCRIPTION OF WORK
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install miscellaneous metal as shown on the Drawings and as specified.
- B. The Work of this Section includes, but is not limited to:
1. Loose steel lintels for installation by others.
 2. Steel grating.
 3. All miscellaneous steel supports, brackets, braces, etc. as shown on Architectural Drawings and as required to fully complete the Project.
- 1.3 RELATED WORK
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- B. Other Specifications which directly relate to the Work of this Section includes, but is not limited to:
1. Unit Masonry (Section 04.20.00).
 2. Modular Fire Vault (Section 13.27.16).
- 1.4 QUALITY ASSURANCE
- A. *Reference Standard:* AISC Specifications.
- B. *Design Loads:* All steel fabrications shall conform to structural loading requirements of the Massachusetts Building Code.
- C. *Welding:* All welding shall be in compliance with the American Welding Society Code.
- 1.5 SUBMITTALS
- A. *Product Data:* For each product used, submit manufacturer's product data, including installation instructions, use limitations, and recommended maintenance procedures.
- B. *Shop Drawings:* Prepare and submit large scaled dimensioned drawings for fabrication and erection for approval prior to fabrication. Drawings shall include complete plans, elevations, and details of construction and installation, including anchorages, connections, accessory items, adjacent work, finishes, welds, reinforcement, etc. Provide installation templates for Work installed by other trades.
- 1.6 DELIVERY, STORAGE, AND HANDLING: Store materials off the ground and under cover. Maintain shop applied primer coatings until finish painting is complete. Protect from all possible damage. Manufactured materials shall be delivered and stored in their original unopened containers.

2.0 PART 2: PRODUCTS

2.1 MATERIALS

- A. *Steel Shapes*: ASTM A36.
- B. *Steel Tubes*: ASTM A500 or A513.
- C. *Bolts and Fasteners*: ASTM A307. Where work is indicated to be attached to existing masonry, provide Hilti "Hit-Reno" epoxy set bolts.
- D. *Steel Pipe*: Provide steel pipe conforming to ASTM A53, schedule 40. Steel shall be free from defects impairing strength, durability, and appearance.
- E. *Steel Grating*: Provide light duty welded steel bar grating.
 - 1. Bearing bars: Rectangular bar on 1 3/16" centers maximum
 - 2. Cross bars: Electroforge welded at right angles to bearing bars at 4" centers max.
 - 3. Surface: Plain
 - 4. Loading: 100# per square foot with deflection not to exceed 1/4"
 - 5. Finish: manufacturer's standard black paint
 - 6. Fabrication and tolerances: in accordance with the NAAMM Metal Bar Grating Manual.
- F. *Grout*: Provide pre-mixed, non-staining, non-corrosive, non-shrink, non-metallic grout complying with CE CRD-C588, type D, 5,000 psi. Acceptable products are:
 - 1. "POR-ROK" expanding grout manufactured by Hallemite Manufacturing Co., Cleveland, OH.
 - 2. "Embeco Pre-Mixed Grout" manufactured by Master Builders, Cleveland, OH.
 - 3. An approved equal.
- G. Accessory items include, but are not limited to fasteners, sleeves, and brackets. All accessory items exposed to view shall match primary steel material in color and finish.

2.2 FABRICATION

- A. *General*: Fabricate all Work to be truly straight, plumb, level, and square. Cut, reinforce, drill, and tap as necessary for proper assembly and use. Curved work shall be formed to true radii. Shop fabricate work to the greatest extent possible. All joints and connections exposed to the weather shall be formed to exclude water. Form hairline tight joints. Form welded joints and seams continuously and grind welds flush and smooth to be invisible after painting.
- B. *Coordination*: Fabricate Work to coordinate with requirements of other Specifications sections. Obtain loading requirements from suppliers of Work to be supported and design and fabricate support systems with a minimum safety factor of 6.
- C. *Welding*: Perform welding in accordance with the American Welding Society Code.

2.3 FINISHES

- A. *Paint Primer*: Paint all work not indicated to be galvanized. Prepare work for priming in accordance with Steel Structures Painting Council SP-6, Commercial Blast Cleaning. Provide two coats for total of 2 mil dry film thickness of rust inhibitive primer as specified in Painting (Section 09.90.00).

- B. *Galvanizing:* Hot-dip nickel galvanize all items located in exterior wall assemblies and in contact with masonry or concrete. Prepare metal for galvanizing by cleaning in accordance with SSPC-SP8. Ensure surfaces are clean, dry, undamaged, and free of all loose rust, dirt, grease, or other contaminants. Hot-dip galvanize in strict compliance with ASTM A123, ASTM A153, ASTM A386, ASTM A143, ASTM A384, and ASTM A385. The galvanizing bath shall contain .05-.09% nickel. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Provide minimum 2 ounces per square foot nickel zinc coverage, but not less than that required by referenced standards. To the greatest extent possible galvanize after fabrication. Do not field cut galvanized items. Touch up damaged or abraded galvanized surfaces with cold galvanizing compound or paint.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. *Manufacturers' Instructions:* Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* The Installer shall examine previous work, related work, and conditions under which this Work is to be performed and notify the General Contractor in writing of all deficiencies and conditions detrimental to the proper completion of his Work. Beginning Work means the Installer accepts substrates, previous work, and conditions.
- C. *Field Conditions:* Field measure and verify existing conditions to accurately to minimize the necessity for field adjustments.
- D. *Coordination:* Provide suitable anchors and fasteners to connect miscellaneous metal items to other construction. Provide setting templates and diagrams and coordinate with other Work so that adequate anchor bolts, blocking, and bracing is in place and accurately located.

3.2 INSTALLATION

- A. *Miscellaneous Supports:* Coordinate support requirements with work of other Sections. Design and provide miscellaneous steel support system as required to provide adequate support and clearances.
- B. *Lintels:* Provide steel lintels for masonry openings as shown on the Drawings for installation under Unit Masonry (Section 04.20.00). Fabricate multi-piece elements to the greatest extent possible.

- 3.3 **ADJUSTING AND REPAIR:** Check all Work and readjust as required. Ensure all surfaces are smooth to the touch. Grind welds smooth. Touch-up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Remove and replace Work that cannot be successfully repaired.

**END OF SECTION
AND DIVISION 05**

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

SECTION 06.10.00 ROUGH CARPENTRY

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install rough wood framing as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Wood blocking, grounds, nailers, and miscellaneous framing.
2. Fasteners and rough hardware.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the Work of this Section include, but are not limited to:

1. Gypsum Board (Section 09.20.00).

1.4 QUALITY ASSURANCE

A. *Standards:* Comply with the following reference standards.

1. PS 20, American Softwood Lumber Standard.
2. NFPA National Design Specifications for Wood Construction.

1.5 SUBMITTALS

A. *Shop Drawings:* Provide complete design calculations for structural assemblies prepared by a structural engineer registered in the Commonwealth of Massachusetts. Ensure shop drawings for structural assemblies are on site and approved by inspecting authority before erection.

1.6 DELIVERY, STORAGE, AND HANDLING: Keep wood materials dry at all times. Stack materials to provide air circulation.

2.0 PART 2: PRODUCTS

2.1 DIMENSION LUMBER: Provide dressed S4S lumber complying with PS-20.

A. *Species:*

1. Provide spruce-pine-fir for regular framing.
2. Provide pressure treated southern yellow pine for framing in contact with masonry or concrete.

- B. *Grading*: Provide the following grades of lumber for each application.
 - 1. Structural Light Framing: No. 1 or No. 1 dense, No. 2 or No. 2 dense. Minimum $f_b = 1,200$ psi and minimum $E = 1,400,000$ psi.
 - 2. Studs: Stud. Minimum $f_b = 1,000$ psi and minimum $E = 1,400,000$ psi.
 - C. *Moisture Content*: Lumber shall be seasoned to a maximum moisture content of 19%. Southern yellow pine shall be kiln dried to a maximum moisture content of 15%.
 - D. *Preservative Treatment*: All lumber in contact with concrete or masonry or used in connection with waterproofing, roofing, and flashing or used in areas of high humidity or moisture, shall be pressure treated with waterborne preservatives complying with AWPA LP-2 and AWPA C2.
- 2.2 FASTENERS: Provide fastening devices of the size, type, and material as suited for each application.
- A. *Bolts, Screws, Nuts, Washers*: Provide square, round, and hex head items in compliance with ANSI B18 and ASTM A307.
 - B. *Wood Screws*: Provide slotted head items in compliance with ANSI B18 and ASTM A549.
 - C. *Nails*: Comply with ASTM A510 and F547.
 - D. *Finish*: All fasteners in contact with concrete or masonry or used in areas of high humidity or moisture, shall be hot-dip galvanized in accordance with ASTM A153.

3.0 PART 3: EXECUTION

3.1 PREPARATION

- A. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.
- B. *Field Measurement*: Where rough carpentry is fitted to other Work, obtain measurements, verify dimensions, and check design intent as shown on the Drawings to ensure proper placement.

3.2 DIMENSION LUMBER FRAMING

- A. *General*: Select individual wood pieces which are free of splits, warps, and twisting. Knots and other acceptable defects shall not interfere with proper placement of fasteners.
- B. *Blocking and Nailers*: Provide blocking, nailers, and shims as required to properly support other Work and to meet tolerances specified in other Sections. Ensure that blocking, nailers, and fasteners are capable of supporting other Work and applied loadings. The complete extent and size of required blocking, nailers, and shims are not shown on the Drawings.

- 3.3 CLEANING: Clean work area of accumulations of sawdust, cut ends, and debris.

END OF SECTION

**SECTION 06.20.00
FINISH CARPENTRY**

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install finish woodwork and custom millwork as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Interior standing, running, and miscellaneous trim.
2. Wainscoting.
3. Plastic laminate counter.
4. Reglaze existing rated transom.

C. *Intent*

1. A major intent of the Work of this Section is to minimally disturb existing wood trims designated to remain.
2. A major intent of the Work of this Section is to match existing wood trim sizes and profiles to the greatest extent possible.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the Work of this Section include, but are not limited to:

1. Rough Carpentry (Section 06.10.00).
2. Joint Sealants (Section 07.92.00).
3. Wood Doors and Frames (Section 08.14.00).
4. Plaster and Gypsum Board (Section 09.20.00).
5. Painting (Section 09.90.00).
6. Plumbing (Section 22.00.00).

1.4 QUALITY ASSURANCE

A. *Manufacturer:* Provide millwork only from manufacturers who comply with AWI Architectural Woodwork Quality Standards and who have been producing similar products for a minimum of 5 years.

B. *Installer:* Employ only experienced personnel for fabrication and installation of millwork.

1.5 SUBMITTALS

A. *Product Data:* Submit manufacturer's product data, including installation instructions, recommended uses, and certification of compliance with specifications requirements.

- B. *Shop Drawings*: Submit large scaled plans, elevations, and details. Show anchorages and connections.
 - C. *Samples*: Submit 2' long X full width samples of all exposed materials.
 - D. *In-Place Samples*: Before beginning Work, provide typical in-place samples of each item and type of Work. Protect and maintain acceptable in-place samples.
- 1.6 PROJECT CONDITIONS: Comply with AWI standards and recommendations for environmental conditions during storage and installation to prevent shrinkage and swelling of woodwork.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. *General*: Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.
 - B. *Wood*: Store materials in a weathertight, well-ventilated area. Keep wood materials dry at all times. Stack materials to provide air circulation.

2.0 PART 2: PRODUCTS

2.1 INTERIOR STANDING, RUNNING, AND MISCELLANEOUS TRIM

- A. *Solid Stock Lumber*
 - 1. Natural Finish: Provide kiln-dried red oak for natural finish, complying with ASTM D3110, worked to shapes as indicated on the Drawings.
 - 2. Painted Finish: Provide kiln-dried poplar for painted finish, complying with ASTM D3110, worked to shapes as indicated on the Drawings. Finger-jointed lumber is not allowed.
 - B. *Extent*: Interior trim includes, but is not limited to:
 - 1. Door casings.
 - 2. Moldings.
 - 3. Chair rail.
 - 4. Wall base.
- 2.2 BEAD BOARD WAINSCOTING: Fabricate tongue and groove bead board wainscoting from quartersawn, kiln-dried red oak for natural finish, complying with ASTM D3110. Overall finished dimension of board shall match existing boards.

2.3 COUNTERTOPS, APRONS, AND BACKSPLASHES

- A. *Plastic Laminate Countertops*: Countertops shall be high pressure laminate on 1½" particle board substrate, fabricated in a single piece no seams.
 - 1. Substrate: Provide 2 layers of ¾" particle board substrate complying with provisions of U.S. Product Standard PS-1 for Construction and Industrial Plywood.
 - 2. Plastic Laminate: Provide high pressure plastic laminate surfacing material which conforms with NEMA LD-3 for all exposed surfaces and edges, with the following characteristics.

- a. Thickness: 0.048".
 - b. Type: General Purpose Type HGS.
 - c. Color: Colors shall be selected by the Architect from the manufacturer's standard range of colors. Up to four colors may be selected.
- 3. Backer Sheets: Provide NEMA LD-3 BK20 backer sheets for all unfinished substrates less than 1½" thick to minimize warping.
 - 4. Backsplashes: Provide 4" high backsplashes and sideplashes, high pressure laminate on ¾" plywood substrate.
- B. *Accessory Pieces*: Provide accessory pieces as indicated on the Drawings and as required to complete installation. Pieces shall include, but are not limited to plastic laminate and solid surface aprons, sink fronts, wall panels.

2.4 GLASS

- A. *Glass Thickness*: Thickness indicated in the Contract Documents are minimum thicknesses only. Provide the proper thickness required for each application. Provide edge clearances and tolerances which comply with manufacturer's recommendations.
- B. *Wire Glass*: UL listed, fire rated, ASTM C1036 polished transparent wire glass complying with ANSI Z97.1, ¼" thickness.

2.5 GLAZING MATERIALS

- A. *Glazing Sealant*: Provide sealant which is compatible with all substrates and materials and which has performance characteristics which are suitable for the intended application. Color shall be selected by the Architect from the manufacturer's standard range of colors.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.

3.2 PREPARATION

- A. Backprime all interior wood.

3.3 STANDING, RUNNING, AND MISCELLANEOUS TRIM: Install in longest practical lengths with a minimum of joints. Scribe and fit work neatly and accurately with hairline tight joints. Stagger joints in adjacent or related members.

3.4 BEAD BOARD WAINSCOTING: Install full length boards with no horizontal joints. Glue bead board to plywood or existing finish and nail or screw at studs. Conceal fasteners.

3.5 COUNTERTOPS

- A. Mechanically fasten countertops to wall framing. Conceal shims, cleats, and blocking from view.
- B. Adhere backsplashes and side splashes to walls with waterproof mastic adhesive, concealed from view.
- C. *Cut-outs*: Coordinate opening for installation of sink. Drill pilot holes at corners before making cuts. Smooth cut edges and coat with waterproof coating or adhesive.
- D. *Sealant*: Seal all joints and items set in countertop with sanitary silicone rubber sealant.

3.6 TOLERANCES

- A. *Plumb and Level*: $\frac{1}{8}$ " in 8'.
- B. *Offset in Surface Alignment*: $\frac{1}{16}$ " maximum.
- C. *Offset in Revealed Adjoining Surface*: $\frac{1}{8}$ " maximum.

3.7 REPAIR, CLEANING, AND PROTECTION

- A. *Repair*: Repair minor damages to eliminate all evidence of repair. Remove and replace Work which cannot be successfully repaired.
- B. *Protection*: Provide temporary protections to ensure that Work is not damaged before final acceptance. Remove protections and re-clean as necessary immediately before final acceptance.

**END OF SECTION
AND DIVISION 06**

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 07.11.00 DAMPPROOFING

1.0 PART 1: GENERAL

- 1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.
- 1.2 **DESCRIPTION OF WORK**
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to complete dampproofing as shown on the Drawings and as specified.
 - B. The Work of this Section includes, but is not limited to:
 - 1. Bituminous dampproofing of concrete masonry in cavity walls.
- 1.3 **RELATED WORK**
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
 - B. Other Work which directly relate to the work of this Section include, but are not limited to:
 - 1. Unit Masonry (Section 04.20.00).
- 1.4 **QUALITY ASSURANCE**
- A. *Source:* Provide primary products of one manufacturer. Provide secondary products and materials which are acceptable to the primary materials manufacturer.
 - B. *Installer:* Installer shall have at least five years experience in the type of work specified and shall be acceptable to the manufacturer of the primary materials.
- 1.5 **SUBMITTALS**
- A. *Product Data:* Submit manufacturer's product data, including installation instructions, recommended uses, and certification of compliance with specifications requirements for each material specified.
- 1.6 **PROJECT CONDITIONS**
- A. *General:* Proceed with Work only when ambient conditions are within the limits established by manufacturers of the materials and products used.
 - B. *Environmental Conditions:* In cold weather, solvent based products may be used in lieu of water-based products only if manufacturer's recommendations, including concrete curing, are strictly followed before installation.
 - C. *Substrate Conditions:* Proceed with work only when substrate construction is complete. Ensure that substrates are free of form materials and inserts.

- 1.7 DELIVERY, STORAGE, AND HANDLING: Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage including dampness and wetting. Remove damaged material from site and dispose of in accordance with applicable regulations.

2.0 PART 2: PRODUCTS

2.1 BITUMINOUS DAMPPROOFING

- A. Provide cold applied, fibrated type liquid emulsion conforming to ASTM D1187, type B or ASTM D1227, type II or III.
- B. *Acceptable Manufacturers:* Provide products which meet or exceed the requirements of this Section by one of the following manufacturers:
1. J&P Petroleum Products, Inc.
 2. Karnak Chemicals.
 3. Pecora Corporation.
 4. Sonneborne Building Products.
 5. Or equal.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.

3.2 BITUMINOUS DAMPPROOFING

- A. *Surface Preparation:* Clean substrates, fill voids, seal joints, and prime substrates as recommended by the dampproofing manufacturer.
- B. *Installation*
1. Install separate flashings, corner protection strips, and cants as recommended by manufacturer.
 2. Protect adjacent work from spillage and migration. Do not clog pipes and conduits with dampproofing, but ensure that holes around penetrations are properly sealed and dampproofed.
 3. Trowel or brush 1/8" thick minimum dry film thickness of dampproofing over all concrete surfaces below grade. Coordinate dampproofing work with flashing work to ensure that water in cavity will be directed to weeps and shed from cavity and ensure compatibility between dampproofing and flashing materials.
- C. *Cleaning and Protection:* Remove masking materials and clean and restore adjacent surfaces and construction to original appearance.

END OF SECTION

**SECTION 07.92.00
JOINT SEALANTS**

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install joint sealers and fillers, not explicitly provided by others and as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Sealing interior joints.
2. Sealing exterior joints.
3. Fire stopping.

C. *Intent*

1. Exterior Work: A major intent of exterior Work of this section is to keep the building dry and to permanently establish and maintain airtight and watertight continuous seals within the limits of normal wear and aging.
2. Interior Work: A major intent of interior Work are to seal and fill all cracks, voids, and gaps, usually, but not always, located between dissimilar materials. In fire-rated assemblies, the Work of this section is intended to maintain required fire-ratings around penetrations.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Specifications which directly relate to the Work of this Section include, but are not limited to:

1. Gypsum Board (09.20.00).
2. Painting (Section 09.90.00).
3. Fixed Louvers (Section 08.91.19).
4. Plumbing (Section 22.00..00)
5. HVAC (Section 23.00.00)
6. Electrical (Division 26)

1.4 QUALITY ASSURANCE: For each type of primary material specified, provide products from a single manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

1.5 SUBMITTALS

A. *Product Data*: Submit manufacturer's product data, including installation and curing instructions, recommended uses, and certification of compliance with specifications requirements.

- B. *Samples*: Submit 4" long samples showing full range of colors available and color and finish variations expected.
- C. *In-place Samples*: Provide typical in-place sample not less than 4 linear feet of each type of sealant and filler.
- D. *Warranty*: Submit written warranty signed by manufacturer, Installer, and Contractor, agreeing to repair or replace Work which exhibits defects in materials or workmanship for a period of 5 years from the date of Substantial Completion. Defects include, but are not limited to, leakage of water, abnormal aging or deterioration, and failure to perform as required. Repair work shall include removal and replacement of adjacent and covering work.

1.6 PROJECT CONDITIONS

- A. *Environmental Conditions*: Execute Work only when existing and forecasted environmental conditions are within the limits established and recommended by manufacturers of the products being used.
- B. *Joint Conditions*: Joints to be sealed shall be in the mid-range of the joints's intended movement, not near their fully closed nor fully open extremes. Joints shall be sealed when ambient temperatures produce this condition, between 50 and 85 degrees F.

1.7 DELIVERY, STORAGE, AND HANDLING: Deliver materials in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

2.0 PART 2: PRODUCTS

2.1 GENERAL

- A. *Colors*: Colors shall be selected by the Architect from manufacturer's standard range of colors.
- B. *Compatibility*: Select and use sealers which are recommended by manufacturer for each intended application. Verify compatibility with adjacent materials.

2.2 SEALANTS

- A. *Interior Sealant*: Provide permanently flexible, latex rubber modified acrylic emulsion sealant, complying with ASTM C834.
- B. *Exterior Sealant*: Provide silicone sealant conforming with AAMA 803.3-92, 809.2-92 or ASTM C920-87, Type S, Grade NS, Class 25.

2.3 FIRESTOPPING

- A. *Intent*: The major intent of this Work is to comply with the Massachusetts State Building Code. Provide materials to prevent passage of flame and products of combustion through concealed spaces and openings including, but not limited to:
 1. Between stories, except within fire-rated shaft enclosures.
 2. Above fire-rated wall or partitions required to extend to underside of structure above.
 3. Concealed furring spaces behind finished surfaces.

4. Locations at penetrations which pass through fire-rated assemblies.
 5. Locations at recessed items that penetrate or interrupt fire-rated assemblies.
- B. *Standards:* Provide materials and products which conform to the following:
1. Fire Resistance: ASTM E119, UL 263, ANSI A2.1, and NFPA 251, as tested by independent agencies.
 2. Burning Characteristics: ASTM E84, Class A or Class 1.

C. *Materials and Products*

1. Safing Insulation: Provide UL listed and labeled semi-rigid, non-asbestos mineral fiberboard, rated non-combustible when tested in accordance with ASTM E136, conforming with FS HH-I-558B form A. Provide US Gypsum Thermal Safing Insulation or equal.
2. Mineral Wool: Provide loose mineral wool rated noncombustible when tested in accordance with ASTM E136, and free of asbestos and glass fiber.
3. Caulk, Putty, and Foam: Provide 3M Fire-Barrier Caulk and Putty, Nelson Electric Flame Seal Putty, or Dow Corning Silicone RTV Foam.
4. Accessories: Provide anchorage and other accessories as needed to provide complete, effective firestopping systems complying with UL designs.

2.4 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. *Primer:* Provide primers as recommended by sealant manufacturers for each surface to which sealant is applied.
- B. *Bond Breaker Tape:* Provide polyethylene or other plastic tape as recommended by sealant manufacturer to prevent three-sided adhesion.
- C. *Backer Rod:* Provide compressible rod of durable nonabsorptive foam material as recommended by sealant manufacturer for compatibility with sealant.
- D. Provide any and all additional materials, including sealants, which are required to achieve specified intent of this Section.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.

3.2 PREPARATION

- A. *Cleaning*: Clean joint surfaces immediately before installation of sealants and accessories. Remove all substances which could interfere with bonding.
 - B. Tape or mask adjoining surfaces to prevent spillage and migration.
 - C. Etch or roughen joint surfaces to improve bonding.
 - D. Prevent three sided adhesion by use of bond breaker tapes or backer rods.
- 3.3 GENERAL SEALING
- A. Force sealant into joints to provide uniform dense, continuous ribbons with no gaps and air pockets. Dry tool sealant to form a smooth dense surface with joint surfaces adhering equally on opposite sides. Ensure compressed sealants will not protrude from joints.
 - B. *Profile*: Ensure sealants are tooled to a profile which will prevent trapping of water.
 - C. *Sealant Depth*: Comply with manufacturer's recommendations and instructions and the following general guidelines.
 - 1. Joint depth shall be equal to joint width for joints up to ½" wide.
 - 2. Joint depth shall be equal to one-half of the joint width for joints over ½" wide.
- 3.4 FIRESTOPPING: Install firestopping materials in thicknesses as required to maintain fire-ratings of assemblies to strictly match UL standard designs.
- 3.5 CURING: Cure sealants in strict compliance with manufacturer instructions and recommendations.
- 3.6 REPAIR AND CLEANING: Remove and replace Work which is damaged or deteriorated in any respect, Clean adjacent surfaces using materials and methods recommended by sealant manufacturer. Remove and replace Work which cannot be successfully cleaned.

**END OF SECTION
AND DIVISION 07**

DIVISION 08 - OPENINGS

SECTION 08.12.13 HOLLOW METAL FRAMES

1.0 PART 1: GENERAL

1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install hollow metal frames as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Door frames.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the work of this Section include, but are not limited to:

1. Rough Carpentry (06.10.00).
2. Finish Carpentry (06.20.00)
3. Joint Sealants (Section 07.92.00).
4. Wood Doors and Frames (Section 08.52.00).
5. Door Hardware (Section 08.71.00).
6. Painting (Section 09.90.00).

1.4 QUALITY ASSURANCE

A. *Standards:* Comply with applicable sections of the following reference standards as published by the Hollow Metal Manufacturers Association, a division of the National Association of Architectural Metal Manufacturers:

1. NAAMM/HMMA 861, "Guide Specifications for Commercial Hollow Metal Doors and Frames."

B. *Source:* Provide products of one manufacturer of frames. Provide secondary products and materials which are acceptable to the frames manufacturer.

1.5 SUBMITTALS

A. *Product Data:* Submit manufacturer's product data, including installation instructions, recommended uses, and certification of compliance with specifications requirements.

B. *Shop Drawings:* Submit large scaled shop drawings and door schedule.

1.6 **DELIVERY, STORAGE, AND HANDLING:** Deliver, store, and handle doors in strict compliance with Steel Door Institute recommendations.

2.0 PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS: Provide products which meet or exceed the requirements of these specifications from one of the following manufacturers:

- A. Curries
- B. Ceko
- C. Amweld
- D. Fenestra
- E. Steelcraft
- F. American Steel Products

2.2 MATERIALS

- A. *Steel*: Provide commercial quality, level, cold-rolled steel conforming to ASTM A366 or hot-rolled, pickled and oiled steel conforming to ASTM A569.
- B. *Galvanized Steel*: Hot dipped zinc coated steel shall comply with ASTM designations A526. Coating weights shall meet or exceed minimum requirements of A60 for alloyed coatings and G60 for spangled coatings, 0.30 ounces per square foot per side or 0.60 ounces per square foot total.
- C. *Galvanized Anchors*: Electrolytically deposited zinc coated steel for anchors and accessories shall comply with ASTM A591 and A568, with class B minimum coating weight.
- D. *Primer*: Frames shall be thoroughly cleaned and chemically treated to ensure maximum paint adhesion. All exposed surfaces shall receive a factory applied coat of rust inhibiting primer, compatible with intended finish coat.

2.3 FABRICATION

- A. *General*: Fabricate frames to be rigid, free from defects and free from warp and buckle.
- B. *Hardware Preparation*: Reinforce, drill, and tap frames to receive mortised hinges, latches, and concealed door closers as required. Comply with applicable sections of ANSI A115.
- C. *Frames*
 - 1. Fabricate frame from cold rolled steel sheets. Use minimum 16 gage steel for interior openings and 14 gage for exterior openings. Miter and weld corners fully. Grind welds smooth and flush for painted finish.
 - 2. Reinforcement: Provide the following minimum steel gages for reinforcement locations indicated:
 - Floor anchors: 14 gage.
 - Strikes: 14 gage.
 - Closers: 12 gage.
 - Hinges: 10 gage.
 - 3. Anchors: Provide steel anchors welded inside jambs suited for each particular application. Provide minimum 14 ga. floor anchors. For masonry walls, provide minimum 16 ga. T type masonry anchors. For metal stud partitions, provide minimum 18 ga. Z type metal clips.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
 - B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.
- 3.2 INSTALLATION: Install doors and frames true and plumb. Anchor steel frames with a minimum of three masonry anchors and a floor anchor at each jamb.

3.3 ADJUSTING, TOUCH-UP, AND REPAIR

- A. *Adjusting:* Adjust clearances and operating parts to work smoothly, easily, and correctly.
- B. *Touch-up and Repair:* Touch damaged shop coatings and repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.

END OF SECTION

**SECTION 08.14.00
WOOD DOORS AND FRAMES**

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install wood doors and frames as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Wood doors.
2. Wood door frames.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the work of this Section include, but are not limited to:

1. Rough Carpentry (Section 06.10.00).
2. Finish Carpentry (Section 06.20.00).
3. Hollow Metal Frames (Section 08.11.13).
4. Door Hardware (Section 08.70.00).
5. Painting (Section 09.90.00).

1.4 QUALITY ASSURANCE

A. *Reference Standards*

1. ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.
2. Glass Association of North America (GANA) Glazing Manual.
3. FGMA Sealant Manual.
4. National Fire Protection Association (NFPA) 80: Fire Doors and Windows.
5. FPA 252: Fire Tests of Door Assemblies.
6. Underwriters Laboratories, Inc. (UL) 10B: Fire Tests of Door Assemblies.
7. UL 10C: Positive Pressure Fire Tests of Door Assemblies.

1.5 SUBMITTALS

A. *Product Data*: Submit manufacturer's product data, including installation instructions, recommended uses, and certification of compliance with specifications requirements.

1. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

B. *Shop Drawings*: Submit large scaled shop drawings and door schedule.

- 1.6 **WARRANTY:** Provide written warranty from the door and frame manufacturer, agreeing to repair or replace Work which exhibits defects in materials or workmanship for the life of the installation.
- 1.7 **DELIVERY, STORAGE, AND HANDLING:** Deliver doors and frames polywrapped to protect against moisture. Store and handle in strict compliance with manufacturer's recommendations. Store doors flat, in a clean, dry, and well ventilated area.

2.0 PART 2: PRODUCTS

2.1 FLUSH DOORS

- A. *Industry Standards:* Provide products in compliance with NWMA Industry Standard No. 1.
 - B. *Thickness:* Provide 1¾" thick doors.
 - C. *Materials*
 1. AWI Premium Grade red oak for transparent finish. Wood shall be kiln dried to moisture content of 6-8%.
 - D. *Veneers*
 1. AWI Premium Grade red oak for transparent finish.
 - E. *Adhesive:* Type I waterproof for face assembly and Type II water-resistant for core assembly.
 - F. *Machining:* Factory machine doors for hardware.
 - G. *Non-rated Doors:* Construct doors from solid lumber rails and stiles with particle board core.
- 2.2 **PRE-FITTING AND PRE-MACHINING:** Prefit and premachine doors as required. Trim equally on both sides to prevent unbalanced construction. Do not trim tops or bottoms more than ¾".

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.

3.2 ENVIRONMENTAL CONDITIONS

- A. Begin installation only after plaster, concrete and other wet Work is completed and dried.
- B. Condition doors to prevailing humidity conditions before installing.

- 3.3 **FITTING AND MACHINING:** Fit doors to frames and machine for hardware to that extent which was not done at the factory.

3.4 CLEARANCES AND TOLERANCES

- A. Non-rated Doors: Provide a uniform 1/8" clearance at heads, jambs, and meeting stiles and a uniform 1/2" clearance at bottoms of doors.
- B. Fire Rated Doors: Provide clearances complying with NFPA 80 Trim as necessary and in strict compliance with door manufacturer's instructions and recommendations. Do not trim top rails. Do not remove labels.

3.5 ADJUSTING AND PROTECTION

- A. *Adjusting*: Adjust doors to work smoothly. Replace doors which cannot be successfully adjusted to operate correctly or fit properly into frames.
- B. *Protection*: Protect doors, frames, and hardware from damage during construction.

END OF SECTION

**SECTION 08.71.00
DOOR HARDWARE**

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.
- 1.2 DESCRIPTION OF WORK
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install finish hardware on new and existing doors as shown on the Drawings and as specified.
- B. The Work of this Section includes, but is not limited to:
1. Finish hardware for new doors.
 2. Lockets for existing doors.
- 1.3 RELATED WORK
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- B. Other Work which directly relate to the work of this Section include, but are not limited to:
1. Hollow Metal Frames (Section 08.11.13).
 2. Wood Doors and Frames (Section 08.14.00).
- 1.4 SUBMITTALS
- A. *Product Data*: Submit manufacturer's product data, including installation instructions and recommendations for use for each item.
- B. *Schedules*: Submit hardware and keying schedules coordinated with manufacturer's data, samples, and Contract Documents.
- C. *Templates*: Provide installation templates.
- D. *Samples*: Submit samples for review of styles and finishes.
- 1.5 DELIVERY, STORAGE, AND HANDLING: Deliver hardware in factory wrapped packages, labeled to coordinate with the final hardware schedule. Each package shall contain appropriate fastenings, instructions, installation templates, and any special tools required for installation. Securely store hardware to prevent damage or theft.
- 1.6 MAINTENANCE STOCK: Provide factory wrapped maintenance stock for all hardware items in the amount of 5% of each type, but never less than one maintenance stock item for each hardware item used. Each package shall contain appropriate fastenings, instructions, installation templates, and any special tools required for installation.

2.0 PART 2: PRODUCTS

2.1 GENERAL

- A. *Finishes*: Finishes shall exactly match those of selected samples with no variation in hue, regardless of base metal. All hardware for doors shall be BHMA 606, Satin Brass, to match existing hardware.
- B. *Fasteners*: Use concealed fasteners whenever possible. Where concealed fasteners are not possible, provide tamper proof screws. Supply Owner with applicable tool to unfasten tamper proof screws.
- C. *Acceptable Products and Manufacturers*: Manufacturers and products are listed to establish the standard of quality, design, and function. Provide the hardware specified or a product of a specified manufacturer which meets or exceeds the specified standard.

2.2 HINGES

- A. *Acceptable Manufacturers*: Roton, Hager, Stanley.
- B. *Type*: Provide template produced, full mortise, 5 knuckle, standard weight, 0.134 gage hinges with non-rising pins. Provide two ball bearings for hinges of doors with closers.
- C. *Size*: Height of hinges shall be 4½". Width shall be coordinated with door jamb and trim conditions.
- D. *Quantity*: Provide three hinges for all doors and door leaves.

2.3 LATCHES AND LOCKS

- A. *Acceptable Manufacturers*: Best, Schlage, Yale. Provide latchsets and locksets of one manufacturer.
- B. *Types*: Provide mortise locks as scheduled. Latch throws shall have a minimum ½" projection. Deadbolts shall have a minimum 1" throw. Locksets shall meet ANSI 156.13 Grade 1.
- C. *Operating Trim*: Provide lever handles for all doors. Provide escutcheons for mortise locks.
- D. *Strikes*: Provide standard closed box strikes with extended curved lips of sufficient length to protect door frames.

2.4 CLOSERS

- A. *Acceptable Manufacturers*: LCN, Sargent, Yale.
- B. *Type*: Provide barrier-free closers, complying with ANSI A117.1 and the Massachusetts Architectural Barriers Board for opening force and delayed action closing. Use parallel arm closers where closers are mounted on push sides of doors.

2.5 MISCELLANEOUS HARDWARE

- A. *Door Stops*: Provide types suited for locations.

2.6 KEYING

- A. *Lock Function*: Review lock functions with Owner before ordering hardware.

- B. Provide Masterkey System. Review specific keying applications with Owner.
- C. *Number of Keys*: Provide three keys and one blank for each lock and 5 master keys.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.

3.2 MOUNTING HEIGHTS AND LOCATIONS

- A. *Hinges*: Mount bottom hinge 10" above the floor. Mount top hinge 5" from top of door. Space other hinges equally between top and bottom hinges.
- B. *Locksets*: Mount center of operating trim 3'-0" above the floor.
- C. *Closers*: Mount closers on secure sides or least public sides of doors.

3.3 INSTALLATION: Fit locksets in doors and remove before painting of doors and frames. Re-install locksets after painting is complete.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. *Adjusting*: Adjust hardware to work easily, smoothly, and properly. Adjust hardware so that doors operate properly and smoothly, without binding or rubbing frames.
- B. *Cleaning*: Clean and polish exposed surfaces of new and existing hardware with a non-abrasive polish.
- C. *Protection*: Provide temporary protections to prevent damage during construction. Remove protections and re-clean and re-adjust hardware as required before final acceptance.

3.5 HARDWARE SCHEDULE

- A. *Acceptable Products and Manufacturers*: Manufacturers and products are listed to establish the standard of quality, design, and function. Provide the hardware specified or a product of a specified manufacturer which meets or exceeds the specified standard.
- B. *Hardware Sets*: All operating trim to be Sparta lever, except as otherwise noted.
 - 1. H1: Storage Rooms Entry Doors:
 - a. Hinges: Hager BB1191
 - b. Lockset: Schlage ND70PD (ANSI F84)
 - c. Closer: LCN 4040 series
 - 2. H2: Bathroom Door:
 - a. Hinges: Hager BB1191
 - b. Locksets: Schlage ND40S (ANSI F76)
 - c. Closer: LCN 4040 series

3. H3: Closet Doors:
 - a. Hinges: Hager 1191
 - b. Lockset: Schlage ND80PD (ANSI F86)

4. H4: Double Closet Doors:
 - a. Hinges: Hager 1191(2 sets)
 - b. Locksets (active leaf): Schlage ND80PD (ANSI F86)
 - c. Locksets (inactive leaf): Schlage ND170
 - d. Flush bolts: Ives

5. H5: Existing Doors::
 - a. Deadbolt: Schlage B 664P

END OF SECTION

**SECTION 08.91.19
FIXED LOUVERS**

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 DESCRIPTION OF WORK
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install exterior louvers as shown on the Drawings and as specified.
 - B. The Work includes, but is not limited to:
 - 1. Exterior aluminum louvers.
- 1.3 RELATED WORK
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
 - B. Other Work which directly relate to the Work of this Section include, but are not limited to:
 - 1. Selective Demolition (Section 02.41.19).
 - 2. Unit Masonry (Section 04.20.00)
 - 3. HVAC (Section 23.00.00).
- 1.4 QUALITY ASSURANCE
- A. *Single Source:* Provide primary products from one manufacturer and secondary materials which are acceptable to the manufacturer of the primary materials.
 - B. *Standards:* Comply with the SMACNA Architectural Sheet Metal Manual for fabrication, details, and installation recommendations, unless more restrictive requirements are specified.
- 1.5 SUBMITTALS
- A. *Product Data:* Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified.
 - B. *Shop Drawings:* Submit large scale shop drawings showing elevations and details. Show anchorages, connections, and accessory items.
 - C. *Samples:* Submit 12" long samples of each material used, showing full range of color and finish variations expected.
- 1.6 DELIVERY, STORAGE, AND HANDLING: Deliver products in unopened factory labeled packages, including mounting hardware. Store and handle in strict compliance with manufacturer's instructions and recommendations.

2.0 PART 2: PRODUCTS

2.1 LOUVERS

- A. Provide louvers with the following characteristics.
1. Depth: 4".
 2. Blade Angle: 45 degrees.
 3. Blade Configuration: Baffled blade.
 4. Material: Minimum 0.064" 6063-T5 extruded aluminum frame and blades.
 5. Free Area: Minimum 50%.
 6. Frame Style: Flanged frame.
 7. Mullions: Concealed.
 8. Finish: Kynar 500 3-coat system meeting performance requirements of AAMA 2605. Color to be selected by the Architect.
- B. *Acceptable Manufacturers*: Provide products which meet or exceed the requirements of these specifications from one of the following manufacturers:
1. Airline Products Co.
 2. Airolite Co.
 3. Construction Specialties, Inc.
 4. Ruskin Manufacturing Co.
 5. Or equal.
- C. *Accessories*
1. Bird Screens: Provide ½" square mesh 0.063" aluminum wire screens with Brown & Sharp 12 gauge extruded aluminum frames and mounted on inside face of louvers. Fabricate screens to be easily removable and finish to match louver.
 2. Insect Screens: Provide 18X16 charcoal aluminum mesh mechanically fastened to nominal 5/16"X1"X0.045" extruded aluminum frame.
 3. Trim Pieces: Provide sills, extensions, and other trim pieces to ensure proper drainage to the exterior. Material and finish shall exactly match louvers.

2.2 MISCELLANEOUS MATERIALS

- A. *Fasteners*: Provide non-magnetic stainless steel fasteners, anchors, and inserts. Provide all supports, anchors, fasteners, and accessory items as required for complete installation. Conceal fasteners from view to the greatest extent possible.
- B. *Bituminous Paint*: Provide SSPC-Paint 12, cold applied mastic to coat all metal surfaces in contact with concrete, masonry, and dissimilar metals.
- C. *Sealants*: Provide sealants suitable for each application and condition to achieve a weathertight installation. The color of exposed sealants shall match the louvers.
- D. *Treated Wood Blocking*: Provide continuous preservative pressure treated wood blocking as required for proper installation of louver.

- 2.3 FABRICATION: Shop fabricate Work to the greatest extent possible. Fabricated Work shall be straight, plumb, level, and square. Joints shall be uniform, tight, and free from sharp edges. Use welded connections wherever possible.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.

3.2 INSTALLATION

- A. Install louvers truly plumb, level, square, and in alignment with adjacent work. Conceal fasteners and connections to the greatest extent possible.
- B. *Sealant:* Seal joints, connections, around entire perimeter, and at any other locations required to achieve a watertight assembly.
- C. *Isolation:* Protect metal from contact with masonry, concrete, and dissimilar metals by coating with bituminous paint.

3.3 CLEANING, TOUCH-UP, AND REPAIR

- A. *Touch-up:* Touch-up damaged coatings and finishes.
- B. *Repair:* Repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.
- C. *Cleaning:* Clean exposed surfaces using materials and methods recommended by manufacturers of material being cleaned.

**END OF SECTION
AND DIVISION 08**

DIVISION 09 - FINISHES

SECTION 09.20.00 GYPSUM BOARD

1.0 PART 1: GENERAL

1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install new gypsum board walls, ceilings, and soffits as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Gypsum board.
2. Veneer plaster.
3. Metal framing supports.
4. Patching existing plaster ceilings and walls.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the work of this Section include, but are not limited to:

1. Rough Carpentry (Section 06.10.00).
2. Painting (Section 09.90.00).
3. Modular Fire Vault (Section 13.27.16).

1.4 QUALITY ASSURANCE

A. *Reference Standards:* Comply with the applicable provisions of the following reference standards:

1. GA Fire Resistance Design Manual, 11th Edition.
2. UL Fire Resistance Directory.
3. UL Building Materials Directory.
4. GA 216, Recommended Specifications for Application and Finishing of Gypsum Board.
5. GA 505, Gypsum Board Terminology Standard.
6. Plastering Information Bureau, "Lath and Plastering".

B. *Single Source:* For each type of primary material specified, provide products from a single manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.

1.5 SUBMITTALS

A. *Product Data:* Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified.

- B. *Certificates*: Submit written certification that fire resistive construction conforms to UL and GA standards.

1.6 PROJECT CONDITIONS

- A. *Environment*: Perform Work only when existing and forecasted conditions conform with recommendations of product manufacturers and GA publications. Ambient interior temperature shall be between 55 and 70° F. Do not perform exterior plastering work in temperatures below 45°F and above 90°F.
- B. *Ventilation*: Provide adequate ventilation. Comply with manufacturers' and GA recommendations. Avoid rapid drying in hot weather.

- 1.7 DELIVERY, STORAGE, AND HANDLING: Deliver materials in unopened factory labeled packages. Store gypsum panels off the ground, in a dry, ventilated space. Provide adequate support under stored gypsum panels to prevent sagging.

2.0 PART 2: PRODUCTS

2.1 METAL FRAMING AND SUPPORTS

- A. *Acceptable Manufacturers*: Provide products which meet or exceed specified requirements by one of the following manufacturers:
 - 1. Allied Industries.
 - 2. National Gypsum Co.
 - 3. National Rolling Mills
 - 4. Marino Industries
 - 5. U.S. Gypsum Co.
 - 6. Or equal.
- B. *Coating*: All metal studs and framing supports shall be galvanized with not less than ASTM A525 G60 coating.
- C. *Studs and Runners*: Provide galvanized steel studs complying with ASTM A446, A527, and C645. Provide 20 gage studs, unless otherwise recommended by manufacturer for conditions, span, and recommended deflections. Provide "knock-out" provisions for piping and electrical installations.
- D. *Furring*: Provide 25 gage 7/8" hat shaped and resilient galvanized furring channels complying with ASTM C645.

2.2 GYPSUM BOARDS

- A. *Acceptable Manufacturers*: Provide products which meet or exceed specified requirements from one of the following manufacturers:
 - 1. Celotex Corp.
 - 2. Georgia-Pacific Corp.
 - 3. Gold Bond Building Products.
 - 4. National Gypsum Co.
 - 5. U.S. Gypsum Co.
 - 6. Or equal.
- B. *Gypsum Base for Veneer Plaster*: Provide regular gypsum base (blueboard) with tapered edges, complying with ASTM C585. Use 1/2" thick for ceiling and soffit applications and 5/8" thick for wall applications.

- C. *Regular Gypsum Board*: Provide regular gypsum board with tapered edges, complying with ASTM C36. Outside of the vault, use ½" thick for ceiling and soffit applications and ⅝" thick for wall applications.
 - D. *Water Resistant Gypsum Board*: Provide water resistant gypsum board conforming to ASTM C630, regular and Type X fire rated, for use in bathroom walls and ceilings. Use ½" thick for ceiling and soffit applications and ⅝" thick for wall applications.
- 2.3 VENEER PLASTER: Provide gypsum plaster with compressive strength of 1500 psi for hand or machine application in a thin monolithic single coat system.
- 2.4 ACCESSORIES
- A. *Metal Trims*: Provide galvanized metal trims, formed for full joint treatment coverage, sized to the thickness of the gypsum board. Trims shall include, but not be limited to, mesh type corner beads, casing beads, plaster grounds and screeds, and expansion joints.
 - B. *Joint Compound and Tape*
 - 1. Joint Compound: Provide ready mixed all purpose vinyl compound complying with ASTM C475.
 - 2. Joint Tape: Provide perforated, cross-fiber paper or fiberglass mesh reinforcing complying with ASTM C475.
 - C. *Fasteners*: Provide screws, complying with ASTM 646 and C514, for each of the following applications:
 - 1. Gypsum board to metal framing: U.S.G. Type S, bugle head.
 - 2. Gypsum board to wood framing and blocking: U.S.G. Type W, bugle head.
 - 3. Gypsum board to gypsum board: U.S.G. Type G, bugle head.
 - D. *Ceiling Anchors*: Provide fasteners which are capable of supporting a minimum of 150 pounds.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
 - B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.
 - C. *Coordination*: Special attention is called to finishing the interior of the modular vault. Apply gypsum wallboard in strict compliance with recommendations and instructions of modular vault manufacturer.
- 3.2 FRAMING: Erect framing in compliance with ASTM C754, recommendations of the gypsum board manufacturer, and the U.S. Gypsum "Gypsum Construction Handbook".

- A. *Walls*: Framing shall extend to the bottom of structure above, except as noted otherwise.
 - B. *Blocking*: Provide additional framing and blocking as required at openings, cut-outs, and built-in anchorages and attachments for other Work.
- 3.3 GYPSUM BOARD: Install gypsum board in strict compliance with ASTM C840 and Gypsum Association publication 216, "Recommended Specifications for the Application and Finishing of Gypsum Board".
- A. *Fasteners*: Space power driven screws a maximum of 12" o.c. to a uniform dimple 1/32" deep. Avoid damage to face paper. Install screws 3/8" from edges and ends of gypsum panels.
 - B. *Wall Openings*
 - 1. Cut both face and back paper of gypsum board.
 - 2. Maintain close tolerances at openings for electrical outlets, piping, and other penetrations.
 - 3. Provide additional reinforcement tape at corners of wall penetrations, including, but not limited to borrowed lites and access panels.
 - C. *Corners and Edges*
 - 1. Corners: Install corner bead trim at all external corners and joint reinforcing tape at all internal corners. Fasten corner beads with screws spaced a minimum of 9" o.c.
 - 2. Edges: Install metal edge trim at all exposed gypsum board edges and wherever gypsum board terminates against masonry, concrete, metal or other dissimilar material. Fasten edge trim with screws spaced a minimum of 9" o.c.
- 3.4 FINISHING GYPSUM BOARD
- A. *Joint Tape*: Apply joint reinforcing tape at all joints between gypsum panels, except where trim accessories are indicated.
 - B. *Joint Compound*
 - 1. Apply joint compound at all joints, flanges of trim accessories, penetrations, fastener heads, and surface defects.
 - 2. Apply joint compound in three coats, sanding before and after second and third coats.
 - 3. Extend joint finishing to floor to provide a smooth flat surface for the installation of wall base.
 - C. *Veneer Plaster*
 - 1. Extent: Cover all new exposed surfaces, walls, ceilings, and soffits with veneer plaster, except the inside of vault.
 - 2. Apply plaster in one coat to a uniform thickness of 1/16" to 3/32". Finish shall be smooth.
 - 3. Scribe joints between plaster and dissimilar materials.

3.5 PLASTER PATCHING

A. *Extent*

1. Patch existing exposed plaster walls and ceilings where penetrations and alterations have occurred.
2. Patch existing plaster walls and ceilings where previous damage are evident and visible.

B. *Preparation:* Sand down any protrusions in wall and ceiling surfaces. Remove switch plate covers, light fixture covers, and other devices mounted to the walls and ceilings. Apply plaster bonding agent and then plaster to all existing surfaces to be repaired. Re-install wall and ceiling mounted items after painting is complete.

C. *Plaster Patching*

1. Apply plaster in one coat to a uniform thickness to match existing finished surfaces. Finish shall be smooth.
2. Repair cracks and indented surfaces by moistening plaster and filling with new material, troweled or ramped flush with adjoining surfaces.
3. Point-up and finish surfaces around fixtures, outlet boxes, piping, fittings, and other Work flush with adjacent plaster.
4. Where new plaster adjoins existing plaster, cut existing plaster at an angle of approximately 45 degrees.

3.6 TOLERANCES: The allowable variation from true, plumb, level, and line is 1/8" in 20'-0".

END OF SECTION

**SECTION 09.30.13
CERAMIC TILING**

1.0 PART 1: GENERAL

- 1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.
- 1.2 **DESCRIPTION OF WORK**
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install new porcelain tile as shown on the Drawings and as specified.
- B. The Work of this Section includes, but is not limited to:
1. Porcelain tile floors and base.
- 1.3 **RELATED WORK**
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- 1.4 **QUALITY ASSURANCE**
- A. *Standards:* Comply with the following reference standards:
1. Tile Council of America, Handbook for Ceramic Tile Installation.
 2. ANSI 108 series, Standard Specifications for the Installation of Ceramic Tile.
 3. ANSI 118 series, Standard Specifications for Materials Used in Ceramic Tile.
 4. ANSI 137.1, Ceramic Tile.
- B. *Source:* For each type of primary material specified, provide products from a single manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.
- 1.5 **SUBMITTALS**
- A. *Product Data:* Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified.
- B. *Samples:* Submit samples for color selection.
- 1.6 **DELIVERY, HANDLING, AND STORAGE:** Deliver all products in manufacturer's unopened containers with grade seals unbroken and labels intact.
- 1.7 **ENVIRONMENTAL CONDITIONS:** Maintain temperature at a minimum of 50°F during tilework and for 7 days after completion.
- 1.8 **MAINTENANCE STOCK:** Supply extra 2% of each tile and color used in clean marked cartons.

2.0 PART 2: PRODUCTS

2.1 TILE

A. *Porcelain Tile*: Provide Standard Grade unglazed porcelain tiles with all-purpose edges conforming with ANSI A137.1 and the following requirements.

1. Tile Size: 12"X12".
2. Thickness: Tile shall be manufactured to specific thickness after firing, nominally 6.0mm or greater.
3. Color: Up to three colors may be selected.
4. Water Absorption: 0.09%.
5. Breaking Strength: 288 lbs.
6. Bond Strength: 217 psi.
7. Coefficient of Friction/Dry: Greater than 0.7.
8. Coefficient of Friction/Wet: Greater than 0.6
9. Acceptable Manufacturer for 12"X12": Crossville Color Box, Daltile Villa Vallets by Daltile, Crossville Palais, or equal.

B. *Trim Tile*: Provide size, color, and finish to match field tile.

1. Base: 4" high cove.

2.2 WATERPROOFING MEMBRANE

A. Provide liquid rubber and powder, job-mixed, cold-applied with reinforcing fabric, seamless, trowel applied waterproofing membrane with the following characteristics.

1. Service Life: Minimum 10 years.
2. Tensile Strength: 2000 lbs. per lin. ft.
3. Compressive Strength: 2000 psi.

B. *Acceptable Manufacturers*: Laticrete International, Boiard Products, American Olean.

2.3 MORTAR MATERIALS

A. *Portland Cement*: Provide cement complying with ASTM C-150 Type 1.

B. *Sand*: Provide sand complying with ASTM C-144.

C. *Water*: Potable.

D. *Lime*: Provide lime conforming with ASTM C-206 Type S or ASTM C-207 Type S.

E. *Reinforcing*: Provide 2"x2"x16/16 gauge welded wire mesh or equivalent.

F. *Latex Thinsset Admixture*: Provide compounded and stabilized latex for blending with neat portland cement or portland-sand mix complying with ANSI 108.5 and ANSI 118.4 the following characteristics:

1. Service Life: Minimum 10 years.
2. Compressive Strength: Minimum 5,000 psi.
3. Bond Strength: Minimum 600 psi in shear at 28 days.
4. Water Absorption: Maximum 3%.
5. Density: 83 lbs. per cu. ft.
6. Acceptable Manufacturers: Laticrete International, Boiard Products.

2.4 MORTAR

- A. *Cement Mortar:*
 - 1. Floors: Provide reinforced cement mortar composed of 1 part portland cement and 6 parts damp sand by volume.
 - 2. Walls: Provide mortar composed of 1 part portland cement, ½ to 1 part lime, and 5 to 7 parts by volume.
 - 3. Scratch Coat: Provide scratch coat for wall application composed of 1 part portland cement and 3 parts dry to 4 parts damp sand, by volume:
 - B. *Latex Portland Cement Mortar:* Provide latex modified portland cement mortar complying with ANSI 118.4 for thinset application.
 - C. *Dry-Set Mortar:* Provide mortar complying with ANSI A118.1.
- 2.5 GROUT: Provide latex modified portland cement grout conforming with ANSI 118.6, color as selected by Architect.
- A. *Waterproofing Admixture:* Provide mortar additive for factory prepared grout with the following characteristics:
 - 1. Service Life: Minimum 10 years.
 - 2. Compressive Strength: 3000 psi.
 - 3. Bond Strength: 500 psi.
 - 4. Acceptable Manufacturers: Laticrete International, Boiardi Products, or equal.

2.6 ACCESSORY MATERIALS

- A. *Sealant:* Provide one part mildew resistant sanitary silicone sealant, Type S, Grade NS, Class 25 formulated with fungicide.
- B. Provide 4 mil polyethylene sheet.
- C. *Metal Lath:* Provide galvanized expanded metal lath.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.

3.2 LAYOUT

- A. *Floors:* Lay out flooring from centerlines with floor patterns accurately aligned in all directions.

- B. *Joints*: Align all wall joints to give straight uniform grout lines, plumb and level. Make joints between tile sheets same width as joints within sheets.
- C. *Cutting Tile*: Lay out so as to minimize cuts less than one half tile in size. Locate tile cuts so as to be least conspicuous. Clean and smooth all cut tile edges before installing.
- D. *Fitting Tile*: Fit tile carefully against trim, door frames, existing adjacent flooring and other built-in items so that joints are uniform in appearance and width. Fit tile carefully against trim, pipes, bath accessories, and other built-in items so that escutcheons, plates and collars will completely overlap cut edges.

3.3 SETTING

- A. *Floors*: Set tile in accordance with ANSI A108.5 and TCA Method F144, Dry-set Mortar or Latex Portland Cement Mortar.

1.2 GROUTING: Apply grout to new ceramic tile walls and floors in strict compliance with manufacturer's recommendations and ANSI A108.10.

1.3 SEALANTS: Apply sanitary silicone sealant at all joints between dissimilar materials in accordance to manufacturer's recommendations.

1.4 CLEANING AND PROTECTION

- A. *Cleaning*: Remove all grout haze, using methods recommended by grout manufacturer. Rinse tile thoroughly and polish surface with soft cloth.
- B. *Protection*: Protect from damage. Prohibit all traffic from newly tiled floors for 7 days.

END OF SECTION

SECTION 09.51.23
ACOUSTICAL TILE CEILINGS

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install new suspended acoustical ceiling tiles as shown on the Drawings and as specified.

B. The Work includes, but is not limited to:

1. Lay-in acoustical tile ceilings.
2. Removing, cutting and reinstalling existing lay-in acoustical tile ceilings for sprinkler head installation.
3. Coordinating lay-out of related Work and Work located in ceilings.

C. *Alternates*: Alternate #1 affects the Work of this Section. Closely examine the Contract Documents to determine the full extent that alternates affect the Work of this Section.

1. Alternate #1: Provide and install 2x4 lay-in acoustical ceiling tiles in existing grid in one room.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the work of this Section include, but are not limited to:

1. Gypsum Board (Section 09.20.00).
2. Fire Suppression (Section 21.00.00)
3. HVAC (Section 23.00.00).
4. Electrical (Section 26.00.00).

1.4 QUALITY ASSURANCE: For each type of primary material required for the Work of this Section, provide first quality products from one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary products.

1.5 SUBMITTALS

A. *Product Data*: Submit manufacturer's product data, including installation instructions, use limitations and recommendations for each material used.

B. *Samples*: Submit minimum 3"X3" samples of each type of acoustical tile, showing full range of colors, textures, and finishes available. Submit 12" long samples of edge trims.

1.6 WARRANTY: All workmanship and materials shall be guaranteed for a period of one year from the date of final acceptance.

- 1.7 DELIVERY, STORAGE, AND HANDLING: All materials and products shall be delivered in unopened, factory labeled packages and stored and handled in conformity with manufacturer's recommendations. Store all materials off the ground and away from all damp surface until ready for use.
- 1.8 MAINTENANCE STOCK: Provide packaged, wrapped, and labeled maintenance stock equal to 2% of the actual quantity of each type of ceiling tile installed.
- 1.9 PROJECT CONDITIONS
- A. Perform work only when conditions are within the limits established by manufacturers of the materials and products used.
 - B. Temperatures shall be within the expected occupancy range of 60 to 85 degrees F. Relative humidity shall be no more than 70%.
 - C. All plastering, concreting, and any other wet Work shall be complete and dry.

2.0 PART 2: PRODUCTS

2.1 ACOUSTICAL CEILING TILES

- A. Base bid: Provide 24"X24"X $\frac{5}{8}$ " tegular non-directional Minatone Cortega acoustical ceiling tiles as manufactured by Armstrong World Industries, Inc. or equal.
- B. Alternate #1: Provide 24"X48"X $\frac{5}{8}$ " lay in non-directional Minatone Cortega acoustical ceiling tiles as manufactured by Armstrong World Industries, Inc. or equal.
- C. *Standards:* Acoustical tiles shall meet the following standards and performance:
 - 1. *Flame Spread*
 - a. Federal Specification SS-S-118B: Class A.
 - b. ASTM E84: 0-25.
 - c. UL Label: 25 or under.
 - 2. *Light Reflectance:* LR-1 light reflectance (75% or over).
 - 3. *Acoustical Performance*
 - a. STC Range: 35-39.
 - b. ASTM C 423: Noise Reduction Coefficient in the 0.50-0.60 range.

2.2 SUSPENSION SYSTEM

- A. Provide direct hung T framing of electrogalvanized steel, finished with low-sheen satin white enamel.
- B. *Standards:* Provide framing which meets ASTM C 635, intermediate duty class.

2.3 ACCESSORIES

- A. Accessories include, but are not limited to hanger wires, attachment devices, and moldings and trim.
- B. *Hangers:* Support suspension system by 12 gage hanger wires.

- C. *Moldings and Trim*: Provide edge moldings and trim to exactly match runners of suspension system.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.

3.2 LAY-OUT

- A. Lay out from centerlines of spaces in both directions. In the case of intersecting corridors, start from the center of the intersection. Lay out as shown on Drawings.
- B. Lay out ceilings in a manner which avoids use of tiles less than 12" in width.

3.3 SUSPENSION SYSTEM: Install ceiling suspension system in strict compliance with ASTM C636. Hanger wires shall be attached to structure above ceiling.

3.4 CEILING TILES: Scribe and cut tiles to fit accurately. Use clean gloves when handling ceiling tiles.

3.5 EDGE MOLDINGS AND TRIM

- A. Provide edge moldings at entire perimeter and provide trim wherever necessary to conceal edges of acoustical tile.
- B. Miter corners accurately with hairline tight joints and connect securely with non-exposed fasteners.
- C. Provide a continuous tooled bead of exposed acoustical sealant between edge moldings and irregular walls to effectively close gaps.

3.6 TOLERANCES: Finished installation shall be level to within 1/8" in 12'-0".

3.7 REPAIR AND CLEANING

- A. *Repair*: Repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.
- B. *Cleaning*: Clean according to methods recommended by manufacturers. Remove and replace Work which cannot be satisfactorily cleaned.

END OF SECTION

SECTION 09.65.00
RESILIENT FLOORING
(Filed Sub-Bid Required)

1.0 PART 1: GENERAL

- 1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.
- 1.2 **FILED SUB-BIDS:** Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of MGL c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the Advertisement. The procedures and requirements for submitting sub-bids are set forth in the Instructions to Bidders.
- 1.3 **DESCRIPTION OF WORK**
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install resilient flooring and base as shown on the Drawings and as specified.
- B. The Work includes, but is not limited to:
1. Vinyl composition tile.
 2. Rubber floor tiles for stair landings.
 3. Resilient wall base.
 4. Rubber treads and risers for stairways.
 5. Reducer strips and trim.
- 1.4 **RELATED WORK**
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- B. Other Work which directly relate to the Work of this Section include, but are not limited to:
1. Cast-in-Place Concrete (Section 03.30.00).
 2. Modular Fire Vault (Section 13.27.16).
- 1.5 **QUALITY ASSURANCE**
- A. For each type of primary material required for the work of this Section, provide first quality products from one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary products.
- B. *Dye Lots:* Use materials from the same manufactured lots to maintain uniformity of color and pattern.
- 1.6 **SUBMITTALS**
- A. *Product Data:* Submit manufacturer's product data, including product analysis, application instructions and recommended uses for each material used.
- B. *Samples:* Submit samples of all materials used, including 12"X12" resilient tile, base, and trims, to the Architect for review.
- 1.7 **WARRANTIES:** Vinyl composition floor tile shall have a limited five year warranty.

- 1.8 DELIVERY, STORAGE, AND HANDLING: All materials and products shall be delivered in unopened, factory labeled packages and stored and handled in conformity with manufacturer's recommendations. Store all materials off the ground and away from all damp surfaces until ready for use.
- 1.9 MAINTENANCE STOCK: Provide packaged, wrapped, and labeled maintenance stock equal to 2% of the actual quantity of each type and color of flooring, trim, and base installed.
- 1.10 PROJECT CONDITIONS
- A. *Environmental Conditions:* Perform work when temperature and humidity are within range established by products' manufacturers. All rooms, subfloors, tiles, and adhesives shall be maintained at minimum temperature of 70° F for at least 48 hours before commencing Work.
- B. *Sequencing:* To the greatest extent possible, proceed with Work in this Section after finishing operations, such as painting, have been completed.
- C. *Existing Conditions:* Some preparation work of existing substrates is expected. No additional costs will be incurred for any preparation work required to complete finish flooring work as Specified.

2.0 PART 2: PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS: Provide products from the manufacturers indicated or equal. When products from other manufacturers are provided, those products must meet or exceed the requirements specified.
- 2.2 VINYL COMPOSITION FLOOR TILE
- A. Provide 12"X12"X1/8" thick vinyl composition thru-chip floor tile (VCT) conforming to the following standards:
1. ASTM F 1066-87.
 2. Federal Spec. SS-T-312B, Type IV, Composition 1.
 3. NFPA (ASTM E-84), Class A.
 4. NFPA 255 or 258 (smoke density), less than 450.
- B. *Acceptable Products:*
1. Armstrong Excelon Stonetex
 2. Mohawk Selections
 3. Tarkett Thru-Quartz
- C. *Colors:* Up to three different colors will be selected from the full range of the manufacturer, including premium designer, deeptone, or bright colors.
- 2.3 RUBBER FLOOR TILE
- A. Provide rubber flooring formulated with 100% virgin elastomers, reinforcing agents, soil-releasing agents, and migrating waxes.
1. Base Thickness: 0.125".
 2. Tile Size: 18"x18" nominally.
 3. Pattern: Hammered.
 4. Acceptable Manufacturers: Endura, Johnsonite, or Estrie Marathon Classic.

5. Color: Color to be chosen by Architect from Manufacturer's full range of colors.

B. *Use*: Stair landings.

2.4 STAIR TREADS, RISERS, AND STRINGERS

A. *Rubber*: Provide one-piece tread and riser composed of first quality resilient rubber compound, with hammered pattern design. Provide stringers to match. Thickness shall be ¼". Treads shall conform to US Federal Specifications RR-T650C, Composition A, Type 1, 2, and 4. All materials shall be free from objectionable odors, blisters, cracks, and other imperfections which will detract from the serviceability and appearance.

B. *Color*: Color selections shall match exactly color selections for rubber floor tiles.

2.5 RESILIENT WALL BASE: Provide rubber base for rubber flooring and vinyl base for vinyl tile and carpeting.

A. *Size*: Provide 4"X½" thick base.

B. *Style*: Provide cove style for resilient floors and straight style for carpeting.

C. *Colors and Finish*: Provide matt finish in colors as selected by the Architect from the manufacturer's standard range of colors.

2.6 EDGE REDUCER STRIPS: Provide 1 5/16" wide rubber, tapered profile reducer strips. Butting gauge shall be equal to adjacent flooring materials.

2.7 ACCESSORIES: Provide all accessory materials, including, but are not limited to, latex leveling compound, concrete primers, and waterproof adhesives, required to complete a smooth, continuous installation. Only factory approved adhesives shall be used.

3.0 PART 3: EXECUTION

3.1 GENERAL

A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.

B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous Work, and existing conditions.

C. *Coordination*: In the case that the Owner opts to engage a separate contractor to provide a high density mobile storage shelving system, the shelving contractor shall be responsible for providing a raised wood flooring system above the concrete slab, including sleepers, subflooring, and underlayment. Fully coordinate finish flooring installation with shelving contractor. Ensure the substrate is satisfactory to the proper execution of the Work of this Section. Beginning Work means that the Installer accepts substrates and work of the shelving contractor.

3.2 PREPARATION

A. *Substrate Condition*: Substrates shall be dry, free of paint and oil and sufficiently clean before Work begins. Except as specifically required otherwise by flooring manufacturer, concrete subfloors shall have hydrometer readings of between 35% and 65%. Reduce

moisture content as needed to meet necessary requirements. Make bond and moisture tests as recommended by flooring manufacturer.

- B. *Leveling*: Inspect all surfaces to receive flooring and base. Fill low areas with latex leveling compound to achieve a true, even surface for tiles or base. Scrape, grind, or sand down ridges and protruding irregularities to create a level, even substrate.
 - 1. Existing conditions: Note that existing basement corridor floor slab may be significantly uneven. Additional leveling required to achieve a suitable substrate for new flooring shall not incur any additional costs.
- C. *Cleaning*: Thoroughly clean and vacuum substrates immediately before installation of materials.
- D. *Primers*: Apply primer prior to the application of adhesive if recommended by the manufacturer for porous or powdery substrates.

3.3 FLOOR TILES

- A. *Extent*: Extend flooring into closets, toe spaces, and similar areas. Provide flooring on removable covers, fixed plates, and other items within floor areas.
- B. *Cutting and Fitting*
 - 1. *Joints*: All joints shall be truly aligned, tight and as inconspicuous as possible. Cut and fit tile close enough to walls that joint will be covered by base, where installed. At other surfaces, scribe and accurately fit tile as required.
 - 2. *At Doors*: Terminate flooring at the centerline of doors when adjacent finish or color is dissimilar to avoid seeing dissimilar material or color when door is closed.
- C. *Edges and Trim*: Provide securely bonded edge strips and trim where necessary for a complete and finished installation. Edge of flooring shall not be exposed.
- D. *Layout and Patterns*
 - 1. Lay out flooring from centerlines with floor patterns accurately aligned in all directions. A drawing showing a pattern with up to 3 colors will be provided.
 - 2. Lay out tiles so that, as far as practicable, no piece of tile shall be less than 6" wide.
- E. *Bonding*: Adhere with full coverage of adhesive, following the manufacturer's recommended trowel notching spreading rates and open times. Roll floor with 150 pound roller in both directions to ensure good contact and bond.

- 3.4 STAIR TREADS & RISERS: Provide a single length of tread/riser for width of stair. Securely adhere with full coverage of adhesive, following the manufacturer's recommended trowel notching spread rates and open times. Roll horizontal surfaces with 150 pound roller and vertical surfaces with hand rollers.

3.5 RESILIENT BASE

- A. *Extent*: Adhere base to walls, columns, kitchen base cabinets, casework and all other permanent fixtures and surfaces. Provide base behind movable items.

- B. *Corners:* Outside corners shall be preformed or field formed. At inside corners, cut and cope base.
- C. *Sealing:* Where base runs along an irregular wall surface, fill top edge with sealant to close all gaps and voids. Provide sealant color to closely match base color as approved by the Architect.
- D. *Bonding:* Tightly bond base with no gaps and with 100% coverage of adhesive. Hand roll base to ensure full contact and adhesion.

3.6 REPAIR, CLEANING, AND PROTECTION

- A. *Repair:* Repair minor damages so that there is no evidence of the repair.
- B. *Cleaning:* Clean surfaces and remove excess adhesive at once. Replace Work that cannot be adequately cleaned or repaired. Polish floor and base to a smooth and even finish.
- C. *Protection:* Prohibit traffic over newly installed flooring for at least 48 hours. Protect the flooring until acceptance of the Work. Re-clean and polish as necessary immediately before final acceptance.

END OF SECTION

**SECTION 09.68.16
SHEET CARPETING**

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 DESCRIPTION OF WORK
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install carpeting as shown on the Drawings and as specified.
- B. The Work includes, but is not limited to:
1. Glued-down carpet.
 2. Resilient edge strips.
 3. Stretching and patching existing carpeting.
- C. *Alternates*: Alternate #1 affects the Work of this Section. Closely examine the Contract Documents to determine the full extent that alternates affect the Work of this Section.
1. Alternate #1: Install new carpeting in one room.
- 1.3 RELATED WORK
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- 1.4 QUALITY ASSURANCE
- A. *Single Source*: For each type of primary material required for the Work of this Section, provide first quality products from one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary products.
- B. *Dye Lots*: Provide all material, including maintenance stock, from one dye lot for each color required.
- 1.5 TESTS AND PERFORMANCE
- A. *Flame Spread*: Provide carpet which complies with applicable state and local codes regarding flame spread, as tested by ASTM E-84.
- B. *Floor Radiant Panel Test*: Provide Class I carpet, in accordance with ASTM E-648.
- C. *Smoke Density Test*: Provide carpet which does not exceed 450 when tested according to ASTM E-662.
- D. *Pill Test*: Provide carpet which passes the Methanamine Pill Test.
- E. *Static*: Provide carpet with static requirements not exceeding 3.5 KV.

1.6 SUBMITTALS

- A. *Product Data:* Submit manufacturer's product data, including product analysis, application instructions, and recommended uses for each material used.
- B. *Verification Samples:* Provide samples showing range of color and finish variations expected, having minimum size of 18"X18" and 6" long samples of edge strips.

1.7 WARRANTIES

- A. *Material Warranty:* A written warranty shall be signed by the Installer and the manufacturer agreeing that damaged or defective carpet will be removed and replaced.
 - 1. The carpet shall be guaranteed not to shrink; show excessive wear, defined as the wearing away of face yarns to reduce pile height by more than ten percent in any area; separate at seams; and pull out of nap.
 - 2. The carpet shall be guaranteed against edge ravel and delamination.
- B. *Installation Warranty*
 - 1. The Installer shall agree in writing to repair or replace all carpet which is not wrinkle-free, has open seams, is stained, or has other installation defects.
 - 2. The warranty period shall last 1 year beginning from the date of Substantial Completion of the Project.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Products and materials shall be delivered and stored in unopened factory packages with mill register number attached. Tag and mark accessory items for identification. Provide protection from loss or damage.
- B. Verify availability of color and style of carpet selected. Schedule deliveries to minimize delay.

1.9 MAINTENANCE STOCK: Provide packaged, wrapped, and labeled maintenance stock equal to 2% of the actual quantity of each type and color of carpet installed. In addition, provide wrapped and labeled usable remnants and scrap pieces.

1.10 PROJECT CONDITIONS

- A. *Environmental Conditions:* Ensure that ambient temperatures are maintained above 65° F and relative humidity is maintained at between 35% and 65% for 72 hours before carpet is installed, during installation and for a minimum of 72 hours after installation is complete.
- B. *Sequencing:* To the greatest extent possible, proceed with Work in this Section after finishing operations, such as painting, have been completed.
- C. *Existing Conditions:* Existing asbestos-containing vinyl tile will be left in place. Take care in preventing damage during installation of carpeting (Alternate #1).

2.0 PART 2: PRODUCTS

2.1 CARPET: Provide commercial grade carpeting with the following characteristics.

1. Construction: Multi-level patterned loop.
2. Fiber: 100% Nylon with built-in static guard.
3. Gauge: 1/10.
4. Pile Weight: 22 oz./sq. yd.
5. Pile Thickness: 0.116 in.
6. Stitches: 10 stitches per inch.
7. Dye Method: 72% solution dyed, 28% yarn dyed.
8. Density: 6,828 oz./cu. yd.
9. Secondary Backing: High tuft bind synthetic.
10. Protective Treatment: Soil and stain protection.
11. Pattern Repeat: 24"x25"
12. Colors: Colors shall be resistant to fading from ultraviolet light. Colors will be selected from manufacturer's standard range of colors
13. Width: 12'-0".
14. Warranty: 10 year wear, 10 year edge ravel, and 10 year delamination.
15. Acceptable Product: Expressions by Richmond Carpet Company.

2.2 ACCESSORY MATERIALS

- A. Accessory materials include, but are not limited to, adhesives, latex leveling compound, and transition strips.
- B. Adhesive: Provide the highest quality, water resistant, non-staining, non-bleeding strippable type as recommended by the carpet manufacturer, which meets flammability requirements for the installed carpet.
- C. Seaming Adhesive: Provide hot-melt seaming adhesive recommended by the carpet manufacturer for taping seams and sealing cut ends.
- D. *Carpet Edging*: Where carpet terminates at other types of floor finishes, use carpet transition reducer, as required, of thickness to match carpet. Provide profile and color selected and approved by the Architect.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.

3.2 PREPARATION

- A. *Substrate Condition*: Verify suitability of substrate to accept carpeting. Check moisture content to be sure it is within limits recommended by the manufacturer. Provide correction measures as needed to reduce moisture when readings exceed 65%. Before beginning Work, acclimatize carpet in installation area for at least 24 hours.
- B. *Leveling*: Fill and level cracks and holes with non-crumbling latex base floor filler.

- C. *Cleaning*: Thoroughly clean and make free of foreign matter. Vacuum immediately before installation of carpet.

3.3 INSTALLATION

- A. *Layout*: Install carpet with a minimum of cross seams or visible side seams. Lay so that pile of adjacent pieces have the same direction. Install in longest practicable lengths and do not piece carpeting.
- B. *Bonding*: Apply adhesive uniformly for 100% coverage and roll whole area slowly and completely in both directions using a 150 pound roller to remove air pockets. Roll whole area a second time to ensure elimination of air pockets.
- C. *Seams*: Provide securely glued seams. Bind all seams with seam cement.

3.4 REPAIR, CLEANING, AND PROTECTION

- A. *Repair*: Repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.
- B. *Cleaning*: Remove any spillage of glue or adhesive from carpet face or seam immediately, using remover recommended by manufacturer. After installation is complete, clean up all dirt and debris. Clean carpet of all spots, using materials and methods recommended by manufacturer. Remove all loose threads with sharp scissors. Vacuum thoroughly, using commercial machine with face beater element.
- C. *Protection*: Provide temporary protections to ensure Work is without damage or deterioration at time of final acceptance. Remove protections and re-clean as necessary immediately before final acceptance.

- 3.5 **ADJUSTMENT**: Return to Project when requested during warranty period for carpet, repair seams and trim and adjust edges to maintain an attractive, freshly-installed appearance.

END OF SECTION

SECTION 09.90.00
PAINTING
(Filed Sub-Bid Required)

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 FILED SUB-BIDS: Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of MGL c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the Advertisement. The procedures and requirements for submitting sub-bids are set forth in the Instructions to Bidders.

1.3 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to complete painting as shown on the Drawings and as specified.

B. The Work includes, but is not limited to:

1. Surface preparation and protection.
2. Priming and painting of all previously painted interior surfaces within the Work area.
3. Priming and painting of all previously painted interior surfaces outside the Work area, that are patched, repaired, or modified.
4. Priming and painting of all new interior surfaces, except those specifically excluded.
5. Stripping paint from masonry surfaces.
6. Refinishing existing board wainscoting.

C. *Excluded Work:* The Work does not include painting of:

1. Concealed surfaces.
2. Surfaces which retain a factory finish.

D. *Alternates:* Alternate #1 affects the Work of this Section. Closely examine the Contract Documents to determine the full extent that alternates affect the Work of this Section.

1. Alternate #1: Paint cmu walls and metal door frames in one additional room. Paint plaster walls and ceiling in one additional room.
2. Alternate #2: Paint all exposed sprinkler piping as shown on the drawings.

1.4 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the Work of this Section include, but are not limited to:

1. Joint Sealants (Section 07.92.00).
2. Hollow Metal Doors and Frames (Section 08.11.13).
3. Wood Doors (Section 08.14.00).
4. Gypsum Board (Section 09.20.00).
5. Modular Fire Vault (Section 13.27.16).
6. Fire Suppression (Section 21.00.00)

- 1.5 **QUALITY ASSURANCE:** For each type of primary material required for the Work of this Section, provide first quality products from one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary products.
- 1.6 **TESTS:** The Owner reserves the right to test any materials and Work by an independent testing agency to verify conformity to Contract Documents. The cost of failed tests shall be borne by the Contractor and corrective work shall be performed at no additional cost to the Owner.
- 1.7 **A. SUBMITTALS**
- B. *Product Data:* Submit manufacturer's product data, including product analysis, application instructions, and recommend uses for each material used.
- C. *Verification Samples:* Before painting in-place samples, submit samples, with a minimal size of 144 square inches, for each type of finish and color selected by the Architect. Samples shall show the full range of color and finish variations expected.
- D. *In-place Samples:* Before beginning Work, provide in-place samples, with a minimal size of 100 square feet, for each type of substrate to be painted or stained.
- E. *Warranty:* All workmanship and materials shall be guaranteed for a period of one year.
- 1.8 **DELIVERY, STORAGE, AND HANDLING**
- A. Products and materials shall be delivered and stored in their unopened factory containers with labels intact. Store and handle in accordance with manufacturer's directions to prevent damage.
- B. Maintain and leave storage and work areas free from fire hazards related to improperly stored rags, solvents, or thinners.
- 1.9 **MAINTENANCE STOCK:** Provide one gallon of each color and type of finish coating used, in labeled unopened factory containers.
- 1.10 **PROJECT CONDITIONS**
- A. *Interior Conditions:* Ensure a minimum interior temperature of 65° F is maintained throughout application and drying time. Paint shall not be applied at temperatures above 90° F. Adequate ventilation, in accordance with manufacturer's recommendations, shall be maintained at all times.
- B. *Exterior Conditions:* No exterior painting shall be undertaken if air or surface temperature is below 50°F, nor immediately following rain or until frost, dew, or condensation has evaporated. Surfaces shall always be tested with moisture meter before proceeding.
- C. *Humidity:* Paint shall not be applied at humidities above 85% RH.

2.0 PART 2: PRODUCTS

2.1 COATINGS

- A. *Acceptable Manufacturers:* Manufacturer's product numbers are included to facilitate product identification. In cases where a discrepancy exists between the name and number of the product, the name takes precedence. Paint products specified are manufactured by Benjamin Moore and Co. except as otherwise noted. Other acceptable paint manufacturers are Sherwin Williams, Pratt and Lambert, and Pittsburgh Paints.

Products of these alternate acceptable manufacturers shall meet or exceed all requirements specified.

- B. *Accessory Materials:* Provide accessory and secondary products in accordance with recommendations by the paint manufacturer and compatible with paint systems specified.
- C. *Colors:* Colors as selected by the Architect, shall be strictly adhered to. Colors shall be selected from Benjamin Moore's Custom Color System. Paint provided by alternate manufacturers must be mixed to exactly match selected colors. The number of interior and exterior colors selected shall not be limited.

2.2 PRIMERS

- A. *Colors:* All primers and undercoats shall be tinted to the approximate shade of the selected finish coat. Provide appropriate Deep Color Base Primers as manufactured by Benjamin Moore, or equal, under deeptone or vivid colors and to cover existing deeptone or vivid colors.
- B. *Stain-sealing Primer:* Provide solvent-thinned stain-sealing primer for sealing water stains and other surface defacements. Provide one of the following products:
 - 1. Benjamin Moore's Speedy Primer Sealer (340).
 - 2. Benjamin Moore's QD 30 (202).
 - 3. Or equal.

- 2.3 ACCESSORY MATERIALS: Accessory materials include, but are not limited to, paint strippers, solvents, cleaners, caulking, putty, and fillers.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.

3.2 PROTECTION

- A. Remove finish hardware, fixtures, switch plate covers, and similar items before painting, store carefully, and replace after painting is complete.
- B. Protect pre-finished items and in-place construction not to be painted with masking tape, canvas drop cloths, polyethylene sheets, or other suitable means as approved by the Architect.
- C. Provide temporary signs to protect newly painted surfaces.

3.3 SURFACE PREPARATION

- A. *General*
 - 1. Thoroughly clean all substances from substrates which may interfere with proper paint adhesion.

2. Fill all dents, cracks, open joints, and other irregularities with suitable filler material and sand smooth.
3. Vacuum all surfaces to remove dust and dirt to prevent raising of dust during the painting process.
4. Prime surfaces within 8 hours after cleaning to prevent contamination of clean substrates.

B. *New Interior Surfaces*

1. Gypsum Board: Repair minor surface defects with joint compound and sand smooth. All surfaces must be free of dust, dry, and clean. Allow adequate time for plaster to cure.
2. Wood to Receive Painted Finish: All surfaces shall be dry and sanded smooth, free of loose dirt, dust, and oil. Putty all nail holes, cracks, and blemishes and seal knots. Backprime all woodwork before installation.
3. Wood Surface to Receive Transparent Finish: All surfaces shall be dry and sanded smooth, free of loose dirt, dust, or grit. Fill joints, cracks, nail holes with paste wood filler, color to match wood, and allowed to dry for 24 hours.
4. Ferrous Metals: Wash all metal surfaces with solvent to remove dirt, grease, and oil. Where shop primer coat is damaged, sand to remove rust and spot prime with rust inhibitive primer.
5. Galvanized Steel: Aggressively clean with solvents to remove grease and oils in accordance with Steel Structures Painting Council Bulletin SSPC-SP1. Remove insoluble contaminants by Brush-off Blast Cleaning (SSPC-SP7).
6. Unprimed Steel: Prepare work for priming in accordance with Steel Structures Painting Council SP-6, Commercial Blast Cleaning.

C. *Existing and Previously Painted Surfaces*

1. Cleaning: Clean all surfaces to remove dirt, oil, grease, wax, mildew, rust, water soluble materials, and other contaminating substances. All surfaces shall be washed with a mild detergent solution and clean water rinse and dry before painting.
2. Scraping: Scrape off all loose, peeling, or scaling existing paint; sand thoroughly to feather edges smooth with adjacent surfaces; and spot prime.
3. Glossy surfaces: Dull glossy surfaces by sanding to ensure proper paint adhesion. Do not use liquid deglossers.
4. Concrete: Surfaces shall be firm and free of dirt, oil, grease, and efflorescence. Prepare surfaces by wire brushing, high pressure detergent washing or blast cleaning.
5. Repair and Patching: Repair holes, cracks, and blemished areas with appropriate patching compound; sand flush with adjacent surfaces; and then spot prime.
6. Stains and Marks: Wash all surfaces that have been defaced with marking pens, crayons, or lipsticks with solvents and then sealed to control residual bleeding. Seal water stains.

- D. *Existing and Previously Stained Surfaces:* Eliminate existing finish on existing wood surfaces, including molding, doors, door trims, wainscoting, stair railing components, and chair rail, through sanding or stripping.

3.4 APPLICATION

- A. *Mixing:* Thoroughly mix coatings by hand or mechanical means before using. Let mechanically agitated latex container stand for an hour or until the air bubbles are no longer visible, whichever is longer. Stir coatings before and occasionally during use. Intermix contents of multiple containers of each color to avoid color differences. Thinning must be approved by the Architect and in accordance with the manufacturer's directions.
- B. *Workmanship:* All materials shall be applied free from runs, sags, wrinkles, streaks, shiners, and brush marks. Apply all materials uniformly. Maintain clean, sharp edges at boundaries between different colors and materials.
- C. *First Coats:* Apply first coat shortly after surface preparation to prevent contamination of the substrate.
- D. *Finishes:* Final finishes shall be uniform and match approved verification and in-place samples. Finish top and bottoms of doors in the same manner as door facings. Do not cover Underwriters Label on doors and frames.
- E. *Unpainted Surfaces:* Previously unpainted surfaces shall receive a minimum of 1 prime coat and 2 finish coats. Apply additional finish coats as required to achieve proper coverage.
 - 1. Unprimed Steel: Provide two coats for total of 2 mil dry film thickness of rust inhibitive primer.
- F. *Factory Primed Surfaces:* Factory primed surfaces shall be spot primed as required and receive a minimum of 2 finish coats. In the case of existing deep colors, primers shall be applied completely over entire surface. Apply additional finish coats as required to achieve proper coverage.
- G. *Previously Painted Surfaces:* Previously painted surfaces shall be spot primed as required and receive a minimum of 2 finish coats. In the case of existing deep colors, primers shall be applied completely over entire surface. Apply additional finish coats as required to achieve proper coverage.
- H. *Transparent Wood Finish:* Stir thoroughly and apply as received in the factory sealed container with a good quality synthetic or bristle brush, a short nap roller, or an application pad. Allow first coat to dry overnight and then sand lightly, rubbing with the wood grain, before applying second coat. Apply additional coats as needed to achieve a uniform finish between all wood surfaces.

3.5 ADJUSTING AND CLEANING

- A. *Restoration:* Re-install and re-position items previously removed and stored for safety and protection.
- B. *Touch up:* Touch up damaged coatings without showing evidence of repair.
- C. *Cleaning:* Clean finished surfaces and remove all splatters from adjacent work.

- D. Remove all drop cloths and maskings, equipment and materials, and debris. Re-clean and touch-up as necessary immediately before final acceptance.

3.6 SCHEDULE OF COATING MATERIALS

A. *Interior Gypsum Board, Plaster and Masonry (outside of Vault)*

- 1. Eggshell Latex System:
 - a. Primer: Latex Quick Dry Prime Seal (201).
 - b. Finish: Regal AquaVelvet (319).
 - c. Use: Walls.
- 2. Flat Latex System:
 - a. Primer: Latex Quick Dry Prime Seal (201).
 - b. Finish: Regal Wall Satin (215).
 - c. Use: Ceilings and soffits.

B. *Interior Gypsum Board inside Vault*

- 1. Satin Epoxy System:
 - a. Primer: Tnemec Series 54-660
 - b. Finish: Tnemec Series 161 Tneme-Fascure..

C. *Interior painted masonry to be stripped*

- 1. Masonry paint removal gel or paste:
 - a. Paste type: Peel Away 1 from Dumond Chemicals
 - b. Gel type: Soy Gel Paint and Urethane Remover from Franmark Chemicals

D. *Transparent Finished Stained Wood*

- 1. Low-Lustre Polyurethane System:
 - a. Primer: Moore's Interior Wood Finishes Penetrating Stain (241)
 - b. Finish: Benwood Polyurethane Finish (435)

E. *Interior Ferrous Metals*

- 1. High Gloss Acrylic Latex System:
 - a. Primer: IronClad Retard-X Rust Inhibitive Latex Primer (162).
 - b. Finish: Impervex Enamel (309).

F. *Galvanized Metals and Exposed Steel Structure*

- 1. Semi-Gloss Epoxy/Polyurethane System:
 - a. Primer: Tnemec Series 161 Tneme-Fascure.
 - b. Finish: Tnemec Series 73 Endura-Shield.

G. *Interior Concrete Floors*

- 1. Lithium Silicate System:
 - a. Primer and Finish: Prosoco LS Guard Floor Hardener and Sealer (40073).

**END OF SECTION
AND DIVISION 09**

DIVISION 10 - SPECIALTIES

SECTION 10.10.00 INFORMATION SPECIALTIES

1.0 PART 1: GENERAL

- 1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 **DESCRIPTION OF WORK**
 - A. The Work of this Section includes all labor, materials, tools, and equipment needed to complete signs as shown on the Drawings and as specified.
 - B. The Work includes, but is not limited to:
 - 1. Room identification signs.
- 1.3 **RELATED WORK:** Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- 1.4 **SUBMITTALS**
 - A. *Product Data:* Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified.
 - B. *Shop Drawings:* Provide dimensioned drawings showing layout of signs, typeface styles and sizes, text and text spacing. For all products, provide dimensioned drawings showing anchorages, mounting, and coordination with adjacent construction.
 - C. *Samples:* Submit 3"X3" samples showing full range of colors and finishes available.
 - D. *Warranty:* Provide warranty against any defects due to faulty materials or workmanship for the "life of the building".
- 1.5 **DELIVERY, STORAGE, AND HANDLING:** Deliver products in unopened factory labeled packages, including mounting hardware. Store and handle in strict compliance with manufacturer's instructions and recommendations.

2.0 PART 2: PRODUCTS

- 2.1 **ROOM IDENTIFICATION SIGNS:** Provide identification signs for interior spaces. Signs shall be one-piece with all graphics, raised characters, and Braille integral to sign. All signs shall conform with the requirements of the regulations of the Massachusetts Access Board.
 - A. *Sign Material:* Provide 0.125 thick scratch-resistant, non-static, fire retardant, washable 3-ply melamine surface laminate with a non-glare surface and phenolic core.
 - B. *Size:* Signs shall be minimum 4¾" high X 9½" long.
 - C. *Typeface:* Provide sans serif typeface and upper case letters.
 - D. *Character Proportion:* Letters and numbers on signs shall have a width-to-height ration between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10.

- E. *Character Height:* Characters and numbers on signs shall be sized consistently at each location and in no case less than 5/8" or greater than 2" high.
- F. *Raised and Braille Characters:* Letters, graphics, and numerals shall be raised 1/32". Letters shall be accompanied by Grade 2 Braille.
- G. *Finish and Contrast:* The background of signs shall be non-glare finish. Color of characters and graphics shall be a contrasting color to background of sign. Colors to be selected by the Architect.
- H. *Acceptable Product and Manufacturers:* Provide HC200C-S as manufactured by Best Manufacturing Sign Systems. Other acceptable manufacturers are Mohawk Systems, Andco Industries, or equal.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.
- C. *Coordination:* Coordinate installation of signs after painting is complete.

3.2 ROOM IDENTIFICATION SIGNS: Mount signs on the wall adjacent to the latch side of doors or in locations as indicated. Mounting location shall allow a person to approach within 3" of signage without encountering protruding objects or standing within the swing of a door. Mount signs so that centerline of sign is 60" above finished floors, using concealed mounting whenever possible. Provide tamperproof fasteners for exposed mounting conditions.

3.3 CLEANING, REPAIR AND PROTECTION

- A. *Touch-up:* Touch-up damaged coatings and finishes.
- B. *Repair:* Repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.
- C. *Cleaning:* Clean exposed surfaces using materials and methods recommended by manufacturers of material being cleaned.

3.4 SIGN SCHEDULE: Provide one sign each, unless otherwise noted, with the following copy. Graphics will be included with each sign.

- A. Vault
- B. Record Review and Storage (3 signs)
- C. Restroom (include accessibility symbol and men's and women's graphics)
- D. Storage Rooms (2 signs)

END OF SECTION

**SECTION 10.22.13
WIRE MESH PARTITIONS**

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 DESCRIPTION OF WORK
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install wire mesh partitions as shown on the Drawings and as specified.
- B. The Work includes, but is not limited to:
1. Wire mesh partitions for storage compartments.
- 1.3 RELATED WORK
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- B. Other Work which directly relate to the work of this Section include, but are not limited to:
1. Resilient Flooring (Section 09.65.00).
 2. Painting (Section 09.90.00)
- 1.4 QUALITY ASSURANCE: Provide primary products from one manufacturer and secondary materials which are acceptable to the manufacturer of the primary materials.
- 1.5 SUBMITTALS
- A. *Product Data*: Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified.
- B. *Shop Drawings*: Submit large scale shop drawings showing complete layout and fabrication details.
- C. *Samples*: Submit finish color samples showing full range of colors and finishes available.
- D. *Warranty*: Provide warranty against any defects due to faulty materials for twenty five years, and workmanship for one year from date of Substantial Completion.
- 1.6 DELIVERY, STORAGE, AND HANDLING: Deliver products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

2.0 PART 2: PRODUCTS

- 2.1 PARTITIONS: Provide wire mesh panels between post uprights, complete with all components, accessories, hardware, and fasteners.
- A. *Wire mesh panels*: Provide steel angle frames with wire mesh securely welded in place; frame joints coped at corner and securely welded; factory drilled holes for fasteners.

- B. *Wire Mesh*: 10 gauge, 0.135 inch steel wire woven into 2 by 1 inch rectangular mesh.
- C. *Frame*: 1 1/4 by 1 1/4 by 1/8 inch hot rolled steel angle.
- D. *Posts*: square 2 by 2 inch 14 gauge steel tube with welded base plate and factory drilled holes for floor anchors and panel attachment. Provide anchors and fasteners appropriate for substrate material.
- E. *Post spacing*: As required to suit dimensions, using manufacturer's standard panel widths. Panels 4 feet or wider require vertical panel stiffeners
- F. *Panel Height*: combine panels using manufacturer's standard panel heights to reach within 2" of bottom of new ductwork. Extend frames to ceiling as required for stability.
- G. *Vertical Panel Stiffeners*: 1/4 by 3/4 inch steel bar securely welded to frame behind mesh.
- H. *Fit*: Fit panel tight to floor. Provide 2 inches nominal clearance around pipes and other penetrations
- I. *Doors*: Provide hinged 36 inch wide by minimum 84 inch high single wire mesh doors constructed from same frame and mesh specifications as panels.
 - 1. Stiffeners: two horizontal and one vertical stiffener.
 - 2. Hinges: 3 5-knuckle butt hinges
 - 3. Locking: Mortise cylinder lock operated by key outside, lever handle inside.
- J. *Finish*: Electrostatic sprayed enamel, as selected by Architect from manufacturer's standard colors.
- K. *Acceptable Product and Manufacturers*: Provide Style 840 wire partition system as manufactured by WireCrafters, or equal.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.
- C. *Coordination*: Coordinate installation of partitions after painting and resilient floor installation is complete.

3.2 INSTALLATION: Install partitions in accordance with manufacturer's instructions. Install plumb, level, and securely anchored to floor and to other structural members where in

3.3 ADJUSTING, TOUCH-UP, AND REPAIR

- A. *Adjusting*: Adjust doors to work smoothly, easily, and correctly.

- B. *Touch-up and Repair:* Touch-up damaged shop coatings and repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.

END OF SECTION

**SECTION 10.28.13
TOILET ACCESSORIES**

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 DESCRIPTION OF WORK
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install toilet accessories as shown on the Drawings and as specified.
- B. The Work includes, but is not limited to:
1. Toilet accessories.
- 1.3 RELATED WORK
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- B. Other Work which directly relate to the work of this Section include, but are not limited to:
1. Rough Carpentry (Section 06.10.00).
 2. Gypsum Board (Section 09.20.00).
 3. Ceramic Tiling (Section 09.30.00).
- 1.4 QUALITY ASSURANCE: Provide primary products from one manufacturer and secondary materials which are acceptable to the manufacturer of the primary materials.
- 1.5 SUBMITTALS
- A. *Product Data*: Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified.
- B. *Setting Drawings*: Provide drawings for installation of all accessories. Provide installation templates and instructions for work installed by others. Show mounting and connections locations and heights and blocking required for adequate support.
- 1.6 DELIVERY, STORAGE, AND HANDLING: Deliver products in unopened factory labeled packages, including mounting hardware and templates. Store and handle in strict compliance with manufacturer's instructions and recommendations.

2.0 PART 2: PRODUCTS

2.1 BATHROOM ACCESSORIES

- A. *Acceptable Manufacturers*: Provide products which meet or exceed the specified requirements from one of the following manufacturers:
1. Brobrick Washroom Equipment Co.
 2. Bradley Corporation.
 3. McKinney/Parker Co.
 4. Or equal.

- B. *Materials:* All stainless steel shall comply with ANSI type 302/304, NAAMM #4 satin finish, 22 gage minimum.

2.2 BATHROOM MIRRORS

- A. *Glass:* Provide ¼" thick, Quality q2, clear float glass with full silver, copper and organic coatings, with uniformly ground and polished edges.
- B. *Mirror Fastening:* Provide concealed galvanized steel wall hanger with theft-resistant screws.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspection:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.

3.2 BATHROOM ACCESSORIES

- A. Secure toilet accessories to walls with concealed fasteners which are appropriate for the condition and application. Ensure that adequate blocking and support is provided.
- B. *Mounting Heights:* All bathrooms shall be accessible to the disabled. Mount toilet accessories at locations and heights required by authorities having jurisdiction and approved by the Architect.

3.3 ADJUSTING, REPAIR, CLEANING, AND PROTECTION

- A. *Adjusting:* Adjust operating parts to work easily, smoothly, and correctly.
- B. *Repair:* Repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.
- C. *Cleaning:* Clean exposed surfaces using materials and methods recommended by manufacturers of material being cleaned.
- D. *Protection:* Provide temporary protections to prevent damage during construction. Remove protections and re-clean as required before final acceptance.

3.4 SCHEDULE OF ACCESSORIES: For the purposes of establishing a standard of quality, catalog numbers from Brobrick Washroom Equipment Co. have been specified. Products from other manufacturers must meet or exceed the specified standard.

- A. *Surface Mounted Toilet Tissue Dispensers:* B-76857.
 - 1. Finish: Satin stainless steel with chrome-plated plastic roller.
 - 2. Location: One for each toilet.
- B. *Grab Bars:* B-6806 series.

1. Finish: 1½" diameter stainless steel, with peened non-slip gripping surface and satin ends and flanges.
 2. Locations: One set each for each handicapped toilet.
- C. *Recessed Paper Towel Dispenser/Waste Receptacle*: B-369.
1. Finish: Satin stainless steel.
 2. Location: One for each restroom.
- D. *Surface Mounted Soap Dispenser*: B-4112.
1. Finish: Satin stainless steel.
 2. Location: One for each sink.
- E. *Utility Hook*: B-76717.
1. Finish: Satin stainless steel.
 2. Location: One for each toilet.
- F. *Mirror*: B-290 series.
1. Finish: Satin stainless steel.
 2. Location: One in each rest room.
- G. *Waste Receptacle*: B-270.
1. Finish: Satin Stainless Steel.
 2. Location: One for each women's toilet.

**END OF SECTION
AND DIVISION 10**

DIVISION 12 - FURNISHINGS

SECTION 12.24.00 WINDOW SHADES

1.0 PART 1: GENERAL

- 1.1 **GENERAL REQUIREMENTS:** All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 **DESCRIPTION OF WORK**
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install window shades as shown on the Drawings and as specified.
 - B. The Work includes, but is not limited to:
 - 1. Manually operated roll-up insulating and room darkening window shade system.
- 1.3 **RELATED WORK**
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
 - B. Other Work which directly relate to the work of this Section include, but are not limited to:
 - 1. Rough Carpentry (Section 06.10.00).
- 1.4 **QUALITY ASSURANCE**
- A. *Source:* Provide primary products from one manufacturer with a minimum of 20 years experience in manufacturing window shades and secondary materials which are acceptable to the manufacturer of the primary materials.
 - B. *Installer:* Installer shall have minimum of 10 years experience installing window shades and be trained and certified by the manufacturer.
- 1.5 **REFERENCES**
- A. NFPA 701-99 - Fire Tests for Flame-Resistant Textiles and Films
- 1.6 **SUBMITTALS**
- A. *Product Data:* Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified.
 - B. *Samples:* Submit frame and track finish color samples and 6"X6" fabric samples showing full range of colors and finishes available.
 - C. *Warranty:* Provide warranty against any defects due to faulty materials for twenty five years, and workmanship for one year from date of Substantial Completion.
- 1.7 **DELIVERY, STORAGE, AND HANDLING:** Deliver products in unopened factory labeled packages, including mounting hardware. Store and handle in strict compliance with manufacturer's instructions and recommendations.

2.0 PART 2: PRODUCTS

2.1 ROOM DARKENING INSULATED WINDOW SHADE SYSTEM

- A. *Acceptable Manufacturers:* Provide products which meet or exceed the specified requirements from Window Quilt Insulated Shades or equal.
- B. *Operation Type:* Manual
- C. *Fabric:* five layers, ultrasonically bonded, consisting of a reflective vapor barrier sandwiched between two layers of polyester batting and covered on both sides with cover fabric.
 - 1. Color: As selected by Architect from manufacturer's standard range of colors.
- D. *Insulating Properties (R-value)*
 - 1. Combined with single pane glazing: 4.58 min.
 - 2. Combined with double pane glazing: 5.88 min.
 - 3. Combined with double pane low E glazing: 7.14 min.
- E. *Shading coefficient:* .14 max. when combined with low-E glazing
- F. *Light reduction:* 99.5%

2.2 SHADE FABRICATION

- A. Fabricate shade to completely fill existing openings from head to sill and jamb to jamb, sealed within a four-sided track. Prior to fabrication, verify actual opening dimensions by on site measurement.
- B. Fabricate shadecloth to hang flat without buckling or distortion.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
- B. *Inspections:* Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning work means that the Installer accepts substrates, previous work, and existing conditions.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install roller shades level, plumb, square and true. Allow proper clearances for window operation hardware.

3.3 ADJUSTING, CLEANING AND PROTECTION

- A. *Adjusting:* Adjust and balance roller shades to operate smoothly, easily, safely and free from binding or malfunction throughout entire operational range.

- B. *Cleaning*: Clean roller shade surfaces after installation, according to manufacturer's instructions.
- C. *Protection*: Provide temporary protections to prevent damage during construction. Remove protections and re-clean as necessary before final acceptance. Repair or replace damaged products before S
- D. Engage Installer to train Owner's personnel to adjust, operate and maintain roller shade systems.

**END OF SECTION
AND *DIVISION 12***

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13.27.16 MODULAR FIRE VAULT

1.0 PART 1: GENERAL

- 1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work of this Section.
- 1.2 DESCRIPTION OF WORK
- A. The Work of this Section includes all labor, materials, tools, and equipment needed to furnish and install modular fire vault as shown on the Drawings and as specified.
- B. The Work includes, but is not limited to:
1. Modular fire vault.
 2. Vault doors.
 3. Steel structure for vault.
 4. Accessories.
- C. *Intent:* A major intent of the Work of this Section is to provide a structurally independent, complete records storage vault which meets the requirements of the Commonwealth of Massachusetts and specified performance criteria.
- 1.3 RELATED WORK
- A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.
- B. Other Work which directly relate to the work of this Section include, but are not limited to:
1. Cast-in-Place Concrete (03.30.00).
 2. Gypsum Board (Section 09.20.00).
 3. Resilient Flooring (Section 09.65.00).
 4. Painting (Section 09.90.00).
 5. Fire Suppression (Section 21.00.00).
 6. HVAC (Section 23.00.00).
 7. Electrical (Section 26.00.00).
- 1.4 REGULATORY REQUIREMENTS: Comply with applicable provisions of the following reference codes and standards. Where conflicts appear between codes, standards, these specifications, or authorities having jurisdiction, the most restrictive requirement applies. Recommendations made in any of the reference standards shall be considered mandatory requirements.
- A. Commonwealth of Massachusetts Performance Standards for Safes and Vaults.
- B. NFPA 232 Standard for the Protection of Records.
- 1.5 QUALITY ASSURANCE
- A. *Source:* Provide pre-engineered, modular vault assemblies from one manufacturer. Provide secondary materials and products which are acceptable to the manufacturer of the primary vault package.

- B. *Installer:* Installer shall have minimum of 5 years experience installing modular vaults and be approved and authorized by the manufacturer of the vault.
- C. *Design Loads:* Steel supports shall conform to structural loading requirements of the Massachusetts Building Code and Commonwealth of Massachusetts Performance Standards for Safes and Vaults, but in no case less than the following:
 - 1. Live Load: 350 lbs./sq. ft.
 - 2. Impact Loads: Ample accommodation shall be made for protection against impact loading by falling equipment or building members and against accumulations of burning debris.
- D. *Welding:* All welding shall be in compliance with the American Welding Society Code.

1.6 SUBMITTALS

- A. *Product Data:* Submit manufacturer's product data, including installation instructions and recommended uses, for each material specified. Provide manufacturer's certifications stating that products and systems comply with requirements.
- B. *Shop Drawings:* Provide large scale shop drawings for fabrication, installation, and erection of all parts of the Work. Provide plans, elevations, and details of anchorages, connections, and accessory items. Provide installation templates and instructions for work installed by others.
 - 1. Structural Shop Drawings: Provide complete design calculations for structural assemblies prepared by a structural engineer registered in the Commonwealth of Massachusetts. Structural shop drawings shall bear the registration stamp of the designing structural engineer.

- 1.7 DELIVERY, STORAGE, AND HANDLING: Deliver, store, and handle in strict compliance with manufacturer's instructions and recommendations. Sequence deliveries to avoid delays and minimize on-site storage. Protect from all possible damage.

2.0 PART 2: PRODUCTS

- 2.1 MODULAR VAULT PANEL: Provide panel designed to meet applicable requirement of NFPA 232 Class 125-2 hr. protection of electromagnetic media and Class 350-6 hr. vault. Panels shall have the following characteristics:
 - A. *Construction:* Panels shall consist of a high temperature (3200 degrees F melting point) refractory fiber core enclosed on three longitudinal sides by expanded metal mesh with structural steel supports at each corner. Vapor barrier of 20 gauge cold rolled sheet steel shall be used to enclose fourth side of panel to seal the interior of the vault against migration of steam into the vault enclosure. Edges of panels shall be tongue and groove design with gasket seals for connection to adjacent panels. Gaskets shall be high temperature fibrous insulation which meets Fire Resistance Classification ASTM E119 and UL263 Time/Temperature Curve. Panels shall be designed for horizontal or vertical use.
 - B. *Size and Configuration:* Provide 8" thick X 2'-0" wide panels weighing 12-14 lbs./sq. ft. Provide maximum height of panels possible in existing space.
 - C. *Thermal Resistance:* R=33 @ 70 degrees F when tested in accordance with ASTM C518.

- D. *Flammability*: No flame spread, smoke developed, or fuel contributed when tested in accordance with ASTM E84 and UL723.
 - E. *Fire Resistance*: When tested in accordance with ASTM E119 and UL 263 Time/Temp. Curve, panels shall achieve a rating of Class 125 Data Rating after 4 hour test. Maximum average temperature of unexposed face shall be no more than 125 degrees F.
 - F. *Acceptable Product*: Firelock CL-350/CL-125 or equal.
- 2.2 VAULT DOOR: Provide door assembly designed to meet applicable standards for Class 350-6/Class 125-4 hr. insulation from heat migration through the vault enclosure.
- A. Door assembly shall consist of a dual door entryway system with a clear opening of 40" wide X 78" high.
 - 1. Exterior door shall be an insulated vault door with an UL 350-6 hour rating.
 - 2. Interior door shall be installed utilizing a custom stanchion. Interior insulating door shall be UL rated to 3 hour and 250 degrees F Rate of Rise Classification. Interior door shall be gasketed to provide a vapor seal to prevent the migration of water vapor into the vault or gas fire suppressant agents out of the vault.
 - 3. Stanchions: Exterior doors shall be fastened to stanchion integral to modular wall panels. Stanchion shall have high temperature (2300 degrees F) gasket strips at the junction of the wall panel and stanchion. Interior door stanchion shall be fastened to concrete floor with anchor bolts. Seal junction between interior and exterior door stanchions with insulating gasket strips.
 - B. *Fire Resistance*: When tested in accordance with ASTM E-119 and UL 263 Time/Temperature Curve, door assembly in the closed position after a duration of 4 hour test shall not exceed 125 degrees F at the inner vault.
 - C. *Closers*: Door system shall be equipped with electromagnetic closer-holder or equivalent. The hold open position shall be capable of being set between 90 degrees and 180 degrees. Closers shall be electrically powered, employing a solenoid operated bullet plunger valve. When energized, bullet plunger valve seals closer's hydraulic closing circuit. Unit must close door during any electrical power interruption, activation of integral smoke detection and/or activation of exterior smoke/heat alarm sensors.
 - 1. Acceptable Product: LCD 4314 MED Series.
 - D. *Emergency Escape*: Doors shall be equipped with inside escape mechanism to ensure life safety evacuation in the event that personnel are within vault during activation of door closure system.
- 2.3 CABLE TRAY: Provide cable tray assembly designed to meet applicable standards for Class 125-4 hour insulation from heat migration through vault enclosure. Cable tray assembly box shall attach to the vault exterior and include one 4" square electrical junction box mounted both on the exterior face and interior face of vault panel. 1" diameter PVC conduit shall penetrate vault panel to carry wiring to the interior of the vault. A UL rated firestop device shall be used to seal cable tray conduit in the event of fire. Firestop device shall be attached to a 20 gauge steel sheet at the interior face of the panel at the point of penetration. Fill junction boxes with intumescent caulk.

- 2.4 FIRE DUCT SYSTEM: Provide fire duct system to allow environmental control of vault interior by the building's HVAC system. Fire duct system shall be designed to meet applicable standards for Class 125-2 hour insulation from heat migration into vault enclosure. Provide damper assembly consisting of three fire rated dampers located in series within a 16 gauge galvanized steel housing. Each damper shall be held in the open position by use of 165 degree F fusible links. The duct shall be insulated with ceramic fiber and protected from physical damage by an external steel jacket.
- 2.5 SUPPORTING STEEL STRUCTURE
- A. *Steel Shapes*: ASTM A36.
 - B. *Steel Tubes*: ASTM A500 or A513.
 - C. *Grout*: Provide pre-mixed, non-staining, non-corrosive, non-shrink, non-metallic grout complying with CE CRD-C588, type D, 5,000 psi. Acceptable products are:
 - 1. "POR-ROK" expanding grout manufactured by Hallemite Manufacturing Co., Cleveland, OH.
 - 2. "Embeco Pre-Mixed Grout" manufactured by Master Builders, Cleveland, OH.
 - 3. An approved equal.
 - D. Accessory items include, but are not limited to fasteners, sleeves, and brackets. All accessory items exposed to view shall match primary steel material in color and finish.
- 2.6 ACCESSORIES: Accessories shall include, but are not limited to:
- A. High temperature fibrous insulation in moldable form which meets Fire Resistance Classification ASTM E119 and UL 263 Time Temperature Curve.
- 2.7 ACCEPTABLE MANUFACTURER: Provide complete vault system manufactured by Firelock or equal.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. Execute all Work in accordance with manufacturer's recommendations and instructions except where the Specifications call for more restrictive requirements.
 - B. *Inspection*: Inspect and verify all existing conditions and previous Work before beginning this Work. Beginning Work means that the Installer accepts substrates, previous work, and existing conditions.
- 3.2 COORDINATION: Coordinate with other Work to avoid project delays, to ensure dimensional accuracy, and to properly prepare for interior finishes and electrical and HVAC connections.
- A. *Electrical*: Coordinate location and requirements of lighting, power, and telephone service to vault.
 - B. *HVAC*: Coordinate location and size of HVAC duct serving vault.
 - C. *Finishes*: Instruct others on proper installation of interior wall, floor, and ceiling finishes.

3.3 **INSTALLATION:** Install Work plumb, true, and square. Anchor floor track securely to existing concrete slab. Seal joints between panels and existing structure with high temperature moldable fibrous insulation. Cover all internal panel structural members with fiber strips.

3.4 **ADJUSTING AND REPAIR**

- A. *Adjusting:* Adjust vault doors to work easily, smoothly, and correctly.
- B. *Repair:* Repair minor damages so that there is no evidence of repair. Remove and replace Work which cannot be satisfactorily repaired.

**END OF SECTION
AND DIVISION 13**

**SECTION 31.23.00
EXCAVATION AND FILL**

1.0 PART 1: GENERAL

1.1 GENERAL REQUIREMENTS: All Contract Documents, including General and Supplementary Conditions, General Requirements (Division 1), and Drawings, apply to the Work in this Section.

1.2 DESCRIPTION OF WORK

A. The Work of this Section includes all labor, materials, tools, and equipment needed to complete earthwork as shown on the Drawings and as specified.

B. The Work of this Section includes, but is not limited to:

1. Temporary protection and access.
2. Excavation, stockpiling, and backfill.
3. Preparation of subgrades for slabs and foundations.
4. Water and erosion control of excavations.
5. Shoring and bracing as needed.
6. Removal and disposal of unsuitable or surplus excavated materials off site.
7. Fill and compaction.

1.3 RELATED WORK

A. Carefully examine all the Contract Documents for requirements which affect the Work of this Section.

B. Other Work which directly relate to the Work of this Section include, but are not limited to:

1. Selective Demolition (Section 02.41.19).
2. Cast-in-place Concrete (Section 03.30.00).

1.4 QUALITY ASSURANCE: The Owner may employ an independent testing agency to perform supervisory tests and certifications. Provide complete cooperation and permit samples to be taken at any time and from any location. Samples will be taken after each lift of fill and compaction. Do not place any fill until the Owner's representative has observed the previous fill layer and compaction and approved the fill materials to be used.

1.5 DELIVERY, STORAGE, AND HANDLING: Materials shall be protected from damage from nature. Storage of materials and equipment on site shall be coordinated with the Owner's representative.

1.6 PROJECT CONDITIONS

A. *Subsurface Conditions:* Existing subsurface information and finish floor elevations are not available. Site conditions and information must be field verified before proceeding with Work.

2.0 PART 2: PRODUCTS

2.1 GENERAL: All materials shall be well graded between the limits specified and capable of being compacted to the required degree of density. Material shall have sufficient fines so that it does not shove and remains stable. Use of recycled materials, such as reprocessed building demolition material, shall not be allowed.

2.2 STRUCTURAL FILL

- A. Provide inert, hard, durable sand and gravel, free from organic matter, clay, surface coatings and deleterious materials, complying to the following gradation.

<u>U.S. Sieve Size</u>	<u>% Finer by Weight</u>
3"	100
1/2"	50-100
No. 4	30-85
No. 10	20-75
No. 60	3-35
No. 200	0-10

B. *Uses:*

1. Fill within building footprint, below base course layer.
2. Backfill adjacent to walls.

2.3 GRAVEL BASE

- A. Provide gravel base that meet the requirements for Dense Graded Crushed Stone, Massachusetts Standard Specifications for Highway and Bridges, Section M2.01.7 derived from a stone quarry and is hard, durable, and free from deleterious materials, clay, loam, or other plastic materials. Gradation will comply to MHD Specification Designation M2.01.7 and the following.

<u>U.S. Sieve Size</u>	<u>% Finer by Weight</u>
2"	100
1 1/2"	70-100
3/4"	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

B. *Uses:* Base course below concrete slabs.

2.4 CRUSHED STONE

- A. Provide inert angular material derived from a stone quarry that is hard, durable, washed stone, free of deleterious materials. Gradation shall comply with the requirements for material MHD Specification Designation M2.01.4 and the following.

<u>U.S. Sieve Size</u>	<u>% Finer by Weight</u>
1"	100
3/4"	90-100
1/2"	10-50
3/8"	0-20
No. 4	0-5

B. *Uses*

1. Below footings and slabs.
2. Where otherwise required.

3.0 PART 3: EXECUTION

3.1 GENERAL

- A. *Inspection and Verification:* The Contractor shall inspect the site and existing conditions. Verify all grades, utility locations, layouts, site improvements, and other existing conditions before beginning Work.
- B. *Regulatory Requirements:* All Work shall conform to the requirements of OSHA and Mass. Dig Safe. Notify authorities and utility companies, as applicable, before proceeding with Work.
- C. *Stockpiling and Disposal:* Materials suitable for reuse shall be stockpiled on the side, in locations acceptable to the Owner. Materials unsuitable for re-use shall be disposed of properly.
- D. *Coordination:* Coordinate Work with separate underground utility work scheduled to be performed by utility companies.

3.2 PROTECTION

- A. *Dust and Erosion Control:* Take effective measures to prevent windblown dust and to control erosion and run off.
- B. *Shoring and Bracing:* Design, engineer, and provide adequate shoring and bracing to prevent movement or settlement of existing and new construction, including buildings, utilities, paving, and site improvements.
- C. *Utilities:* Locate, mark, and protect all utilities from damage and disruption of services.

3.3 EXCAVATION

- A. Excavate to elevations and subgrades indicated. Ensure that footings rest on undisturbed natural soil or compacted structural fill.
- B. *Dewatering:* Dewater as necessary to maintain dry excavations. Provide temporary water control ditches, pumps, and piping as needed to control water.
- C. *Stabilizing Excavations:* All excavations shall be stabilized by cutting back the side slopes or using shoring and bracing as required by 20 CFR 1926 Subpart P, Excavations.
- D. *Footing Excavation:* Excavate to a depth of 1'-0" below finished footing grades. For wall footings, extend 1'-0" beyond width of footings on both sides.

3.4 FILL

- A. *Moisture Content:* Control moisture content of subgrades and fill materials by drying wetting to levels required for proper compaction, as established by ASTM D1557, Method C. Wet fill which cannot be dried within 48 hours of placement shall be removed and replaced with drier fill.
- B. *Placement:* Place fill in horizontal loose layers and compact after each layer. Fill areas for site development as required to raise grade to required subgrade elevations.
- C. *Footings:* Fill below footings with $\frac{3}{4}$ " crushed stone. For wall footings, extend crushed stone 1'-0" beyond width of footings on both sides.

- D. *Proofrolling*: Proofroll all footing and slab subgrades with dynamic vibratory compactor weighing a minimum of 200 pounds and imparting a minimum of 4 kips of force.

3.5 COMPACTION

- A. *Gravel Base*: Compact in maximum 12" loose lifts to at least 95% of the Modified Proctor maximum dry density (ASTM D1557), within moisture content within $\pm 2\%$ of optimum moisture content.
- B. *Structural Fill*: Compact all fill placed within and below the structure to at least 95% of the Modified Proctor maximum dry density (ASTM D1557), within moisture content within $\pm 2\%$ of optimum moisture content. Lifts shall not exceed 6" in confined areas and 12" in open areas where larger compactors can be utilized. Use hand-operated equipment within 10 feet behind retaining walls and do not over-compact the backfill material.

**END OF SECTION
AND DIVISION 31**

**SECTION 21.00.00
FIRE SUPPRESSION SPRINKLER SYSTEM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of DIVISION 0-BIDDING AND CONTRACT REQUIREMENTS and other DIVISION 1 Specification Sections, apply to this section.

1.2 FIRE PROTECTION SYSTEMS NARRATIVE

- A. The information contained within the report outlines the basis of design, sequence of operation and testing criteria that is critical to the successful completion of the Work.
- B. The narrative report may be updated as construction progresses, with a final version submitted for final commissioning of the life safety systems by the local fire department. Close coordination between the design team and construction team will be necessary to complete the Fire Protection Systems Narrative Report in accordance with State regulations.

1.3 SUMMARY

- A. Related sections include:
 - 1. Division 23.00.00-Mechanical
 - 2. Division 26.00.00-Electrical

1.4 SCOPE

- A. Work shall include, but not be limited to, the following:
 - 1. Provisions for the installation of a wet sprinkler system complete with 100% protection, throughout the entire building.
 - 2. Provisions for the installation of an attic dry sprinkler system complete with 100% protection.
 - 3. Provisions for a NOVEC 1230 non-water based system protecting the new Vault.
 - 4. Provisions for a new Preaction Sprinkler System protecting the new storage room.
 - 5. Provisions for connection of a new fire service main, connected to the existing main at the basement level.
 - 6. Provisions for demolition of all unused sprinkler system piping and appurtenances at the partial basement level.
 - 7. Provisions for a service backflow preventer and wet alarm valve assembly.
 - 8. Provisions for a dry pipe valve assembly.
 - 9. Provisions for a fire department inlet connection.
 - 10. Preparation of hydraulic calculations and shop drawings, in accordance with NFPA 13, sealed by an engineer registered in the Commonwealth of Massachusetts.
 - 11. Firestopping of all rated penetrations.

1.5 THREE TIER PROJECT PROCESS

- A. This project shall be designed and constructed under the three tier system, per the Massachusetts building code, 780 CMR, chapter 9.
- B. TIER ONE, CONSTRUCTION DOCUMENTS
 - 1. Prior to issuance of a building permit, construction documents for the fire protection system must be submitted and a building permit obtained prior to the installation of fire protection systems or modifications, alterations, additions or deletions to an existing fire protection system.

2. The construction documents shall contain conform to all requirements listed in the building code.

C. TIER TWO, SHOP DRAWINGS

1. Prior to installation of fire protection systems, shop drawings and hydraulic calculations shall be prepared by the contractor.
2. Drawings and hydraulic calculations shall conform to all requirements listed in the building code. The shop drawings and hydraulic calculations shall then be submitted to the engineer of record. When the engineer of record is satisfied with the drawings and hydraulic calculations, they will be sealed.
3. The contractor shall then submit drawings and hydraulic calculations to the building official and fire official, and obtain approval.

D. TIER THREE, RECORD DRAWINGS

1. As built plans shall be provided to the building owner for all fire protection and life safety systems that are sealed as reviewed and approved by the engineer of record, performing construction control.
2. Shop drawings shall be modified as necessary, with any field changes identified by clouds on the drawings.
3. When the engineer of record is satisfied with the drawings and hydraulic calculations, they will be sealed. These completed documents will then be incorporated into the operation & maintenance manuals, and delivered to the owner.

1.6 REFERENCES

- A. American National Standards Institute (ANSI)
- B. American Society for Testing and Materials (ASTM)
- C. American Water Works Association (AWWA)
- D. Underwriter's Laboratories (UL)
- E. National Fire Protection Association (NFPA)
 1. NFPA 13 – Standard for the Installation of Automatic Sprinkler Systems.
 2. NFPA 72 – National Fire Alarm Code.
 3. NFPA 241 – Standard for Safeguarding Construction Alteration and Demolition Operations.
 4. NFPA 291 – Recommended Practice for Fire Flow Testing and Marking of Hydrants
 5. NFPA 2001 - Standard on Clean Agent Fire Protection Systems.

1.7 SUBMITTALS

- A. The following items require submittal as Product Data. All submittals shall indicate UL listing and FM approval labels and the installation and environmental conditions for which the listing and approvals are based.
1. Pipe and fittings. Correspond each group of pipe and fittings to the intended system application.
 2. Supports (Hangers) and fasteners.
 3. Seismic Restraint Assemblies: include installation drawings.
 4. Through Penetration Fire Stops: include UL system number and installation drawing for each penetration type indicating type of construction to be penetrated, diameter of penetration, and sleeve and penetrating pipe material and schedule.
 5. System Control valves, general service valves and check valves.
 6. Relief valves.
 7. Test and Drain Assembly.
 8. Fire service flexible joint assembly.
 9. Backflow Preventer.
 10. Sprinklers; indicate finish, orifice size, response application, temperature rating and location to be installed.
 11. Fire Department Inlet Connection.
 12. Alarm Valves; include all trim and accessories.
 13. Signaling Devices.
 14. Electric Bell.
 15. Pressure Gauges.
 16. Spare Sprinkler Cabinet.
 17. Pipe Identification Markers; indicate naming convention to be used.
 18. Dry Pipe Valve
 19. Sleeves and firestopping materials.
- B. The following Shop Drawings shall be submitted
1. Fabrication Plans – Sprinkler system fabrication drawings shall include all information required of Working Plans as specified in NFPA 13. Fabrication plans shall be referred to as Working Plans in this Section.
 2. Hydraulic Calculations prepared in accordance with the requirements of NFPA 13 shall accompany the Working Plans.
 3. Seismic Bracing Calculations prepared in accordance with NFPA 13 shall accompany the working plans.
- C. The following Test Certificates and Reports shall be submitted:
1. Hydrant Flow Test Report in accordance with NFPA 291 Figure 2-11. Submit report prior to submittal of Working Plans.
 2. Contractor's Material and Test Certificates for Underground Piping prepared in accordance with NFPA 13 Figure 8-1(b). Submit certificate before connecting fire service to above ground piping.

3. Contractor's Material and Test Certificates for Aboveground Piping prepared in accordance with NFPA 13 Figure 8-1(a).

1.8 COORDINATION DRAWINGS

- A. Prepare coordination drawings for mechanical and electrical systems and where work by sub-contractors or fabricators require off-site fabrication of production materials that must accurately interface. Coordination drawings shall indicate how work shown by separate shop drawing will interface, and shall indicate sequence of installation.
- B. Each of the following sub-contractors shall indicate their work on a set of mylar transparencies prepared by the Contractor. Coordination drawings shall show the work of all major trades and without excluding the work of any particular trade, and shall include but not be limited to the work of the following trades:
 1. HVAC
 2. Plumbing
 3. Process systems
 4. Electrical
 5. Fire Protection
- C. Copies of the coordination drawings shall be distributed to each subcontractor and subsequently each trade shall indicate its work and show elevations, sizes, pipe insulation, junction boxes, and fixture sizes.
- D. Conflicts shall be identified for immediate attention and resolution. Upon resolution of all conflicts, the coordinated drawings shall be signed by all trades and submitted to the Engineer in accordance with Division 1, for review and confirmation of compliance with the Contract Documents.
- E. Additional work required to accommodate a trade that failed to coordinate his work in a timely manner will be paid for by the subcontractor who failed to coordinate his work.
- F. Where conflicts occur with placement of materials of various trades, the Contractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Contractor shall then final date and sign each drawing.
- G. A Sub-contractor who fails to promptly review and incorporate his work on the drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
- H. Fabrication shall not start until such transparencies of completed coordination drawings are received by the Engineer and have been reviewed.
- I. Review of coordination drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Process, Mechanical, HVAC, Electrical and other work.
- J. Coordination Drawings shall include but are not necessarily limited to:
 1. Structure
 2. Light fixtures
 3. Access panels
 4. Sheet metal, heating coils, boxes, grilles, diffusers, etc.
 5. All heating piping and valves
 6. Soil, waste and vent piping
 7. Major Process Piping (4"Ø and Larger)
 8. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Unless otherwise noted, all products shall be listed by Underwriter's Laboratories.
- B. Supports – B-Line Systems Incorporated, Grinnell Corporation, or Tolco Incorporated.
- C. Seismic Restraint Assemblies – B-Line Systems Incorporated, Loos and Company Incorporated, or Tolco Incorporated.
- D. Through Penetration Fire Stops – 3M Fire Protection Products, Hilti Corporation, or Nelson Firestop Products.
- E. Outside Screw and Yoke Valves, Flanged Check Valves and Non-rising Stem Gate Valves – Nibco Incorporated, Mueller Company, or Stockham Valves and Fittings.
- F. Butterfly Valves – Grinnell Corporation, Milwaukee Valve Company Incorporated, or Victaulic Company of America.
- G. Grooved Check Valves – Grinnell Corporation, Victaulic Company of America, or Viking Corporation.
- H. Test and Drain Assemblies – Viking Manufacturing Incorporated, Grinnell Corporation, or Victaulic Company of America.
- I. Backflow Preventers – Ames, Watts or Febco .
- J. Sprinklers – Viking, Reliable or Victaulic.
- K. Fire Department Valves and Hose Cabinets – Elkhart, Croker or Potter Roemer.
- L. Alarm Valves – Viking, Reliable or Victaulic.
- M. Signaling Devices – Gamewell, System Sensor or Potter.

2.2 PIPE AND FITTINGS

- A. Piping and fittings are described in the following tables.

PIPE MATERIAL SPECIFICATION INDEX				
Service	Drawing Designation(s)	Pressure Rating (psi)	Table	Material
Wet Sprinkler	F, SP	175	2	Carbon Steel
Sprinkler Drain	SPD	175	2	Galvanized Carbon Steel
Between FDC & Check Valve	FDIC	175	4	Galvanized Carbon Steel
Dry Sprinkler	DS	175	2	Galvanized Carbon Steel

TABLE 2 – CARBON STEEL PIPING		
	2" and smaller	2 ½" and larger
Pipe	Schedule 40 conforming to ASTM A53, A135 or A795	Schedule 40 or 10 conforming to ASTM A53, A135 or A795
Fittings	Class 125 cast iron conforming to ANSI/ASME B16.1, class 125 cast iron threaded conforming to ANSI/ASME B16.4, or forged steel socket welded conforming to ASME B16.11	Class 125 cast iron conforming to ANSI/ASME B16.1, class 125 cast iron threaded conforming to ANSI/ASME B16.4, or 175 psi (WWP) malleable iron grooved mechanical
Joining Methods	Thread or shop weld	Thread with Schedule 40 pipe, roll groove or shop weld with Schedule 10 pipe.
Flanges	Class 150 plain face conforming to ANSI B16.5	
Gaskets & Bolts	Gaskets – Full face rubber 1/8" thick Bolts and Nuts – Conforming to ANSI B18.2.1 and B18.2.2 respectively	

2.3 PIPE SUPPORTS

- A. Components attaching to piping (Hangers) shall be adjustable swivel loop type when supporting piping 2" and smaller. Hangers shall be clevis type when supporting piping 3" and larger.
- B. Components attaching to structure shall be beam clamp type when attaching to structural steel members. Concrete inserts or anchors shall be used when attaching to structural concrete.
- C. All components of pipe supports located exterior to the structure including hangers, rods and attachments to structure, shall be galvanized. Nuts and bolts for such supports shall be stainless steel.

2.4 SEISMIC RESTRAINT

- A. All components of the seismic restraint system shall conform to the NFPA 13 requirements for protection of piping against damage due to earthquakes.
- B. Sway Bracing
 - 1. Sway bracing system shall be capable of withstanding forces in tension and compression unless specifically listed as a tension only system.
 - 2. Sway bracing assembly components shall be of one manufacturer with the exception of the bracing member in accordance with the assembly listing.

2.5 THROUGH PENETRATION FIRE STOPS

- A. Penetration fire stops shall conform to the testing requirements of ASTM E 814 with the appropriate 'F' and 'T' rating for the wall or floor being penetrated.
- B. Penetration firestops shall be appropriate for the combination of construction to be penetrated, diameter of penetration and sleeve and penetrating pipe material and schedule.

2.6 VALVES

- A. Control Valves
 - 1. Outside Screw and Yoke valves for system pressures less than 175 psi shall be rated for 175 psi working water pressure, cast or ductile iron body with interior and exterior epoxy coating, resilient EPDM wedge, flanged ends and pre-grooved rising stem suitable for tamper switch mounting.
 - 2. Butterfly Valves sized 2 ½" and larger shall be ductile iron body and EPDM disc with grooved ends. Butterfly Valves sized 2" and smaller shall be bronze body with threaded ends and stainless steel EPDM disc. All valves shall have an

indicating actuator with a pre-wired integral supervisory switch and a minimum 300 psi working water pressure.

- B. Check Valves sized 2 ½" and larger shall be swing type cast or ductile iron body with flanged or mechanical ends, rubber-coated disc and shall be rated for 175 or 250 psi working water pressure as appropriate. Check valves sized 2" and smaller shall be bronze body with threaded ends and shall be rated for 175 psi working water pressure.
- C. Relief Valves shall be fixed setting, 175 psi rated, cast brass body with ¾" NPT male inlet X ¾" NPT female outlet.
- D. Test and Drain Valves
 - 1. Test Assemblies shall be combination test and drain assemblies with threaded ends, sight glass, orifice and pressure rating appropriate to system pressures.
 - 2. Globe Valves shall be bronze body, threaded end rated for at least 175 psi.

2.7 BACKFLOW PREVENTERS

- A. Backflow prevention devices shall be approved by the local water authority.
- B. Backflow preventer shall be Double Check Valve Assembly type with epoxy-coated cast iron or stainless steel body, test cocks and flanged end resilient wedge OS&Y gate valves.

2.8 SPRINKLERS

- A. Style: Sprinklers shall be upright as defined in NFPA 13.
- B. Unless otherwise noted, all sprinklers shall be of one manufacturer.
- C. Type.
 - 1. Standard sprinklers shall be 1/2" NPT standard spray pattern with glass bulb fusible element.
- D. Response Application
 - 1. Unless otherwise noted sprinklers shall be UL listed as quick response.
- E. Temperature Ratings
 - 1. Unless otherwise noted sprinkler temperature ratings shall be in accordance with NFPA 13.

2.9 FIRE DEPARTMENT INLET CONNECTION

- A. Connection shall be 30° angle storz type hard-coated aluminum body flush mount, with inlet and outlet size as specified on drawings. The inlet of the connection shall be storz and the outlet shall be NPT. Connection shall be provided with cap, chain and lettered escutcheon plate.
- B. The finish of the inlet connection and associated components shall be rough polished brass.

2.10 DEVICES

- A. Wet Alarm Valve (AV) – Alarm check valve rated for 175 psi working water pressure with ductile iron body, aluminum bronze clapper, stainless steel rod and springs and EPDM seat seal. Valve shall include standard vertical trim package, retard chamber and alarm pressure switch.

2.11 SIGNALING DEVICES

- A. All signaling devices shall be UL listed and FM approved for their intended use including outdoor or hazardous areas.

- B. All signaling devices shall have two sets of SPDT Form C contacts, be enclosed in NEMA 4 enclosures and have a listed pressure rating of at least 250 psi.
- C. Waterflow switches shall be vane type with a 10 gpm minimum alarm flow and adjustable pneumatic retard of 0-90 seconds.
- D. Pressure switches shall have two independently operating set of contacts, each adjustable over a pressure range of 10-175 psi.

2.12 ACCESSORIES

- A. Electric Bells shall be 24 VDC, 6" diameter with output decibel ratings as specified in UL 464. Bell shall include weatherproof backbox for outdoor applications.
- B. Pressure Gauges shall be Bourdon tube-type, at least 4" in diameter, with black figures on white background. Gauges for air pressure service shall include a retard feature.
- C. Spare Sprinkler Cabinet shall be factory assembled for the purpose of storing spare sprinklers with steel construction with red epoxy coating on all surfaces. Cabinet shall be sized to accommodate the appropriate number of spare sprinklers and wrenches as indicated by NFPA 13.
- D. Pipe Identification Labels shall be snap-on laminated plastic with acrylic coating and utilize black lettering on a red background. Lettering size and style shall be in accordance with the ANSI A13.1.

2.13 NOVEC 1230 FIRE SUPPRESSION SYSTEM

A. SCOPE

1. This specification outlines the requirements for a "Total Flooding" clean agent fire extinguishing system using Novec 1230 fluid and utilizing a JFS-C1 conventional detection and control system. The work described in this specification includes all engineering, labor, materials, equipment and services required to install and test the clean agent fire extinguishing and control system.

2. APPLICABLE STANDARDS AND PUBLICATIONS

- a. The design, equipment, installation, testing and maintenance of the Clean Agent Suppression System shall be in accordance with the applicable requirements set forth in the latest edition of the following codes and standards.
 - 1) NFPA 2001 - Clean Agent Fire Extinguishing Systems.
 - 2) NFPA 70 - National Electric Code.
 - 3) NFPA 72 – National Fire Alarm and Signaling Code.
 - 4) FM - Factory Mutual Approval Guide.
 - 5) UL - Fire Protection Equipment Directory.
 - 6) NEMA - Enclosures for Industrial Controls and Systems.
 - 7) Department of Transportation (DOT) Title 49 Code of Federal Regulations
 - 8) All Requirements of Authority Having Jurisdiction (AHJ)

- b. The standards listed, as well as all other applicable codes, standards, and good engineering practices shall be used as "minimum" design standards.

3. REQUIREMENTS

- a. The Suppression System installation shall be made in accordance with the drawings, specifications and applicable standards. Should a conflict

occur between the drawings and specifications, the specifications shall prevail.

4. EXCLUSIONS

- a. The work listed below shall be provided by others, or under other sections of this specification:
 - 1) 120 VAC or 220 VAC power supply to the system control panel.
 - 2) Interlock wiring and conduit for shutdown of HVAC, dampers and/or electric power supplies, relays or shunt trip breakers.
 - 3) Connection to local/remote fire alarm systems or listed central alarm station(s).

5. QUALITY ASSURANCE

a. MANUFACTURER

- 1) The manufacturer of the suppression system hardware and detection components shall be ISO 9001 and 14001 registered.
- 2) The name of the manufacturer shall appear on all major components.
- 3) All devices, components and equipment shall be the products of the same manufacturer.
- 4) All devices, components and equipment shall be new, standard products of the manufacturer's latest design and suitable to perform the functions intended.
- 5) All devices and equipment shall be UL Listed and/or FM Approved.

b. INSTALLER

- 1) The installing contractor shall be trained by the supplier to design, install, test and maintain fire suppression systems. Advanced Safety Systems Inc. in Peabody MA is the Authorized Janus Distributor in New England, 978-532-5730. www.advancedsafetysystems.com
- 2) When possible, the installing contractor shall employ a NICET certified special hazard designer, Level II or above, who will be responsible for this project.
- 3) The installing contractor shall be an experienced firm regularly engaged in the installation of automatic Clean Agent, or similar, fire suppression systems in strict accordance with all applicable codes and standards.
- 4) The installing contractor must have a minimum of five (5) years experience in the design, installation and testing of Clean Agent, or similar, fire suppression systems. A list of systems of a similar nature and scope shall be provided on request.
- 5) The installing contractor shall show evidence that his company carries a minimum \$2,000,000.00 liability and completed operations insurance policy. These limits shall supersede limits required in the general conditions of the specifications.

- 6) The installing contractor shall maintain, or have access to, a Clean Agent recharging station. The installing contractor shall provide proof of this ability to recharge the largest Clean Agent system within 24 hours after a discharge. Include the amount of bulk agent storage available.
- 7) The installing contractor shall be an authorized stocking distributor of the Clean Agent system equipment so that immediate replacement parts are available from inventory.
- 8) The installing contractor shall show proof of emergency service available on a twenty-four-hour-a-day, seven-day-a-week basis.

6. SUBMITTALS

- a. The installing contractor shall submit the following design information and drawings for approval prior to starting installation on this project.
- b. Working plans indicating detailed layout of system, locating each component (e.g. agent cylinder, control panel, electric/manual pull station, audible and visual alarms). Include control diagrams, wiring diagrams, written sequence of operation or cause to effect matrix along with battery calculations, and pipe locations including size and length. Refer to NFPA 2001 Section 5.1.2.
- c. Product data for each piece of equipment comprising the system including storage cylinders, control valves and pilot controls, control panels, nozzles, push-button stations, detectors, alarm bells or horns, switches, and annunciators.
- d. Design calculations derived from the Janus Design Suite™ computer program written specifically for Novec 1230 and verified by both Underwriters Laboratories and Factory Mutual. Analysis shall include calculations to verify system terminal pressures, nozzle flow rates, orifice code number, piping pressure losses, component flow data, and pipe sizes considering actual and equivalent lengths of pipe and elevation changes. Flow calculation shall also supply pressure venting estimates as required by NFPA 2001. In addition, the flow calculation software shall print specifications of all piping used in the design (mass, ID, etc). Designers using this software shall be trained and certified by Janus Fire Systems.
- e. Submit drawings, calculations and system component data sheets for approval to the local fire prevention agency, owner's insurance underwriter, and all other authorities having jurisdiction before starting installation. Submit approved plans to the architect/engineer for record.

7. SYSTEM DESCRIPTION AND OPERATION

- a. The fire protection system shall be a Total Flooding System utilizing Novec 1230 clean agent. System is a fixed installation where equipment is designed and installed to provide fire extinguishing capability for hazards described. The system shall be supplied by Janus Fire Systems, or approved equal.

Janus Fire Systems
1102 Rupcich Drive
Millennium Park
Crown Point, IN 46307
(219) 663-1600

- b. The system shall provide an Novec 1230 minimum design concentration of 4.2% by volume for Class A hazards and a minimum of 5.85% by volume for Class B hazards, in all areas and/or protected spaces, at the minimum anticipated temperature within the protected area. The system should be designed to discharge its liquid contents in 10 seconds or less. System design shall not exceed 9% for normally occupied spaces, adjusted for maximum space temperature anticipated, with provisions for room evacuation before agent release. Concentration may vary depending on the AHJ but may never be less than 4.2% for Class A and Class C and may never be less than 5.85% for Class B.
- c. The system shall be complete in all ways. It shall include all mechanical and electrical installation, all detection and control equipment, agent storage cylinders, Novec 1230 agent, discharge nozzles, pipe and fittings, manual release and abort stations, audible and visual alarm devices, auxiliary devices and controls, shutdowns, alarm interface, caution/advisory signs, functional checkout and testing, training and all other operations necessary for a functional, UL Listed and/or FM Approved Novec 1230 Clean Agent Suppression System.
- d. The system(s) shall be actuated by a combination of ionization and/or photoelectric detectors installed for maximum area coverage of 250 sq. ft. (23.2 m²) per detector, in both the room and above ceiling protected spaces. Photoelectric detectors shall be installed in underfloor protected spaces. If the airflow is one air change per minute, photoelectric detectors only shall be installed or maximum area coverage of 125 sq. ft. (11.6 m²) per detector. (Ref. NFPA 72).
- e. Detectors shall be Cross-Zoned detection requiring two detectors to be in alarm before release.
- f. Automatic operation of each protected area shall be as follows:
- g. Actuation of one (1) detector, within the system, shall:
 - 1) Flash the COMMON ALARM lamp and corresponding zone lamp on the control panel face.
 - 2) Display "DETECTION ZONE #" on the control panel LCD.
 - 3) Energize an alarm bell and/or an optional visual indicator.
 - 4) Transfer auxiliary contacts which can perform auxiliary system functions such as:
 - 5) Operate door holder/closures on access doors
 - 6) Transmit a signal to a fire alarm system
 - 7) Shutdown HVAC equipment
- h. Actuation of a 2nd detector, within the system, shall:
 - 1) Flash the PRE-DISCHARGE lamp on the control panel face.
 - 2) Display "PREDISCHARG OUTPUT #" on the control panel LCD.
 - 3) Energize a pre-discharge horn or horn/strobe device.
 - 4) Shut down the HVAC system and/or dampers.
 - 5) Start time-delay sequence (not to exceed 60 seconds) as displayed on the control panel LCD.
 - 6) System abort sequence is enabled at this time.
 - 7) After completion of the time-delay sequence, the cylinder electric actuator shall activate, the Novec 1230 Clean Agent system shall discharge and the following shall occur:

- 8) Illuminate the "DISCHARGED" lamp on the control panel face. Display "RELEASING OUTPUT #" on the control panel LCD.
- 9) Shutdown of all power to high-voltage equipment.
- 10) Energize a visual indicator(s) outside the hazard in which the discharge occurred.
- 11) The system shall be capable of being actuated by manual discharge devices located at each hazard exit. Operation of a manual device shall duplicate the sequence description above except that the time delay and abort functions shall be bypassed. The manual discharge station shall be of the electrical actuation type and shall be supervised at the main control panel.

B. MATERIALS AND EQUIPMENT

1. GENERAL REQUIREMENTS

- a. The Clean Agent System materials and equipment shall be standard products of the supplier's latest design and suitable to perform the functions intended. When one or more pieces of equipment must perform the same function(s), they shall be duplicates produced by one manufacturer.
- b. All devices and equipment shall be UL Listed and/or FM approved.
- c. The fire suppression agent shall be Novec 1230 fire protection fluid; clean dry, non-corrosive, non-damaging, non-deteriorating, and meeting the requirements of NFPA 2001. The agent shall be suitable for use in normally occupied spaces. Agent shall be listed as "Acceptable" on the EPA's SNAP list.

2. CLEAN AGENT STORAGE AND DISTRIBUTION

- a. Each system shall have its own supply of clean agent.
- b. The system design can be modular, central storage, or a combination of both design criteria.
- c. Systems shall be designed in accordance with the manufacturer's guidelines.
- d. Each supply shall be located within the hazard area, or as near as possible, to reduce the amount of pipe and fittings required to install the system.
- e. The clean agent shall be stored in Janus Fire Systems Sv, Mv, or Lv Series Agent Storage Cylinder Assemblies. Cylinders shall be super-pressurized with dry nitrogen to an operating pressure of 360 psi @ 70°F (24.8 bar @ 20°C). Cylinders shall be of high-strength low alloy steel construction and conform to NFPA 2001 and the regulations of the US Department of Transportation (USDOT), Transport Canada and/or CE.
- f. Cylinders shall be fitted with a resilient pressure seat type forged brass valve and shall have a threaded steel anti-recoil protective cap or grooved style anti-recoil protective plate for handling and shipment.
- g. The primary cylinder assembly(s) shall be actuated by a resettable electric actuator with optional mechanical override located at each primary agent cylinder or connected bank of cylinders. Non-resettable or explosive devices shall not be permitted.
- h. Each primary cylinder shall be able to pneumatically actuate up to 15 slave cylinders. The distance between the primary cylinder and the farthest slave cylinder (including any rises or drops) shall not exceed 100

ft (30.48 m) in either direction when using flexible hose or copper tubing for pilot actuation. The distance between the primary cylinder and the farthest slave cylinder (including any rises or drops) shall not exceed 25 ft (7.62 m) in either direction when using 1/4 in (8 mm) schedule 40 pipe for pilot actuation.

- i. The cylinders shall be mounted using wall racks on solid walls. The cylinders and racks shall be arranged to allow a service aisle for cylinder removal and cylinder weighing.
- j. Mv and Lv cylinders of a maximum storage capacity greater than 130 lbs (59.0 kg) shall come fitted with Liquid Level Indicators. Each cylinder assembly shall have a pressure gauge and low pressure switch to provide visual and electrical supervision of the cylinder pressure. The low pressure switch shall be wired to the control panel to provide an audible and visual supervisory condition signal in the event the cylinder pressure drops below 280 psi (19.3 bar). The pressure gauge shall be color coded to provide an easy, visual indication of cylinder pressure.
- k. Each cylinder assembly shall have a pressure relief provision that automatically operates before the internal pressure exceeds 850 psi (58.6 bar) to 1000 psi (68.9 bar).
- l. Engineered discharge nozzles shall be provided within the manufacturer's guidelines to distribute the Novec 1230 fluid throughout the protected spaces. The nozzles shall be designed to provide proper agent quantity and distribution.
- m. Nozzles shall be available in 3/8 in (10 mm) through 2 in (50 mm) pipe sizes. Each size shall be available in 90° Corner [Listed with a protection coverage area of 24' x 24' (7.31 m x 7.31 m)], 180° Sidewall [Listed with a protection coverage area of 39' x 39' (11.88 m x 11.88 m)], and 360° Center Room [Listed with a protection coverage area of 39' x 39' (11.88 m x 11.88 m)] distribution patterns.
- n. Nozzles shall be of corrosion resistant construction and shall be designed specifically for application of Novec 1230 fire protection fluid.
- o. Nozzles shall be permanently marked as to part number and orifice diameter.
- p. Nozzles shall be listed at a maximum 18'4" (5.56 m) elevation and listed at a maximum 4'5" (1.37 m) distance below a ceiling while still achieving sufficient mixing.
- q. Nozzles should be listed and/or approved to be used in the upright or pendant position.
- r. Ceiling plates can be used with the nozzles to conceal pipe entry holes through ceiling tiles.
- s. Distribution piping, and fittings, shall be installed in accordance with the manufacturer's requirements, NFPA 2001 and approved piping standards and guidelines. All distribution piping shall be installed by qualified individuals using accepted practices and quality procedures. All piping shall be adequately supported and anchored at all directional changes and nozzle locations. The piping shall be laid out to give maximum flow and to avoid possible mechanical, chemical or other damage. Installation shall follow drawings as closely as possible. System designer must be consulted for anything other than minor deviations in pipe routing.
- t. Black or galvanized steel pipe shall be either ASTM A53 seamless or electric welded, Grade A or B or ASTM A-106, Grade A, B, or C. ASTM A-120, ordinary cast-iron pipe, aluminum pipe, or non-metallic pipe shall

not be used. Stainless steel pipe shall be 304, 316, 304L, or 316L for threaded connections or 304L or 316L for welded connections.

- u. Threaded fittings must comply with NFPA 2001 and be at a minimum class 300 malleable iron, class 300 ductile iron, or have a minimum rated working pressure of 416 psi (28.7 bar) at 70°F (21.1°C). Cast iron and Class 150 pound fittings shall not be used.
- v. Grooved fittings and couplings must comply with NFPA 2001 and have a minimum rated working pressure of 416 psi (28.7 bar) at 70°F (21.1°C). Piping shall be rolled or cut grooved in accordance with the fitting or coupling manufacturer's guidelines.
- w. Gaskets must be compatible with Novec 1230 fluid (typically EPDM having a temperature range of -30°F to 230°F [-34°C to 110°C]). Gasket lubricant must be in accordance with manufacturer's specifications.
- x. The minimum allowable working pressure at 70°F (21.1°C) for pipe and fittings in closed sections of pipe must be greater than or equal to the maximum operating pressure of the discharge pipe safety relief valve rated at 450 psi (31.02 bar).
- y. All pipe and fittings shall be new and of recent manufacture.
- z. Reductions in pipe sizes may be accomplished using threaded or grooved concentric reducing fittings, steel or stainless steel concentric swage fittings, or steel or stainless steel reducing bushings. All such fittings must comply with NFPA 2001 and have a minimum rated working pressure of 416 psi (28.7 bar) at 70°F (21.1°C). Pipe reductions can be made using machined or forged steel hex bushings. Malleable and/or cast iron bushings are NOT to be used.
- aa. All piping shall be reamed, blown clear and swabbed with suitable solvents to remove burrs, mill varnish and cutting oils before assembly.
- bb. All screwed pipe shall be coated with Teflon tape or an appropriate pipe joint compound. When tape or pipe joint compound is used, coating of the threads must start at least two threads back from the pipe end. On small piping, care must be taken so as not to allow sealant to enter valves or controls.
- cc. All pipe must be thoroughly cleaned before installation. A wire flue brush should be pulled through the length several times, followed by clean cloth rags treated with a noncombustible metal cleaner designed for the purpose. All foreign matter and oil must be removed by this process.
- dd. All pipe and fittings installed out of doors or in corrosive areas must be galvanized or treated with a proper protective coating.
- ee. Piping shall be pneumatically tested in a closed circuit for a period of 10 minutes at 40 psi (2.76 bar) per the latest edition of NFPA 2001. At the end of 10 minutes, the pressure drop shall not exceed 20 percent of the test pressure. The pressure test shall be permitted to be omitted if the total piping contains no more than one change in direction fitting between the storage container and the discharge nozzle, and where all piping is physically tested for tightness.

3. PRESSURE SWITCHES

- a. The system shall include a normally open contact on a pressure switch actuated by the agent discharge to shut down equipment and sound alarm.
- b. Switches shall be heavy duty, single pole, double throw.
- c. Pressure switch shall require manual reset.

- d. Pressure switch is only required when a manual valve actuator is supplied on the primary cylinder.
- e. Pressure Operated Releases
 - 1) The system shall include releases capable of holding maximum loads of 35 lbs (15.9 kg) to release self closing doors, dampers, windows, louvers, lids or valves upon agent discharge (Note to Specifier: All devices to be closed must be self-closing and capable of being held open by a cable or chain hooked to the release.)
 - 2) Piping to pressure releases shall be as specified above for discharge piping. All take-offs for pressure release piping shall be from the top of the discharge piping.

4. CONTROL PANEL

- a. The control panel shall be a JFS-C1 Conventional Control Panel, P/N 18630.
- b. The JFS-C1 Control System and its components shall be UL Listed and/or FM Approved for releasing service.
- c. The JFS-C1 Control System shall perform all functions necessary to operate the system detection, actuation and auxiliary functions as outlined.
- d. The JFS-C1 Control System shall be capable of providing 8.0 AH or 12.0 AH battery standby power supplies, providing from 24 to 90 hours standby
- e. The JFS-C1 Control System shall be microprocessor based with hardware and software integration designed to guarantee reliability
- f. The JFS-C1 Control System shall support Cross-Zoned, Single Detector Release and Manual Release detection/actuation methods
- g. The JFS-C1 Control System shall provide the following capabilities and functions
- h. The Control System shall include four (4) input zones, four (4) output zones, one (1) abort, one (1) supervisory, one (1) form C alarm contact, one (1) form C trouble contact, one (1) form A supervisory contact, and one (1) form A water flow contact
- i. A 2 line 32 character alpha numeric liquid crystal display shows the condition, status and circuit for all Alarm, Supervisory and Trouble condition
- j. Individual LED indicators:

1) AC POWER:	Green LED
2) INPUT ALARM (4):	Red LED
3) OUTPUT (4):	Red LED
4) SUPERVISORY 1/ABORT:	Yellow LED
5) SUPERVISORY 2:	Yellow LED
6) SYSTEM TROUBLE:	Yellow LED
7) ALARM SILENCED:	Yellow LED
8) POWER TROUBLE:	Yellow LED

- | | | |
|-----|--------------------------|------------|
| 9) | GROUND FAULT: | Yellow LED |
| 10) | PRE-DISCHARGE/DISCHARGE: | Yellow LED |
| 11) | SUPERVISORY/TROUBLE: | Yellow LED |

- k. Buzzer Silence: Press the scroll or scroll down buttons. Once all events in the trouble or supervisory queue have been viewed, the buzzer and appropriate outputs will silence. The applicable TROUBLE or SUPERVISORY LED will change from flashing to steady.
- l. Note: Any continuous trouble conditions that have been silenced automatically resound 24 hours after the first trouble condition was silenced.
- m. Signal Silence Switch: Activation of the Alarm Signal Silence Switch shall cause all silenceable Alarm Indicating Appliances to return to the normal condition after an alarm condition.
- n. System Reset Switch: Activation of the System Reset Switch shall reset all alarm circuits if condition has been corrected.
- o. Zone Status LEDs: The alarm, supervisory or trouble LED(s) shall flash until event(s) have been acknowledged and remain steady on. Any subsequent new alarm, supervisory or trouble condition will sound again all indications and flash new events.
- p. Supervisory: A short circuit on this zone shall cause the supervisory LED to flash. The Signal Silence switch shall silence the alarm causing the supervisory LED to remain steady. An open circuit shall report as a zone trouble.
- q. Optional module (Model CAM Janus Fire Systems P/N 18632) to convert one (1) Class B indicating circuit to one (1) Class A Circuit.
- r. Optional module (Model CA2Z Janus Fire Systems P/N 18631) to convert two (2) Class B initiating circuit to two (2) Class A circuits.
- s. Optional module (Model ARM-2 Janus Fire Systems P/N 18633) to provide two (2) Form C contacts.
- t. Optional module (Model ARM-44 Janus Fire Systems P/N 19091) to provide eight (8) Form C contacts.
- u. Battery/Earth fault supervision shall be provided.
- v. Adjustable delay timer shall be available, zero to sixty seconds; the manual release defaults to 30 seconds.
- w. Cross zone option shall be selectable (two zones in alarm before release).
- x. 3 Abort Function options shall be selectable.
- y. Initiating circuit disable feature.
- z. A supervised manual release circuit shall be provided, which when activated shall override the Abort.
- aa. One-man walktest with automatic 30 minute restoration and releasing circuit disable.
- bb. The Power Supply for the Control Panel shall be integral to the Control Panel itself, and shall provide all control panel and peripheral device power needs.

- cc. Input power shall be universal 120 VAC, 60 Hz (165VA) or 220 VAC, 50/60 Hz (185 VA). The power supply shall provide an integral battery charger for use with batteries up to 12 AH.
- dd. The Power Supply shall be designed to meet UL and NFPA requirements for power-limited operation on all indicating and initiating circuits.
- ee. The control panel shall be housed in a cabinet designed for mounting directly to a wall or vertical surface. The back box and door shall be constructed of 18 gauge steel with provisions for electrical conduit connections into the sides and top. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. The cabinet shall be approximately 5 inches deep and 14.25 inches wide. Height shall be approximately 18.5 inches. Space shall be provided in the cabinet for 8.0 AH or 12.0 AH batteries.

5. DETECTORS

- a. The detectors shall be spaced and installed in accordance with the manufacturer's specifications and the guidelines of NFPA 72.
- b. Smoke detectors shall be 24VDC photoelectric (Janus Fire Systems P/N 18635) or ionization (Janus Fire Systems P/N 18636) type.
- c. Each detector shall contain a visual status and alarm indicator for 360° viewing.
- d. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
- e. Built in magnetic detector sensitivity test feature.
- f. Vandal resistant security lock.
- g. Radio frequency and transient protection.

6. MANUAL RELEASE (ELECTRIC)

- a. The electric manual release station shall be a dual action device which provides a means of manually discharging the clean agent fire extinguishing system when used in conjunction with the JFS-C1 control system.
- b. The manual release station shall be Janus Fire System P/N 18703.
- c. The manual release station shall be a dual action device requiring two distinct operations to initiate a system actuation.
- d. The manual release station shall bypass the time delay and abort functions, shall cause the system to discharge and shall cause all release and shutdown devices to operate in the same manner as if the system had operated automatically.
- e. The manual release station faceplate shall include the type of agent to be discharged and operating instructions. The letters shall be silk-screened in a contrasting color.
- f. A manual release station shall be located at each exit from the protected hazard.

7. MANUAL RELEASE (MECHANICAL)

- a. Mechanical Manual Release shall be made available in the event all battery back-up and commercial power is lost. Janus Fire Systems P/N 17001, Manual Valve Actuator, shall be installed atop the electric valve actuator. Consideration should be given for convenience of operation and egress from the hazard area(s).

8. ABORT STATION
 - a. The Abort Station shall be "Dead Man" type and shall be located next to each manual release station.
 - b. Locking" or "Keyed" abort stations shall not be permitted.
 - c. The Abort Station shall be Janus Fire Systems P/N 18847.
 - d. Operating instructions shall be silk-screened onto the faceplate material in a contrasting color.
 - e. The Abort Station shall be located adjacent to each manual station and can be furnished with a Manual Release Switch (Janus Fire Systems P/N 18850). To avoid confusion, the Abort Station shall appear distinctly different from a fire alarm manual station.
9. AUDIBLE and VISUAL ALARMS
 - a. Audible alarm and visual signal devices shall operate from the JFS-C1 Control Panel.
 - b. Alarms shall operate on 24 VDC nominal polarized.
 - c. Audible alarms shall provide continuous or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.
 - d. A Strobe device shall be placed outside, and above, each exit door
10. BATTERIES
 - a. Shall be 12.0 volt, Gell-Cell type (2 required).
 - b. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure. Optional battery power for ninety hours
 - c. The batteries are to be completely maintenance free.
11. ELECTRICAL INSTALLATION
 - a. Installation shall be in accordance with the NFPA 70 (NEC), NFPA 72, NFPA 2001, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
 - b. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
 - c. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
 - d. At the final inspection a factory trained representative of the manufacturer of the major equipment shall perform the all tests required.
 - e. Conduit installation shall be in accordance with The National Electrical Code (NEC), local and state requirements

C. DOCUMENTATION AND TESTING

1. SYSTEM INSPECTION AND CHECKOUT

- a. After the system installation has been completed, the entire system shall be checked out, inspected and functionally tested by qualified, trained personnel, in accordance with the manufacturer's recommended procedures and NFPA standards.
- b. All containers and distribution piping shall be checked for proper mounting and installation.
- c. All electrical wiring shall be tested for proper connection, continuity and resistance to earth.
- d. The complete system shall be functionally tested, in the presence of the owner or his representative, and all functions, including system and equipment interlocks, must be operational at least five (5) days prior to the final acceptance tests.
- e. Each detector shall be tested in accordance with the manufacturer's recommended procedures, and test values recorded.
- f. All system and equipment interlocks, such as door release devices, audible and visual devices, equipment shutdowns, local and remote alarms, etc. shall function as required and designed.
- g. Each control panel circuit shall be tested for trouble by inducing a trouble condition into the system.

2. TRAINING REQUIREMENTS

- a. Prior to final acceptance, the installing contractor shall provide operational training to each shift of the owner's personnel. Each training session shall include control panel operation, manual and (optional) abort functions, trouble procedures, supervisory procedures, auxiliary functions and emergency procedures.

3. OPERATION AND MAINTENANCE

- a. Prior to final acceptance, the installing contractor shall provide complete operation and maintenance instruction manuals, two (2) copies for each system, to the owner. All aspects of system operation and maintenance shall be detailed, including piping isometrics, wiring diagrams of all circuits, a written description of the system design, sequence of operation and drawing(s) illustrating control logic and equipment used in the system. Checklists and procedures for emergency situations, troubleshooting techniques, maintenance operations and procedures shall be included in the manual.

4. AS-BUILT DRAWINGS

- a. Upon completion of each system, the installing contractor shall provide two (2) copies of system "As-Built" drawings to the owner. The drawings shall show actual installation details including all equipment locations (e.g. control panel(s), agent container(s), detectors, alarms, manuals and aborts, etc.) as well as piping and conduit routing details. Show all room or facilities modifications, including door and/or damper installations completed.

5. ACCEPTANCE TESTS

- a. At the time "As-Built" drawings and maintenance/operations manuals are submitted, the installing contractor shall submit a "Test Plan" describing procedures to be used to test the control system(s). The Test Plan shall include a step-by-step description of all tests to be performed and shall indicate the type and location of test apparatus to be employed. The

tests shall demonstrate that the operational and installation requirements of this specification have been met. All tests shall be conducted in the presence of the owner and shall not be conducted until the Test Plan has been approved.

- b. The tests shall demonstrate that the entire control system functions as designed and intended. All circuits shall be tested: automatic actuation, solenoid and manual actuation, HVAC and power shutdowns, audible and visual alarm devices and manual override of abort functions. Supervision of all panel circuits, including AC power and battery power supplies, shall be tested and qualified.
- c. A room pressurization test shall be conducted, in each protected space, to determine the presence of openings which would affect the agent concentration levels. The tes
- d. shall be conducted using the Door Fan system with integrated computer program. All testing shall be in accordance with NFPA 2001, Appendix B.
- e. If room pressurization testing indicates that openings exist which would result in leakage and/or loss of the extinguishing agent, the installing contractor shall be responsible for coordinating the proper sealing of the protected space(s) by the general contractor or his sub-contractor or agent. The general contractor shall be responsible for adequately sealing all protected space(s) against agent loss or leakage. The installing contractor shall inspect all work to ascertain that the protected space(s) have been adequately and properly sealed. If the first room pressurization test is not successful, in accordance with these specifications, the installing contractor shall direct the general contractor to determine, and correct, the cause of the test failure. Copies of successful test results shall be submitted to the owner for record. Upon acceptance by the owner, the completed system(s) shall be placed into service.

6. SYSTEM INSPECTIONS

- a. The installing contractor shall provide two (2) inspections of each system, installed under this contract, during the one-year warranty period. The first inspection shall be at the six-month interval, and the second inspection at the 12-month interval, after system acceptance. Inspections shall be conducted in accordance with the manufacturer's guidelines and the recommendations of NFPA 2001.
- b. Documents certifying satisfactory system(s) operation shall be submitted to the owner upon completion of each inspection.

7. WARRANTY

- a. All Janus Fire Systems components furnished and installed under this contract shall be warranted against defects in design, materials and workmanship for the full warranty period which is standard with the manufacturer, but in no case less than one (1) year from the date of system acceptance.

2.14 PREACTION SYSTEM

- A. A preaction system shall be provided. The method of release of the deluge valve priming water pressure shall be released by an activation of the supplemental detection system only. The pressure system riser shall be of a listed and approved assembly. The system riser shall be equipped with a rubber seated check valve downstream of the deluge valve and prior to the supervisory air connection. The preaction system shall be provided with all necessary appurtenances to complete the system. The system shall be installed in conformance with the

most current Edition of N.F.P.A. 13, Standard for Installation of Sprinkler Systems. The Preaction System shall be of the Single Interlock type.

B. System Devices

1. Water Control Valve: Preaction systems shall utilize a 90 (infinity) pattern type of deluge valve. Deluge valve shall employ a positive vent on the priming line to ensure that the deluge valve will not prematurely reset. Inlet and outlet connections of deluge valve can be flanged by flanged or flanged by grooved, respectively. Deluge valve shall be U.L. listed and Factory Mutual approved. Deluge valve shall have a working pressure of 175 PSI. Valve trim shall be compatible and shall be installed following the manufacturer's specifications. Deluge valve manufacturer to be Viking Corporation. Deluge Valve Model to be E-1.
2. Pneumatic Actuator: Preaction system utilizing pneumatic release detectors shall employ a pneumatic actuator between the detection and the operating systems. The device shall actuate a release in the deluge valve priming water supply. The actuator of the pneumatic release system shall be U.L. listed and Factory Mutual approved for use with the deluge valve installed. Pneumatic actuator manufacturer to be Viking Corporation. Pneumatic actuator model to be H-1.
3. Solenoid Valve: Deluge valve priming water release device shall be an electrically operated solenoid valve when electric releases are used as the supplemental detection system. Solenoid valve shall be constructed of a ½" brass body with a stainless steel core tube, core, plugnut and springs. Solenoid valve shall have a maximum working pressure of 175 PSI. Solenoid valve shall be U.L. listed for its intended use. Solenoid valve shall be listed for use with Viking Model E. Deluge Valves and Viking Model H Flow Control Valves.
4. System Control Valve: Preaction system control valve shall be a listed indicating type valve. Control valve shall be U.L. listed and Factory Mutual approved for fire protection installations. System control valve shall be rated for normal system pressure but in no cases less than 175 PSI.
5. Compressed Air Supply: An air supply capable of restoring system pressure within 30 minutes shall be provided. A riser mounted air compressor with an air maintenance device between the air compressor and the air supply inlet on the system riser.
6. Supplemental Detection System: A supplemental detection system shall be provided for all preaction systems.
7. System Check Valve: Check valves shall be U.L. listed and Factory Mutual approved for use on fire protection systems. Sprinkler riser check valves shall be manufactured with supply side and system side gauge connections and a main drain outlet in conformance with N.F.P.A. 13 Standard for installation of Sprinkler Systems. Check valves shall be constructed of a ductile iron body with a brass seat and a rubber faced clapper assembly hinged to a removable access cover. Check valves shall be equipped with a removable access cover for periodic inspection as required in N.F.P.A. 25, Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems. Check valves shall have a working water pressure of 250 PSI. Check Valve manufacturer to be Viking Corporation. Valve model to be F-1 Easy Riser Check Valve.
8. Fire Department Connection: A system fire department connection shall be provided on the system riser in accordance with N.F.P.A. 13, Standard for Installation of Sprinkler Systems. Fire department connection shall be of a brass body with an integral clapper assembly to separate flow between inlets. Fire department connection shall be installed in an area accessible for the first response unit. Fire department connection shall be U.L. listed and Factory Mutual approved for fire protection use.
9. High-Low Air Pressure Switch: Supervisory air pressure shall be maintained on all preaction systems with 20 sprinklers or more on the system piping. Low air pressure alarm will

activate by way of a pressure supervisory alarm pressure switch. The low air pressure alarm switch shall be compatible with system devices. Low air pressure alarm switch enclosure shall be U.L. listed and Factory Mutual approved for the application in which it is used. Low air pressure alarm switch shall have the ability to be wired for Class A or Class B service. Low Air Pressure Alarm Switch shall be Viking, part number 09472 or 09473.

10. Water Flow Pressure Switch: Water flow will activate an alarm by way of an alarm pressure switch. The alarm pressure switch shall be compatible with system devices. Alarm pressure enclosure shall be U.L. listed and Factory Mutual approved. Alarm pressure switch shall have the ability to be wired for Class A or Class B service. Alarm Pressure Switch shall be Viking, part number 01123A.
11. Water Motor Alarm: Water flow will activate a hydraulic powered water motor alarm by way of integral valve alarm line trim piping. Water motor gong shall be connected to a water pressure retarding chamber to limit the propensity of unnecessary alarms. Water motor alarm shall be equipped with a rear closure plate to limit the access of foreign materials or accumulation of debris. Water motor alarm shall be U.L. listed and Factory Mutual approved for the application in which it is used. Water Motor Alarm manufacturer to be Viking Corporation. Water Motor Alarm Model to be F-2.
12. Deluge Valve Release Panel: System release panel shall be capable of a dual hazard split release, dual hazard combined release, single hazard cross zone release, single hazard two zone release. Release panel shall be equipped with a local tone alarm to annunciate loss of A/C power, system trouble, circuit trouble and low auxiliary D/C power supply. Release panel shall be capable of supervising trouble and audible alarms. Trouble and alarm audible alarms shall be able to be silenced at release panel. Release panel shall be housed in a vented enclosure with ambient temperature compatibility of 32 (infinity) F to 120 (infinity) F. Panel enclosure shall be of adequate size to house auxiliary D/C power supply. Auxiliary D/C power supply shall consist of (2) 12 volt lead acid batteries of the same ampere hour rating. Actual ampere hour rating to be established by auxiliary D/C power requirement. Release Panel shall be a Viking B-1 Par-3 Panel.
13. Air Maintenance Device: Air supplies provided for sprinkler systems shall be equipped with an automatic air pressure maintaining device. Air maintaining device shall be equipped with an air supply bypass with a field adjustable air pressure regulator with a built in ball check valve to eliminate air loss when system is in service. Air maintenance device shall have a factory setting of 40 PSI. Air Maintenance Device manufacturer to be Viking Corporation. Air Maintenance Device Model to be E-1.
14. Compressor: Provide preaction system air pressure maintenance compressor, sized to pressurize the system to 40 psi within 30 minutes. Air compressor to be riser mounted, 1/6 HP, similar to Viking model F-1 maintenance air compressor.
15. All detector and device wiring is by the fire protection contractor. The electrical contractor shall provide panel, air compressor power, and a single fire alarm and trouble signal to the releasing panel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform hydrant flow tests in accordance with NFPA 291 for use with hydraulic calculations.

3.2 PIPE SIZING

- A. Feed mains

1. As part of the work, confirm the pipe sizing shown on the drawings with hydraulic calculations using the Hazen-Williams correlation in accordance with NFPA 13.
2. The calculations shall confirm that the design criteria can be met with a minimum 10 psi "safety factor".

B. Sprinkler piping

1. Sprinkler mains including the floor control valve assembly shall be no smaller than as indicated on the drawings.
2. As part of the work, sprinkler branch piping shall be sized based upon hydraulic calculations using the Hazen-Williams correlation in accordance with NFPA 13.
3. As part of the work, sprinkler piping downstream of and including floor control valve assemblies shall be sized based upon hydraulic calculations using the Hazen-Williams correlation in accordance with NFPA 13.
4. Pipe sizing shall be based upon hydraulic calculations for each design criteria shown on the drawings.
5. Pipe sizing shall be such that the system demand can be met with a minimum 10 psi "safety factor".
6. An outside hose stream allowance of 250 shall be added at the connection to the city main.
7. Velocity in sprinkler piping shall not exceed 21 feet per second.

C. General

1. Do not perform pipe sizing calculations prior to submitting water supply flow test results for review.

3.3 PIPE AND FITTINGS

A. Applications

1. Piping between fire department inlet connection and check valve shall consist of galvanized schedule 10 black carbon steel rolled groove pipe with galvanized mechanical grooved fittings and couplings.
2. Welded outlets shall be permitted on sprinkler mains and branches.
3. Sprinkler drain piping shall be assembled as Sprinkler.
4. Provide flanges and flanged fittings of appropriate duty at valves and equipment as necessary.

3.4 GENERAL SYSTEM

A. Beam Clamps - Install all beam clamps with retaining straps.

B. Fire Stopping - Provide through penetration fire stops in accordance with local building code requirements at pipe penetrations through rated walls, floors and assemblies.

C. Watertight Penetrations

1. In general, exterior wall and floor penetrations shall be required to be watertight. Coordinate with other sections for other locations that may require special penetration requirements, such as roof assemblies.
2. Unless specified otherwise in other Sections, watertight penetrations shall consist of a sleeve (extending 2 inches above finish floor), watertight sealant continuous around the circumference of the sleeve at the sleeve/slab interface, and mechanical link assembly filling the annular space between the penetrating pipe and sleeve.

- 3. Where penetrations are required to be both watertight and fire rated, the combined assembly shall be in agreement with the UL listing and FM approval of the through penetration fire stop to be used.
 - D. Gauges and Pressure Switches - Install with isolation valves to allow for removal of device without interrupting water supply to system. Supervise valves as indicated on drawings.
 - E. Drain Valves - Install main and auxiliary drain valves on system low points of appropriate type and size in accordance with NFPA 13.
- 3.5 SEISMIC RESTRAINT ASSEMBLIES
- A. Install seismic restraint systems in accordance with the NFPA 13 requirements for Protection of Piping against Damage due to Earthquakes.
 - B. Install seismic separation assemblies in accordance with NFPA 13 where piping crosses building seismic joints.
- 3.6 ADJUSTING OF VALVES
- A. Install all valves in locations that are readily accessible. Install system control valves in areas that allow for safe fire department access during emergency conditions.
 - B. Provide all valves with permanent tags that indicate the valve-number and function.
 - C. Install indicating valves such that indicator is clearly visible from the floor level below.
- 3.7 BACKFLOW PREVENTERS
- A. Install backflow preventers in accordance with local Water Authority regulations.
- 3.8 SPRINKLERS
- A. Applications
 - 1. Areas open to structure: Pendent or upright standard sprinklers with standard brass finish.
 - B. Install sprinklers such that cover plate or escutcheon is flush against gypsum or acoustical tile as recommended by manufacturer. Correct sprinklers that are not flush by adjusting them in accordance with the manufacturer's instructions and/or re-installing affected portions of the wall or ceiling assembly if required.
 - C. Install sprinklers in accordance with the requirements of NFPA 13 regarding obstructions to sprinkler discharge. All obstructions such as ductwork, piping, lighting, cable trays, floating ornamental ceilings, etc. shall be considered. Adjust sprinkler locations and/or add sprinklers as necessary if obstructions are installed after the installation of the sprinklers and cannot be relocated to accommodate the sprinklers.
 - D. Provide and install guards on sprinklers susceptible to mechanical damage.
 - E. Provide and install baffles to prevent cold soldering of intermediate level sprinklers.
- 3.9 FIRE DEPARTMENT INLET CONNECTIONS
- A. Install an automatic ball drip valve such that piping between the fire department inlet connection and check valve is able to completely drain automatically. Discharge of ball drip shall be piped through exterior wall or an appropriate drain receptacle.
 - B. Review the exact location and mounting height of all connections with a representative of the responding Fire Department. Promptly report in writing any significant adjustments to inlet locations requested by the official.
- 3.10 SIGNALING DEVICES
- A. Adjust the retard setting of flow switches to 45 seconds.

- B. Adjust the alarm setting of pressure switches to 10 psi below normal static water pressure.
- C. Adjust the alarm settings of hi/low pressure switches to 10 psi above and below normal system air pressure.

3.11 COORDINATION WITH FIRE ALARM

- A. Coordinate the interface of all supervisory, alarm and operation functions associated with the sprinkler/standpipe systems described in this Section to the extent that all signals are received and processed as is intended by NFPA 72.
- B. Coordinate this portion of work with the fire alarm work to successfully complete all testing required by NFPA 13 and 72.
- C. Promptly report conflicts with the Fire Alarm portion of work as they arise during installation.

3.12 PIPE IDENTIFICATION

- A. Apply pipe identification markers in accordance with ANSI A13.1.

3.13 TESTING

- A. Schedule testing with a representative of the Owner and Authorities Having Jurisdiction. Tests shall be performed in a manner deemed satisfactory by the Owner and Authorities
- B. Replace components that do not pass tests and reschedule tests procedures to demonstrate compliance.
- C. Perform the following tests in accordance with NFPA 13.
 - 1. Flush sprinkler piping.
 - 2. Hydrostatically test sprinkler piping.
 - 3. Test operation of waterflow detection devices.
 - 4. Main drain flow test.
 - 5. Test operation of control valves.
 - 6. Test pressure-regulating devices.
 - 7. Test operation of the backflow prevention device.
- D. Perform the following tests in accordance with NFPA 24.
 - 1. Hydrostatic testing of the water service piping shall be in accordance with the above referenced standard.

3.14 CONTRACT CLOSEOUT

- A. Provide in accordance with Section 01.7 00 – Contract Closeout.

END OF SECTION 21.00.00

**SECTION 22.00.01
PLUMBING
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**SECTION 22.00.01
PLUMBING**

PART 1 - GENERAL

1.01 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.

1.02 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. Alterations, additions -and/or removal of existing plumbing systems and fixtures within the renovated area in order to conform to new space requirements.
 2. Valves.
 3. Insulation.
 4. Hangers, supports and attachments.
 5. Core drilling for the Work of this Section.
 6. Coordination drawings and record drawings and similar requirements.
 7. Sump pump in basin for fire protection service.
 8. Standpipe drain connection for fire protection preaction service, vent and piping extensions to existing.
- B. Alternates: Not Applicable to this section.
- C. Items To Be Installed Only: Install the following items as furnished by the designated Sections:
1. Section 10.28.13 - TOILET ACCESSORIES:
 - a. Toilet room accessories.
- D. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 03.30.00 - CAST-IN-PLACE CONCRETE for cutting and patching of concrete walls.
 2. Section 23.00.0 – HEATING, VENTILATING AND AIR CONDITIONING for coordination with HVAC piping and ductwork and for condensate drains.
 3. Section 07.92.00 - JOINT SEALANTS fro firestopping.
- 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.

1.03 SUBMITTALS

- A. Comply with requirements specified in Section 01.33.00 – SUBMITTAL REQUIREMENTS.
- B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
 - 1. Plumbing fixtures and trim.
 - 2. Piping.
 - 3. Fittings, unions, flanges, and couplings.
 - 4. Insulation.
 - 5. Valves.
 - 6. Water hammer arrestors.
 - 7. No-hub couplings.
 - 8. Hangers, plates, and inserts.

1.04 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."

1.05 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.

1.06 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.

1.07 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.

1.08 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.

1.09 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.

1.10 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. Factory Mutual Association (FM).
 7. Underwriters' Laboratories (UL).
 8. American National Standards Institute (ANSI).
 9. Compressed Gas Association (CGA).
 10. Canadian Standards Association (CSA).
- 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).

1.11 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 DCAM. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Designer and DCAM's

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 DCAM's 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 DCAM's 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.

1.12 RECORD DRAWINGS

- A. Comply with requirements specified in Section 01.77.00 – 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.

1.13 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. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance.
- B. Furnish three copies of manuals to Designer for approval and distribution to DCAM's 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. Valve directory.
- D. Operating instructions: Upon completion of installation or when DCAM's 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.

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. Sanitary Drainage Piping Above Floor (Soil, Waste, and Vent)

- 1. Piping 2" and larger shall be no-hub service weight cast iron soil pipe except at urinals and cleanouts and joints just prior to exiting the building which shall be service weight hub and spigot with lead and oakum joints.
- 2. Piping 2" and smaller shall be type "L" copper.
- 3. Couplings for joining no-hub cast iron soil pipe: Couplings shall have a shield constructed of corrugated 304 stainless steel and provide a shield thickness of 0.16 inches or greater. Shield shall be a minimum width of 3 inches for pipe sizes 1-1/2 inch through 4 inch, and a minimum width of 4 inches for pipe sizes 5 inch through 10 inches. Couplings with at least 4 sealing bands shall require 80 inch pounds of torque per band. Tightening screws shall be 3/8 inch hexagon head. Couplings with only 2 sealing bands on sizes 1-1/2 inch through 4 inches shall require 125 inch pound of torque per band. Gaskets shall be neoprene rubber conforming to ASTM C-564.
- 4. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fitting and lead free solder and non-corrosive flux.
- 5. Connections between earthenware of any fixture and flanges in soil and waste piping shall be made absolutely gas and watertight with closet setting compounds and gaskets which must be absolutely gas and fireproof, watertight, stainproof, containing neither oil nor asphaltum and which will not rot, harden or dry under any extreme climatic change, and must adhere on wet surfaces.

C. Water Piping (Domestic)

- 1. Above Ground
 - a. 2-1/2 inches and smaller shall be hard drawn Type L copper with wrought or cast copper fittings.

- b. 3 inches and larger may be hard drawn Type L copper with roll grooved mechanical couplings.
- c. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fitting and lead free solder and non-corrosive flux.
- d. Provide galvanized malleable iron unions, with bronze facings conforming to ANSI B16.39 for sizes 2 inch and smaller.
- e. Provide steel flanges conforming to ANSI B16.5, standard or welding neck pattern.

D. 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: Full port ball type.

B. Valves in the interior domestic water piping systems (cold water, hot water) and gas 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 approved 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, full 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, full 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.

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., Elecen Metal Products or approved 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"

- 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. 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.
- J. 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.

- K. Hanger rods for other installations shall be sized in accordance with the recommended load capacities of ASTM Specifications Designation A-107, latest amendment.
- L. 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.
- M. Exposed rods, clamps and hangers shall be electrogalvanized coated.
- 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.

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 PIPE COVERING

A. General

1. The pipe covering specified herein for piping system shall be provided to strict accordance with the manufacturer's printed instructions, the best practice of the trade and to the full intent of this Specification.
2. Flame/Smoke Ratings: Provide complete fibrous glass pipe insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
3. Manufacturer: Subject to compliance with requirements, provide products of Armstrong World Industries, Inc., Knauf Fiber-Glass, Owens Corning or approved equal.
4. Apply insulation after systems have been tested, proved tight and approved by Designer. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.
5. No leaks in vapor barrier or voids in insulation will be accepted.
6. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and ping, to provide firestop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

B. Interior Hot and Cold Water:

1. 1" thickness fiberglass piping insulation:
 - a. ASTM E-547, Class I
2. Fire retardant foil face jackets for ping insulation: ASTM C-921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at installation option.

3. Encase piping fittings insulation with one piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
4. Encase exterior piping insulation with aluminum jacket with weatherproof construction.
5. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

2.06 CLEANOUTS

- A. Cleanouts shall be Jay R. Smith, Josam, Zurn or approved equal.
- B. Bodies of cleanout ferules in hub and spigot or no-hub piping shall be standard pipe size conforming in thickness to that required for pipe and fittings, and shall extend not less than 3/4 inch above the hub of the pipe. The cleanout plug shall be of cast brass and shall be provided with a raised nut 3/4 inch high. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of the same size as the pipe line. Cleanouts in threaded waste piping shall be cast iron drainage "T" pattern 90 degree branch fittings with extra heavy brass screw plugs of the same size as the pipe.

2.07 PLUMBING FIXTURES

- A. In general, the work of this Article shall include, but not be limited to:
 1. Plumbing fixtures and trim.
 2. Faucets.
 3. Stops and supplies.
 4. Traps and tailpieces.
 5. Drain outlets.
 6. Shower assemblies.
 7. Flow controls.
 8. Carriers and supports.
 9. Lavatory insulators.
- B. Fixtures and Trim
 1. Acceptable Manufacturers: Submit manufacturers not listed below for review and approval as specified for substitutions in Article Quality Assurance in this Section.
 - a. Vitreous China: Zurn, American Standard, Crane or Kohler.
 - b. Faucets: Symmons, Chicago Faucet Co., Kohler or T & S Brass.
 - c. Self Closing Faucets: Chicago Faucet Co., Kohler or Symmons.
 - d. Carriers and Supports: Jay R. Smith, Wade, or Zurn.
 - e. Stops and Supplies: Chicago Faucet Co., Kohler or McGuire.
 - f. P-Traps: McGuire, Sanitary-Dash, or Jameco.
 - g. Security Fixtures: Acorn, Willoughby, or Metcraft.
 - h. Handicap Lavatory Insulators: Plumberexx, TCI Products or Truebro.
 2. Fixture Trim and Accessories: Provide fixtures complete with floor mounted fixture carrier supports; faucets, flushometers; drain outlets, tailpieces, P-traps and stops and supplies.
 - a. Color and Finish: All trim exposed to view shall be polished chrome plated, and all fixtures and toilet seats shall be white unless specified otherwise.
 - b. Drain Outlets: Provide drain outlet of the same manufacturer as the fixture or faucet trim with chrome plated 17 gauge minimum weight tailpiece.
 - 1) Provide 1-1/4 inch tailpiece on lavatories.
 - 2) Provide 1-1/2 inch tailpiece on sinks.

- 3) Provide offset drain outlets on handicapped use lavatories and sinks.
3. P-Traps: Cast brass adjustable P-trap with cleanout plug, ground joint and 17 gage minimum weight extension with escutcheon.
 - a. Provide McGuire No. 8090 1-1/4 inch by 1-1/2 inch on lavatories.
 - b. Provide McGuire No. 8089 1-1/2 inch by 1-1/2 inch on sinks.
4. Stops and Supplies: Provide stops and supplies of the same manufacturer as the fixture or faucet trim, or provide McGuire Model 170-LK loose key angle stop with 5 inch long 2 inch nominal copper sweat extension, bell escutcheon, and 3/8 inch O.D. by 12 inch flexible riser.
5. Flushometers: Diaphragm operated, cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified.
6. Water Conservation: Provide water conserving fixtures and trim in compliance with the following maximum water use requirements. Provide Omni or equal variable pressure flow controls on showers, sinks, and lavatory faucets.
 - a. Public lavatories: 0.5 gpm
 - b. Water Closets: 1.6 gallons per flush.
7. Fixture Supports: Provide floor mounted fixture support carriers for wall mounted fixtures including but not limited to: water closets.
8. Toilet Seats: Provide extra heavy-duty, commercial/industrial type, elongated, open front, solid white injection molded plastic with integral bumpers; and self-sustaining stainless steel check hinges.
 - a. Acceptable Manufacturers: Bemis, Beneke, or Church.

2.08 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.

2.09 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	3/4 inch	8 inches
2-1/2 inches to 6 inches	1-1/4 inch	12 inches

3. Plumbing Systems: Provide color-coded identification markers in compliance with the following schedule with contrasting legend letters.

Service	Identification	Color Code
Cold Water	Dom. Cold Water	Green
Hot Water	Dom. Hot Water	Green
Soil or Waste	Sanitary	Yellow
Vent	Plumbing Vent	Yellow

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.

3.02 DISINFECTION, CLEANING AND ADJUSTING

A. Disinfection

1. Each potable water system (cold and hot water) shall be cleaned and disinfected by this Contractor. Cleaning and disinfection shall be performed after all pipes, valves, fixtures and other components of the systems are installed, tested and ready for operation.

2. All hot and cold water piping shall be thoroughly flushed with clean potable water, prior to disinfection, to remove dirt and other contaminants. Screens of faucets shall be removed before flushing and re-installed after completion of disinfection.
3. Disinfection shall be done using sodium hypochlorite in the following manner:
 - a. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of disinfecting agent into main water supply is not permitted.
 - b. All sectional valves shall be opened during disinfection. All outlets shall be fully opened at least twice during injection and the residual checked with orthotolidin solution.
 - c. When the chlorine residual concentration, calculated on the volume of water the piping will contain indicated not less than 50 ppm (parts per million) at all outlets, then all valves shall be closed and secured.
 - d. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.
 - e. After the retention, the residual shall be not less than five parts per million. If less, then the process shall be repeated as described above.
 - f. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolidin tests shall be not greater than the incoming water supply. (This may be zero.)
4. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:
 - a. Name and location of the job and date when disinfection was performed.
 - b. Material used for disinfection.
 - c. Retention period of disinfectant in piping system.
 - d. ppm chlorine during retention.
 - e. ppm chlorine after flushing.
 - f. Statement that disinfection was performed as specified.
 - g. Signature and address of company or person performing disinfection.
5. Upon completion of final flushing (after retention period) the plumbing subcontractor shall obtain a minimum of one water sample from each hot and cold water line and submit samples to a State-approved laboratory. Samples shall be taken from faucets located at highest floor and furthest from meter or main water supply. The laboratory report shall show the following:
 - a. Name and address of approved laboratory testing the samples.
 - b. Name and location of job and date the samples were obtained.
 - c. The coliform organism count. (An acceptable test shall show the absence of coliform organisms.)

6. If analysis does not satisfy the above minimum requirements, the disinfection procedure shall be repeated.
 7. Before acceptance of the systems, this Contractor shall submit to DCAM's Project Manager for his review, three (3) copies of Certification of Performance as specified above.
 8. Under no circumstances shall this contractor permit the use of any portion of domestic water systems until properly disinfected, flushed and certified.
- B. Cleaning and Adjusting
1. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by operation of the system for testing.
 2. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings due to the Plumbing sub-contractor's failure to properly clean the piping system shall be repaired by this Contractor at no increase in Contract costs.
 3. At the completion of the work, all water systems shall be adjusted for quiet operation.
 4. All automatic control devices shall be adjusted for proper operation.
 5. All plumbing fixtures and exposed metal work shall be cleaned and polished. Floor drain strainers and traps shall be cleaned of all debris.
 6. All items of equipment shall be thoroughly inspected. Any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Designer and DCAM's Project Manager for inspection and approval.

3.03 SYSTEMS

- A. Sanitary Waste System
1. The Plumbing subcontractor shall be responsible for checking each pipe for alignment, center line elevation and invert grade for underground installations.
 2. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the Project Manager so that no trench water, earth or other substance will enter the pipe or fittings.
 3. Sanitary drainage piping three inches and smaller in diameter shall pitch a minimum of 1/4 inch per foot. Piping four inches and larger in diameter shall pitch a minimum of 1/8 inch per foot.
 4. The changes in direction of each drainage system shall be made with "Wye" branches and 1/8 bends. Provide long sweep bends at bottom of stacks with a vertical cleanout just above the floor at places where a "Wye" and 1/8 bends and end cleanouts cannot be installed.
 5. Every fixture shall be separately trapped and the traps must be vented unless an approved battery vented system is being installed. Floor drains shall be considered as a fixture.
 6. Vents shall be connected to the discharge of each trap in the sanitary system, thence carried individually to a point above the flood level of the fixture before connecting with any other vent pipes. Pitch the branch vents back to the fixture.

7. Collect individual vent pipes together in branch vent lines and connect to vent stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The vents passing through the roof shall be a minimum size of four inches in diameter.
8. Cleanouts shall be provided in drainage piping at changes in directions, at foot of stacks or other required points accessible for cleaning or rodding out.
9. Cleanouts shall be of the same size as the pipe installed in up to four inches in diameter and not less than four inches in diameter for piping larger than four inches in diameter.
10. The maximum horizontal distance between cleanouts in piping four inches in diameter and smaller shall not be more than 50 feet apart. In piping five inches in diameter and larger, cleanouts shall not be more than 100 feet apart.
11. Traps on sanitary piping not integral with fixtures and in accessible locations shall be provided with a brass trap screw protected by the water seal, and will be regarded as a cleanout.
12. Test tees with brass cleanout plugs shall be provided at the foot of all vertical soil, waste and storm drainage stacks and at each floor. Wherever cleanouts on vertical lines occur concealed behind finished walls, they shall be extended to back of finished wall, and a wall plate shall be provided.

B. Cold and Hot Water Piping

1. 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.
2. Provide shock absorbers at each individual or each group of fixtures.
3. 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.
4. 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.
5. Piping connections to equipment shall be provided with unions or flanges to permit convenient disassembly for alterations and repairs.
6. 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.
7. 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.
8. Pipe shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing.
9. Cutting and Patching
 - a. Cutting and patching shall be performed under other Sections. Locate all other than cored openings required for the installation of the Medical Gas Systems. Indicate the size and exact location of the opening required for the work of other Sections. Coordinate the opening with the work of the other trades so as not to interfere with their work. Thoroughly investigate the

existing conditions in the vicinity of the required openings as much as possible.

- b. Patching of the existing walls around openings shall be performed by the respective trade responsible for the finish material in which the opening is made.

10. System Shutdowns

- a. Coordinate shutdowns of existing systems with DCAM's Project Manager, and submit a written request at least ten working days in advance of the proposed shut-down. Minimize system shut downs as much as possible. Submit a list of all affected areas, the proposed work to be performed, and the expected length of the shut-down, including time for retesting and certification.
- b. Coordinate the requirements for retesting and certification of the existing system.

3.04 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.
- 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. Pipe Covering Installation

- 1. Before pipe covering is applied, all pressure tests shall have been performed and approved by the Local Plumbing Inspector.
- 2. Pipe covering shall be applied over clean, dry surfaces.
- 3. Pipe covering shall be continuous and shall be carefully fitted with side and end joints butted firmly and tightly together and finished as specified herein.
- 4. Pipe covering and auxiliaries shall be kept dry during storage and application.
- 5. Adhesives, cements and coatings shall not be applied when the ambient temperature is below 40 degrees Fahrenheit.
- 6. Valve bodies shall have covering applied up to the stem.
- 7. It is the intent of this Specification that all vapor barriers be sealed and be continuous throughout. Staples shall not be used on vapor barrier jackets.
- 8. Where pipe covering ends occur at equipment or fixtures, end caps on the covering shall be provided.
- 9. Adequate operating clearances shall be provided at control mechanisms.
- 10. Pipe covering for flanges shall overlap the adjoining pipe by a minimum of three inches on each side.
- 11. Pipe covering shall be provided on all piping passing through ceilings and through the interior above ground sleeves (wall and floor).
- 12. All voids and seams in insulation shall be filled with insulating cement and finished as specified herein.
- 13. End joints of each section of the installed pipe covering shall be tightly butted.

D. 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.

E. 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.

F. Installation of Plumbing Fixtures

1. General:
 - a. Refer to Architectural Drawings for locations and mounting heights of all plumbing fixtures.
 - b. Provide with all plumbing fixtures, all trim, supports, fittings, connections and all incidentals necessary to make a complete installation in accordance with plumbing codes and the Contract Documents.
 - c. All visible hanger nuts and all escutcheons shall likewise be chrome-plated over nickel plate.
2. Examination:
 - a. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.

- b. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- c. Do not proceed until unsatisfactory conditions have been corrected.

3. Fixture Roughings

- a. Install rough plumbing including fixture carriers and supports, valves and water hammer arrestors within chase tolerances. Supply roughing through finish walls and at hose bibbs and shower heads shall be secure and free of movement. Locate valves and water hammer arrestors within 12 inches of approved access panel location.
- b. Align exposed waste and supply pipe roughings with fixture connections within 1 inch tolerance. Provide flush valves in alignment with the fixture, without vertical or horizontal offsets. Obtain fixture manufacturer roughing data sheets for recommended roughing dimensions.
- c. Provide fixture templates for casework contractor for counter mounted sinks and lavatories.
 - 1) Rough handicapped use water closets to locate the flush valve handle on the wide side of the toilet stall.
- d. Secure fixture supports to floor slab construction with lag bolts and metal expansion shields to support at least 250 pounds on the front rim of the fixture for 5 minutes.
- e. Mounting Heights:
 - 1) Handicapped Use Water Closets: 17 inches to rim.
 - 2) Handicapped Use Lavatories: 34 inches maximum to rim with at least 29 inches from finish floor to bottom of apron.
- f. Provide fixture rough-in piping connections sizes in accordance with the following schedule:

	HW	CW	S or W
Water Closets	-	1 inch	4 inches
Lavatories	2 inch	2 inch	12 inches

4. Fixture Supports

- a. All fixtures shall be supported and fastened to the building structure. The method of support for each type fixture shall be specified herein, except when the fixture designations on the Contract Drawings indicate modifications.
- b. Installations shall be complete with all necessary bolts, nuts and washers, iron or brass connecting nipples between fixtures and piping system of the proper length and graphite non-asbestos gaskets for closet connections.
- c. Where wall hung fixtures are secured to masonry walls or partitions, they shall be fastened with 1/4 inch through bolts provided with nuts and washers at back. Bolt heads and nuts shall be hexagon and exposed bolts, nuts, washers and screws shall be chromium-plated brass.
- d. Where secured to concrete or brick walls, they shall be fastened with brass bolts or machine screws in lead sleeve type expansion shields and shall

extend at least three inches into solid concrete or brick work, except fixtures specified to be supported or chair carriers.

5. Installation of Fixtures

- a. Mount fixtures level at elevations shown on architectural drawings. Refer to toilet room elevations and casework details.
- b. Install handicapped use fixtures in accordance with the requirements to the Architectural Access Board Code and ANSI A117.1. Insulate hot water supply and waste piping under lavatories.
- c. Grout wall and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.
- d. Caulk deck-mounted trim at the time of assembly, including fixture and casework mounted. Caulk self-rimming sinks installed in casework.

6. Fixture Trim:

- a. All materials specified to be chromium plated shall be thoroughly cleaned and polished before plating, and plate shall be heavily, thoroughly and evenly applied, guaranteed not to strip or peel.
- b. Where escutcheons are not furnished with plumbing fixtures, this Contractor shall supply them. Escutcheons shall be the type and material specified herein.
- c. Each fixture shall be separately trapped using the type and size of trap specified herein and required by the Plumbing Code.
- d. Unless otherwise specified, faucets and all exposed fittings shall be chromium plated. Chromium plating for brass shall be applied on a first plating of nickel.
- e. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture.
- f. All brass shall conform to brass tubing and shall be not less than No. 17 gauge.

7. Adjustments and Cleaning

- a. After completion of the installation work and equipment start-ups, perform the necessary adjustments to systems installed under this Section. Submit verification that systems are operating at the specified temperatures and pressures.
- b. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- c. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.
- d. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.
- e. Replace washers of leaking and dripping faucets and stops.

- f. Open fixture stops, and clean faucet aerators.
 - g. Adjust metering faucets to deliver a maximum of 1/4 gallon of hot water at a rate of 2 gpm and operate for at least 10 seconds upon activation.
 - h. Temperature adjustments: Adjust pressure balanced mixing valves at showers to provide a maximum temperature of 112 degrees F. Adjust metering faucets in public toilet rooms to provide a maximum temperature of 110 degrees F.
 - i. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.
8. Protection
- a. Provide protective covering for installed fixtures and fittings.
 - b. Do not allow use of fixtures for temporary facilities, except when approved in writing by DCAM's Project Manager.

3.05 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 DCAM's 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 DCAM's 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. 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.

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. 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.
- 4. 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. 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.
- C. 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.
- D. 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.

3.08 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.

3.09 CLEANING

- A. Piping
 - 1. Furnish pipe cleaning chemicals, chemical feed equipment, materials and labor necessary to clean piping.
 - 2. Maintain continuous blow down and make-up, as required during flushing operation.

3.10 SYSTEM SHUTDOWNS

- A. Coordination shutdowns of existing systems with the owner 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 affected areas, the proposed work to be performed, and the expected length of the shut-down including time for retesting.

3.11 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.

END OF SECTION

DIVISION 23 - HVAC

**SECTION 23.00.00
HVAC WORK**

(FILED SUB-BID REQUIRED)

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.
- B. Filed Sub-bids
 - 1. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
 - 2. Sub-bidders must be DCAM Certified in the listed trade and shall include a Current DCAM sub-bidder Certificate of Eligibility and a signed DCAM Sub-bidder's Update Statement with the bid.
- C. Sub Sub-Bid Requirements: None under this Section.
- D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings: M0, M1, M2.

1.2 SUMMARY

- A. Perform work and provide material and equipment as shown on the drawings, as specified and in accordance with this Section. Completely coordinate work of this Division with work of others and provide a complete and fully functional installation.
- B. Drawings and Specifications form complimentary requirements. Provide work specified and not shown, 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.
- C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction. Perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.
- D. Examine Drawings and other Sections of Specifications for requirements that affect work of this Section.

1.3 CONTRACT DOCUMENTS

- A. Listing of Drawings does not limit responsibility of determining full extent of work required by these Contract Documents. Refer to Architectural, HVAC, Plumbing, Fire Protection, Electrical, Structural, Site Utility and all 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 an 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, provide all other components and materials necessary to make the systems fully complete and operational.
- E. Data that may be furnished electronically (on compact disk (CD), diskette, electronic mail, or otherwise) is diagrammatic. Electronically furnished information is subject to the same limitation of precision described above. If furnished, electronic data is for convenience and generalized reference, and shall not substitute for sealed or stamped construction documents.

1.4 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications conflict or are unclear, submit clarification request in writing before Award of Contract. Otherwise, Architect'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, submit clarification request in writing before installation. Otherwise, make changes in installed work required for compliance with manufacturer instructions or codes and standards within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, provide material, installation or work that is of the higher standard.
- D. It is the requirement of these contract documents to require provision of 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 or its coordination with other building elements. In these cases, where notification required by Paragraph (A) above has not been submitted, 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 in accordance with the design intent.
- E. In cases covered by Paragraph (D) above, where the contractor believes engineering guidance is needed, submit a sketch identifying proposed solution. Architect shall review, note if necessary, and approve the sketch.
- F. Where discrepancies exist between the mechanical, plumbing, fire protection, and electrical drawings in regards to what trade owns equipment such as disconnects, starters, etc., the discrepancy shall be brought to the Architect's attention in accordance with paragraph (A)

above. If the scope is not resolved prior to the Award of Contract, the Electrical Contractor shall provide such items.

1.5 MODIFICATIONS IN LAYOUT

- A. Drawings are diagrammatic. They indicate general arrangements of mechanical 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. Check Contract Drawings, as well as Shop Drawings, to verify and coordinate spaces in which work of this section will be installed.
- C. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- D. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to paragraphs above. Systems shall be run in a rectilinear fashion.
- E. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

1.6 REQUEST FOR INFORMATION (RFI'S)

- A. Where an RFI is a request to resolve a conflict or an unclarity, or a request for additional detail, contractor's RFI shall include a sketch or equivalent description of contractor's proposed solution, in accordance with paragraphs "Discrepancies in Documents; and "Modifications in Layout" above.
- B. To expedite the processing of RFIs under Division 23, the Contractor shall request an RFI form, or similar form including the same information to the Architect, with a copy to the Engineer. Contractor shall include proposed solution, with sketches as required, in the indicated space on the form.

1.7 RELATED WORK IN OTHER SECTIONS

- A. The following work is not included in Division 23 Sections and shall be performed under other Sections.
 - 1. Cutting and patching of masonry, concrete, tile and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks.
 - 2. Flashing of wall and roof penetrations.
 - 3. Installation of access panels in floors, walls, furred spaces or above ceilings.
 - 4. Electric power wiring for all equipment shall be provided by Division 26 Electrical Work.
 - 5. Installation of circuit breakers (furnished by ATC Contractor) and final electrical panel terminal connections for ATC control power wiring shall be provided by Division 26 Electrical Work.

1.8 CODES, STANDARDS, AUTHORITIES AND PERMITS

- A. Perform work in accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities that have legal jurisdiction over the site.
- B. Prior to work commencement of work, notify State and applicable authorities and submit all of the applicable notifications for construction, operation and/or demolition.
- C. 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 (AIA) (formerly National Board of Fire Underwriters).
 - 5. Occupational Safety and Health Act (OSHA).
 - 6. Underwriters Laboratories (UL)
 - 7. Factory Mutual Association (FM)
 - 8. Owner's Insurance Underwriter.
- D. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME, ANSI, ASTM, and AGA for intended service.
- E. When requirements cited in this Specification conflict with each other or with Contract Documents, most stringent shall govern work. Architect may relax this requirement when relaxation does not violate ruling of authorities that have jurisdiction. Approval for relaxation shall be obtained in writing.
- F. Unless indicated otherwise, the most recent editions of applicable specifications and publications of the following organizations form part of these Contract Documents.
 - 9. American National Standards Institute (ANSI).
 - 10. American Society of Mechanical Engineers (ASME).
 - 11. National Electric Manufacturers Association (NEMA).
 - 12. American Society for Testing and Materials (ASTM).
 - 13. American Water Works Association (AWWA).
 - 14. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
 - 15. Air Moving and Conditioning Association (AMCA).
 - 16. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

- 17. Air Conditioning and Refrigeration Institute (ARI).
 - 18. Thermal Insulation Manufacturers Association (TIMA).
 - 19. Institute of Electrical and Electronics Engineers (IEEE).
 - 20. Insulated Cable Engineers Association (ICEA).
 - 21. Manufacturer's Standardization Society of the Valve & Fittings Industry (MSS)
- G. Secure and pay for all permits and inspections required by the Authorities having Jurisdiction. Secure trade permits prior to beginning work.

1.9 GUARANTEE AND 24 HOUR SERVICE

- A. Guarantee the Work of this Section in writing for one year following the date of Substantial Completion. If the equipment is used for ventilation, temporary heat, or other use prior to initial beneficial occupancy by the Owner, the bid price shall include an extended period of warranty covering the one-year of beneficial occupancy by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to Architect'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 1 and of Paragraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
- C. Replace material and equipment that require excessive service during guarantee period. Excessive service shall be defined as more than 3 service calls for the same material or equipment within a 12 month period.
- D. Provide 24-hour service beginning on the date of Substantial Completion and lasting until the termination of the guarantee period. Service may be provided by a separate service organization subject to Owner 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. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to Owner.
- F. This Paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.

1.10 RECORD DRAWINGS

- A. As work progresses and for duration of Contract, maintain complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Include actual location of existing utilities if they differ from design documents. Record valve tags as they are installed. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, underground (buried) piping routes and supports and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.
- B. Underground and utility work shall be located by distances to landmarks, such as building foundations. Give actual dimensions of everything installed including elevations and elevations at each change in direction.

- 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.
- D. At completion of work, prepare a complete set of record drawings in electronic format. Deliver the following to the Engineer for approval.
 - 1. CD delivered in most current AutoCAD format, or approved format drawings.
 - 2. It is the Contractor's responsibility to configure the drawing layers consistent with the Engineers format for this project.
 - 3. One set of blackline drawings stamped "record" and signed by the appropriate subcontractor. A hard copy of Record Drawings must indicate changes and deviations from design by the use of revision clouds.
- E. The Installing Contractor shall certify Record Drawings for accuracy.
 - 1. The Architect/Engineer will not certify the accuracy of the record drawings - this is the sole responsibility of the contractor.
- F. Each trade shall submit the record set for approval by the Authority Having Jurisdiction in a form acceptable to the Authority, when required by the jurisdiction. Such drawing format size changes, and supplemental information required for the submittal are the requirement of the contractor.

1.11 BULLETINS, MANUALS, AND OPERATING INSTRUCTIONS

- A. Obtain at time of purchase of equipment, electronic versions of operation, lubrication and maintenance manuals for all items. Assemble this literature along with other information in coordinated electronic 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. The manuals shall contain the following:
 - 1. Engineering flow diagrams and controls sequences from project mechanical drawings, approved automatic temperature controls submittal, equipment startup procedures and operational instructions. Startup and operational instructions shall list valves, switches, and other devices used to start, stop and control systems. Describe procedure to be followed in case of malfunctions. 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. Operating instructions: Upon completion of installation, prior to Owner accepting portions of building and equipment for operational use, instruct Owner's operating personnel in operation of systems and equipment. Instruction shall be performed by equipment and controls vendors' factory-trained personnel. Owner shall determine which systems require additional instruction. Duration of instructions for controls shall take equipment through complete cycle of operation (at least five working days or 40 hours of training). Make adjustments under operating conditions.

1.12 SUBMITTALS

- A. This Paragraph supplements Division 1.
- B. Submittal Cover Sheet:
 - 1. Shop drawings shall be submitted with a separate cover sheet completed for each product, rather than one cover sheet for multiple products, whether or not supplied by one manufacturer or vendor.
- C. Submittal Procedures and Format
 - 1. Review submittal packages for compliance with Contract Documents and then submit for review. Review by Contractor is intended to ensure that the shop drawings contain adequate information to verify each specification requirements as well as the performance and dimensional requirements shown on the drawings before submitted to Architect. If a shop drawing is returned with a "rejected" or "revise and resubmit" it indicates the shop drawing was not adequately reviewed by the Contractor. Subsequent submittals shall include a written response to previous items.
 - 2. Submit six sets of each product data shop drawing. After review, five sets of each product data shop drawing will be returned with reviewer's comments attached.
 - 3. Provide additional copies of reviewed shop drawings for full distribution.
 - 4. Shop drawings showing manufacturer's product data shall contain detailed dimensional drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data, alone, is not acceptable), electrical requirements and wiring diagrams. 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.
- D. Acceptable Manufacturers: The Architect's 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. These are acceptable only if, as a minimum, they:
 - 1. Meet all performance criteria listed in the schedules and outlined in the specification. For example, to be acceptable, an air handling unit must deliver equal CFM against equal external static pressure using equal or less horsepower as the air handler listed in the schedules.
 - 2. Have identical operating characteristics to those called for in the specification. For example, a reciprocating compressor will not be acceptable if a rotary model is specified.
 - 3. 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 that the Architect has determined that the manufacturer's products will fit within the available space - this determination is solely the responsibility of the contractor.

4. 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 architectural enclosures and details, and for diffusers and plumbing fixtures - being the same size and of the same physical appearance as scheduled or specified products.
- E. Responsibility
1. Intent of Submittal review is to check for capacity, rating, and certain construction features. 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 submittals marked "APPROVED" 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 shop drawing errors or deviations from requirements of Contract Documents. Noting of some errors while overlooking others will not excuse proceeding in error. Contract Documents requirements are not limited, waived nor superseded by review.
 2. **INFORM SUBCONTRACTORS, MANUFACTURERS AND SUPPLIERS OF SCOPE AND LIMITED NATURE OF REVIEW PROCESS AND ENFORCE COMPLIANCE WITH CONTRACT DOCUMENTS.**
- F. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project schedule. Working days listed reference the time in the Engineer's office. It does not include transmittal or review time of others. 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.
- G. Material and equipment requiring Shop Drawing and Product Data Submittals shall include but not limited to:
1. Piping, pipe fittings, valves and strainers.
 2. Water system special fittings.
 3. Diffusers, registers, grilles, splitters, dampers and accessories.
 4. Inline fan with filter.
 5. Automatic controls and temperature controls.
 6. Ductwork insulation.
 7. Vibration isolators.

8. Pipe, pipe hangers, sleeves and inserts.
9. Air conditioning unit with built in condenser.
10. Motor starters.
11. Motors.
12. Access panels.
13. Color selection chart for equipment.
14. Complete ductwork construction details and duct construction standards.
15. Identification for pipe, duct, valves and equipment.
16. Charcoal filter and filter housing mounted in the ductwork.

1.13 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. Demolition of existing HVAC system serving the room as shown on drawings.
 2. Sleeves, inserts and hangers.
 3. Flexible connections for vibrating and rotating equipment.
 4. Equipment supports.
 5. Vibration isolators.
 6. Motors.
 7. Sheet metal work.
 8. Complete air distribution system including low pressure ductwork, diffusers, registers, grilles, splitters, dampers, and similar items.
 9. Insulation for duct, piping, equipment and tanks.
 10. Duct mounted filters.
 11. Ventilating air fans.
 12. Condensate drain piping from cooling coil drain pans and individual AC unit drain pans.
 13. Pipe, duct, valve and equipment identification.
 14. Instruction manuals and startup instructions.
 15. Testing and balancing.
 16. Cleaning.

17. Automatic temperature controls and other controls.
 18. Core drilling for the Work of this Section.
 19. Coordination drawings and record drawings and similar requirements.
- B. Items to Be Furnished Only: Furnish the following items for installation by the designated Sections:
1. Section 04.20.00 – UNIT MASONRY:
 - a. Access doors in masonry openings.
 - b. Pipe and duct sleeves for placement into masonry openings.
 2. Section 09.20.00 – GYPSUM BOARD ASSEMBLIES:
 - a. Access doors in gypsum board openings.
 - b. Pipe and duct sleeves for placement into gypsum board openings.
 3. Section 09.51.23 – ACOUSTICAL TILE CEILINGS:
 - a. Access doors in acoustical tile.
 4. Section 26.00.00 – ELECTRICAL WORK:
 - a. Magnetic starters.
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 07.84.40 – PENETRATION FIRESTOPPING for coordination of floor and wall penetrations with firestopping contractor.
 2. Section 09.51.23 – ACOUSTICAL TILE CEILINGS for coordination with acoustical ceilings.
 3. Section 26.00.00 - ELECTRICAL WORK for electrical power to mechanical equipment as indicated on the Drawings.
- D. 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.
- E. Give notices, file plans, obtain permits and licenses, pay fees and backcharges, 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.
- F. Demolition work shall include the following:
1. The contractor shall completely familiarize himself with all existing building and site conditions and limitations which may have a bearing on the operations herein specified, and shall include all work required to complete the project as shown on the drawings. No extra compensation will be allowed for unforeseen conditions that can be determined from a careful examination of the site and areas to be renovated.
 2. Items of value which are not indicated to be returned to the owner shall become the property of the contractor. Storage or sale of items on the project site is prohibited.
 3. Protection: ensure the safe passage of persons in and around the building during demolition. Prevent injury to persons and damage to property. Provide

adequate shoring and bracing to prevent collapse. Immediately repair damaged property to the condition before being damaged. Take effective measures to prevent dust migration.

4. Utilities: maintain all utilities except those requiring removal or relocation. Keep utilities in service and protect from damage. Do not interrupt utilities serving used areas without first obtaining permission from the owner. Provide temporary services as required. Coordinate all work with owner.
5. All work must be coordinated w/ owner prior to any commencement of work.
6. Perform work and provide material and equipment as shown on drawings and as specified in this section of specifications. Give notices, file plans, obtain permits from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with specifications and drawings.
7. Strictly comply with applicable codes, regulations and requirements of authority having jurisdiction.
8. The general contractor shall remove all material debris from the site as it accumulates. Do not store, sell, burn, or otherwise dispose of debris on site. Remove all materials in such manner as to prevent spillage. Keep all pavements and areas adjacent to and leading from the site, clean and free of mud, dirt, and debris at all times.
9. Transfer of responsibility and disposition of materials
 - a. Upon receipt of notice to proceed with the work, the title to all materials for demolition shall be vested in the contractor whereupon the owner will not be responsible for the condition, loss, or damage to said property. All such items shall be removed from the owner's property
10. Clean-up and repair
 - a. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protection and leave interior areas broom clean.
 - b. Repair demolition performed in excess of that required. Return structures and surfaces to existing condition prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.
11. All existing ductwork, equipment, and piping systems serving the building and specified for removal shall be disconnected and dropped to the floor for removal by the general contractor.
12. The associated steam piping shall be disconnected and demolished from the existing unit ventilator and radiators serving the new vault space. The demolition shall include the removal of all hangers.

PART 2 - PRODUCTS

2.1 DUCTWORK

- A. General: Except where applicable codes require more stringent duct construction standards, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC

Duct Construction Standards”. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications and joint types and intervals. Where duct pressure requirements exceed SMACNA “HVAC Duct Construction Standards”, SMACNA Round and Rectangular “Industrial Duct Construction Standards” shall be used. In jurisdictions where codes require different construction standards, comply with the most stringent standard.

1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
2. Tie Rods: Galvanized steel, ¼ inch (6 mm) minimum diameter for 36 inch (900 mm) length or less; 3/8 inch (9 mm) minimum diameter for lengths longer than 36 inches (900 mm).
3. Spin in collars shall not be used.

B. Materials:

1. Sheet metal ducts shall be constructed of hot-dipped galvanized sheet metal with G90 Commercial coating according to ASTM A 653/A 653M unless specified otherwise.

Duct Construction Class	Static Pressure Rating	Pressure	SMACNA Seal Class	SMACNA Leakage Class***	Velocity
2” wg (500 Pa)	2” (500 Pa)	Pos. or Neg.	A	6	2500 fpm (13 m/s) or less
*** Total system leakage shall not exceed 2% of design CFM for return and exhaust ductwork.					

Duct Construction Class	Static Pressure Rating	Pressure	SMACNA Seal Class	SMACNA Leakage Class*	Velocity
2” wg(500 Pa)	2” (500 Pa)	Pos. or Neg.	B	12	2500 fpm (13 m/s) or less
*total system leakage shall not exceed 5% of design CFM.					

C. Rectangular Duct Fittings: General

1. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with applicable SMACNA “HVAC Metal Duct Construction Standard”, 1985, 1st Edition, Figures 2-1 through 2-10 or “Industrial Duct Construction Standards”. All elbows shall be full radius (centerline radius = 1.5 times duct width) type. No mitered elbows are permitted. Where full radius will not fit, provide short radius elbow with full length splitter vanes. Note: Vanes are not shown on plans for clarity at reduced scale, but are required. Where square elbows are shown, provide turning vanes.
 - a. Turning vanes shall be single wall type fabricated from the same material as the duct. Tab spacing shall be SMACNA Standard. Non-standard tab spacings are not acceptable. Do not skip tabs. Mounting rails shall have friction insert tabs that align the vanes automatically. Acceptable manufacturers: Ductmate “Pro-Rail” or equal.

D. Round Duct Fabrication

1. General: "Basic Round Diameter" as used in this section is the diameter of the size of round duct that has a circumference equal to the perimeter of a given size of flat oval duct.
2. Round Ducts: Fabricate round supply ducts and exhaust ducts with spiral lockseam construction.
3. Round Ducts: Fabricate round supply ducts using seam types identified in SMACNA "Industrial Duct Construction Standards" and "HVAC Duct Construction Standards," 1985 Edition, Figure 3-1, RL-1, RL-4, or RL-5. Seams Types RL-2 or RL- 3 may be used if spot-welded on 1 inch intervals.

E. Round Supply Fittings Fabrication

1. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "Industrial Duct Construction Standards" and "HVAC Duct Construction Standards," 1985 Edition, Figures 3-4 (except 90° tee fittings, 90° tap and 90° saddle tap shall not be used) and 3-5 and with metal thickness' specified for longitudinal seam straight duct.
2. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
3. Elbows: Fabricate in die-formed, gored or pleated, construction. Fabricate the bend radius of die-formed, gored, and pleated elbows with centerline radius equal to 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
 - a. Round Elbows – 8 inches (200 mm) and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations with gored construction.
 - b. Round Elbows – 10 inches (250 mm) Through 14 inches (350 mm): Gored or pleated elbows for 30, 45, 60, and 90 degrees. Fabricate nonstandard bend angle configurations with gored construction.
 - c. Round Elbows - Larger Than 14" (350 mm): Gored elbows.

- F. Automatic Dampers: Install automatic dampers furnished under Automatic Temperature Control Paragraph, as shown on Drawings, and as specified. Provide sealed wall penetrations for Seal Class A ductwork.

2.2 FLEXIBLE DUCTWORK

- A. Flexible duct connected to insulated or lined duct shall be insulated with 1-1/2", 1/2 lb. density fiberglass insulation and flame retardant (UL Listed) vapor barrier, meeting ASTM E-84 rating.
- B. Submittals shall include data on core, in addition to other data listed above required to ensure that submitted product meets the requirements of these specifications.
- C. Provide sealing compound for installation.
- D. Flexible duct length shall not exceed 5 feet at connection to air terminals.

2.3 SEALING MATERIALS

- A. Joint and Seam Sealants, General: The term sealant used here is not limited to materials of adhesive or mastic nature, but also includes tapes and combinations of open weave fabric strips and mastics.
- B. Joint and Seam Tape: 2 inches (50 mm) wide, glass-fiber-fabric reinforced.
- C. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with the tape to form a hard, durable, airtight seal.
- D. Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.
- E. Flanged Joint Mastics: One-part, acid-curing, silicone elastometric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- F. Sealants shall have maximum flame spread of 25 and maximum smoke developed of 50.

2.4 SHEETMETAL PLENUMS AND CONNECTIONS TO LOUVERS

- A. Shall be cross-broken and properly reinforced with angle irons to SMACNA requirements.
- B. Shall have bottom and corner seams soldered watertight at least 12 inches (305 mm) up from bottom.
- C. Shall have neoprene gaskets or other non-corrosive material to make connections to louvers watertight.
- D. Shall pitch connection back towards the louver. Provide 2 inches (50 mm) half-coupling drain connection at bottom of plenum unless noted otherwise. Pipe drain to nearest floor drain.
- E. Shall have unused portions of louvers blocked off with sheet metal; sealed air- and water-tight; insulated with 2 inches (50 mm) thick rigid or board insulation.

2.5 ACCESS PANELS/DOORS

- A. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors. In insulated ducts, access doors shall be insulated double wall. Gauges of door materials, no. of hinges, no. and type of door locks shall be as required by the SMACNA Duct Construction Standards. Unhinged doors shall be chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "Sandwich." Door metal shall be the same as the attached duct material. For grease and high temperature ducts, door assembly shall be rated for 2300°F. The minimum sizes are:
 - 1. Fire dampers - 12" x 12", or larger.
 - 2. Automatic control dampers - 6" x 6" minimum.
 - 3. All louver plenums – 12"x12"
- B. Generally access doors are not shown on the drawings, but shall be provided in accordance with the above.

2.6 MANUAL VOLUME DAMPERS

- A. General: Provide factory fabricated manual adjustable volume dampers with required hardware and accessories. Provide all damper operators with locking devices and damper position indicators, which hold dampers in position without vibration. Seal duct penetrations consistent with pressure class.
 - 1. Manual volume dampers shall be provided on each supply, return and general exhaust duct take-off and at each take-off to register, grille, or diffuser (not all are shown on drawings.)
 - 2. Dampers larger than 12" in height shall be opposed multi-blade.
 - 3. Dampers shall be made ¼" undersize.
- B. Dampers shall have linkage outside airstream and suitable for vertical or horizontal applications.
 - 1. Frames: Galvanized sheet steel channels with welded corners or aluminum sheet channels for use in aluminum ductwork.
 - 2. Blades: Damper blades shall be two gauges heavier than adjoining ductwork, opposed blade dampers shall have blades 16-gauge minimum.
- C. Dampers shall have 2" handle extensions where used on externally insulated ductwork.

2.7 DIFFUSERS, REGISTERS, AND GRILLES

- A. Provide steel diffusers, registers, and grilles for supply, return and exhaust outlets of size, type and design shown on Drawings. Reggio or approved diffusers shall be provided in critical historical areas as defined by the architect.
- B. Manufacturers: Subject to compliance with the requirements of this specification and requirements of the product schedule, provide products by one of the following:
 - 1. Titus
 - 2. Krueger
 - 3. Price Industries
- C. Equipment shall be tested and rated according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets".
- D. Equipment shall handle air quantities at operating velocities:
 - 1. With maximum diffusion within space supplied or exhausted.
 - 2. Without objectionable air movement as determined by Architect.
 - 3. With sound pressure level not to exceed NC30.
- E. Supply, return and exhaust outlets shall have opposed blade volume dampers operable from front.
- F. Supply registers shall have two sets of directional control blades.
- G. Surface mount diffusers, registers and grilles shall be furnished with gaskets and installed with faces set level and plumb, tightly against mounting surface.
- H. Finish shall be as directed by Architect.

- I. Coordinate diffusers, registers and grilles with ceiling and wall construction. Refer to Architectural Drawings for exact lengths and for framing and mitering arrangements that may differ from those shown on HVAC Drawings.

2.8 HVAC SYSTEMS INSULATION

A. MANUFACTURERS

1. Use products manufactured by Owens-Corning, Manville, Knauf, Schuller or Certainteed except where the product of another manufacturer is specifically identified for a special type of insulation.

B. MATERIALS

1. Products shall possess a flame spread rating of not over 25, a smoke developed rating and a fuel contributed rating no higher than 50, as determined by ASTM E84 testing.

C. DUCT INSULATION (EXTERNAL)

1. General: Insulation shall be Certain-Teed, Knauf, Manville or Owens Corning. Install insulation, mastics, adhesives, coatings, covers, weather-protection and other work exactly as required by manufacturer's recommendations. Materials shall meet requirements of Adhesive and Sealant Council Standards and SMACNA.
2. Apply insulation after systems have been tested, proved tight and approved by Architect. Remove dirt, scale, oil, rust and other foreign matter prior to installation of insulation.
3. Leaks in vapor barrier or voids in insulation will not be accepted.
4. ASTM E-84 minimum fire hazard ratings shall be 25 flame spread, 50 fuel contributed and 50 smoke developed.
5. Where ducts are insulated, flexible connections to ducts shall be insulated.
6. Insulate standing seams with same material and thickness as duct.
7. Acoustically lined ductwork shall not be insulated externally, except as noted otherwise.
8. Insulation shall be continuous through wall and ceiling openings and in sleeves.
9. Transmission rates of vapor barriers shall not exceed 0.02 perms.
10. Insulation and vapor barrier shall be continuous around entire perimeter of ducts. Ducts supported by metal straps shall have insulation encompassing straps, where straps penetrate at top of duct tightly seal around strap with insulating tape. Ducts supported by trapeze type hangers under ducts shall have 6 lb. density rigid insulation provided between duct and hanger, insulation shall be same thickness and vapor barrier as specified for specific duct type. Rigid insulation section shall be full width of duct and minimum 12" long. Tape and seal all seams where rigid insulation meets other insulation.

D. Concealed Rectangular/Circular Ductwork

1. Insulate supply and outside air ducts in concealed spaces and return duct not in return air plenum ceilings with at least 2" thick fibrous glass duct wrap, with foil-kraft flame resistant vapor barrier.

2. Insulation density shall be $\frac{3}{4}$ lb/cf and maximum K-factor shall be 0.30 at 75°F mean temperature.
3. If insulation does not have precut lap make lapped, butt joints by cutting 2" strip of insulation away from vapor barrier. Apply 6" strips of approved adhesive on 16" centers and wrap duct with insulation. Staple lapped joint with outward-clinching staples. Seal stapled joints airtight with approved vapor barrier mastic or pressure-sensitive tape.
4. For rectangular duct 24" or larger in any dimension, augment application method specified in item 3 with approved mechanical fasteners, such as weld pins with speed washers, on 18" centers on bottom of duct.
5. Cover breaks in vapor material with patches of same material, secured with adhesive and staples. Seal staples with approved vapor barrier coating.
6. Fill voids in insulation at jacket penetrations and seal with vapor barrier coating.
7. Seal and flash terminations and punctures with fibrous glass cloth between two coats of vapor barrier coating.
8. Terminate vapor barrier and extend insulation at standoff brackets.

2.9 PIPE INSULATION

- A. Insulation shall be fibrous glass insulation with factory-applied fire retardant vapor barrier jacket with K factor of at least 0.23 at 75°F mean temperature: by Owens Corning, Certain-Teed, Johns-Manville or Knauf, installed as required by manufacturer. ASTM E-84 fire hazard ratings shall be 25 flame spread, 50 smoke developed and 50 fuel contributed.
- B. Apply insulation after systems have been tested, proved tight and approved by Architect. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.
- C. No leaks in vapor barrier or voids in insulation will be accepted.
- D. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and piping, to provide firestop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.
- E. Insulate flexible connections to same thickness and with same material as adjoining pipe insulation.
- F. Provide fibrous dual temperature insulation with factory applied vapor barrier jacket on chilled water, condensate drain, hot and cold water piping, unless noted otherwise.
- G. Cooling coil condensate drain piping shall have $\frac{3}{4}$ " thick insulation. Insulation thickness for indoor steam and condensate piping shall be as follows:

TABLE A Insulation Thickness								
Piping System Types	Fluid Temperature Range, °F	Insulation Thickness		Insulation Conductivity Btu-hr/ft ² -°F at Mean Temperature °F				
		≤ 1.5"	> 1.5"					
HEATING SYSTEMS								
Steam/Cond.	180-220	1.5	3					0.27 @ 75

- H. Provide longitudinal lap and 6" wide vapor barrier joint seal strips secured with approved adhesive.

2.10 STEAM AND CONDENSATE HEATING PIPING

A. SUMMARY

This Section includes the following for LP steam less than 15 psig and condensate piping:

1. Pipe and fittings.
2. Strainers.
3. Steam traps.
4. Thermostatic air vents.

B. PERFORMANCE REQUIREMENTS

1. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures:
2. LP Steam Piping: 125 psig.
3. Condensate Piping: 125 psig at 250 deg F.

C. SUBMITTALS

1. Product Data: For each type of the following:
2. Pressure-reducing and safety valve.
3. Steam trap.
4. Air vent and vacuum breaker.
5. Shop Drawings: Detail, 1/4 inch equals 1 foot scale, fabrication of pipe anchors, hangers, pipe, multiple pipes, alignment guides, and expansion joints and loops and their attachment to the building structure. Detail locations of anchors, alignment guides, and expansion joints and loops.
6. Field quality-control test reports.
7. Operation and maintenance data.

D. QUALITY ASSURANCE

1. ASME Compliance: Comply with ASME B31.1, "Power Piping" and ASME B31.9, "Building Services Piping" for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label.

E. STEEL PIPE AND FITTINGS

1. Steel Pipe: ASTM A 53/A 53M, black steel, plain ends, Type, Grade, and Schedule as indicated in Part 3 piping applications articles.
2. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125, 150, and 300 as indicated in Part 3 piping applications articles.
3. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 piping applications articles.
4. Cast-Iron Threaded Flanges and Flanged Fittings: ASME B16.1, Classes 125 and 250 as indicated in Part 3 piping applications articles; raised ground face, and bolt holes spot faced.
5. Stainless-Steel Bellows, Flexible Connectors:
6. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforced, protective jacket.
7. End Connections: Threaded or flanged to match equipment connected.
8. Performance: Capable of 3/4-inch misalignment.
9. CWP Rating: 150 psig.
10. Maximum Operating Temperature: 250 deg F.

F. JOINING MATERIALS

1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
2. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
3. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

G. DIELECTRIC FITTINGS

1. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
2. Insulating Material: Suitable for system fluid, pressure, and temperature.
3. Dielectric Unions:

4. 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. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries, International Inc.
 - d. Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group.
5. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

H. VALVES

1. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."
2. Stop-Check Valves:
3. 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. Crane Co.
 - b. Jenkins Valves; a Crane Company.
 - c. Lunkenheimer Valves.
 - d. A.Y. McDonald Mfg. Co.
4. Body and Bonnet: Malleable iron.
5. End Connections: Flanged.
6. Disc: Cylindrical with removable liner and machined seat.
7. Stem: Brass alloy.
8. Operator: Outside screw and yoke with cast-iron handwheel.
9. Packing: Polytetrafluoroethylene-impregnated packing with two-piece packing gland assembly.
10. Pressure Class: 250.

I. STRAINERS

1. Y-Pattern Strainers:
2. Body: ASTM A 126, Class B cast iron, with bolted cover and bottom drain connection.

3. End Connections: Threaded ends for strainers NPS 2 and smaller; flanged ends for strainers NPS 2-1/2 and larger.
4. Strainer Screen: Stainless-steel, 20 mesh strainer, and perforated stainless-steel basket with 50 percent free area.
5. Tapped blowoff plug.
6. CWP Rating: 250-psig working steam pressure.

J. STEAM TRAPS

1. Thermostatic Traps:
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Armstrong International, Inc.
 - 2) Barnes & Jones, Inc.
 - 3) Dunham-Bush, Inc.
 - 4) Hoffman Specialty; Division of ITT Industries.
 - 5) Spirax Sarco, Inc.
 - 6) Sterling.
 - b. Body: Bronze angle-pattern body with integral union tailpiece and screw-in cap.
 - c. Trap Type: Balanced-pressure.
 - d. Bellows: Stainless steel or monel.
 - e. Head and Seat: Replaceable, hardened stainless steel.
 - f. Pressure Class: 125.
2. Float and Thermostatic Traps:
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Armstrong International, Inc.
 - 2) Barnes & Jones, Inc.
 - 3) Dunham-Bush, Inc.
 - 4) Hoffman Specialty; Division of ITT Industries.

- 5) Spirax Sarco, Inc.
- 6) Sterling.
- b. Body and Bolted Cap: ASTM A 126, cast iron.
- c. End Connections: Threaded.
- d. Float Mechanism: Replaceable, stainless steel.
- e. Head and Seat: Hardened stainless steel.
- f. Trap Type: Balanced pressure.
- g. Thermostatic Bellows: Stainless steel or monel.
- h. Thermostatic air vent capable of withstanding 45 deg F of superheat and resisting water hammer without sustaining damage.
- i. Maximum Operating Pressure: 125 psig.

K. THERMOSTATIC AIR VENTS

- 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. Armstrong International, Inc.
 - b. Barnes & Jones, Inc.
 - c. Dunham-Bush, Inc.
 - d. Hoffman Specialty; Division of ITT Industries.
 - e. Spirax Sarco, Inc.
 - f. Sterling.
- 2. Body: Cast iron, bronze, or stainless steel.
- 3. End Connections: Threaded.
- 4. Float, Valve, and Seat: Stainless steel.
- 5. Thermostatic Element: Phosphor bronze bellows in a stainless-steel cage.
- 6. Pressure Rating: 125 psig.
- 7. Maximum Temperature Rating: 350 deg F.

L. LP STEAM PIPING APPLICATIONS

- 1. LP Steam Piping: Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

2. Condensate Piping above Grade: Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.
3. Condensate Piping below Grade: Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

M. VALVE APPLICATIONS

1. Install shutoff duty valves at branch connections to steam supply mains, at steam supply connections to equipment, and at the outlet of steam traps.

N. PIPING INSTALLATION

1. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Use indicated piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
2. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
3. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
4. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
5. Install piping to permit valve servicing.
6. Install piping free of sags and bends.
7. Install fittings for changes in direction and branch connections.
8. Install piping to allow application of insulation.
9. Select system components with pressure rating equal to or greater than system operating pressure.
10. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
11. Install drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
12. Install steam supply piping at a minimum uniform grade of 0.2 percent downward in direction of steam flow.
13. Install condensate return piping at a minimum uniform grade of 0.4 percent downward in direction of condensate flow.
14. Reduce pipe sizes using eccentric reducer fitting installed with level side down.

15. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to top of main pipe.
16. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."
17. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
18. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
19. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.
20. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."
21. Install drip legs at low points and natural drainage points such as ends of mains, bottoms of risers, and ahead of pressure regulators, and control valves.
 - a. On straight runs with no natural drainage points, install drip legs at intervals not exceeding 300 feet.
 - b. Size drip legs same size as main. In steam mains NPS 6 and larger, drip leg size can be reduced, but to no less than NPS 4.
22. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
 - a. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
 - b. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

O. STEAM-TRAP INSTALLATION

1. Install steam traps in accessible locations as close as possible to connected equipment.
2. Install full-port ball valve, strainer, and union upstream from trap; install union, check valve, and full-port ball valve downstream from trap unless otherwise indicated.

P. HANGERS AND SUPPORTS

1. Install hangers and supports according to Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with requirements below for maximum spacing.

2. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
3. Install the following pipe attachments:
 - a. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - b. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - c. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - d. Spring hangers to support vertical runs.
4. Install hangers with the following maximum spacing and minimum rod sizes:
 - a. NPS 3/4: Maximum span, 9 feet; minimum rod size, 1/4 inch.
 - b. NPS 1: Maximum span, 9 feet; minimum rod size, 1/4 inch.
 - c. NPS 1-1/2: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 - d. NPS 2: Maximum span, 13 feet; minimum rod size, 3/8 inch.
 - e. NPS 2-1/2: Maximum span, 14 feet; minimum rod size, 3/8 inch.
 - f. NPS 3: Maximum span, 15 feet; minimum rod size, 3/8 inch.
 - g. NPS 4: Maximum span, 17 feet; minimum rod size, 1/2 inch.
5. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

Q. PIPE JOINT CONSTRUCTION

1. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
2. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
3. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
4. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

- b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
5. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

R. TERMINAL EQUIPMENT CONNECTIONS

- 1. Size for supply and return piping connections shall be the same as or larger than equipment connections.
- 2. Install traps and control valves in accessible locations close to connected equipment.
- 3. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

S. FIELD QUALITY CONTROL

- 1. Prepare steam and condensate piping according to ASME B31.9, "Building Services Piping," and as follows:
 - a. Leave joints, including welds, uninsulated and exposed for examination during test.
 - b. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - c. Flush system with clean water. Clean strainers.
 - d. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
- 2. Perform the following tests on steam and condensate piping:
 - a. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - b. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.
 - c. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

3. Prepare written report of testing.

2.11 WATER PIPING AND FITTINGS

A. General

1. Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials. Provide dielectric fittings to connect different piping materials.
2. Fittings for steel piping 2" and smaller shall be screwed. Steel piping shall be seamless or electric-resistance welded ASTM A53 or ASTM A106, Grade B.
3. Pipe takeoffs shall have no less than three elbow swings.
4. Copper piping 2" and smaller shall be ASTM B88, hard-drawn, Type L with lead-free soldered joints.

B. Special Requirements for Water

1. Provide air vent at each high point and drain valve at each low point for complete system drainage.
2. Provide a shutoff/isolation valve in the following locations in the distribution system:
 - a. To each supply and return riser serving two or more terminal units.
 - b. To each supply and return riser branch off a main serving two or more terminal units.
 - c. To each supply and return main take-off serving two or more terminal units.
3. Equipment condensate drains shall be trapped at equipment connection. Drain lines shall run full size of drain tapping to nearest storm drain or as shown on Drawings with a pitch of 1" in 10 feet.
4. Pitch condensate pump discharge downward in direction of flow 1" in 10 feet, unless otherwise noted.

C. Schedule of Pipe and Fitting Materials

Service	Pipe Material Weight	For Type of Joints	Fitting Material	Pressure Rating psi swp. or Weight
Condensate Drain	Copper Type L	Soldered	Copper	125
Cold water	Copper Type L	Soldered Copper	Wrought	125
PVC shall not be substituted for copper for the drains.				

D. Connections

1. Provide dielectric fittings at connections of dissimilar materials.
2. Make piping connections 2" dia. and smaller to valves and equipment with 300 psi brass seat unions on steel piping and with heavy semi-flushed brass unions on copper tubing.
3. Make screw joints tight with Teflon (polytetrafluoroethylene) tape for water. Use tapered threads.

2.12 VALVES AND STRAINERS

- A. Valves on chilled water and hot water shall be as shown on tables.
- B. Valves shall have name of manufacturer and guaranteed working pressure cast or stamped on bodies. Valves of similar type shall be by single manufacturer. Gaskets and packings shall not contain asbestos.
- C. Ratings shall include ANSI Class Rating and hole pattern for flanges.
- D. Ball Valves: Provide full port ball valves with reinforced Teflon seats, seals, bearings and packing. Provide balancing stop on at least one valve per equipment connection and as necessary for balancing service. Valves on insulated piping shall have 2" extended stems. Valves shall be by Apollo, Cannon, Kitz, Milwaukee, Rockwell, Stockham, Grinnell or Watts.

CHILLED AND HOT WATER SERVICE Maximum 250°F and 125 psig (½"-12")						
Specialty	Application	Type	Size	Body/Seat, Body/Trim	Connection	Minimum Rating ^{1,2}
Ball Valve	Isolation (with locking handle) and Modulation	Full Port 3-pc.	½"-2"	Bronze/Teflon	Sweat	125 psig WOG
		Full Port 2 pc.	½"-2"	Bronze/Teflon	Threaded	125 psig WOG

2.13 PIPE HANGERS AND SUPPORTS

- A. Provide pipe stands, supports, hangers and other supporting appliances as necessary to support work required by Contract Documents.
- B. Secure vertical piping to building construction to prevent sagging or swinging.
- C. Horizontal copper tubing shall have maximum hanger spacing of 5 ft. for tubing 1¼" dia. and smaller and 10' for tubing 1½" and larger.
- D. Reduce spacing to a maximum of 10'- 0" apart, regardless of pipe size, as necessary for fittings, valves and other concentrated loads.
- E. Support piping 3" dia. and under from structure with Carpenter and Patterson Fig. 100 clevis hangers or approved equal.
- F. Hangers shall be by Carpenter and Patterson, F & S, or Grinnell Co. Figure numbers of Carpenter and Patterson are specified to establish standards of quality for performance and materials.
- G. Hangers for horizontal lines shall be vertically adjustable to obtain pitch requirements of Piping Paragraph.

2.14 ESCUTCHEONS AND DUCT COLLARS

- A. Provide adjustable escutcheons on exposed piping that passes through finished floors, walls and ceilings. Escutcheons shall be chromium-plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.
- B. Provide 4" wide 20 gauge galvanized sheet metal collars at sleeves and prepared openings, sized to cover entire duct penetration including sleeve and seal, and to accommodate duct and insulation as necessary. Edges shall have milled lips ground smooth. Paint to match finish of duct or as directed by Architect.

2.15 MOTORS, STARTERS AND WIRING

- A. Provide motors and controls, and furnish starters for HVAC equipment. Provide control and other related wiring including interlocks. Power wiring (to panelboards, disconnect switches, starters and motors) will be provided under Section 260001, ELECTRICAL. Starters that are not integral to equipment will be installed and wired under Section 26001, Electrical, and furnished under this Section 230001.
- B. Unless otherwise specified, motors shall be NEMA Design B, constant speed, self-ventilated squirrel cage induction. Motors shall have 1.15 service factor unless totally enclosed. Motors shall have Class B insulation.
 - 1. Motors under ½ HP, shall be designed for 120 V, 60 Hz, single phase, unless otherwise specified.
 - 2. Motors ½ HP and over shall be as required in schedules.
- C. All motors shall be high or premium efficiency type. They shall conform to NEMA Standard MG-1-12.53a and shall have their efficiencies determined in accordance with IEEE Standard 112 Method B. The NEMA nominal efficiency shall be listed on the motor nameplate. Minimum nominal efficiencies shall be as follows:

Premium Efficiency Motor Totally Enclosed Fan-Cooled (TEFC)				Premium Efficiency Motor Open Drip-Proof (ODP)			
Size HP	Speed (rpm)			Size HP	Speed (rpm)		
	1200	1800	3600		1200	1800	3600
NEMA Nominal Efficiency				NEMA Nominal Efficiency			
1	82.5	85.5	78.5	1	82.5	85.5	80.0
1.5	87.5	86.5	85.5	1.5	86.5	86.5	85.5
2	88.5	86.5	86.5	2	87.5	86.5	86.5
3	89.5	89.5	88.5	3	89.5	89.5	86.5
5	89.5	89.5	89.5	5	89.5	89.5	89.5

- D. Starters that require interlocks or remote control shall be magnetic with HAND-OFF-AUTOMATIC switch in cover. Provide magnetic starters as necessary, with auxiliary contacts, buttons and switches in required configurations. Refer to paragraph AUTOMATIC TEMPERATURE CONTROLS for interlock requirements. Starters shall be by single manufacturer: Cutler-Hammer, Clark, Arrow Hart or Square D.
 - 1. Each 3-phase, 60 Hz motor shall be provided with magnetic starter with either ON-OFF push button or hand-off-automatic switch.
 - 2. Other motors shall be provided with a manual starter with ON-OFF switch.
 - 3. Control relay for each starter shall be for operation on 120 V, single phase, and transformer of sufficient capacity within starter case shall be furnished for this purpose.
 - 4. Provide inverse time limit overload and under voltage protection in each leg and with pilot lights. Provide red and green On-Off pilot lights.
 - 5. Provide nameplates with engraved white lettering to designate area and equipment served.
 - 6. Starters for refrigeration machines shall be furnished by unit manufacturer.

2.16 INLINE FANS

A. General:

1. Fans shall be tested and performance rated in accordance with Air Moving and Conditioning Association Standards and shall bear AMCA certified rating seal.
2. Fans shall be either L.C. Cook, Penn Ventilator, Greenheck, ILG or ACME.
3. Duct mounted supply air fans shall be of the centrifugal, belt driven, in-line type. The fan housing shall be of the rectangular design and constructed of heavy gauge galvanized steel, and shall include rectangular duct mounting collars on the inlet and outlet.
4. Removable panels shall be provided on each side of the fan cabinet, and shall be of sufficient size to permit access for service to all of the fan's internal components without further dismantling of the cabinet.
5. The fan wheel shall be of the galvanized steel, forward curved, centrifugal type. Wheels shall be statically and dynamically balanced.
6. Motors shall be of the heavy duty type with permanently lubricated and sealed ball bearings. The wheel shaft shall be ground and polished steel mounted in permanently sealed bearings. The bearings shall be selected for a minimum L10 life in excess of 100,000 hours (L50 average life of 500,000 hours) at maximum cataloged RPM. Drives shall be sized for a minimum of 150% of the driven horsepower. Pulleys shall be of the machined cast type, keyed and securely attached to the wheel and motor shafts. The motor pulley shall be adjustable for final system balancing.
7. Heavy gauge galvanized steel mounting rails shall support the drive assembly, motor, wheel, and scroll.
8. Fans shall have true internal vibration isolation (no metal to metal contact) of the drive assembly, motor, wheel, and scroll.
9. All fans shall be tested in an AMCA Accredited Laboratory and shall be certified to bear the AMCA Certified Ratings Seal for sound and air performance.
10. The fan shall include an integral filter rack to accept 2" pleated 30% filters.
11. Fans shall be manufactured by Greenheck Fan Corporation in Schofield, Wisconsin.

2.17 AIR COOLED SELF CONTAINED AC UNIT FOR ENVIRONMENTAL ROOM CONTROL (VAULT AC UNIT)

A. SUMMARY

1. These specifications describe requirements for an environmental control system. The system shall be designed to control temperature and relative humidity conditions within the room.
2. The manufacturer shall design and furnish all equipment in the quantities and configurations shown on the project drawings.

3. Standard 60Hz units are CSA Certified to the harmonized U. S. and Canadian product safety standard CSA C22.2 No 236/UL 1995 for "Heating and Cooling Equipment" and are marked with the CSA c-us logo.
4. The system model number(s) shall be:
 - a. Self-Contained Unit: Liebert MMD12A with condenser fan blower model MM2CF

B. DESIGN REQUIREMENTS

1. The environmental control system shall be a factory assembled unit. On direct expansion models, the refrigeration system shall be self-contained within the unit housing.
2. The self-contained units shall be designed for above-dropped-ceiling installation and serviceable from the front and bottom of the system.
3. The system shall have a total cooling capacity of 12,000 BTU/hr, and a sensible cooling capacity of 11,000 BTU/hr, based on the entering air condition of 75°F dry bulb, and 61°F wet bulb.

C. SUBMITTALS

1. Submittals shall be provided with the proposal and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity data; Piping and Electrical Connection Drawings.

D. Quality Assurance

1. The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, "Hi-Pot" Test (two times rated voltage plus 1000 volts, per UL requirements), and Metering Calibration Tests. The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

E. CABINET CONSTRUCTION

1. The cabinet and chassis shall be constructed of heavy gauge galvanized steel and designed for easy installation and service access from front and bottom of unit only. Mounting brackets shall be factory attached to the cabinet.

F. AIR DISTRIBUTION

1. The air distribution system shall be constructed with a quiet, direct-drive fan assembly equipped with double-inlet blower, self-aligning ball bearings, and lifetime lubrication. Fan motor shall be permanent-split capacitor, high efficiency type, equipped with two speeds for air flow modulation. Dehumidification shall utilize the lower fan speed.
 - a. A return air filter box shall be provided with hinged filter access for ducted units, and shall include a 1" duct flange. A 1" duct flange shall

also be provided for air discharge. Filters shall be 30% efficiency based on ASHRAE 52-76.

G. MICROPROCESSOR CONTROL

1. The control system shall be micro-processor based. The wall-mounted control enclosure shall include a 2-line by 16 character LCD display providing continuous display of operating status and alarm condition. An 8-key membrane keypad for setpoint/program control, unit on/off, and fan speed shall be located below the display.
 - a. Temperature and humidity sensors shall be located in the wall box which shall be capable of being located up to 300 ft (91.4m) from the evaporator unit, using field-supplied four (4) conductor wire.
 - b. The LCD display shall provide an on/off indication, fan speed indication, operating mode indication (cooling, heating, humidifying, dehumidifying) and current day, time, temperature and humidity (if applicable) indication. The monitoring system shall be capable of relaying unit operating parameters and alarms to the DDC system.
 - c. Control Setpoint Parameters
 - Temp. Setpoint 65-85°F (18 to 29°C)
 - Temp. Sensitivity 1 to 5°F (1 to 3°C)
 - Humidity Setpoint 20-80% RH
 - Humidity Sensitivity 1 to 10% RH
2. Unit Controls
 - a. The control system shall prevent compressor short-cycling by a 3 minute timer from compressor stop to the next start.
 - b. A common alarm relay shall be provided to provide a contact closure to a remote alarm device. Two (2) terminals shall also be provided for remote on/off control. Individual alarms shall be “enabled” or “disabled” from reporting to the common alarm.
 - c. The control shall be programmable on a daily basis or on a 5 day/2 day program schedule. It shall be capable of accepting 2 programs per day.
 - d. The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 1 to 90 seconds. The control shall be capable of displaying temperature values in °F or °C.
 - e. For start-up after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the unit or from the central site monitoring system.
3. Alarms
 - a. The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:

- High Temperature
 - Low Temperature
 - High Humidity
 - Low Humidity
 - High Water Alarm - Lockout Unit Operation
 - High Head Pressure
 - Loss of Power
 - Compressor Short Cycle
- b. Custom Alarms
- Humidifier Problem
 - Filter Clog
- c. Alarm Controls
- Each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm (except for high head pressure).
- 1) Audible Alarm
- The audible alarm shall annunciate any alarm that is enabled by the operator.
- 2) Common Alarm
- A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device.

H. SYSTEM COMPONENTS

1. Direct Expansion Self-Contained System
- a. Refrigeration System
- 1) The refrigeration system shall consist of a (scroll) (rotary) compressor with vibration isolating grommets, evaporator coil, condenser coil, externally equalized thermostatic expansion valve, high pressure safety switch, filter drier, hot gas bypass circuit, factory R-407C refrigerant charge and externally equalized expansion valve. Hot gas bypass shall be provided to reduce compressor cycling and optimize performance under low load conditions.
- 2) Evaporator Coil
- a) The evaporator coil shall have 2.4 sq.ft. face area, 4 rows deep. It shall be constructed of copper tubes and aluminum fins. The coil shall be provided with a stainless steel drain pan.
- 3) Air-Cooled Condenser Coil
- a) The air-cooled condenser section shall contain a factory mounted and piped condenser coil constructed of copper tubes and aluminum fins. No piping, brazing, dehydration or charging shall be required. The condenser coil shall be factory mounted within the unit cabinet.

- 4) Air-Cooled Condenser Fan
 - a) A factory-supplied condenser fan shall be field-mounted to the end of the evaporator cabinet. The system shall be provided with a fan speed control system to permit operation at -20°F inlet ambient air temperature and sized to provide full rated cooling capacity at 95°F entering air from plenum space. Condenser fan electrical and refrigerant pressure connections shall be field attached to the cooling chassis using factory provided wiring harness and capillary tube/fitting.
2. Steam Generating Humidifier
 - a. The environmental control system shall be equipped with a steam generating humidifier that is controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, steam distributor, and electronic controls. The need to change canister shall be annunciated on the microprocessor wall box control panel. An LED light on the humidifier assembly shall indicate cylinder full, over-current detection, fill system fault, and end of cylinder life conditions.
3. SCR Electric Reheat
 - a. The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include an agency approved safety switch to protect the system from overheating.
 - b. The SCR (Silicon Controlled Rectifier) controller shall proportionally control the reheat elements to maintain the selected room temperature. The rapid cycling made possible by the SCR controller provides precise temperature control, and the more constant element temperature improves heater life. The unit microprocessor control shall operate the SCR controller, while cooling is locked on.
4. Hot Gas Reheat
 - a. The complete hot gas reheat system shall include a copper tube, aluminum fin coil, three-way solenoid valve, and refrigerant check valve.
5. Hot Gas Bypass
 - a. A hot gas bypass valve shall be factory installed and piped to enable system capacity reduction.
6. Disconnect Switch, Non-Locking
 - a. The non-automatic, non-locking, molded case circuit breaker shall be factory mounted in the high voltage section of the electrical panel. The switch shall be accessible from the front of the unit.
7. Remote Sensors

- a. The unit shall be supplied with remote temperature and humidity sensors. The sensors shall be connected to the unit by shielded cable.

8. High-temperature Sensor

- a. The high temperature sensor shall immediately shut down the system when high temperatures are detected. The sensor shall be mounted with the sensing element in the return air.

9. Condensate Pump

- a. The condensate pump shall be complete with integral float switch, pump, motor assembly, and reservoir

2.18 ACCESS PANELS

A. Description: Interior construction access panels.

1. Manufacturers:

- a. Milcor
- b. Knapp
- c. Nystorm
- d. Inland Steel

B. Coordinate selection with other Divisions supplying similar access panels.

C. Access panels shall have same fire rating classification as surface penetrated.

D. Access panels are generally not shown on the drawings, but shall be provided.

E. Provide proper access to materials and equipment that require inspection, replacement, repair or service, and coordinate their delivery with the installing Trade. If proper access cannot be provided, confer with Architect as to best method of approach for minimizing effect of reduced access that may result.

F. Coordinate and prepare a location, size, and function schedule of access panels required to fully service equipment and deliver to a representative of the installing Trade. Furnish and install distinctively colored buttons (color as selected by Architect) in finished ceiling to identify access panels

G. Furnish access panels for installation under other Sections where fire dampers, smoke detectors, controls, shut-off valves, control valves, or other items installed under this Section require access and are concealed in floor, wall, furred space or above ceiling.

H. Access panels shall be at least large enough to remove the component requiring access. Where individual components (e.g. control valves) requiring access are within 8" of the finished surface, panels shall be a minimum of 12" x 12". Where component is more than 8" from surface and at equipment requiring service (e.g. fire dampers), access panels shall be a minimum of 24" x 24".

PART 3 - EXECUTION

3.1 MATERIALS AND WORKMANSHIP

- A. Work shall be neat and rectilinear. Ductwork, piping and conduit shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment in accordance with manufacturers written instructions. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe and duct 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. Owner will not be responsible for material and equipment before testing, commissioning, and acceptance.

3.2 SPECIAL RESPONSIBILITIES

- A. Cooperate and coordinate with work of other Sections in executing work of this Section.
 - 1. Perform work so 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 Owner.
 - 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 Architect.
 - 6. Notify Architect of location and extent of existing piping, conduit, ductwork and equipment that interferes with new construction. In coordination with and with approval of Architect, relocate piping, ductwork and equipment to permit new work to be provided. Remove non-functioning and abandoned piping, ductwork and equipment. Dispose of or store items.

3.3 MECHANICAL DEMOLITION

- A. Refer to Division 1 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Refer to drawings for general description of areas requiring demolition.
- C. Refer to General Contractor's/Construction Manager's Instructions for existing equipment and materials that shall remain the property of the Owner.

- D. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
 - 1. Equipment to Be Removed: Disconnect and cap services and remove equipment. Equipment shall be removed from premises and legally disposed of.
 - 2. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

3.4 CLEANING

A. Ductwork

- 1. Ducts shall be thoroughly cleaned so that no dirt or dust shall be discharged from diffusers, registers or grilles, when system is operated.
- 2. Provide temporary connections required for cleaning. Provide cheesecloth for openings during cleaning.
- 3. Replace filters prior to final inspection and testing.

3.5 DUCTWORK INSTALLATION REQUIREMENTS:

- 1. Install ducts in accordance with SMACNA standards.
- 2. Install ducts with the fewest possible joints.
- 3. Provide clearance of 1 inch (25 mm) where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, where applicable.
- 4. Ductwork shall be free from vibration under all conditions of operation.
- 5. Install control dampers furnished by the ATC contractor.

3.6 CONNECTIONS

- A. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connection and no external vibration isolators.
- B. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.
- C. Connections from trunk to branch ducts shall be as detailed on Drawings.
- D. Spin in collars shall not be used.

3.7 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope
- E. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Architect and in accordance with code requirements.
- F. Distribute equipment loads on building structural members provided for equipment support.
- G. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs for floor, wall or ceiling mounting of equipment.
- H. Provide steel supports and hardware for proper installation of hangers, anchors and guides.
- I. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.
- J. 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.
- K. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that will void warrantee. Report in writing to Architect, prior to purchase or shipment of equipment involved, on conditions that may prevent proper installation.

3.8 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
- B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.
 - 2. Data:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
 - 3. Size: 2-1/2 by 4 inches (64 by 100 mm) for control devices, dampers, and valves; 4-1/2 by 6 inches (115 by 150 mm) for equipment.
- C. Access Panel and Door Markers: 1/16-inch- (1.6-mm-) thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch (3.2-mm) center hole for attachment.
 - 1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

3.9 START UP, TESTING AND BALANCING

A. General

1. Provide qualified personnel, equipment, apparatus and services for start-up, testing and balancing of mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City, Town or County Inspectors, Owners and Architect. Ensure that all contractors are present on site during the entire time that these procedures take place. Note that some procedures listed below have a distinct order of precedence; e.g., the testing of the temperature control system shall not occur until major pieces of mechanical equipment have been started up and testing is complete. Ensure that any listed orders of precedence for procedures are followed.
2. Do not cover or conceal work before testing and inspection and obtaining approval.
3. Instruments for testing and balancing shall have been calibrated within one month prior to testing and balancing. Calibration shall be traceable to NBS Standards. Provide photostat of certificate of calibration to Architect's representative at meeting demonstrating balancing procedures mentioned in Paragraph 4 above.
4. Leaks, damage and defects discovered or resulting from start up, testing and balancing shall be repaired or replaced to like-new condition with acceptable materials. Tests shall be continued until system operates without adjustments or repairs.
5. For each piece of equipment, copy nameplate data and include in report.
6. Submit six copies of testing and balancing reports to Architect for approval.
7. Provide capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo-wells and gauge connections at no additional cost to Owner.
8. Qualified representative of equipment manufacturer shall be present at test.

B. Equipment Start Up

1. Start up the following pieces of equipment in strict accordance with manufacturer's instructions and with manufacturer's representative present:
 - a. Fans
 - b. AC unit

C. Automatic Temperature Controls Testing

1. General
 - a. Installation of the building automation system shall be performed by this Contractor or his subcontractor(s). However, all installation shall be under the personal supervision of the Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design, scheduling, coordination, programming, training, and warranty requirements for the project be delegated to a subcontractor.

2. Access to Site

a. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner's Representative.

3. Code Compliance

a. All wiring shall be installed in accordance with the more stringent of all applicable electrical codes, equipment manufacturer's recommendations, and wiring specifications in Division 26.

4. Cleanup

a. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract. Clean the exposed surfaces of tubing, hangers, and other exposed metal of grease, plaster, or other foreign materials.

D. Air and Water Balancing

1. General

- a. Provide qualified personnel, equipment and services for balancing and adjusting of mechanical systems. Submit resumes at demonstration of balancing meeting.
- b. Personnel shall be experienced and qualified to perform, record, and evaluate all procedures contained here and/or as outlined on drawings.
- c. For each belt driven fan on job, provide, under the work of the mechanical section, one spare sheave of size to be determined after traverses are complete.
- d. Submit procedures, recording forms, and test equipment for review prior to balancing.
 - 1) Balancing procedure or sequence is contained herein.
 - 2) Recording forms used for balancing must be submitted to Architect for approval before balancing is started.
 - a) Failure to submit forms will result in rejection of entire submittal.
 - b) Submit description of balancing equipment being used.
 - 3) Balancing shall not begin until system has been installed complete and capable of normal operation.
 - a) All grilles, dampers, fans, coils, pumps, valves and linkages shall be installed and operating prior to balancing.

- b) System shall be capable of operating under control as specified on drawings and/or contained herein.

2. Air System Balancing:

- a. Visually inspect all dampers on branch take offs to ensure that they are fully open.
- b. Start fans, verify that fan rotation is correct. If not, coordinate with electrical contractor to switch power leads such that the fan rotates correctly.
- c. Check nameplate voltage on motor, compare to scheduled voltage. Notify Architect immediately of any discrepancies. Measure and record actual voltage across all power leads. Notify Architect of discrepancies immediately.
- d. Check motor nameplates full load amps, measure and record amperage across all power leads. If there are marked discrepancies in amperage draws between legs, notify Architect immediately.
- e. Measure and record fan and motor rpm. Check that motor rpm agrees with nameplate and scheduled rpm.
- f. Add ½" of static pressure to the system, to simulate the effect of dirty filters. Static may be added by throttling branch volume dampers, blanking off portions of the filter section, covering filter section with cheesecloth or other suitable means. Confirm ½" static has been added with new static pressure reading across fan. Open dampers, remove cheesecloth, etc. after traverses are complete.
- g. Perform pitot tube traverse of supply ducts downstream from AHU discharges and return ducts. Summing CFM totals from diffusers is not an acceptable method of determining total airflow from AHU's. At Architect's request, show Architect holes where traverses were taken. Perform traverses in accordance with procedures outlined in latest edition of the SMACNA HVAC Testing. Adjusting and Balancing Manual, except that if recommended lengths of straight duct before and after traverse points are not available, increase number of measuring points by 50%. If a 24 point traverse would be called for given the duct cross section area-measure 36 points, for example.
- h. Measure amperage at each power leg after traverse is complete. If an overload condition exists with measured CFM equal to scheduled CFM, notify Architect immediately.
- i. Balance each diffuser on each floor to within 10% of scheduled values. Follow procedures in SMACNA manual referenced above.
- j. For constant volume systems, perform pitot tube traverses for branch ducts on each floor. Adjust volume dampers to produce design CFM for each branch.
- k. Traverse all exhaust ducts. By sheave adjustment or damper throttling balance fans to $\pm 10\%$ airflow scheduled on drawings.

END OF SECTION

DIVISION 26 - ELECTRICAL WORK

SECTION 26.05.00

GENERAL CONDITIONS FOR ELECTRICAL WORK

(FILED SUB-BID REQUIRED, COMBINED WITH SECTIONS:
260500, 260519, 260526, 260529, 260533, 260553, 262726, 262813, 262816 & 265100)

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. RELATED DOCUMENTS

1. Drawings and General Provision of Contract, including General and Supplementary Conditions and DIVISION 01 specifications, apply to this section.
2. Where Paragraphs of this Section conflict with similar paragraphs of the General and Supplementary Conditions and DIVISION 01, requirements of this Section shall prevail.

B. Filed Sub-bids

1. Sub-bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of sub-bids are set forth in the **Advertisement**. The procedures and requirements for submitting sub-bids are set forth in the **Instructions to Bidders**.
2. Sub-bidders must be DCAM Certified in the listed trade and shall include a Current DCAM sub-bidder Certificate of Eligibility and a signed DCAM Sub-bidder's Update Statement with the bid.

C. Sub Sub-Bid Requirements: None under this Section.

D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings: E-1, E-2, E-3, E-4, E-5 & E-6.

1.2 DESCRIPTION OF WORK

- A. The general scope of work for this project shall be the installation of a second records vault in the basement, the conversion of two classrooms on the first floor into six storage rooms, the conversion of a single use bathroom into a mixed use barrier free toilet room, the installation of acoustic ceiling tile ceilings with new lighting in the basement and first floor and fire alarm system connections to a new sprinkler system (sprinkler system installed by others).

- B.** Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Lighting (indoor, normal, night, emergency and exit) including all fixtures, lamps, mounting accessories, switches, controls, outlets, wiring, raceways, and all other components and fittings required to complete the work indicated in the contract documents.
 2. Grounding and bonding of all electrical systems and equipment installed or modified under this contract.
 3. Fire alarm system modifications required to complete the work indicated in the contract documents.
 4. Wiring devices (switches and receptacles) complete with associated wallplates.
 5. Power wiring to HVAC, plumbing and fire protection equipment.
 6. Installation and wiring of VFD's and other motor controllers provided by other contractors.
 7. Testing of all electrical systems installed or modified under this contract.
 8. Coordination between electrical and other trades.
 9. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.
 10. Core drilling for the Work of this Section.
 11. Coordination drawings and record drawings and similar requirements.
 12. 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. The requirements of DIVISION 01 in relation to hoisting and rigging being the responsibility of the General Contractor, do not apply to the work of this Section.
 13. Staging, Planking and Scaffolding: The Electrical Work 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.
- C.** Alternates: Alternate #1: Provide new lighting in the two file storage rooms on the first floor.
- D.** Items To Be Installed Only: Install the following items as furnished by the designated Sections:
1. DIVISION 21 – FIRE SUPPRESSION:
 - a. Connections to fire alarm system for water flow switches and tamper switches.
 2. DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING:
 - a. Power connections for HVAC control panels, pumps, fans etc... Installation and wiring of VFD's and other motor controllers provided by the HVAC Contractor.

1. DIVISION 07 - THERMAL AND MOISTURE PROTECTION:
 - a. Coordination of floor and wall penetrations with firestopping contractor.
 2. DIVISION 09 - FINISHES:
 - a. Coordination with gypsum ceilings.
 3. DIVISION 09 - FINISHES:
 - a. Coordination with acoustical ceilings.
 4. DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING:
 - a. Coordination with HVAC piping and ductwork, motors, and DDC wiring except 120 VAC power to control panel as indicated on the Drawings
- F. The Electrical Sub-Contractor shall be responsible for filing all documents and securing of all inspections and approvals necessary for the electrical work. The Owner shall be responsible for payment of all fees related to these permits.

1.3 SUBMITTALS

- A. Comply with requirements specified in DIVISION 01.
- B. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
1. Light fixtures, including ballasts and lamps.
 2. Overcurrent and switching devices.
 3. Wiring devices and wall plates.
 4. Fire alarm system devices.
 5. Wiring and cables.
 6. Conduit.
 7. Boxes and fittings.
 8. Safety switches.

1.4 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.

1.5 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 Engineer 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 Owner's representative 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. National Fire Protection Association (NFPA)
 - 4. Local Town Regulations and By-laws
 - 5. Underwriter's Laboratories, Inc. (UL)
 - 6. National Electrical Manufacturer's Association (NEMA)
 - 7. 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.

1.6 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.

1.7 COORDINATION

- A.** HVAC, Plumbing, Fire Protection, Fire Alarm, 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 Engineer. 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 Owner, 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 Owner.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Engineer 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 Owner.

1.8 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 thermostats, 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. Pipe Tracing shall be furnished and installed by the specified subcontractor. Power connections shall be by the Electrical Subcontractor.

1.9 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 Engineer for his determination prior to proceeding with the work.

1.10 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 Engineer.

1.11 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.

1.12 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.

1.13 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.

1.14 TOOLS AND EQUIPMENT

- A.** Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

1.15 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 Owner's representative.

1.16 RECORD DRAWINGS, PROJECT CLOSEOUT

- A.** Comply with requirements specified in DIVISION 01.
- 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, control changes and corrections to schedules. Schedules shall show actual manufacturer and make and model numbers of final equipment installation.
- D.** Availability of marked up As Built drawings shall be a prerequisite to scheduling final inspection of this contract and said drawings and original contract documents will be used in checking completion of the work.
- E.** Non-availability of marked up As Built drawings or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the Architect until the discrepancy has been corrected.

1.17 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 Engineer'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 Owner's representative 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. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Engineer.
3. Provide 24 hour service beginning on the date the project is accepted by Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to Owner. Service can be provided by this contractor or a separate service organization. Choice of service organization shall be subject to Engineer and Owner's representative'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.
4. Submit copies of equipment and material warranties to Engineer before final payment.
5. At end of guarantee period, transfer manufacturers' equipment and material warranties still in force to User Agency.
6. This Paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
7. Other sections of this Specification may specify warranty requirements that exceed those of this Paragraph. Those paragraphs will govern.
8. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of work by Owner's representative, and shall not initiate the guarantee period.
9. Non-durable items, such as electric lamps, 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.
10. 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 Owner's representative's satisfaction, advise Engineer in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Engineer will direct course of action.

1.18 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

- A. Refer to DIVISION 01 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.

1.19 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 Owner.
- 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 mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
 7. 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.

1.20 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.

1.21 TEMPORARY POWER AND LIGHTING

- A.** The Electrical Subcontractor shall furnish and install feeders of sufficient size from the existing electrical service for the electric light and power requirements for the areas of work while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot of floor area in the building. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all rooms, space, stairwells, and corridors. Minimum sized lamp used shall be 100 watt. Where higher lighting intensities are required by Federal or State Standards of Laws or otherwise specified, the above specified wattage shall be increased to provide these increased intensities.
- B.** All cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.
- C.** 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 entire floor and 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.
- D.** The Electrical Subcontractor shall install and maintain the wiring and accessories for the offices of the General Contractor and Owner's representative as specified in the contract form.
- E.** All temporary electrical work shall meet the requirements of the National Electrical Code Article 590 Temporary Installations, the Local Authority Having Jurisdiction and all Federal Standards and Laws.
- F.** All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.
- G.** The General Contractor will pay for the cost of electric energy consumed by himself and by all of his Subcontractors, unless otherwise indicated.

- H. 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.
- I. Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten 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.

1.22 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 Engineer 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 Owner's representative, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner's representative prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of 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 Engineer and the Owner's representative 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 re-used 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 materials (PCB lighting ballasts, fluorescent lamps, etc.) 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. Owner's Representative 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 Engineer to suit the project progress schedule, as well as the completion date of the project.
 - 2. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural drawings.

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 competition, 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 such as lighting fixtures 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 manufacturers products will be unacceptable.
- D. Where Specifications list manufacturer's names and/or "as approved" or "Equal approved by Engineer", other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Engineer.
- E. All materials shall be new and shall be UL listed.

PART 3 - EXECUTION

Not Used.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, XHHW, and SO.
- C. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. O-Z/Gedney; EGS Electrical Group LLC.

3. 3M; Electrical Products Division.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN single conductors in raceway.
- B. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN single conductors in raceway or Metal-clad cable Type MC.
- C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- D. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- E. Class 2 Control Circuits: Power-limited cable, concealed in building finishes.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in DIVISION 07.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both wall surfaces.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to DIVISION 07.
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to DIVISION 07.
- J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to DIVISION 07.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- D. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.2 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- C. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.

1.2 SUBMITTALS

- A. Product Data: For steel slotted support systems.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Unistrut; Tyco International, Ltd.
 - 3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 6. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.

7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in DIVISION 05 for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Comply with requirements in DIVISION 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See DIVISION 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks and manholes, and underground handholes, boxes, and utility construction.

1.2 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, compression type.

2.2 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Thomas & Betts Corporation.
 - b. Hubbell Incorporated; Wiring Device-Kellems Division
 - c. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Thomas & Betts Corporation.
 - b. Hubbell Incorporated; Wiring Device-Kellems Division.
 - c. Wiremold Company (The); Electrical Sales Division.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.
- E. Nonmetallic Floor Boxes: Nonadjustable, round.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

- H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic.
- I. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Concealed Conduit, Aboveground: EMT.
 - 3. Underground Conduit: RNC, Type EPC- 80-PVC, direct buried.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: Rigid steel conduit.
 - 6. Raceways for Optical Fiber or Communications Cable: EMT.

7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- I. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- J. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- K. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

3.3 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in DIVISION 07.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 INSTRUCTION SIGNS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.4 EQUIPMENT IDENTIFICATION LABELS

- A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in DIVISION 09 for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- G. Painted Identification: Comply with requirements in DIVISION 09 for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 10-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Lighting.
 - 2. Normal Power.
 - 3. Fire Alarm.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

- d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Wall-box motion sensors.
 - 3. Snap switches and wall-box dimmers.
 - 4. Wall-switch and exterior occupancy sensors.
- B. See DIVISION 26 for workstation outlets.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 2. Leviton Mfg. Company Inc. (Leviton).
 - 3. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; HBL5351 (single), CR5352 (duplex).
 - b. Leviton; 5891 (single), 5352 (duplex).
 - c. Pass & Seymour; 5381 (single), 5352 (duplex).
 - 2. Products used in Damp and Wet locations shall be listed weather-resistant type.

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; GFST20
 - b. Leviton; 8598
 - c. Pass & Seymour; 2084
 - 2. Products used in Damp and Wet locations shall be listed weather-resistant type.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - b. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - c. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
- C. Pilot Light Switches, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; HPL1221PL for 120 V and 277 V.
 - b. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
 - c. Pass & Seymour; PS20AC1-PLR for 120 V.
 - 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

3. Products used in Patient Care Areas of healthcare occupancies shall be listed Hospital Grade type.

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 1. Plate-Securing Screws: Metal with head color to match plate finish.
 2. Material for Finished Spaces: Smooth, high-impact nylon (unless otherwise noted).
 3. Material for Unfinished Spaces: Galvanized steel.
 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable "while-is-use" type cover.

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

- A. Comply with DIVISION 26 Section "Identification for Electrical Systems."
 - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled (normal power) and red-filled (normal/emergency or emergency power) lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers, and motor-control centers.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA FU 1 for cartridge fuses.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mersen
 - 2. Cooper Bussmann
 - 3. Littelfuse

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

- A. Motor Branch Circuits: Class RK1, time delay.
- B. Other Branch Circuits: Class RK5, time delay.
- C. Control Circuits: Class CC, fast acting.

3.2 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in DIVISION 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers.
- C. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
- D. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Lugs: Suitable for number, size, and conductor material.
 - 5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- E. Features and Accessories:
 1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in DIVISION 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. See DIVISION 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.2 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes.
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.
- D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In Interior Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
 - 1. Basis-of-Design Product: The design of each item of exterior luminaire and its support is based on the product named. Subject to compliance with

requirements, provide either the named product or a pre-approved equivalent product by another manufacturer.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 BALLASTS

- A. Electronic Ballasts for Linear Fluorescent Lamps: Comply with ANSI C82.11; programmed-start type, unless otherwise indicated, and designed for type and quantity

of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Sound Rating: A.
 2. Total Harmonic Distortion Rating: Less than 10 percent.
 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 4. Operating Frequency: 42 kHz or higher.
 5. Lamp Current Crest Factor: 1.7 or less.
 6. BF: 0.85 or higher.
 7. Power Factor: 0.98 or higher.
- B. Electromagnetic Ballasts for Linear Fluorescent Lamps: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.
1. Ballast Manufacturer Certification: Indicated by label.
- C. Ballasts for Temperatures Minus 20 Deg F and Higher for Linear Fluorescent Lamps: Electromagnetic type designed for use with indicated lamp types.
- D. Ballasts for Dimmer-Controlled Lighting Fixtures with Linear Fluorescent Lamps: Electronic type.
1. Dimming Range: 100 to 5 percent of rated lamp lumens.
 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
 3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
- E. Ballasts for Bi-Level Controlled Lighting Fixtures with Linear Fluorescent Lamps: Electronic type.
1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
 - a. High-Level Operation: 100 percent of rated lamp lumens.
 - b. Low-Level Operation: 50 percent of rated lamp lumens.
 2. Ballast shall provide equal current to each lamp in each operating mode.
 3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.
- F. Ballasts for Compact Fluorescent Lamps: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
1. Lamp end-of-life detection and shutdown circuit.
 2. Automatic lamp starting after lamp replacement.
 3. Sound Rating: A.
 4. Total Harmonic Distortion Rating: Less than 20 percent.
 5. Transient Voltage Protection: IEEE C62.41, Category A or better.

6. Operating Frequency: 20 kHz or higher.
 7. Lamp Current Crest Factor: 1.7 or less.
 8. BF: 0.95 or higher, unless otherwise indicated.
 9. Power Factor: 0.98 or higher.
 10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
 11. Ballast Case Temperature: 75 deg C, maximum.
- G. Ballasts for Dimmer-Controlled Lighting Fixtures with Compact Fluorescent Lamps: Electronic type.
1. Dimming Range: 100 to 5 percent of rated lamp lumens.
 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
 3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
- H. Internal-Type Emergency Fluorescent Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
1. Emergency Connection: Operate 1 fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 2. Night-Light Connection: Operate one fluorescent lamp continuously.
 3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 4. Battery: Sealed, maintenance-free, nickel-cadmium type.
 5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

2.4 EXIT SIGNS

- A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
1. Lamps for AC Operation: Fluorescent, 2 for each fixture, 20,000 hours of rated lamp life.
 2. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.5 EMERGENCY LIGHTING UNITS

- A. Description: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.6 LAMPS

- A. Low-Mercury Fluorescent Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T8 Rapid-Start low-mercury Fluorescent Lamps: Rated 32 W maximum, nominal length 48 inches, 2800 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life 24,000 hours, unless otherwise indicated.
- C. T8 Rapid-Start low-mercury Fluorescent Lamps: Rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 85 (minimum), color temperature 3500 K, and average rated life of 24,000 hours, unless otherwise indicated.
- D. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, and suitable for use with dimming ballasts, unless otherwise indicated.
 1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
 2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
 3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
 4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
 5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
 6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with DIVISION 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

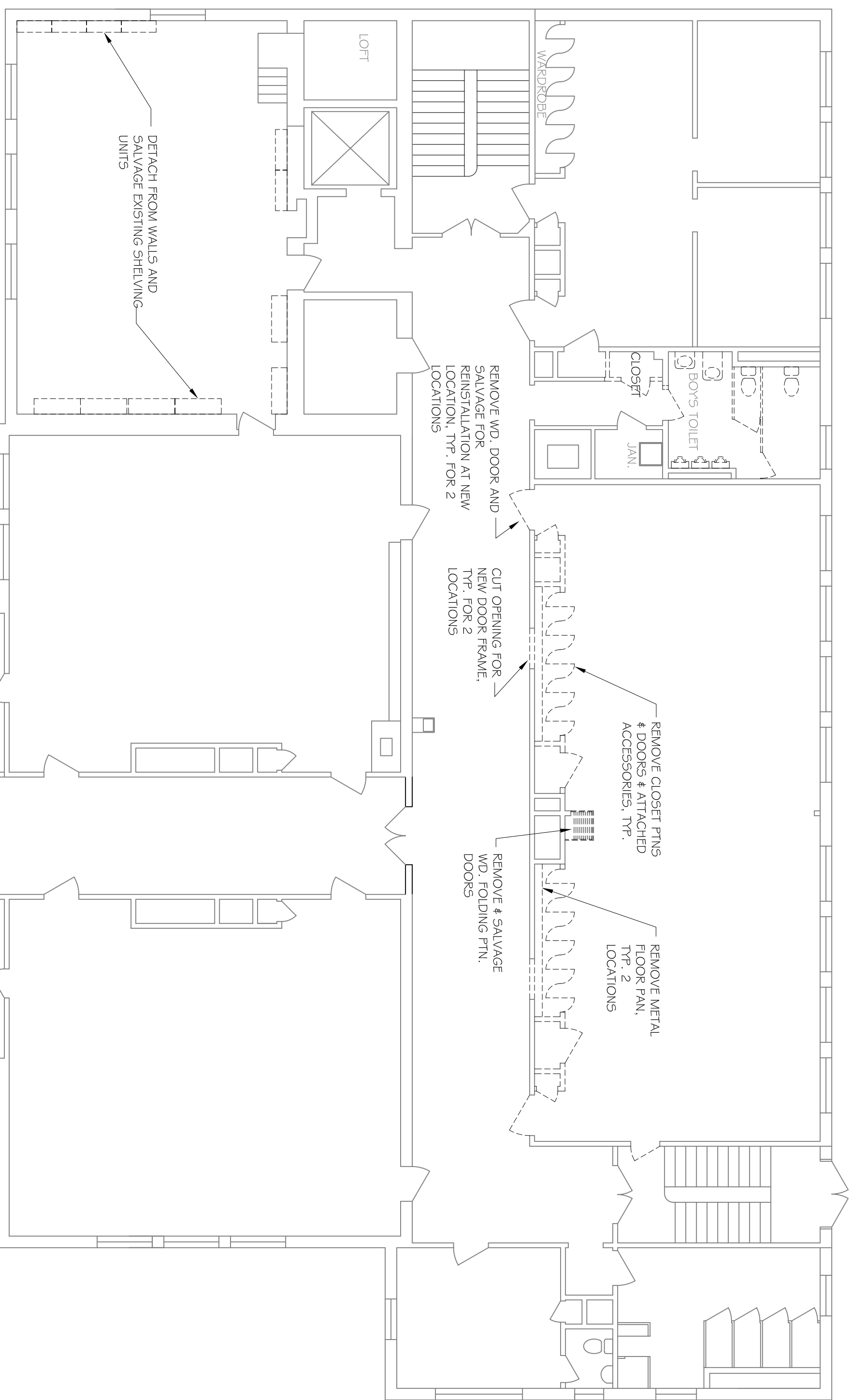
3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
- D. Adjust aimable lighting fixtures to provide required light intensities.
- E. Connect wiring according to DIVISION 26 Section "Low-Voltage Electrical Power Conductors and Cables."

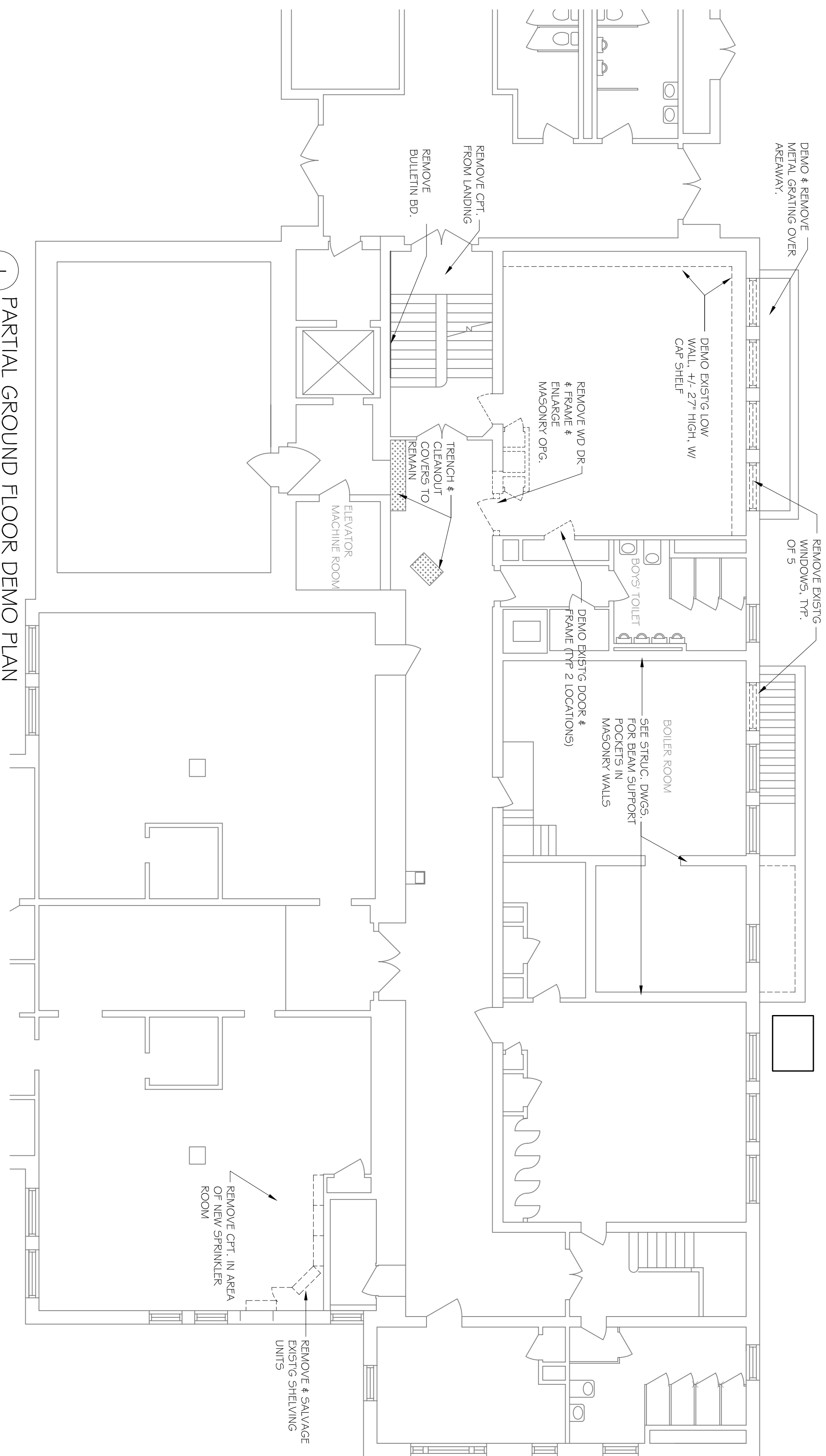
3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100



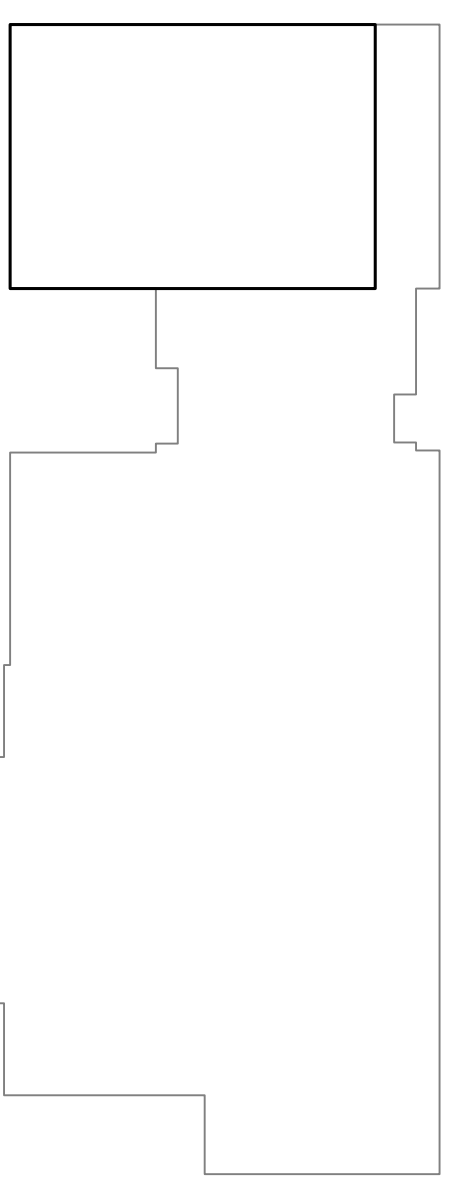
2 FIRST FLOOR DEMO PLAN
1/8" = 1'-0"



1 PARTIAL GROUND FLOOR DEMO PLAN
1/8" = 1'-0"

- GENERAL NOTES:
1. DRAWINGS ARE NOT TO BE SCALED.
 2. DRAWINGS SHOW DESIGN INTENT. CONTRACTOR IS RESPONSIBLE FOR MEANS, METHODS & SEQUENCES OF CONSTRUCTION.
 3. VERIFY ALL DIMENSIONS TO CONFORM TO STATE & LOCAL BUILDING CODES & ORDINANCES.
 4. FIELD VERIFY ALL EXISTG CONDITIONS & DIMENSIONS.

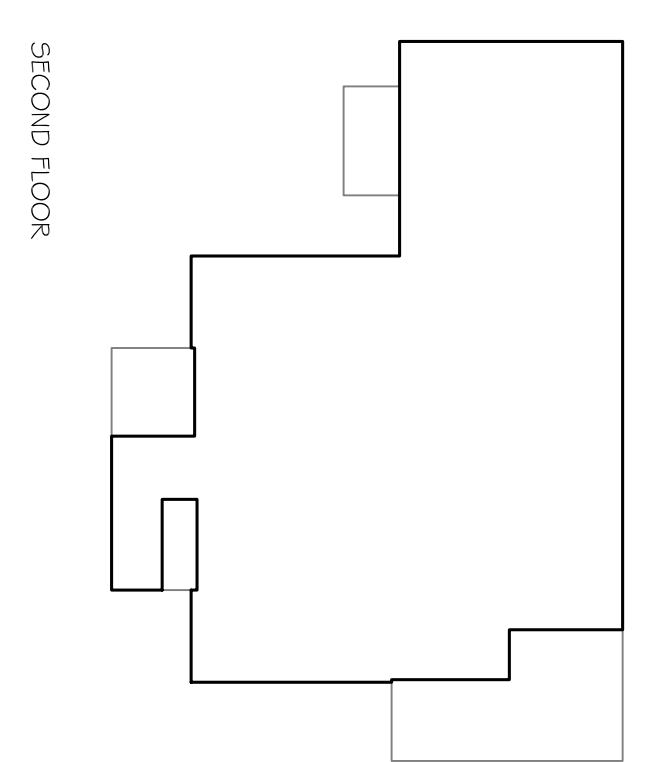
KEY PLANS - ALT. #2



STREET LEVEL FLOOR

GROUND FLOOR

KEY PLANS - BASE BID & ALT. #1



STREET LEVEL FLOOR

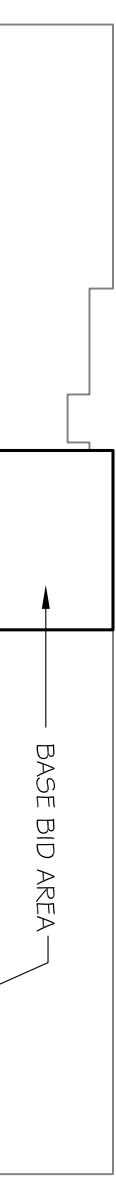
GROUND FLOOR

SECOND FLOOR

STREET LEVEL FLOOR

GROUND FLOOR

FIRST FLOOR



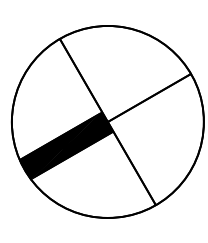
STREET LEVEL FLOOR

GROUND FLOOR

FIRST FLOOR

GROUND & FIRST FLOOR DEMOLITION PLANS

DATE: 09-08-12
SCALE: 1/8" = 1'-0"

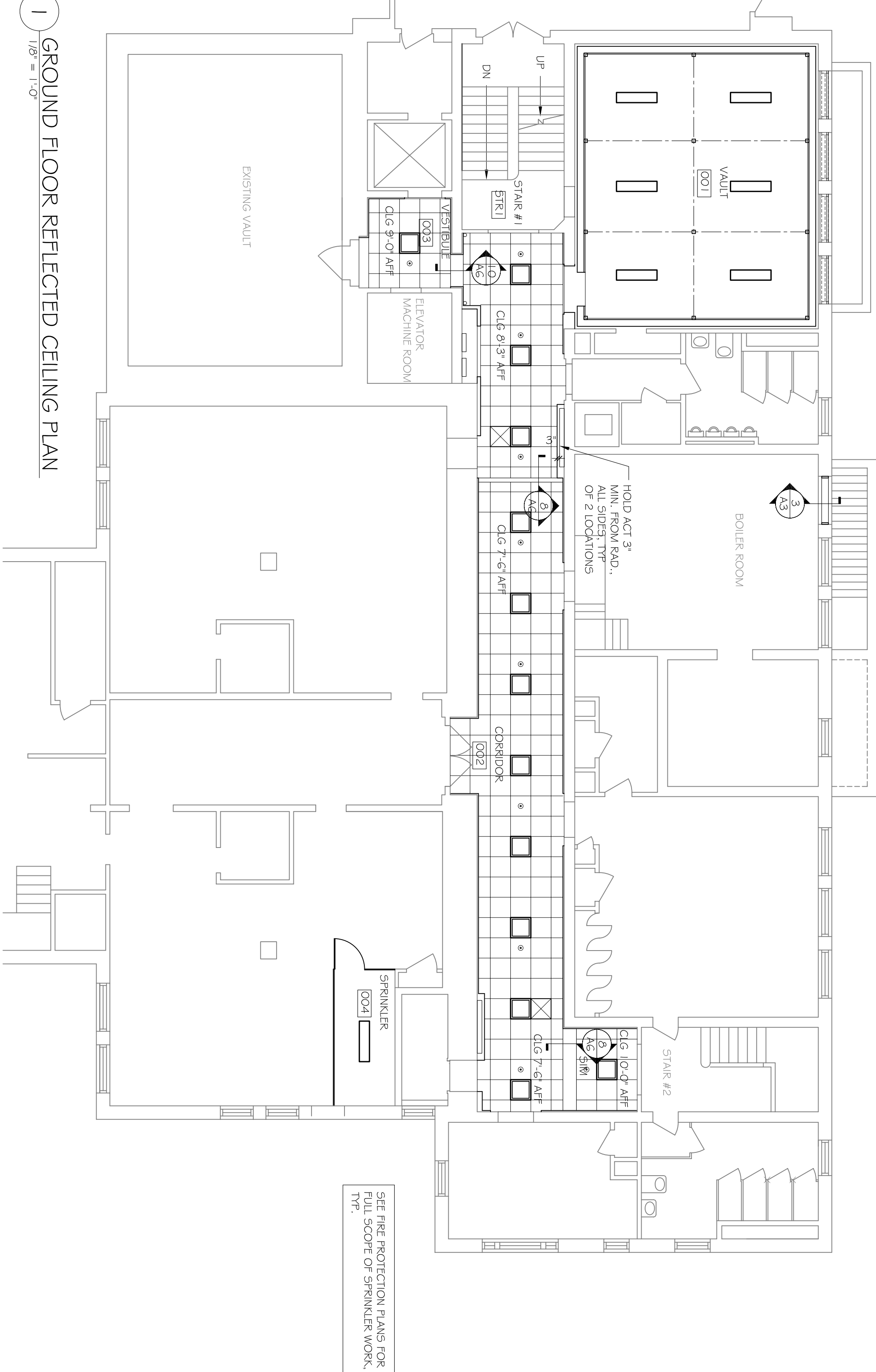
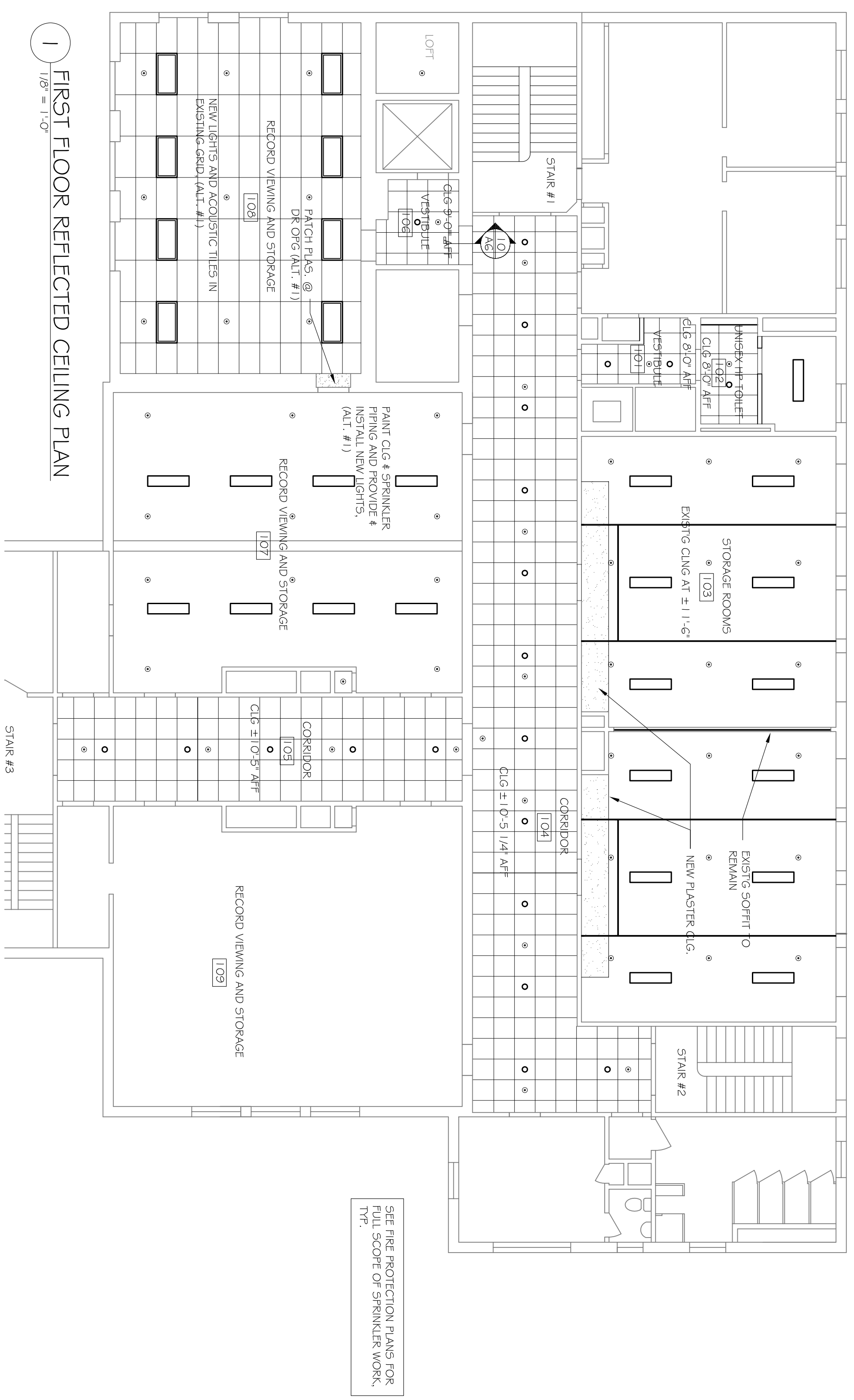


ARCHIVAL VAULT AT THE FORMER BRIGHT SCHOOL- PHASE 2

260 GROVE STREET, WALTHAM, MA

KANG ASSOCIATES, INC.
339 BOSTON POST ROAD
SUDBURY, MA 01776

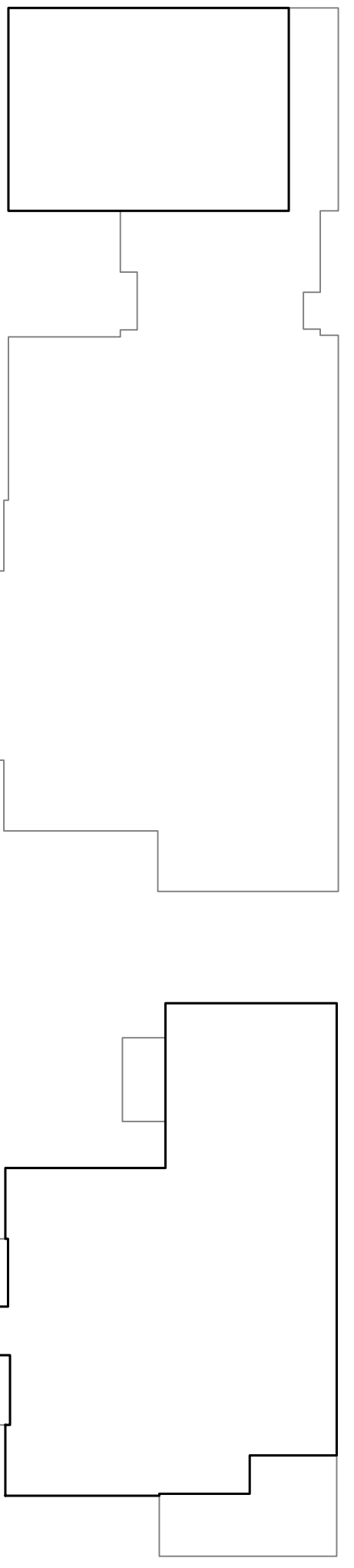
D1



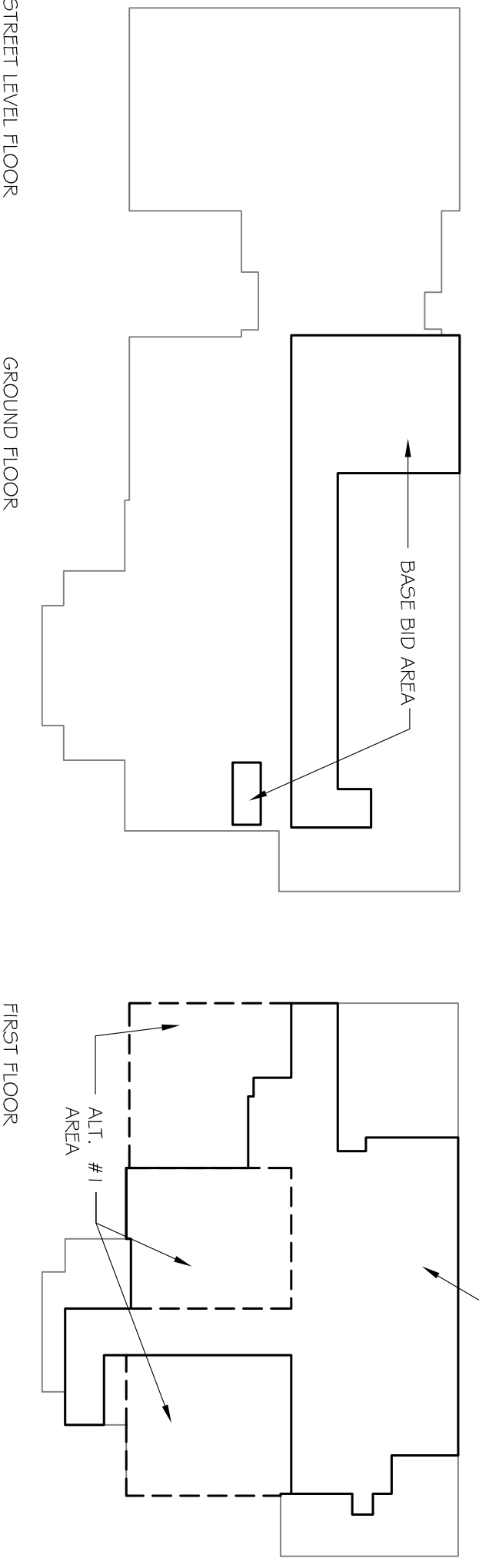
1 GROUND FLOOR REFLECTED CEILING PLAN
1/8" = 1'-0"

1 FIRST FLOOR REFLECTED CEILING PLAN
1/8" = 1'-0"

KEY PLANS - ALT. #2



KEY PLANS - BASE BID & ALT. #1



- GENERAL NOTES:
1. DRAWINGS ARE NOT TO BE SCALED.
 2. DRAWINGS SHOW DESIGN INTENT. CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION.
 3. ALL CONSTRUCTION TO CONFORM TO STATE & LOCAL BUILDING CODES & ORDINANCES.
 4. FIELD VERIFY ALL EXISTING CONDITIONS & DIMENSIONS.

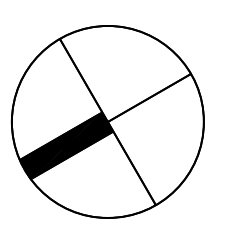
- NOTES:
- REFLECTED CEILING PLAN SHOWS INTENDED LOCATIONS OF CEILING MTD ITEMS. REFER TO THE MEP AND FF DINGS FOR INFORMATION ON THESE ITEMS.
 - CEILING ARE EXISTING PLASTER UNLESS INDICATED OTHERWISE.
 - PATCH CEILINGS AT REMOVED LIGHT FIXTURES, DEMOLISHED WALLS, AND OTHER ATTACHED ITEMS.

- KEY:
- RECESSED CEILING LIGHT FIXTURE.
 - SURFACE MTD LIGHT FIXTURE.
 - LAY-IN LIGHT FIXTURE.
 - SPRINKLER HEAD

KANG ASSOCIATES, INC.
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SUDBURY, MA 01776

ARCHIVAL VAULT AT THE FORMER BRIGHT SCHOOL- PHASE 2

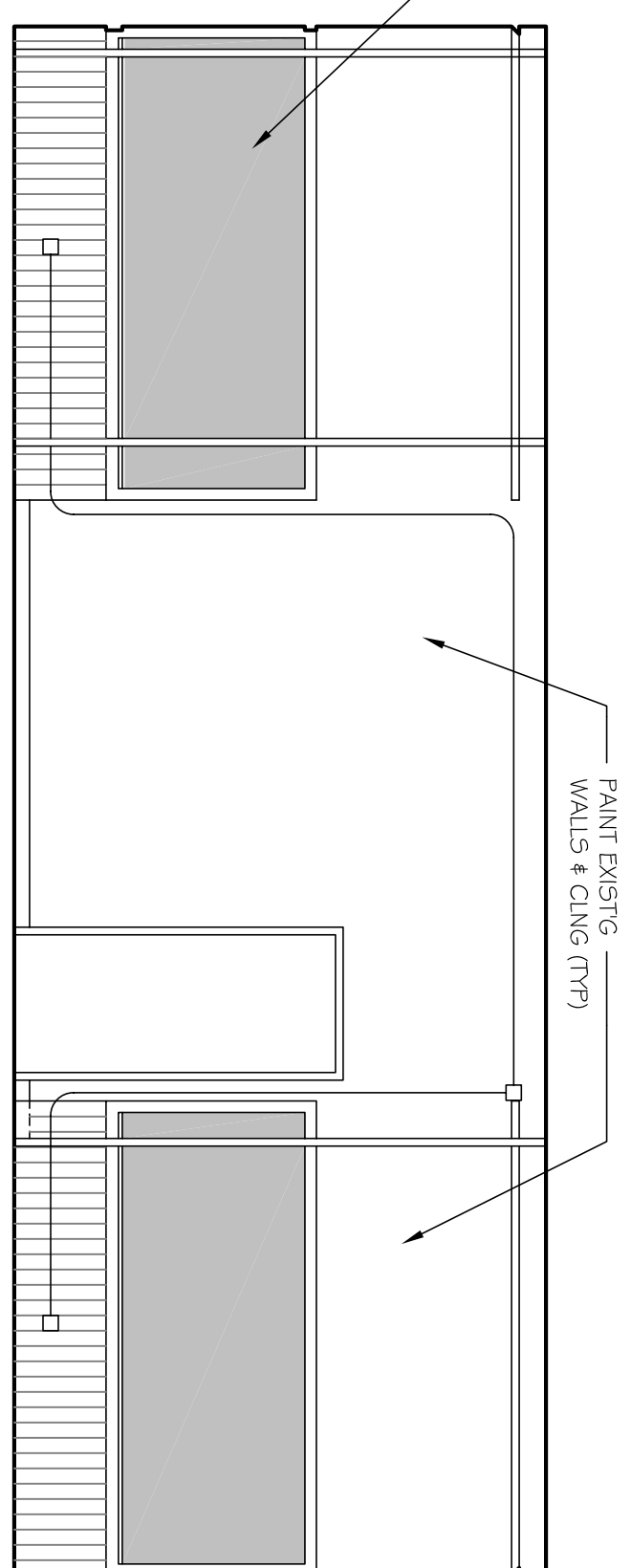
260 GROVE STREET, WALTHAM, MA



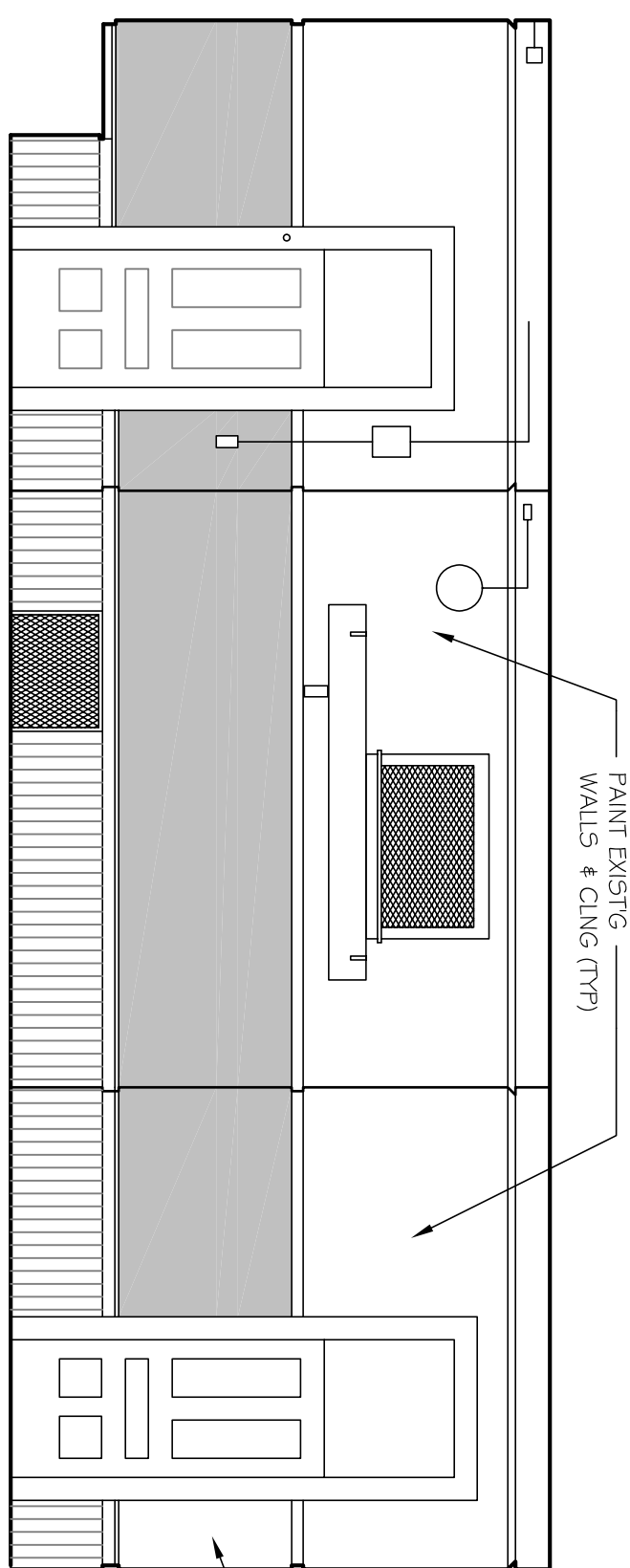
DATE: 09-12-12
SCALE: 1/8" = 1'-0"
GROUND & FIRST FLOOR REFLECTED CEILING PLANS

A2

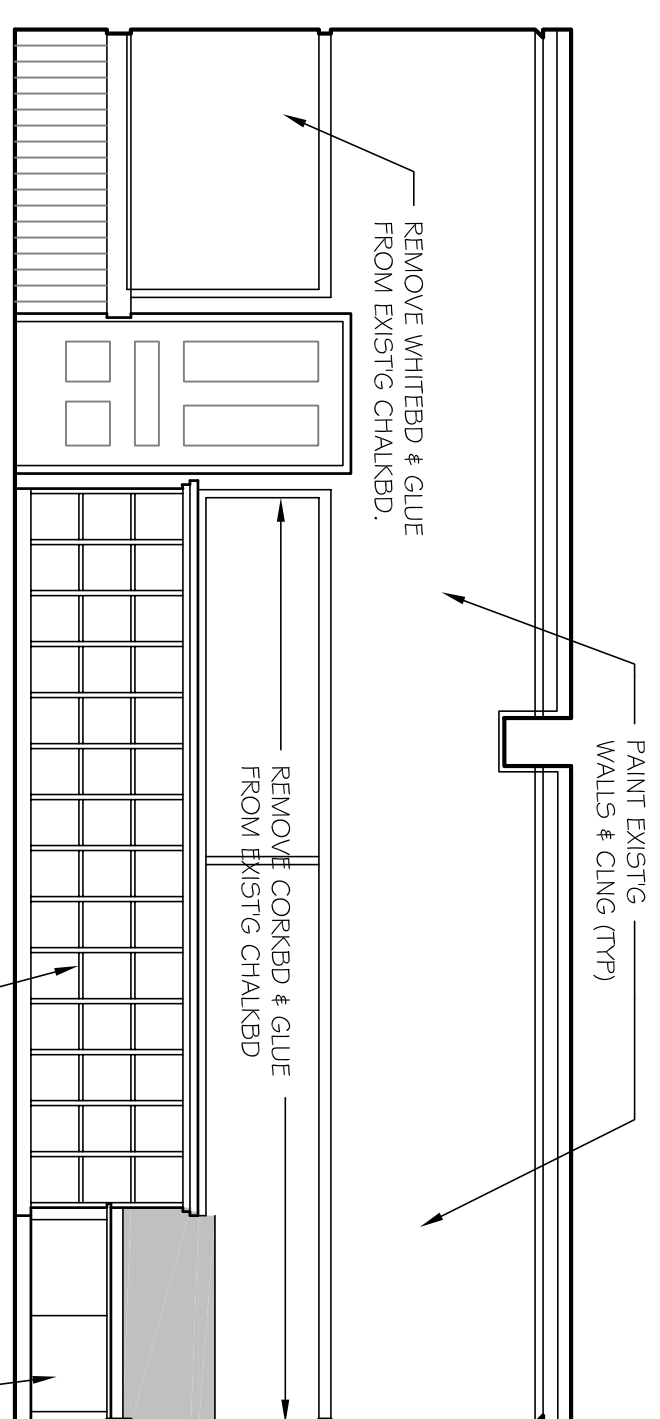
SHADDED AREAS REPRESENT EXIST'G CHAIRS, TO REMAIN, TYP.



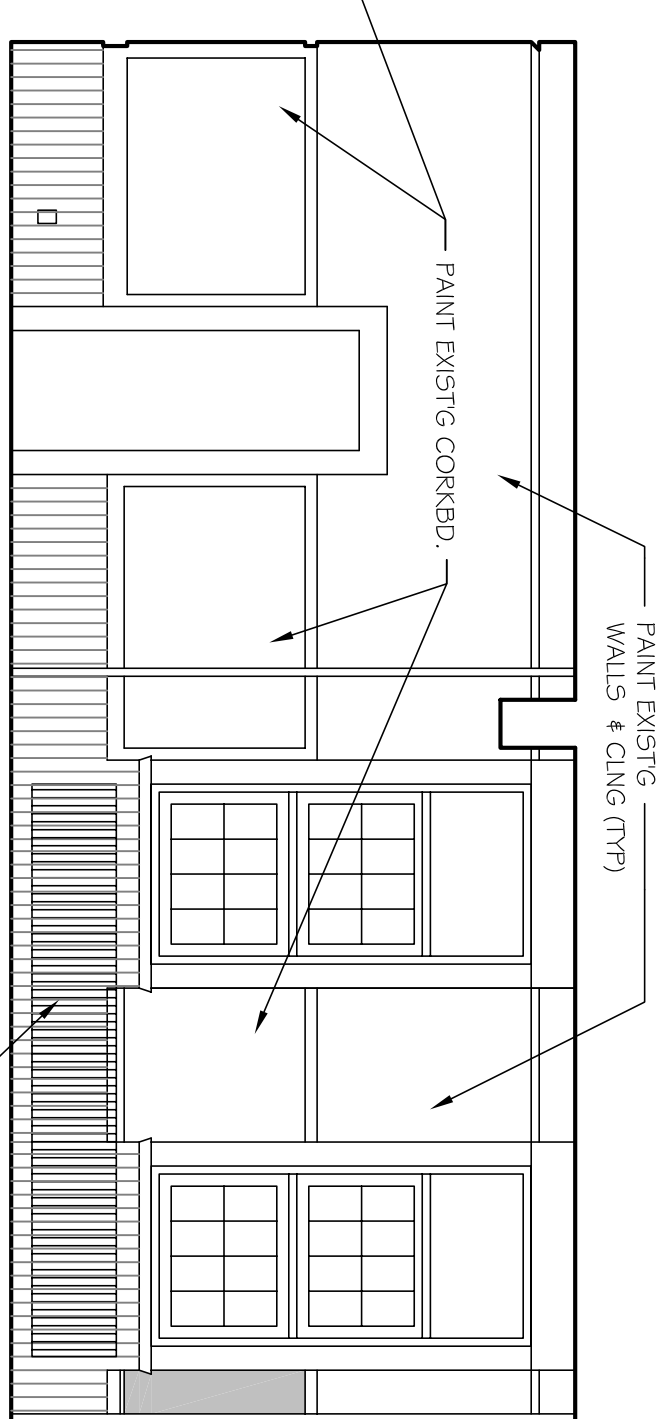
8 FILE STORAGE 108 ELEVATION
1/4" = 1'-0"



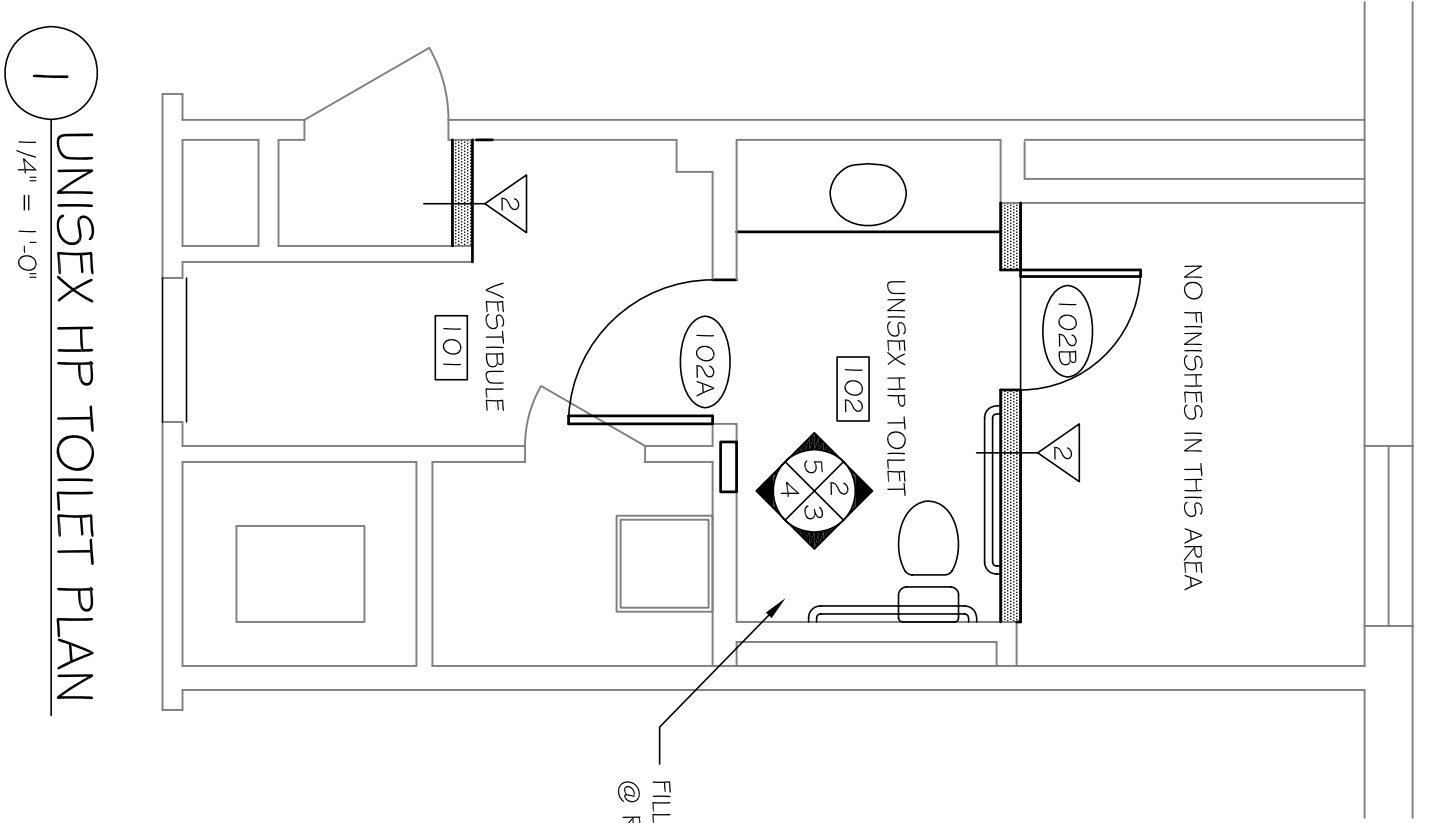
6 FILE STORAGE 108 ELEVATION
1/4" = 1'-0"



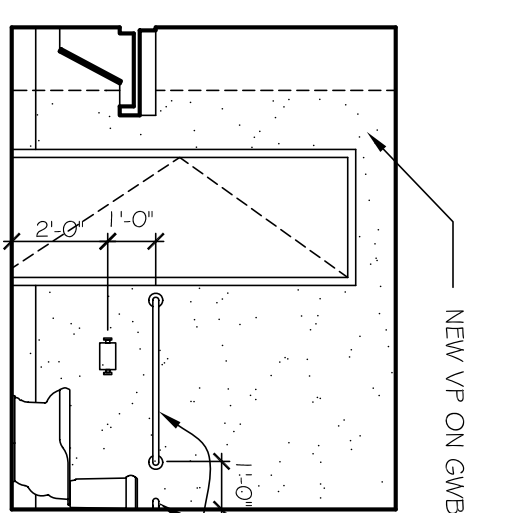
9 FILE STORAGE 108 ELEVATION
1/4" = 1'-0"



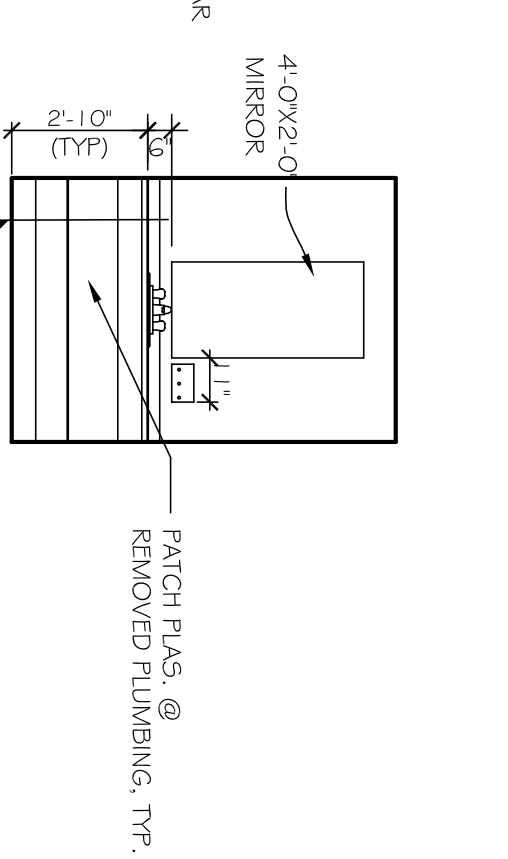
7 FILE STORAGE 108 ELEVATION
1/4" = 1'-0"



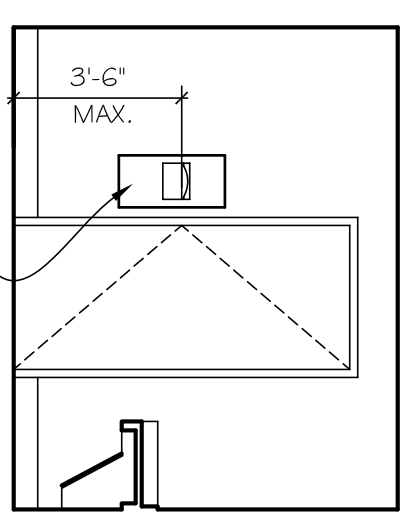
1 UNISEX HP TOILET PLAN
1/4" = 1'-0"



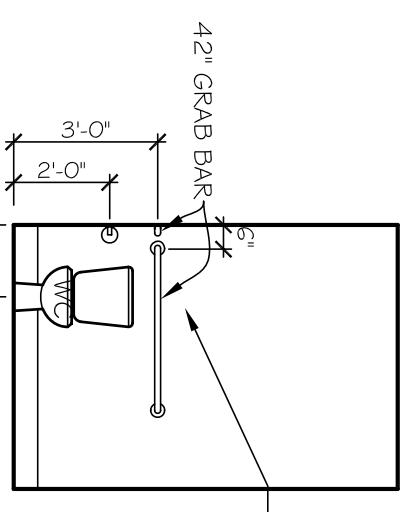
4 TOILET ELEVATION
1/4" = 1'-0"



5 TOILET ELEVATION
1/4" = 1'-0"



2 TOILET ELEVATION
1/4" = 1'-0"



3 TOILET ELEVATION
1/4" = 1'-0"

- GENERAL NOTES:
1. DRAWINGS ARE NOT TO BE SCALED.
 2. DRAWINGS SHOW DESIGN INTENT; CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS & CONDITIONS OF ALL CONSTRUCTION TO CONFORM TO STATE & LOCAL BUILDING CODES & ORDINANCES.
 3. FIELD VERIFY ALL EXIST'G CONDITIONS & DIMENSIONS.
 4. PATCH PLAS. @ REMOVED PLUMBING, TYP.

KANG ASSOCIATES, INC.
339 BOSTON POST ROAD
SUDBURY, MA 01776

ARCHIVAL VAULT AT THE FORMER BRIGHT SCHOOL- PHASE 2

260 GROVE STREET, WALTHAM, MA

DATE: 09-08-12
SCALE: 1/4" = 1'-0"

INTERIOR ELEVATIONS & ENLARGED PLANS

A5

ROOM #	DESCRIPTION	FLOOR	BASE	WALLS			CEILING	REMARKS
				NORTH	EAST	SOUTH		
001	VAULT	VCT	VIN	GWB	GWB	GWB	GWB	COORDINATE W/ VAULT MANUF.
002	CORRIDOR	VCT	VIN	VP	EXISTG	VP	VP	
003	VESTIBULE	VCT	VIN	EXISTG	VP	VP	VP	
004	SPRINKLER STAIR #1	EXISTG	NONE	NONE	EXISTG	EXISTG	EXISTG	REMOVE CRT GULF & SEAL CONC. FLR
101	VESTIBULE	CT	CT	VP	VP	VP	VP	CT BASE @ NEW WALLS
102	UNSEX HP TOILET	CT	CT	VP	VP	VP	VP	CT BASE @ NEW WALLS
103	STORAGE ROOMS	VCT	VIN	VP	VP	VP	VP	PAINT WALLS & CLG. EXISTG FINISHED WOOD TO REMAIN.
104	CORRIDOR	EXISTG	EXISTG	VP	VP	VP	VP	RE-FINISH EXISTG WD WAINSCOTING, DOORS, & TRIMS. CLEAN & POLISH EXISTG TERR. FLR. & BASE.
105	CORRIDOR	EXISTG	EXISTG	VP	VP	VP	VP	RE-FINISH EXISTG WD WAINSCOTING, DOORS, & TRIMS. CLEAN & POLISH EXISTG TERR. FLR. & BASE.
106	VESTIBULE	CT	CT	VP	VP	VP	VP	RE-FINISH EXISTG WD WAINSCOTING, DOORS, & TRIMS. CLEAN & POLISH EXISTG TERR. FLR. & BASE.
107	RECORD VIEWING & STORAGE	EXISTG	EXISTG	VP	VP	VP	VP	STRETCH/PATCH EXISTG CRT. PAINT WALLS ABOVE WAINSCOTING. ALT.#1: PAINT CLG & NEW SPRINKLER PIPES
108	RECORD VIEWING & STORAGE	EXISTG	EXISTG	VP	VP	VP	VP	ALT.#1: PAINT WALLS & NEW ACT TILES IN EXISTG CLG GRID
109	RECORD VIEWING & STORAGE	CFT	VIN	EXISTG	EXISTG	EXISTG	EXISTG	ALT.#1: PAINT WALLS ABOVE WAINSCOTING, PAINT CLG & NEW SPRINKLER PIPES, NEW CARPETING & VIN BASE.
5TR3	STAIR #3	EXISTG	EXISTG	EXISTG	EXISTG	EXISTG	EXISTG	PATCH PLASTER WALLS AS NEEDED. CLEAN & POLISH EXISTG TERR. FLR. & BASE.

FINISH SCHEDULE

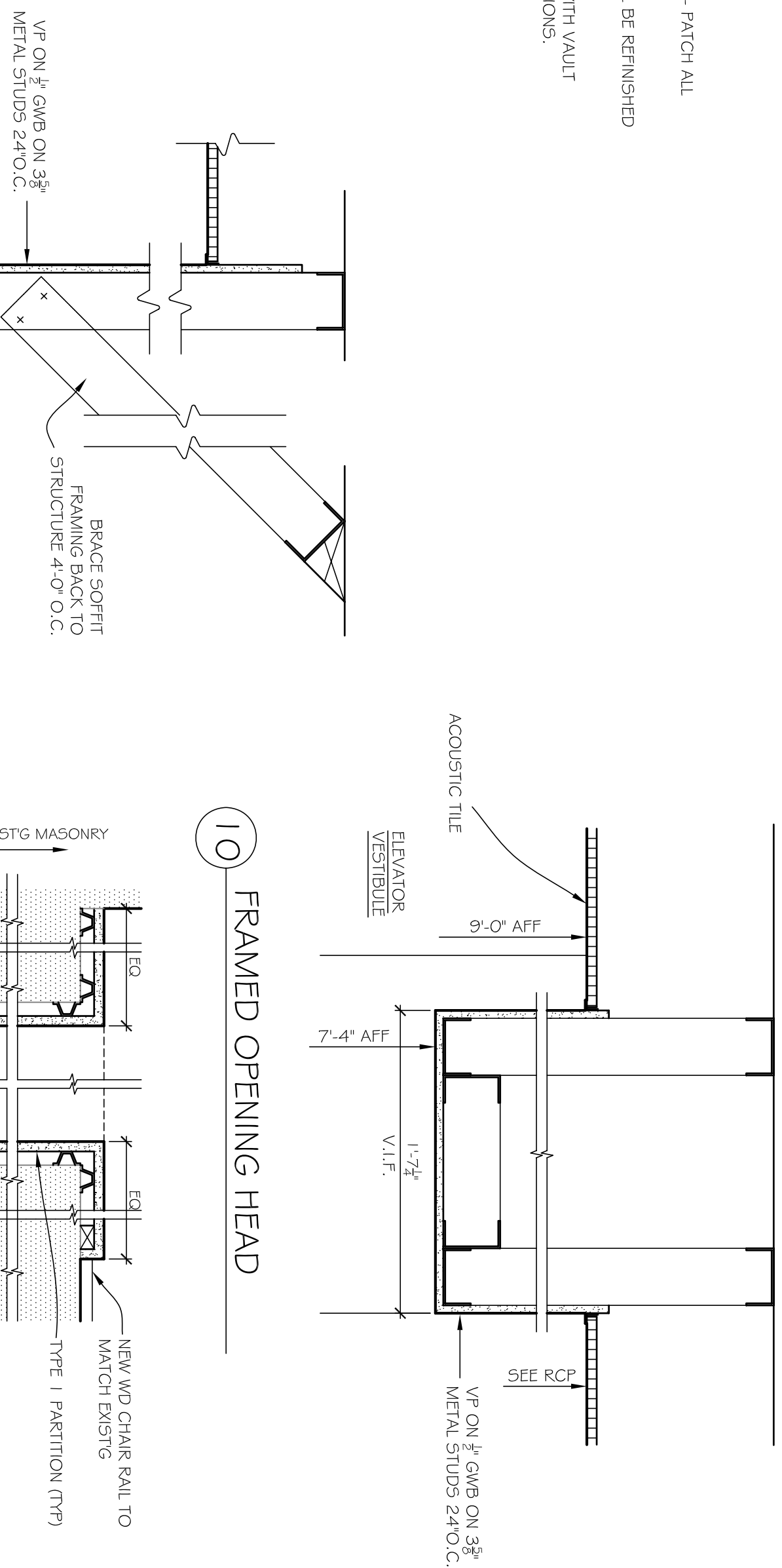
DOOR #	FRAME MAT'L	DOOR WIDTH	HW SET	HEAD/JAMB DTL	COMMENTS
001	FRM VLUIT MANUF	PER VLUIT MANUF			
002A	STL	2'-2'-6 7/8"-0"	H4		
002B	EXISTG	EXISTG	H5		
102A	STL	3'-0" X 7'-0"	H2		
102B	STL	2'-6" X 7'-0"	H3		
103A	WD	EXISTG	H1		RE-USE EXISTG DOOR IN NEW FRAME & LOCATION
103B	WD	EXISTG	H1		RE-USE EXISTG DOOR IN NEW FRAME & LOCATION

DOOR SCHEDULE

- COORDINATE DEPTH OF DOOR FRAMES W/ WALL CONSTRUCTION.

FINISH SCHEDULE NOTES:

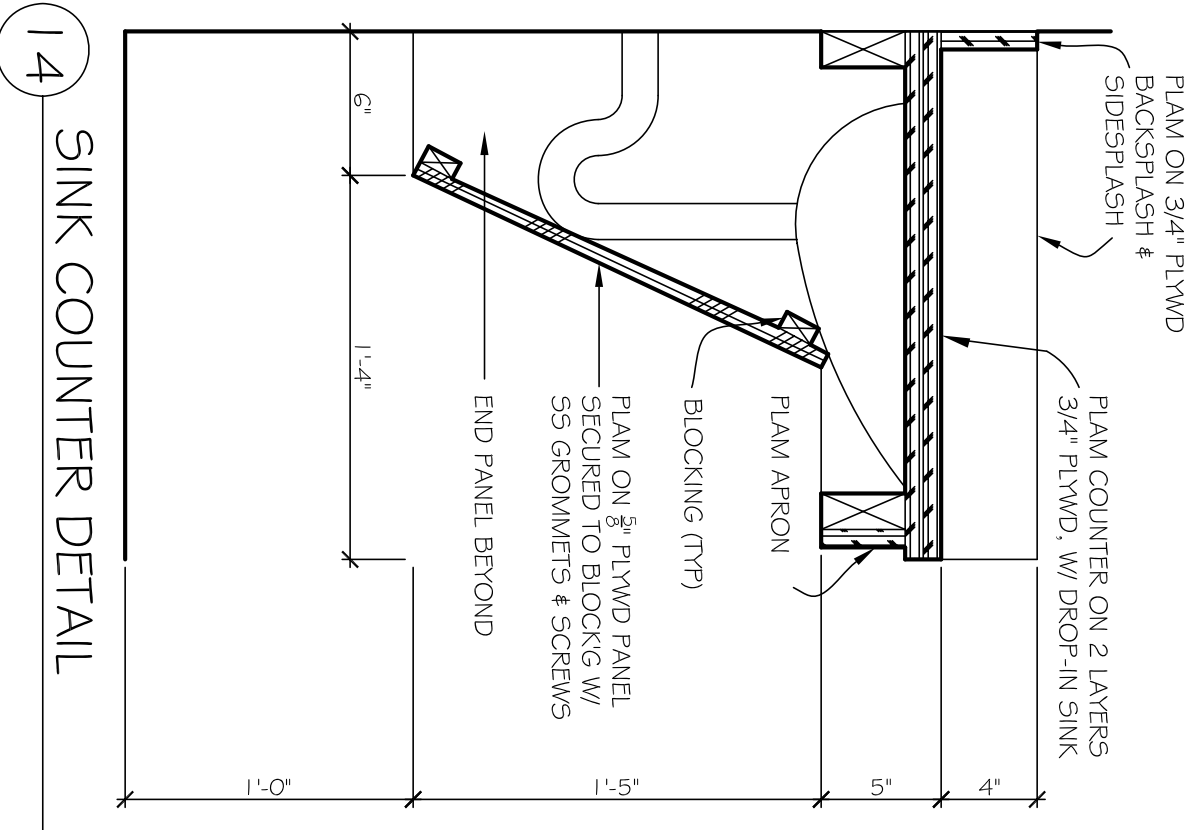
- ALL FINISHES ARE NEW UNLESS OTHERWISE NOTED - PATCH ALL EXISTG FINISHES IN SCHEDULED AREAS AS REQD UNLESS NOTED OTHERWISE.
- APPLY FINISHES IN VAULT IN STRICT COMPLIANCE WITH VAULT MANUFACTURERS INSTRUCTIONS & RECOMMENDATIONS.



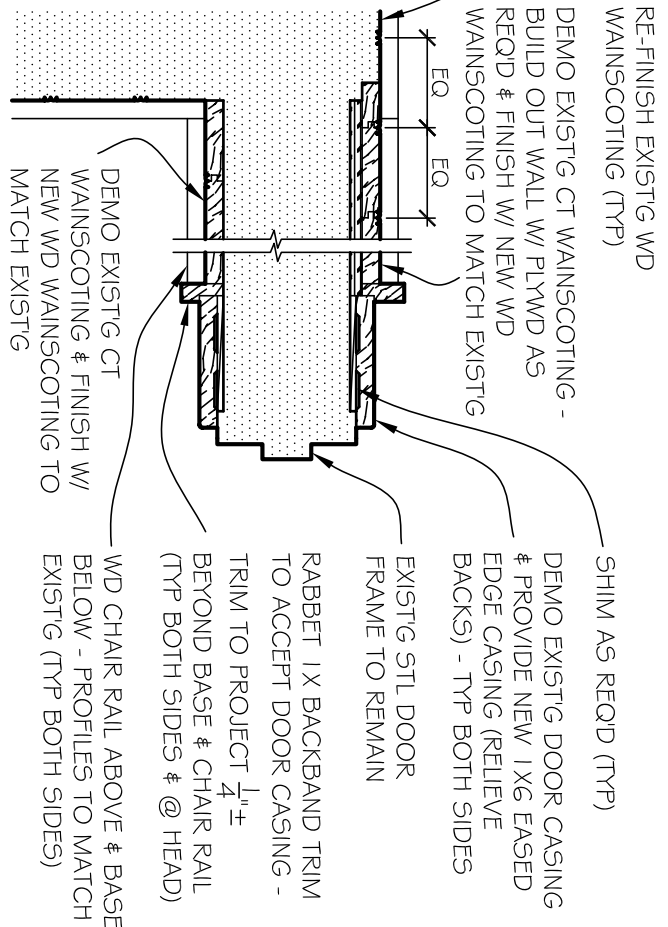
10 FRAMED OPENING HEAD

8 SOFFIT

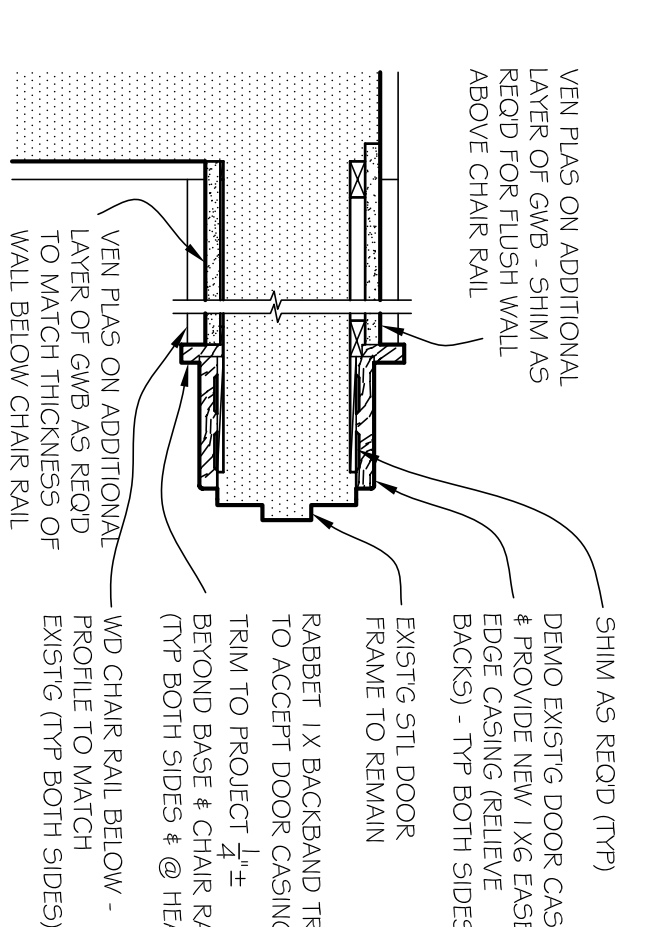
9 FRAMED OPENING JAMB



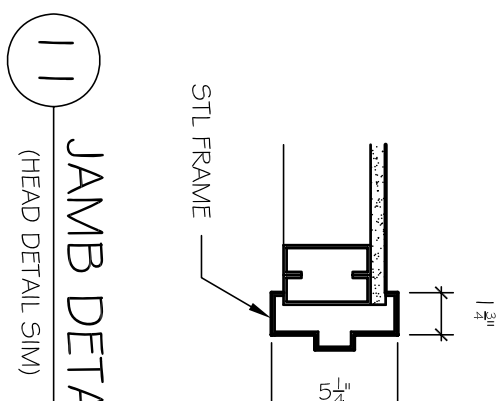
14 SINK COUNTER DETAIL



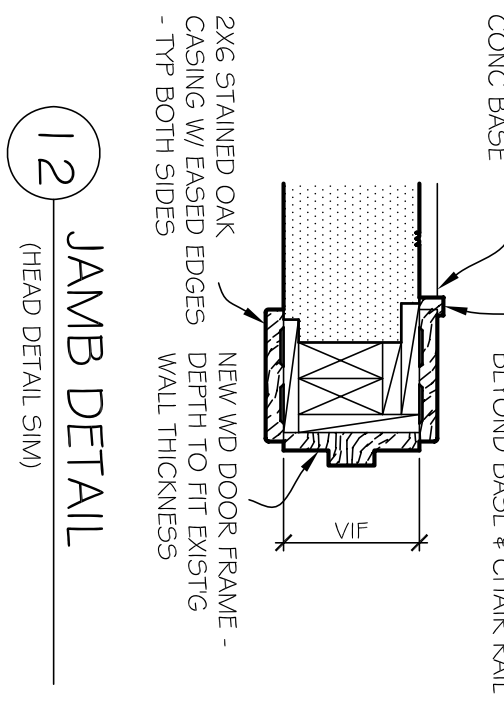
6 DOOR JAMB



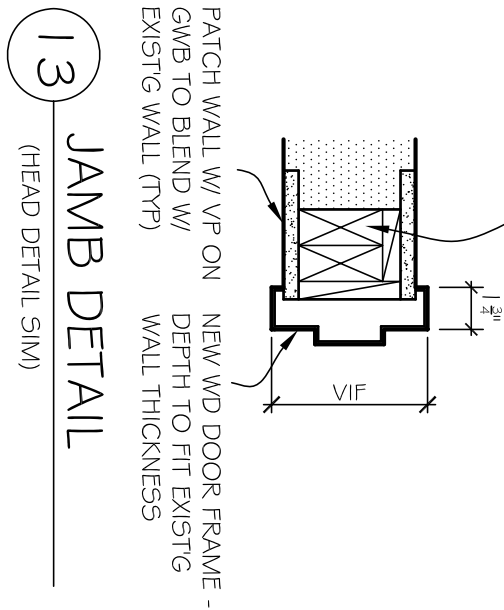
7 DOOR JAMB



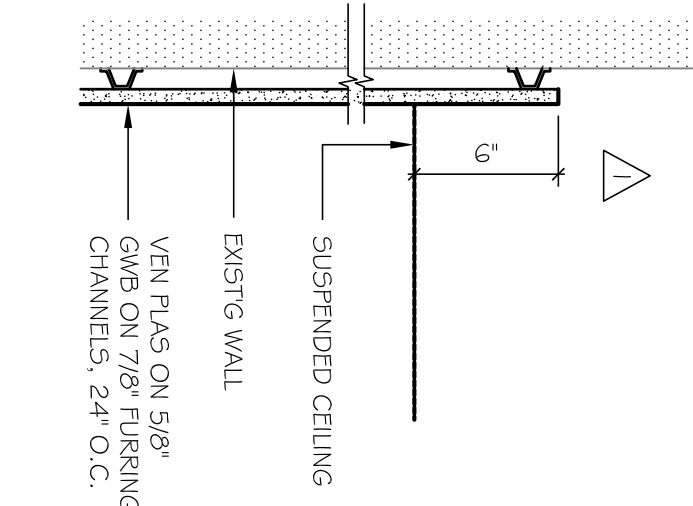
11 JAMB DETAIL



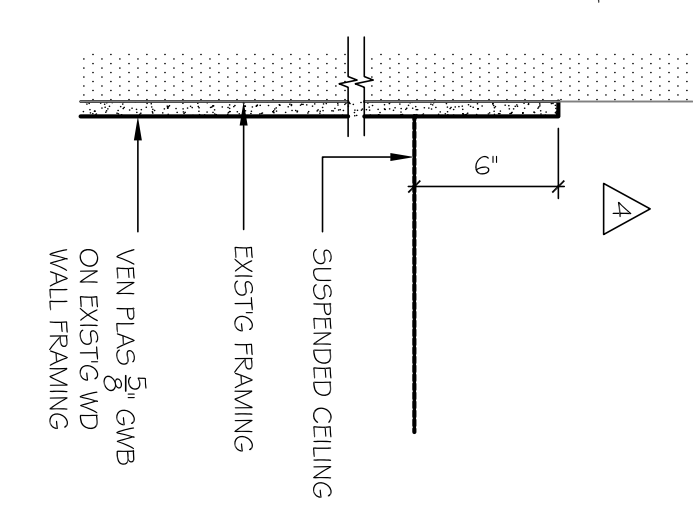
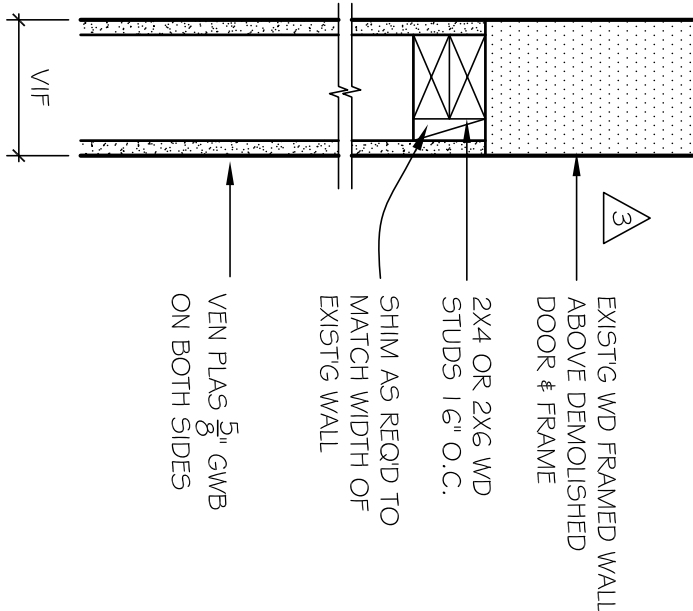
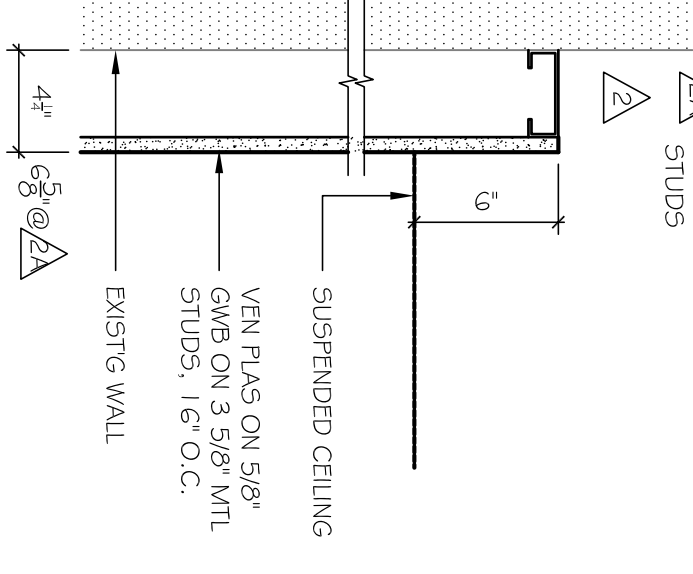
12 JAMB DETAIL



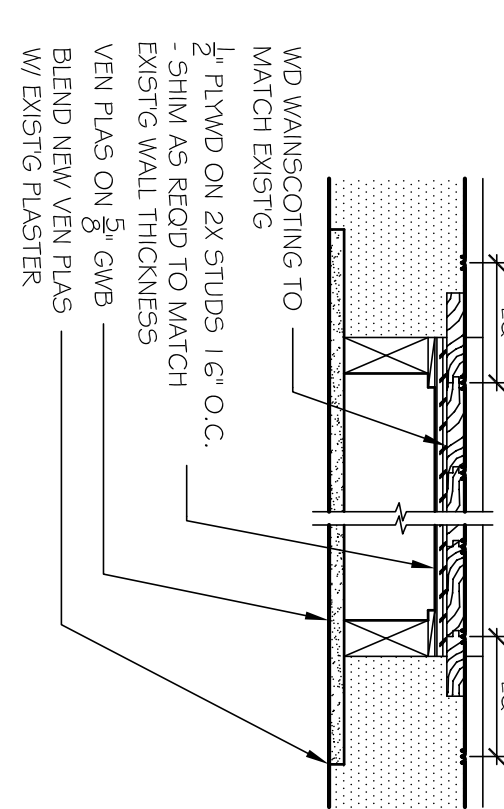
13 JAMB DETAIL



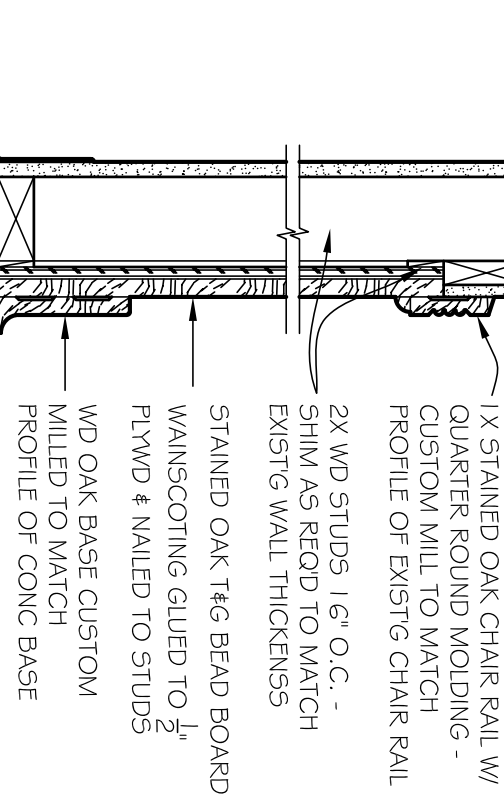
1 PARTITION TYPES



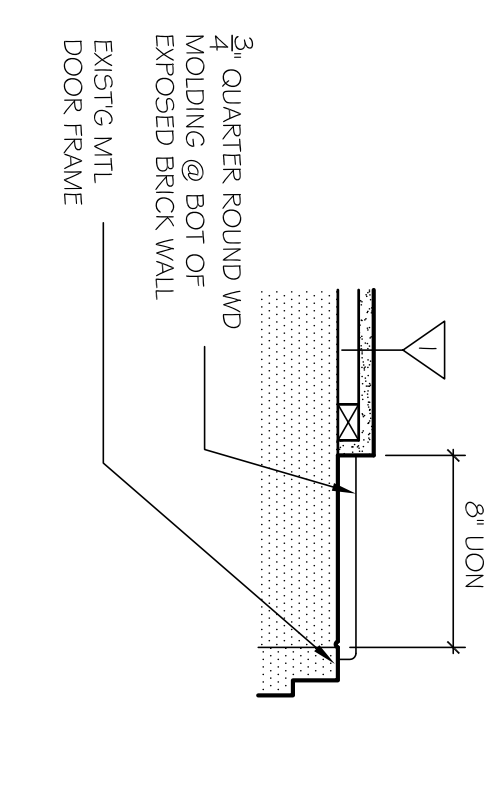
4 WAINSCOTING INFILL



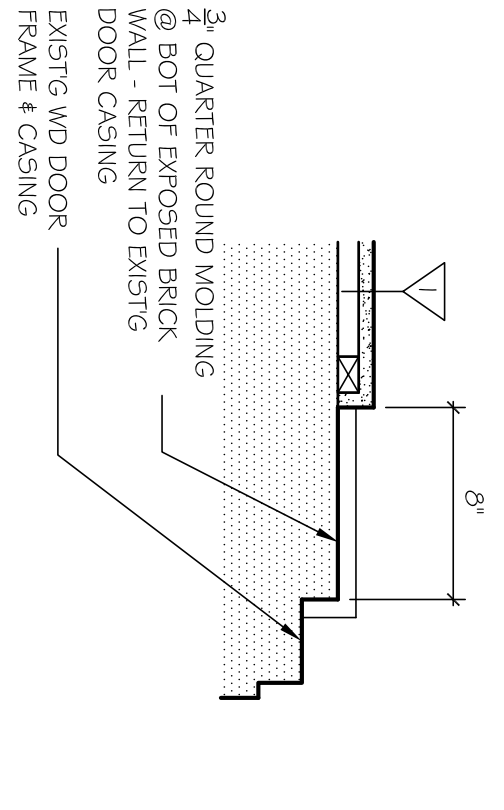
5 WALL INFILL



2 EXISTING DOOR JAMB



3 EXISTING DOOR JAMB



KEY FOR DETAILS:

 EXISTG CONSTRUCTION
 TO REMAIN

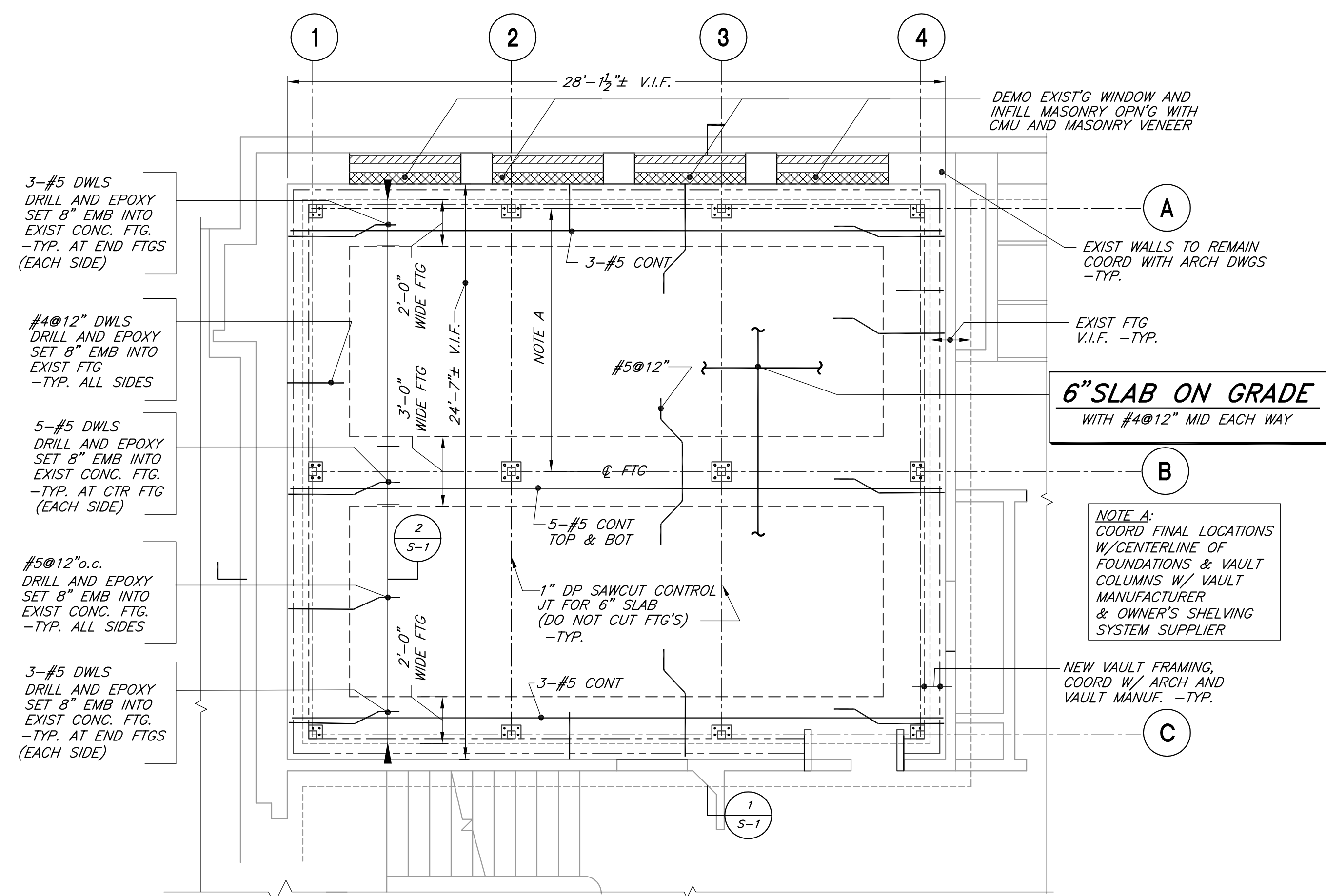
GENERAL NOTES:
 1. DRAWINGS ARE NOT TO BE SCALED.
 2. CONTRACTOR IS RESPONSIBLE FOR MEANS, METHODS & SEQUENCES OF ALL CONSTRUCTION TO CONFORM TO STATE & LOCAL BUILDING CODES & FIELD VERIFY ALL EXISTING CONDITIONS.
 3. ALL CONSTRUCTION TO CONFORM TO STATE & LOCAL BUILDING CODES & FIELD VERIFY ALL EXISTING CONDITIONS.
 4. DIMENSIONS.

DATE: 09-08-12
 SCALE: 1/16" = 1'-0"
SCHEDULES & DETAILS

ARCHIVAL VAULT AT THE FORMER BRIGHT SCHOOL- PHASE 2
 260 GROVE STREET, WALTHAM, MA

KANG ASSOCIATES, INC.
 339 BOSTON POST ROAD
 SUDBURY, MA 01776

A6



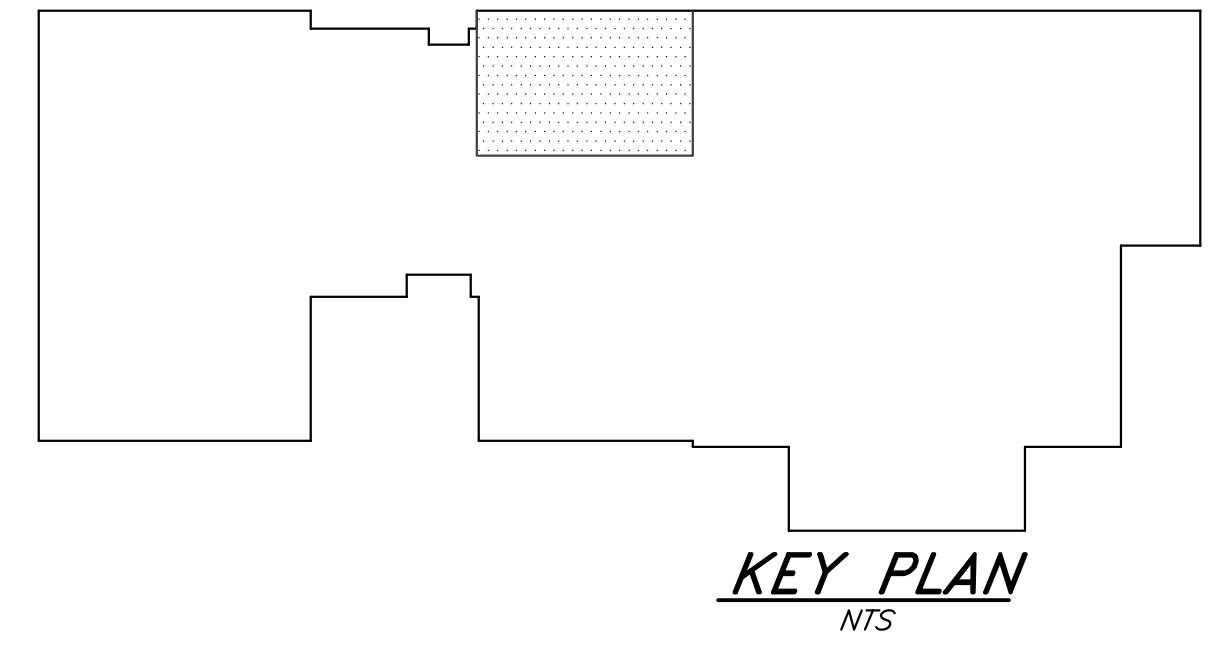
FOUNDATION FLOOR PLAN
1/4"=1'-0"

LINTEL SCHEDULE
(BY MISCELLANEOUS METALS)

MASONRY OPENING	LINTEL SIZE
1'-4" TO 3'-0"	L 3 1/2 x 3 1/2 x 5/16
3'-1" TO 4'-6"	L 4 x 3 1/2 x 5/16 (4" LEG VERT)
4'-7" TO 6'-0"	L 5 x 3 1/2 x 5/16 (5" LEG VERT.)

NOTES:

- PROVIDE LINTELS OVER ALL OPENINGS EXCEPT WHERE LINTELS BLOCKS ARE PROVIDED
- PROVIDE ONE ANGLE FOR EACH 4" OF WALL THICKNESS. FOR 6" WALLS, PROVIDE TEE OR BUILT UP SECTION WITH PROPERTIES EQUAL TO OR GREATER THAN 1 1/2 TIMES THE ANGLE PROPERTIES FOR A 4" WALL THICKNESS.
- PROVIDE 8" OF BEARING EACH END OF ALL LINTELS.
- ALL EXTERIOR LINTELS SHALL BE HOT-DIPPED GALVANIZED.
- PROVIDE TEMPORARY SHORING AS REQUIRED.



- GENERAL**
- STRUCTURAL WORK SHALL CONFORM TO REQUIREMENTS OF "THE COMMONWEALTH OF MASSACHUSETTS STATE BUILDING CODE", EIGHTH EDITION.
 - EXISTING DIMENSIONS AND CONDITIONS MUST BE VERIFIED OR DETERMINED IN THE FIELD AND ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT BEFORE PROCEEDING WITH THE AFFECTED PORTION OF THE WORK.
 - NOTES AND DETAILS SHOWN ON ANY DRAWINGS SHALL BE CONSIDERED TYPICAL FOR ALL SIMILAR CONDITIONS, UNLESS OTHERWISE NOTED.
 - SHOP DRAWINGS FOR CONCRETE REINFORCING SHALL BE SUBMITTED TO THE ARCHITECT AND A STAMPED APPROVAL RECEIVED BEFORE FABRICATION MAY PROCEED. FABRICATION AND ERECTION SHALL PROCEED FROM APPROVED SHOP DRAWINGS ONLY.
 - CONCRETE MIX DESIGN DATA AND MANUFACTURERS DATA SHALL BE SUBMITTED TO THE ARCHITECT AND A STAMPED APPROVAL BEFORE ORDERING OF CONCRETE.
 - A QUALIFIED TESTING AGENCY FOR TESTING AND INSPECTION OF ALL CONCRETE AND MASONRY WORK SHALL BE RETAINED BY THE OWNER AS APPROVED BY THE ARCHITECT. REFER TO SPECIFICATIONS.

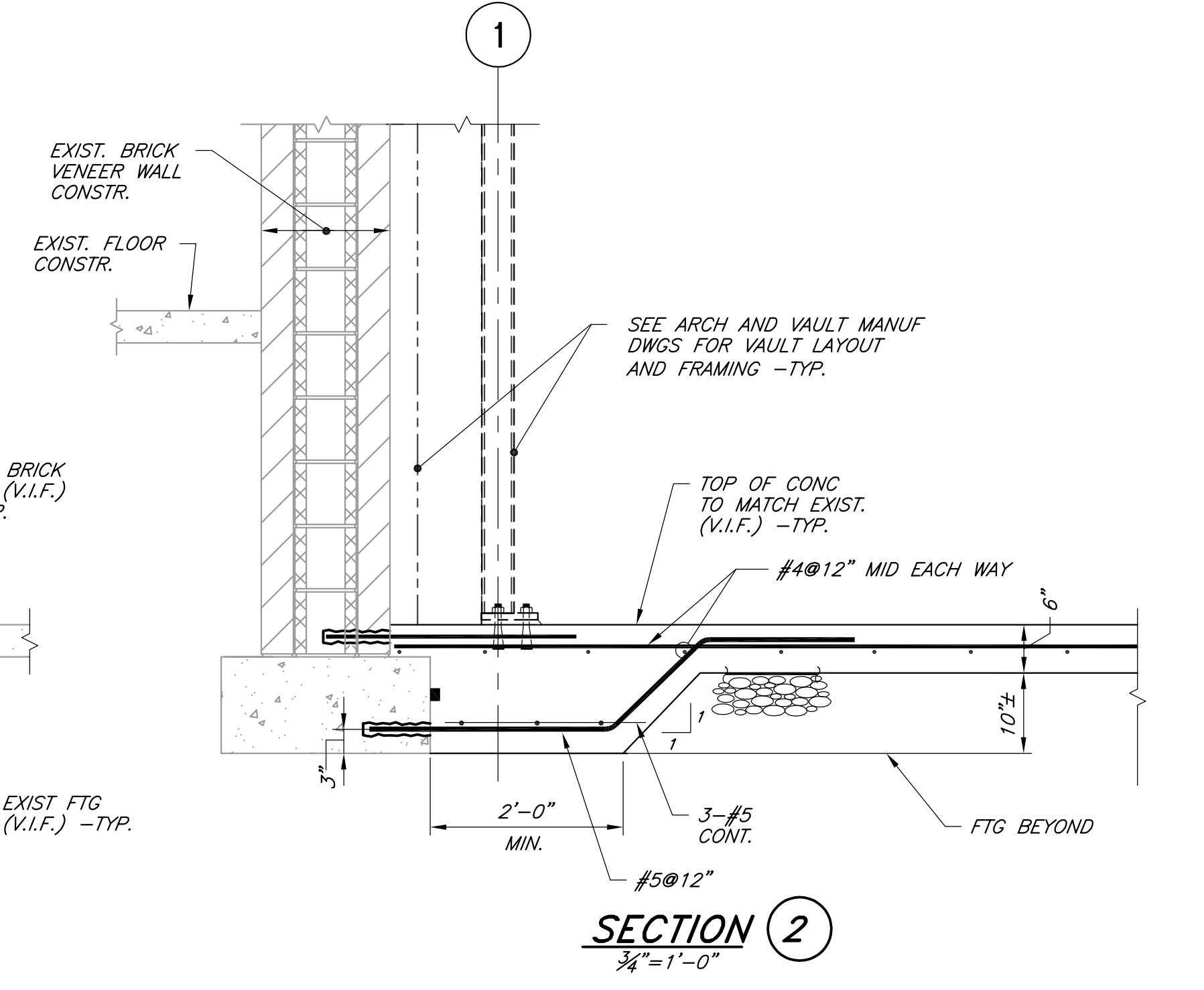
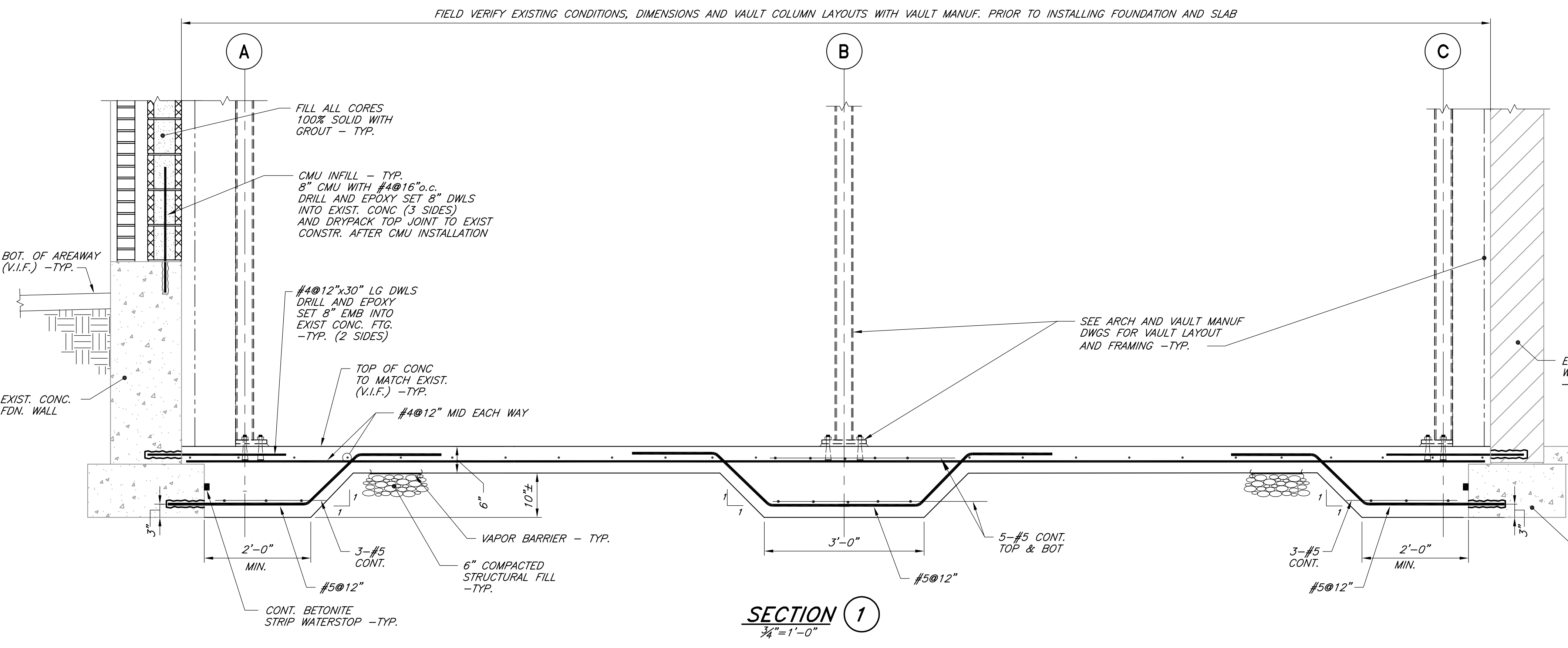
- STRUCTURAL LOADS**
- | | |
|-------------------------|---------|
| L1. FIRST FLOOR STORAGE | 150 PSF |
| L2. VAULT FLOOR LOAD | 250 PSF |
| L3. VAULT ROOF | 350 PSF |

- FOUNDATION**
- THE BOTTOM SURFACE OF ALL SPREAD FOOTINGS SHALL REST ON UNDISTURBED NATURAL MATERIAL OR ON COMPACTED STRUCTURAL FILL, WITH A MINIMUM ALLOWABLE BEARING PRESSURE OF 2.0 TONS PER SQUARE FOOT (CONTRACTOR TO VERIFY IN FIELD).

- CONCRETE**
- CONCRETE WORK SHALL CONFORM TO ACI STANDARD 318 -05 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE".
 - CONCRETE MINIMUM 28 DAY STRENGTH SHALL BE 4000 PSI (NORMAL WEIGHT)
 - CONCRETE SHALL BE NORMAL WEIGHT CONCRETE WITH A NOMINAL DENSITY OF 145 PCF.
 - REINFORCING BARS SHALL CONFORM TO ASTM A 615 GRADE 60, AND SHALL BE DEFORMED. LAP ALL CONTINUOUS BARS A MINIMUM OF 40 DIAMETERS UNLESS OTHERWISE NOTED. PROVIDE MATCHING CORNER AND INTERSECTION WALL BARS.
 - CLEAR CONCRETE PROTECTION FOR REINFORCING:
A. FOOTINGS: 3"
 - CURE ALL CONCRETE AT A MINIMUM TEMPERATURE OF 50°F FOR AT LEAST 7 DAYS.

- CONCRETE MASONRY**
- CONCRETE MASONRY CONSTRUCTION WORK SHALL CONFORM TO "BUILDING CODE REQUIREMENTS AND COMMENTARY FOR MASONRY STRUCTURES (ACI 530/530R -02)" AND "SPECIFICATIONS FOR MASONRY STRUCTURES AND RELATED COMMENTARIES (ACI 530.1/530.1R -08)". CONCRETE MASONRY WALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH LOW LIFT GROUTING METHOD.
 - CONCRETE MASONRY STRENGTH (f_m) SHALL NOT BE LESS THAN 1500 PSI WITH SPECIAL INSPECTION.
 - CONCRETE MASONRY UNITS (CMU) SHALL CONFORM TO ASTM C90, NORMAL WEIGHT, TYPE 1 AND TO NCMA "REQUIREMENTS FOR LOAD BEARING CONCRETE MASONRY". COMPRESSIVE STRENGTH SHALL BE AS REQUIRED FOR SPECIFIED CONCRETE MASONRY STRENGTH (f_m), BUT NOT LESS THAN 1900 PSI FOR THE AVERAGE OF 3 UNITS OR 1700 PSI FOR AN INDIVIDUAL UNIT, BASED ON THE AVERAGE NET AREA.
 - MORTAR FOR REINFORCED CMU SHALL CONFORM TO ASTM C270, TYPE M OR S, AND HAVE A 28-DAY COMPRESSIVE STRENGTH EQUAL TO THE SPECIFIED CONCRETE MASONRY STRENGTH (f_m), BUT NOT LESS THAN 1800 PSI.
 - GROUT SHALL CONFORM TO ASTM C476, FINE TYPE, AND HAVE A 28-DAY COMPRESSIVE STRENGTH EQUAL TO THE SPECIFIED CONCRETE MASONRY STRENGTH (f_m), BUT NOT LESS THAN 3000 PSI.
 - GROUTING SHALL BE LIMITED TO A MAXIMUM WALL HEIGHT OF 4 FT PER LIFT.
 - MINIMUM HORIZONTAL JOINT REINFORCEMENT FOR WALLS SHALL BE #9 WIRE SPACED VERTICALLY AT 16" o.c. AT A MINIMUM.
 - REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR REQUIRED FIRE RATINGS.

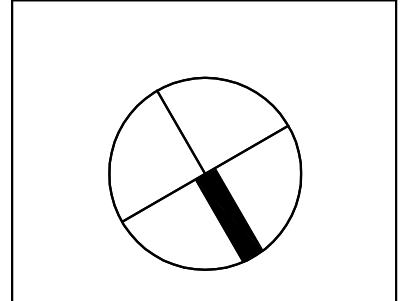
- STRUCTURAL STEEL**
- STRUCTURAL STEEL WORK SHALL CONFORM TO THE AISC "SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS". STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING UNLESS OTHERWISE NOTED:
A. STEEL BEAMS ASTM A992 OR A588 GRADE B F_y = 50 KSI
B. TUBES ASTM A 500, GRADE B F_y = 46 KSI
C. PLATES ASTM A 36 F_y = 36 KSI
 - SHOP CONNECTIONS SHALL BE WELDED TO CONFORM TO ASTM A 233, E70 SERIES OR BOLTED TO CONFORM TO ASTM A 325.
 - CONNECTIONS SHALL BE WELDED TO CONFORM TO ASTM A233, E70 SERIES, OR BOLTED TO CONFORM TO ASTM A325, TYPE N BOLTS.
 - STRUCTURAL STEEL EXPOSED TO THE WEATHER IN THE FINISHED PROJECT SHALL BE HOT DIP GALVANIZED TO CONFORM TO ASTM A123. TOUCH UP AS REQUIRED WITH ZINC RICH PAINT AFTER ERECTION.



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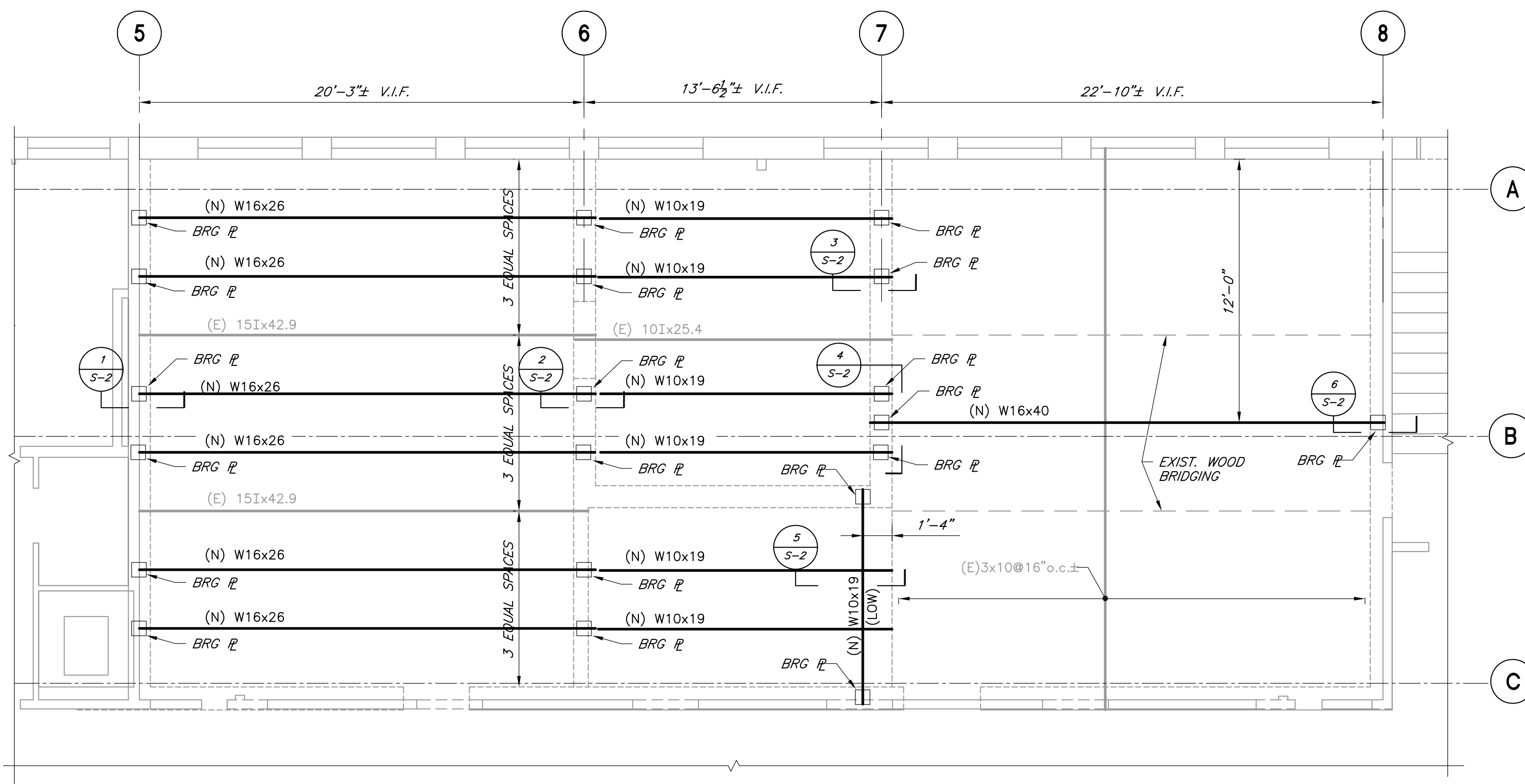
**ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL - PHASE 2**
260 GROVE STREET, WALTHAM, MA



DATE: 8-6-2012
SCALE: AS NOTED

PLANS & DETAILS

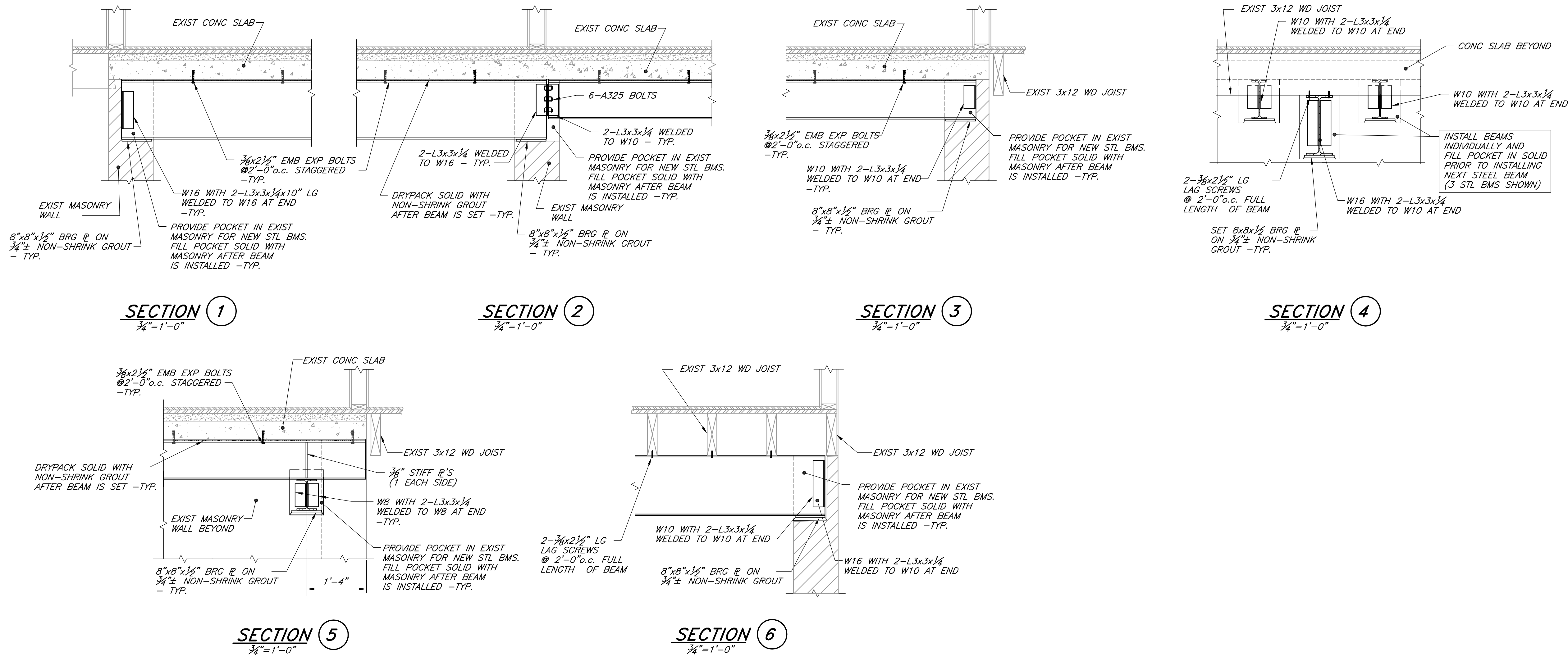
S-1



FIRST FLOOR FRAMING PLAN

1/4"=1'-0"

- NOTE:
 1. SEE GENERAL NOTES ON DRAWING S-1
 2. BRG PL = 8"x8"x1/2" BEARING PLATE ON 3/4"± NON-SHRINK GROUT.

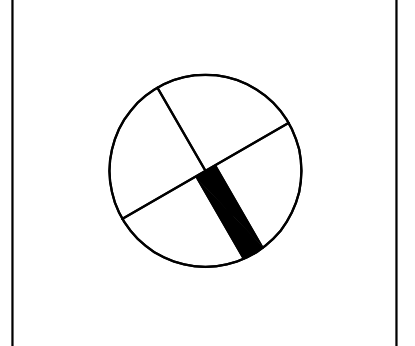


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structural engineers
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 REG. EXPIRES 12/31/2025

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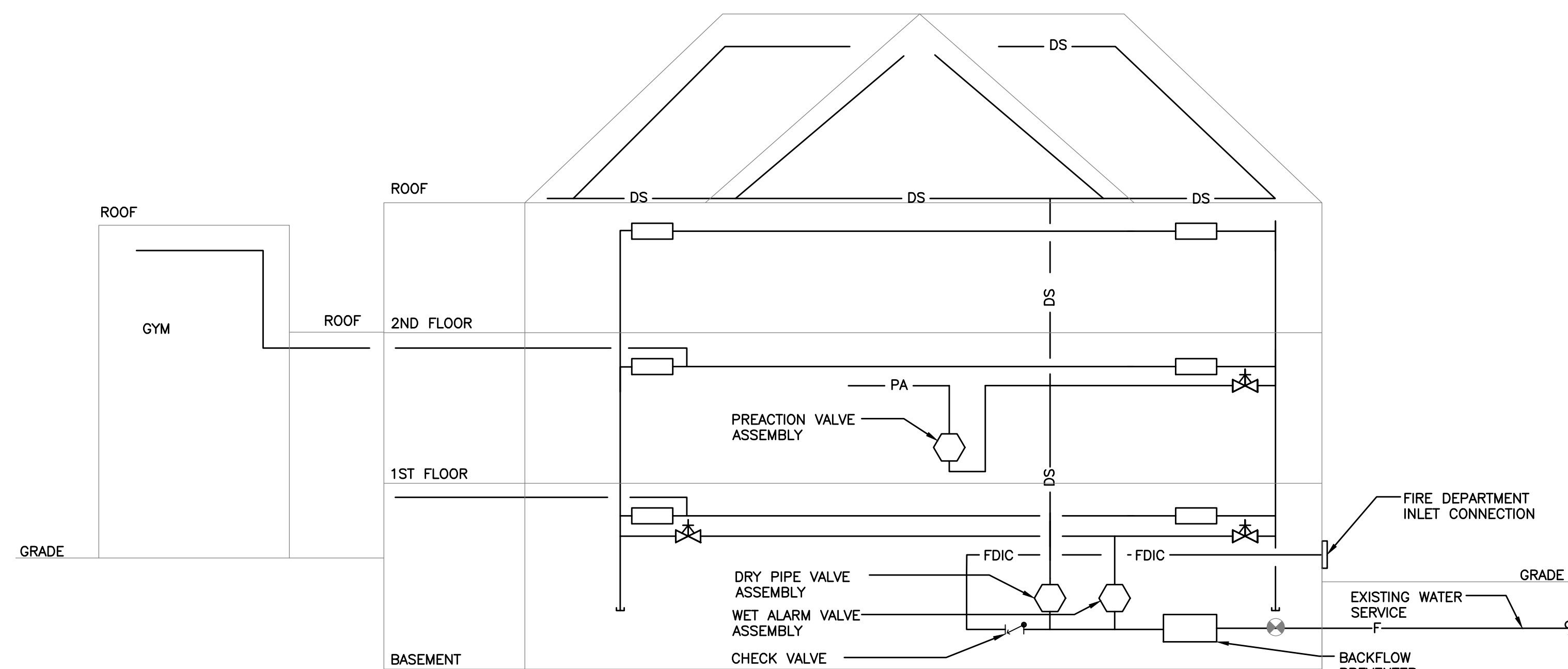
S-2

SPRINKLER GENERAL NOTES

- 1) 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 SYSTEM CONCEPT, THE MAIN COMPONENTS OF THE SYSTEMS AND THE APPROXIMATE GEOMETRIC RELATIONSHIPS. BASED UPON THE SYSTEMS CONCEPT, THE MAIN COMPONENTS, AND THE APPROXIMATE GEOMETRIC RELATIONSHIPS, PROVIDE ALL OTHER COMPONENTS AND MATERIALS NECESSARY TO MAKE THE SYSTEMS FULLY COMPLETE AND OPERATIONAL.
- 2) MAKE REASONABLE AND NECESSARY MODIFICATIONS IN LAYOUTS AND COMPONENTS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES AND TO COORDINATE IN ACCORDANCE WITH SPECIFICATIONS.
- 3) MAINTAIN MAXIMUM HEADROOM AT ALL LOCATIONS. ALL PIPING TO BE AS TIGHT TO UNDERSIDE OF DECK AS POSSIBLE. ALL EXPOSED PIPING SHALL BE APPROVED BY ENGINEER AND SHALL MAINTAIN REQUIRED CLEARANCES.
- 4) SYSTEMS SHALL RUN IN A RECTILINEAR FASHION.
- 5) MAINTAIN COMPLETE AND SEPERATE SET OF INSTALLATION DRAWINGS ON SITE AT ALL TIMES. RECORD WORK COMPLETED AND ALL MODIFICATIONS CLEARLY AND ACCURATELY.
- 6) ALL SYSTEM COMPONENTS SHALL BE UL-LISTED IN ACCORDANCE WITH NFPA REQUIREMENT, AND SHALL BE INSTALLED IN ACCORDANCE WITH LISTING REQUIREMENTS.
- 7) THREADED ROD SHALL NOT BE FORMED OR BENT. ALL BOWED, BENT OR OTHERWISE DEFORMED THREADED ROD SHALL BE REPLACED WITH NEW.
- 8) PROVIDE SUPERVISION AT ALL VALVES.
- 9) PROVIDE SIGNAGE AT ALL CONTROL VALVES, DRAIN VALVES AND TEST CONNECTIONS INDICATING VALVE FUNCTION AND PORTION OF SYSTEM CONTROLLED.
- 10) PROVIDE FIREPROOF THROUGH PENETRATION ASSEMBLIES AT ALL PENETRATIONS OF SMOKE AND/OR FIRE RATED FLOORS AND WALLS IN ACCORDANCE WITH BUILDING CODE AND SPECIFICATION REQUIREMENTS.
- 11) FIRE PROTECTION WORK SHALL COMMENCE AT THE BLIND FLANGE WITHIN THE BUILDING, PROVIDED BY THE SITE CONTRACTOR.
- 13) SPRINKLERS SHALL BE PROVIDED THROUGHOUT.
- 14) PROVIDE ADDITIONAL SPRINKLERS BEYOND CODE REQUIRED MINIMUMS TO PROVIDE SYMMETRICAL LAYOUTS.
- 15) ALL UPRIGHT SPRINKLERS SHALL BE INSTALLED IN WITH 1" RISER NIPPLES.
- 16) ALL PIPING SHALL BE ARRANGED TO DRAIN BACK TO CONTROL VALVE ASSEMBLY. WHERE PIPING CANNOT DRAIN BACK TO CONTROL VALVE ASSEMBLY PROVIDE ADDITIONAL DRAIN CONNECTIONS IN ACCORDANCE WITH NFPA 13 REQUIREMENTS.
- 17) ALL PAINTED OR OTHERWISE DAMAGED SPRINKLERS SHALL BE REPLACED WITH NEW.

MASSACHUSETTS THREE TIER PROCESS

- THIS PROJECT SHALL BE DESIGNED AND CONSTRUCTED UNDER THE THREE TIER SYSTEM, PER THE MASSACHUSETTS BUILDING CODE, 780 CMR, CHAPTER 9.
- A. TIER ONE, CONSTRUCTION DOCUMENTS
 1. PRIOR TO ISSUANCE OF A BUILDING PERMIT, CONSTRUCTION DOCUMENTS FOR THE FIRE PROTECTION SYSTEM MUST BE SUBMITTED AND A BUILDING PERMIT OBTAINED PRIOR TO THE INSTALLATION OF FIRE PROTECTION SYSTEMS OR MODIFICATIONS, ALTERATIONS, ADDITIONS OR DELETIONS TO AN EXISTING FIRE PROTECTION SYSTEM.
 2. THE CONSTRUCTION DOCUMENTS SHALL CONTAIN CONFORM TO ALL REQUIREMENTS LISTED IN THE BUILDING CODE.
 - B. TIER TWO, SHOP DRAWINGS
 1. PRIOR TO INSTALLATION OF FIRE PROTECTION SYSTEMS, SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE PREPARED BY THE CONTRACTOR.
 2. DRAWINGS AND HYDRAULIC CALCULATIONS SHALL CONFORM TO ALL REQUIREMENTS LISTED IN THE BUILDING CODE. THE SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL THEN BE SUBMITTED TO THE ENGINEER OF RECORD. WHEN THE ENGINEER OF RECORD IS SATISFIED WITH THE DRAWINGS AND HYDRAULIC CALCULATIONS, THEY WILL BE SEALED.
 3. THE CONTRACTOR SHALL THEN SUBMIT DRAWINGS AND HYDRAULIC CALCULATIONS TO THE BUILDING OFFICIAL AND FIRE OFFICIAL, AND OBTAIN APPROVAL.
 - C. TIER THREE, RECORD DRAWINGS
 1. AS BUILT PLANS SHALL BE PROVIDED TO THE BUILDING OWNER FOR ALL FIRE PROTECTION AND LIFE SAFETY SYSTEMS THAT ARE SEALED AS REVIEWED AND APPROVED BY THE ENGINEER OF RECORD, PERFORMING CONSTRUCTION CONTROL.
 2. SHOP DRAWINGS SHALL BE MODIFIED AS NECESSARY, WITH ANY FIELD CHANGES IDENTIFIED BY CLOUDS ON THE DRAWINGS.
 3. WHEN THE ENGINEER OF RECORD IS SATISFIED WITH THE DRAWINGS AND HYDRAULIC CALCULATIONS, THEY WILL BE SEALED. THESE COMPLETED DOCUMENTS WILL THEN BE INCORPORATED INTO THE OPERATION & MAINTENANCE MANUALS, AND DELIVERED TO THE OWNER.



1 FIRE PROTECTION DIAGRAM
SCALE: NONE

FIRE PROTECTION LEGEND

SYMBOL	ABBREV.	DESCRIPTION
— F —	F	FIRE SERVICE PIPING
— DS —	DS	FIRE SERVICE PIPING
— SP —	SP	SPRINKLER SYSTEM PIPING
○	—	SPRINKLER HEAD TO BE INSTALLED
⊕	CTE	CONNECT TO EXISTING
⊙	—	HYDRAULIC NODE
1"	—	PIPE SIZE
7-8	—	CUT LENGTH
— L —	—	CHECK VALVE
— FDIC —	—	FIRE DEPARTMENT INLET CONNECTION PIPING
— I —	—	FIRE DEPARTMENT INLET CONNECTION
D	—	WALL MOUNTED ELECTRIC BELL
⊕	—	WET ALARM VALVE ASSEMBLY
⊙	—	DRY PIPE ALARM VALVE ASSEMBLY
— I —	OS&Y	ISOLATION VALVE
⊙	—	ION TYPE SMOKE DETECTOR
⊙	—	PHOTO TYPE SMOKE DETECTOR
■	—	ABORT SWITCH
□	—	RELEASE SWITCH
▽	—	FIRE ALARM HORN/STROBE
▲	—	AGENT DISCHARGE STROBE

FIRE PROTECTION SYSTEM INTENT

1. ALL WORK SHALL BE INSTALLED IN CONFORMANCE WITH NFPA 13.
2. PERFORM A NEW FLOW TEST AND USE THE RESULTS WHEN PREPARING HYDRAULIC CALCULATIONS.
3. PREPARE SHOP DRAWINGS AND HYDRAULIC CALCULATIONS AS PRESCRIBED BY NFPA 13. SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE SEALED BY AN ENGINEER REGISTERED IN MASSACHUSETTS.
4. SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE SUBMITTED BY A STATE LICENSED CONTRACTOR AND A PERMIT OBTAINED FROM THE PLYMOUTH FIRE DEPARTMENT PRIOR TO THE COMMENCEMENT OF WORK.

SPRINKLER SCHEDULE

SYMBOL	TYPE	FINISH	MAKE	MODEL	SIZE	K	REMARKS
○	UPRIGHT	BRONZE	VIKING	VK100	½"	5.6	AREAS WITH NO CEILINGS/ ATTIC UPRIGHT DRY
⊙	RECESSED PENDENT	CHROME	VIKING	VK	½"	5.6	AREAS WITH FINISHED CEILINGS
⊙ DS	DRY PENDENT	CHROME	VIKING	VK	½"	5.6	AS REQUIRED/ CANOPIES

SPRINKLER SYSTEM DESIGN CRITERIA

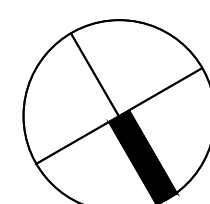
AREA DESCRIPTION	NFPA OCCUPANCY CLASSIFICATION	DESIGN DENSITY (GPM/SQ FT)	CALCULATION AREA (SQ FT)	HOSE ALLOWANCE (GPM)	MAX AREA (SQ FT)
MECHANICAL ROOMS, STORAGE ROOMS, VAULT, BOILER ROOM, ATTIC SPACES WITH EQUIPMENT	ORDINARY HAZARD GROUP 1	.15	1500	250	130
CORRIDORS, UNUSED ATTIC SPACES, CONCEALED SPACES	LIGHT HAZARD	.10	1500	250	130

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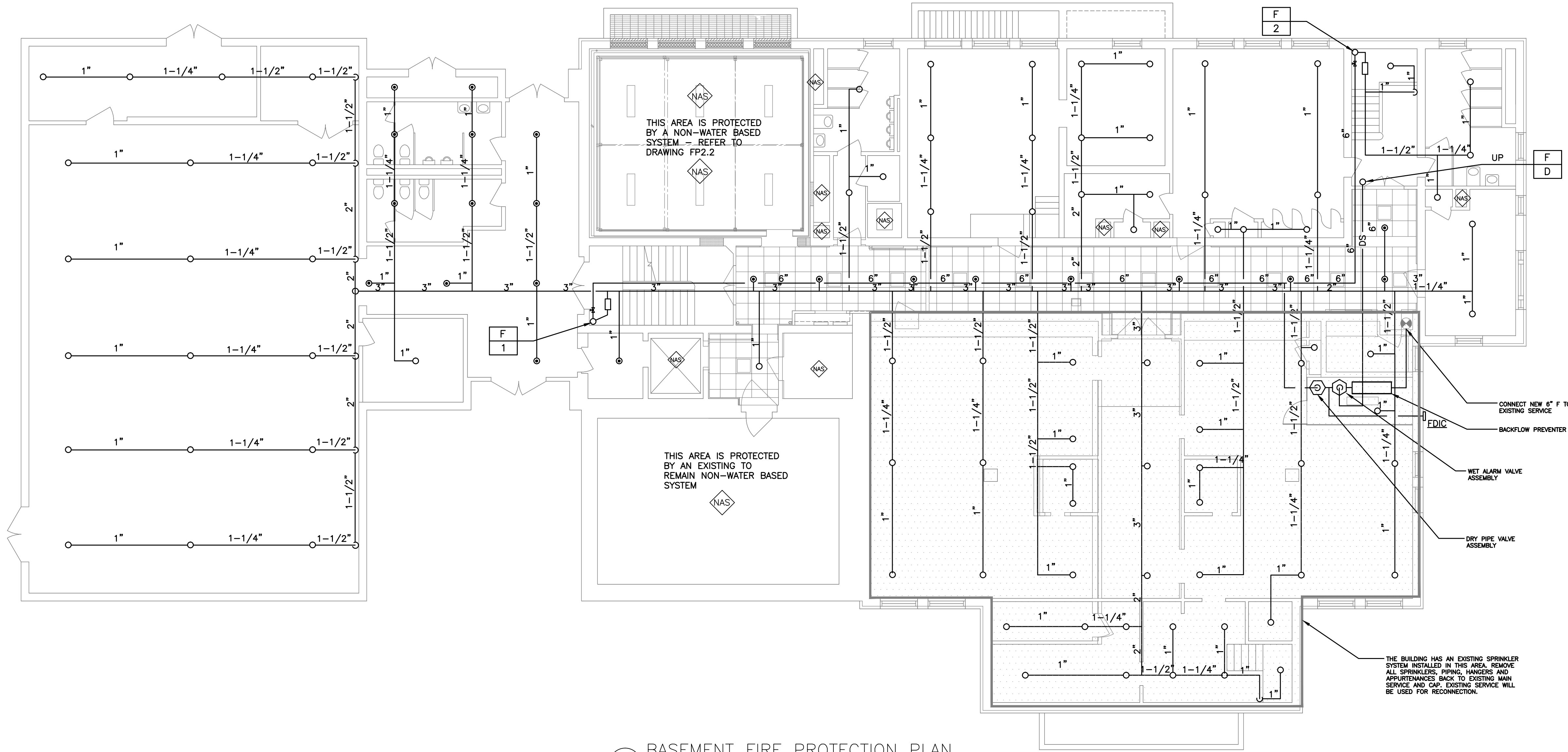


DATE: 08-08-12

SCALE: AS NOTED

FIRE PROTECTION
PLANS, NOTES &
DETAILS

FP0.0



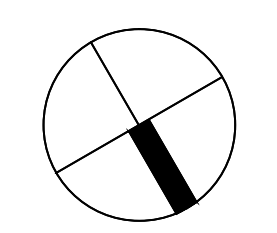
A BASEMENT FIRE PROTECTION PLAN
 FP1.0 Scale: 1/8"=1'-0"

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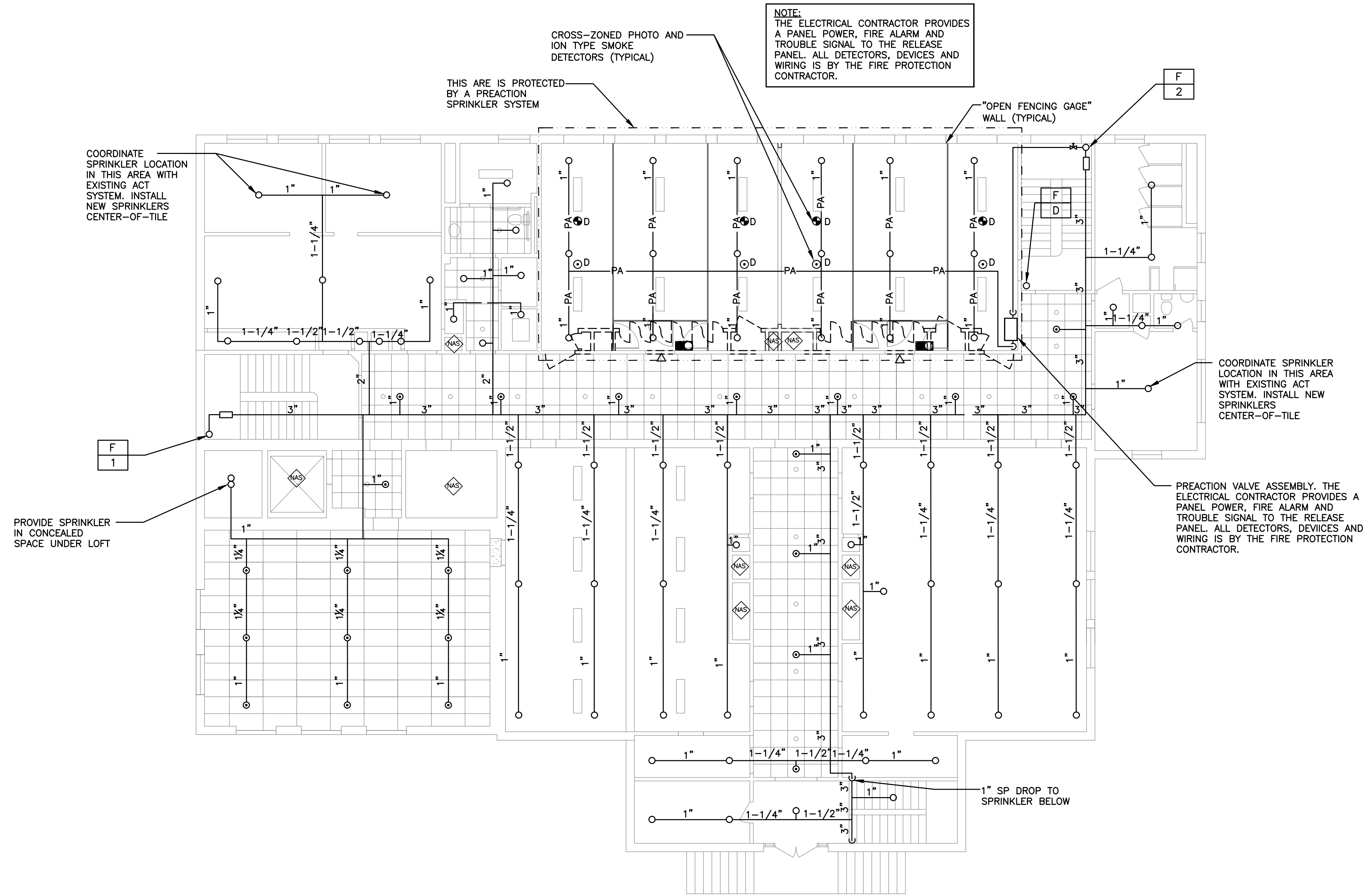


DATE: 08-08-12

SCALE: AS NOTED

FIRE PROTECTION
 BASEMENT PLAN

FP1.0



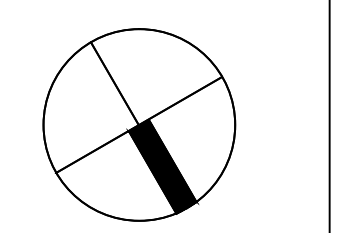
A FIRST FLOOR FIRE PROTECTION PLAN
 FP1.1 Scale: 1/8"=1'-0"

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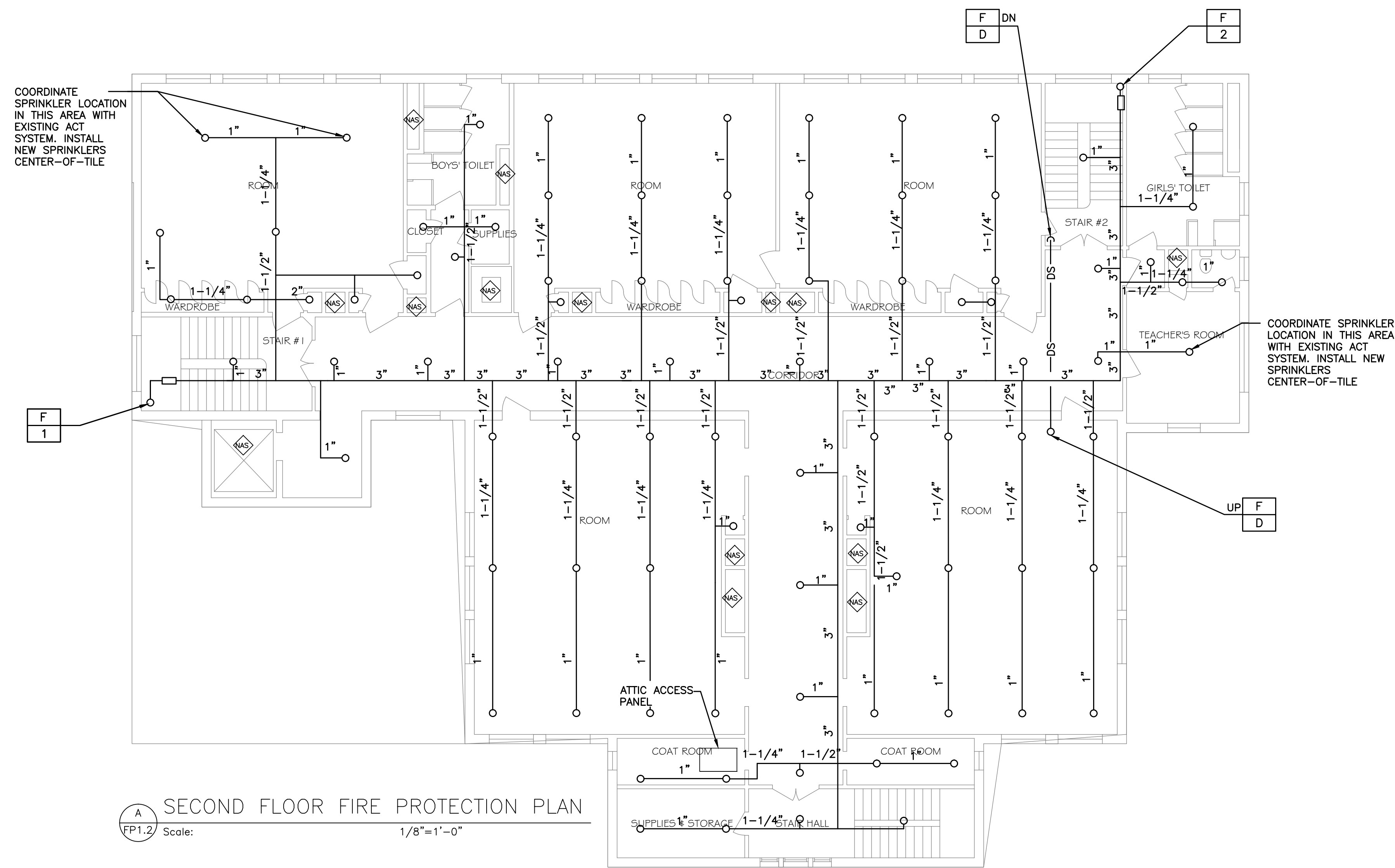
**ARCHIVAL VAULT AT THE
 FORMER BRIGHT SCHOOL- PHASE 2**
 260 GROVE STREET, WALTHAM, MA



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FIRE PROTECTION
 FIRST FLOOR
 PLAN

FP1.1



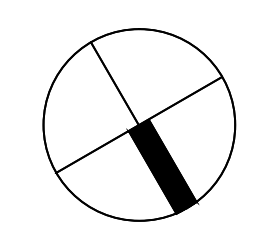
A SECOND FLOOR FIRE PROTECTION PLAN
 FP1.2 Scale: 1/8"=1'-0"

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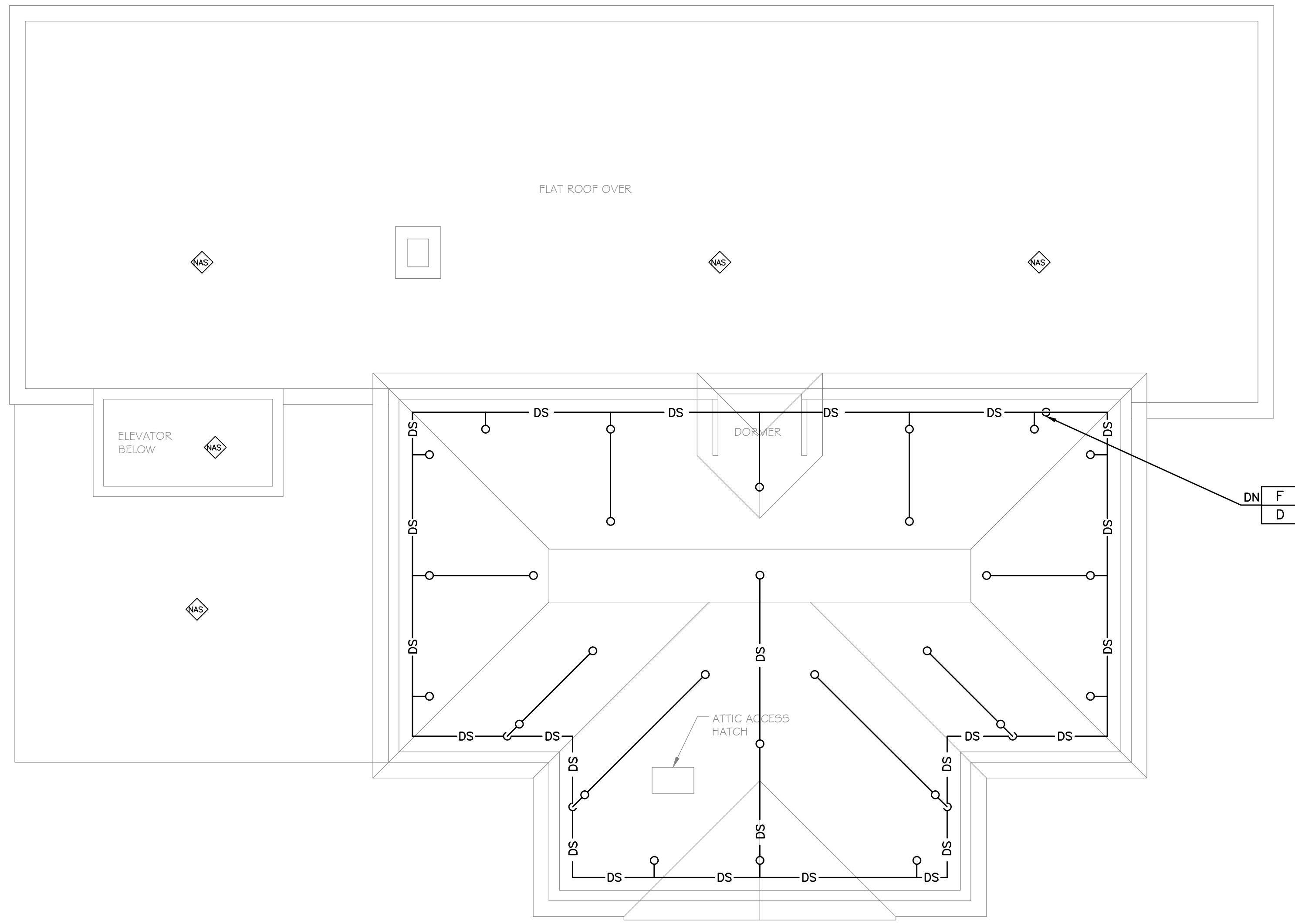
**ARCHIVAL VAULT AT THE
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 260 GROVE STREET, WALTHAM, MA



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FIRE PROTECTION
 SECOND FLOOR
 PLAN

FP1.2



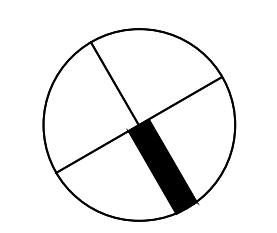
A ATTIC FIRE PROTECTION PLAN
 FP1.3 Scale: 1/8"=1'-0"

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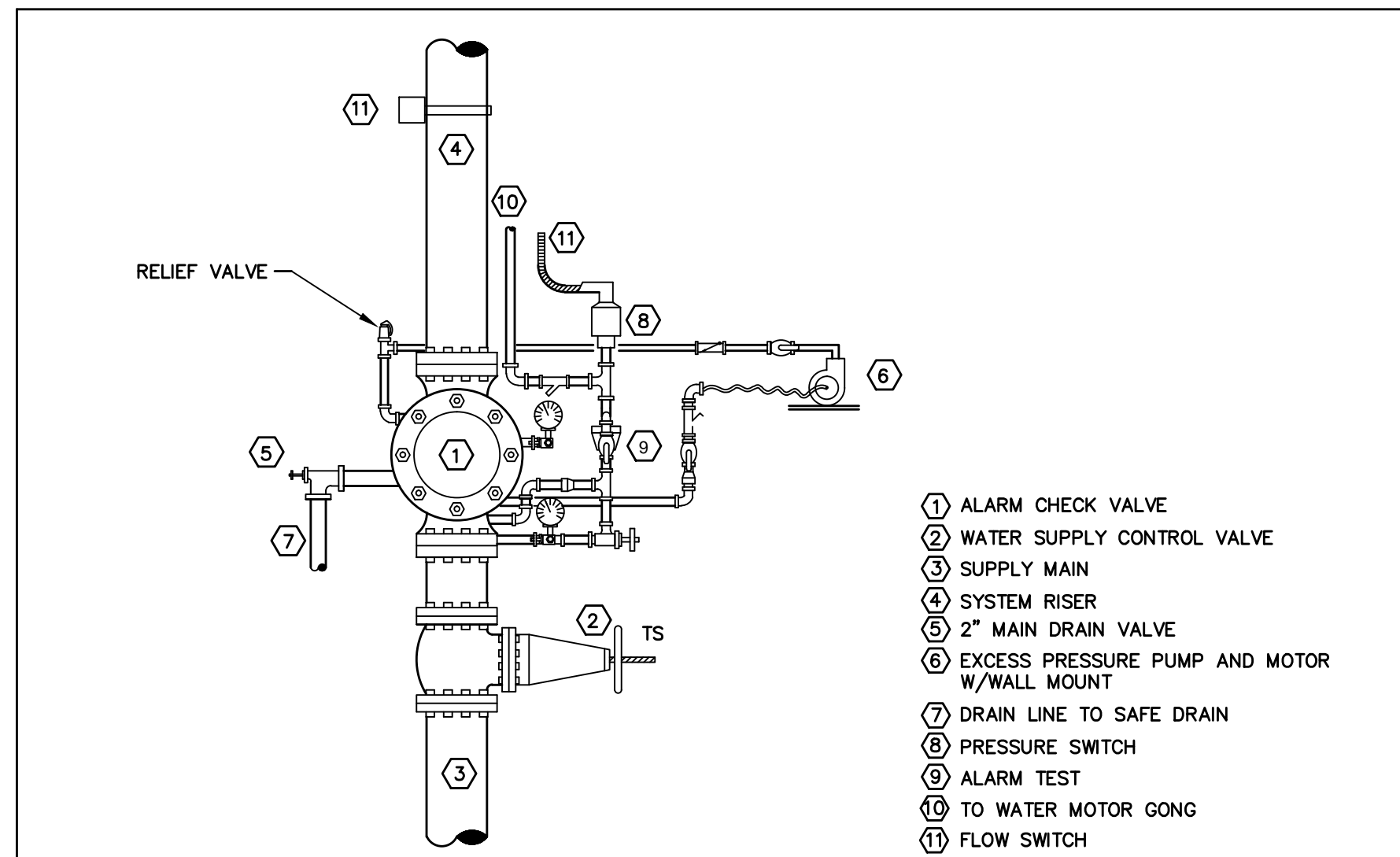


DATE: 08-08-12

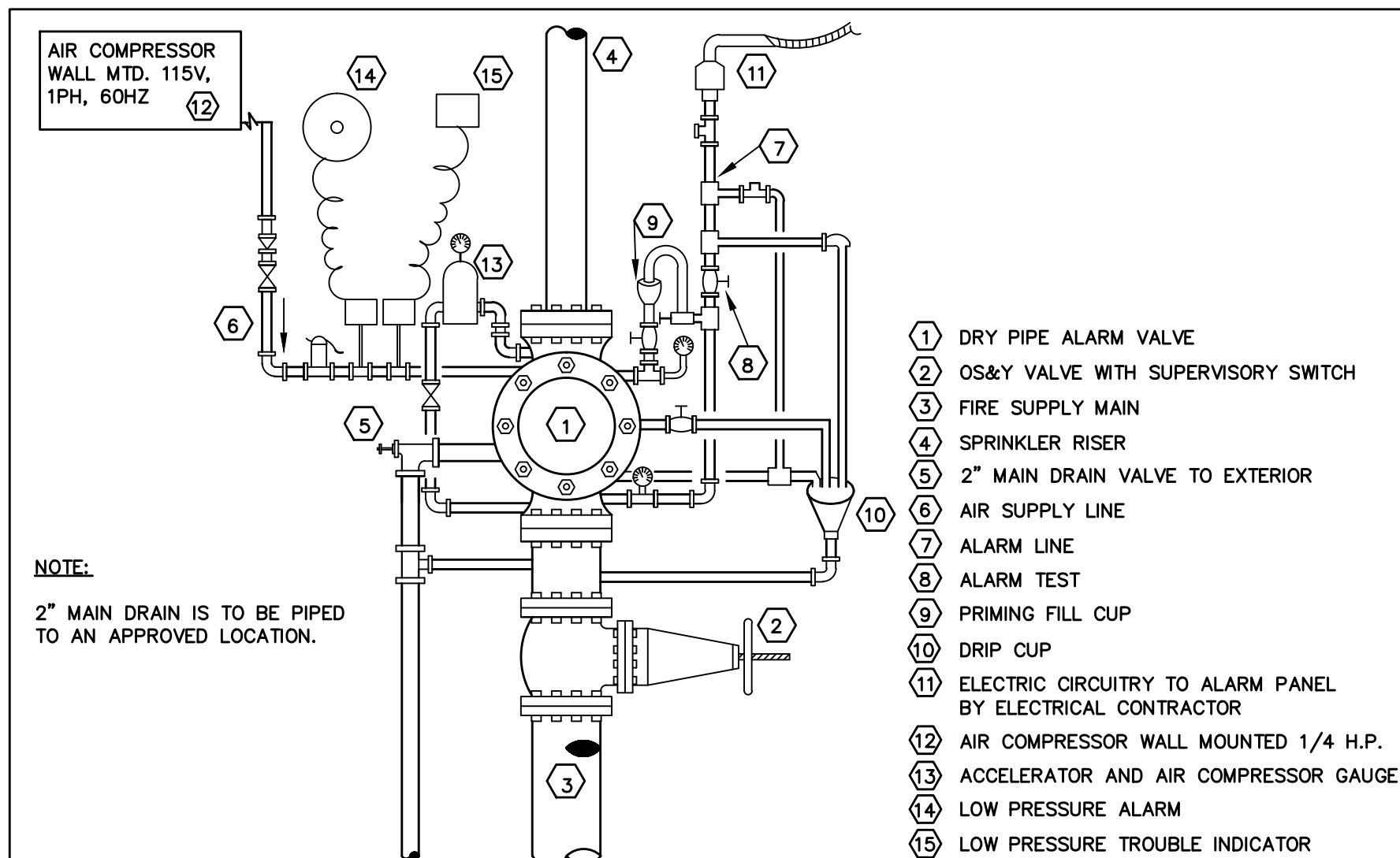
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FIRE PROTECTION
 ATTIC FLOOR
 PLAN

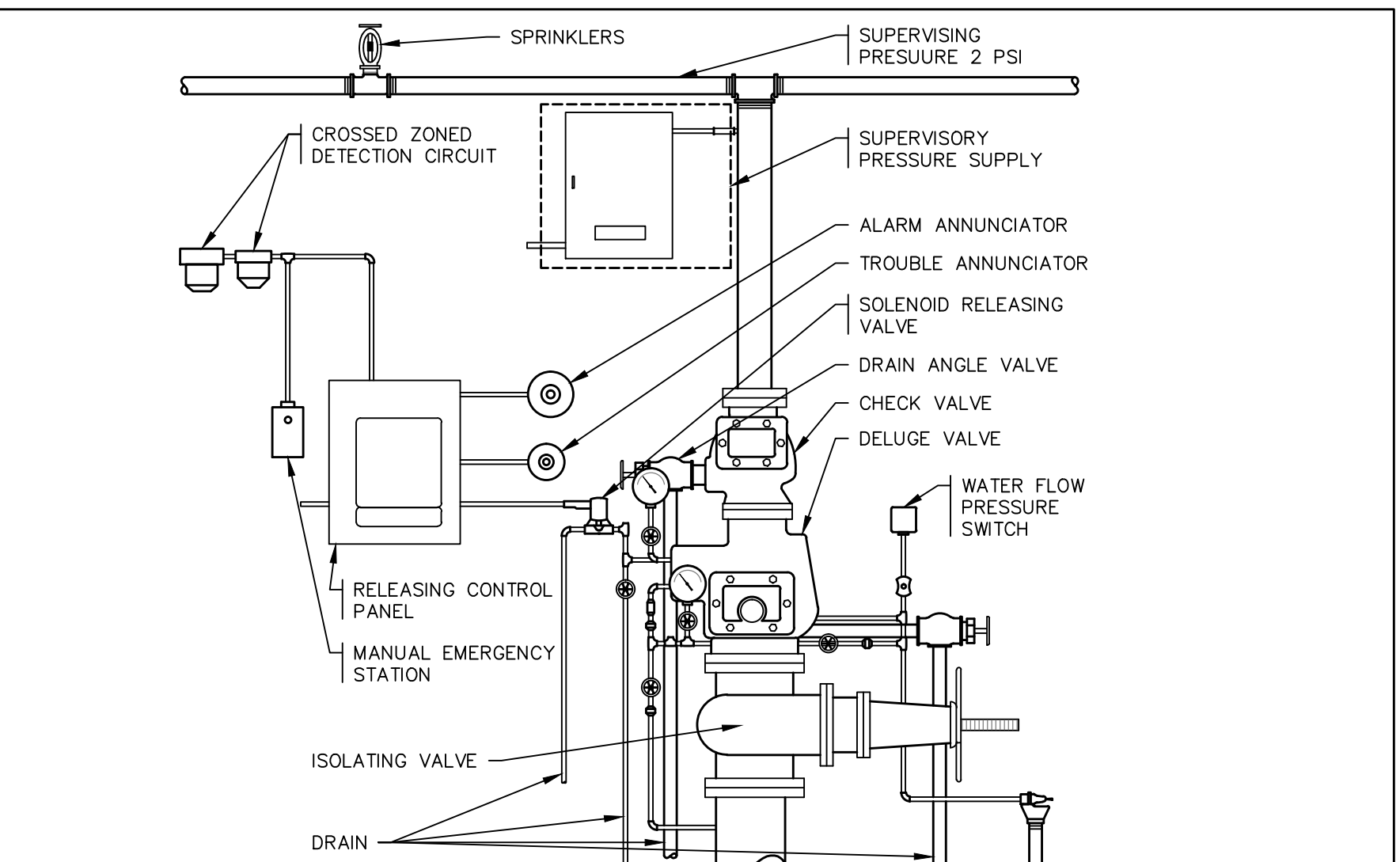
FP1.3



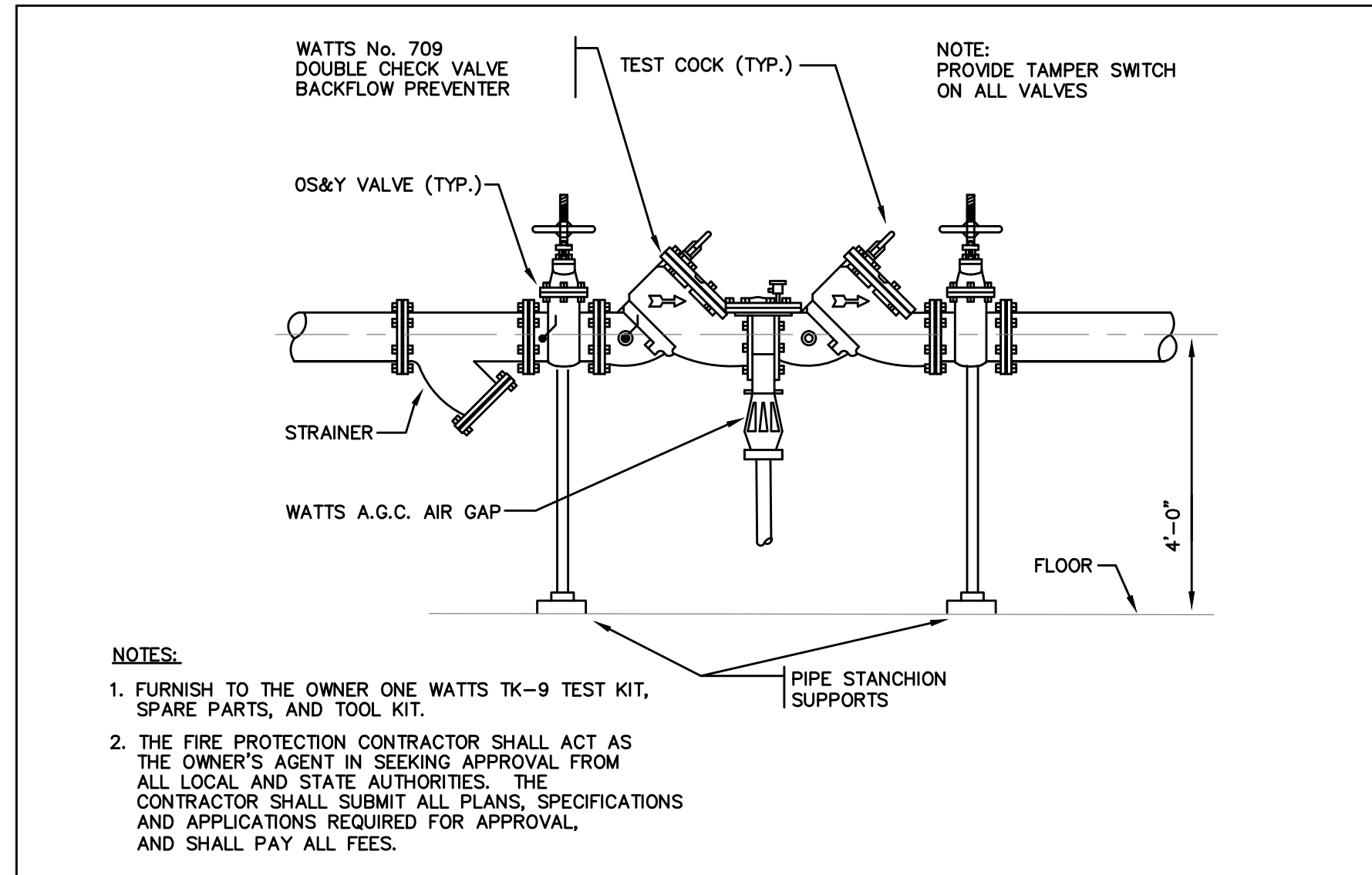
1 WET ALARM VALVE ASSEMBLY
SCALE: NONE



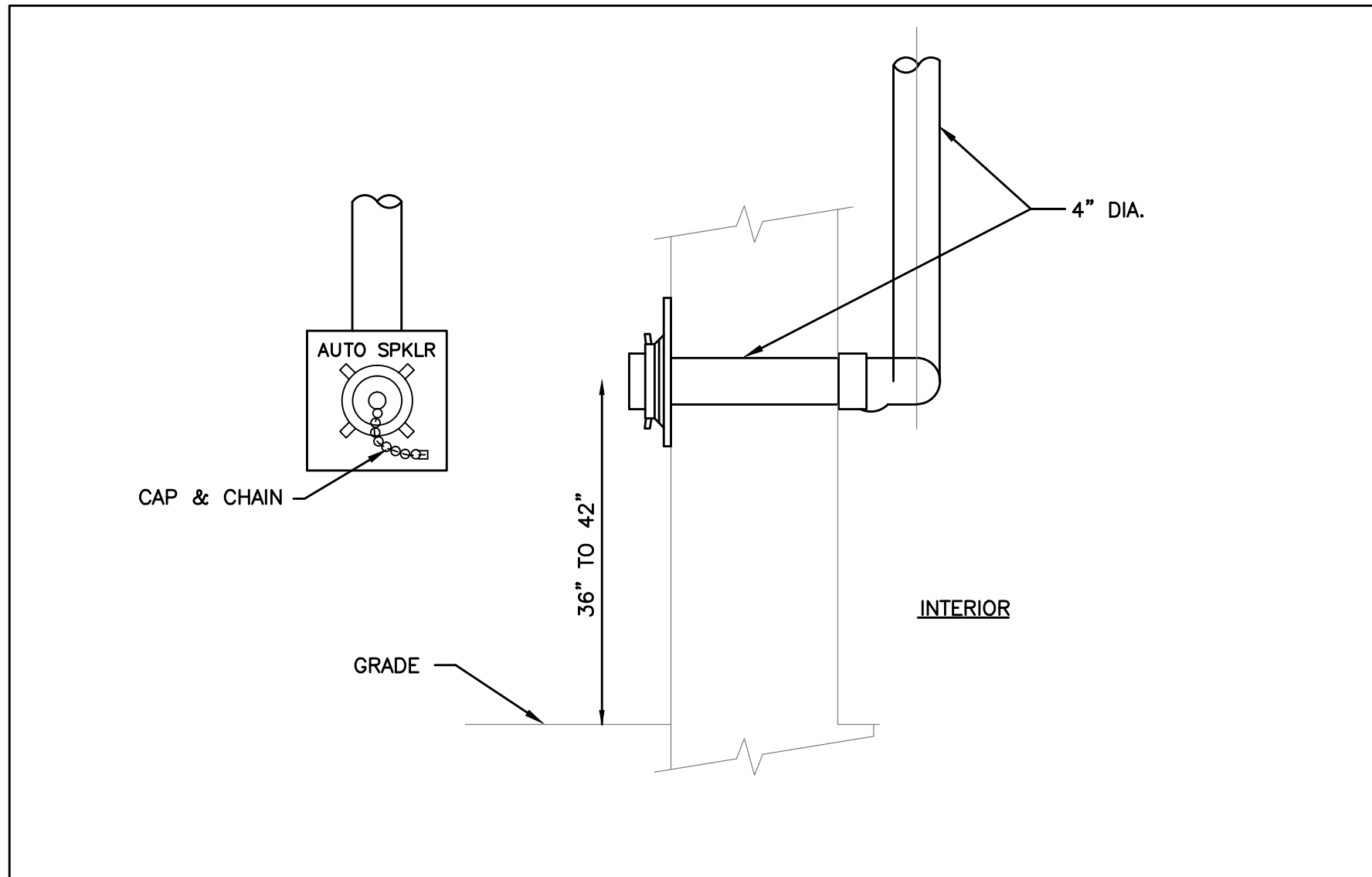
2 DRY PIPE VALVE ASSEMBLY
SCALE: NONE



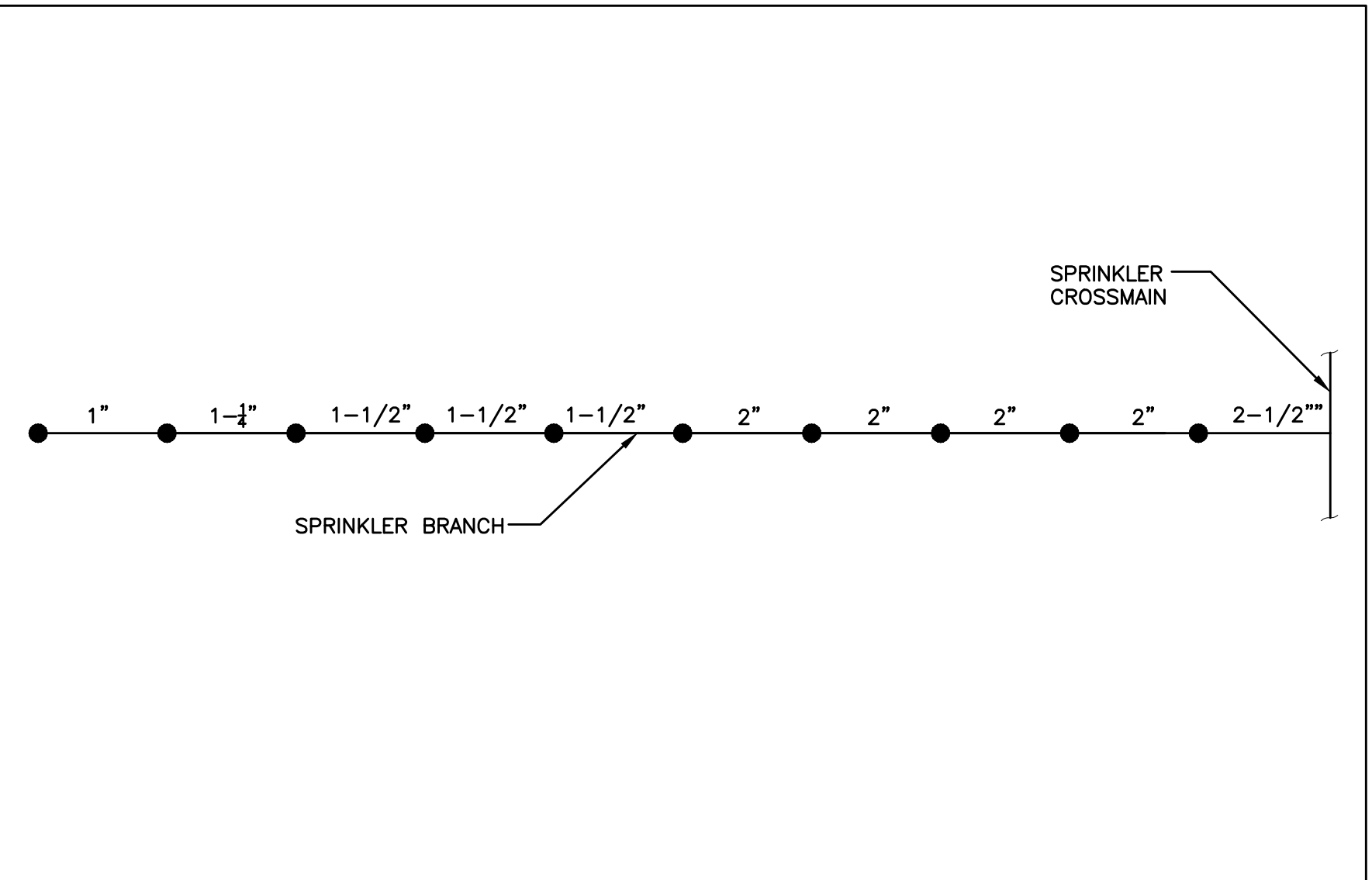
3 PREACTION VALVE ASSEMBLY
SCALE: NONE



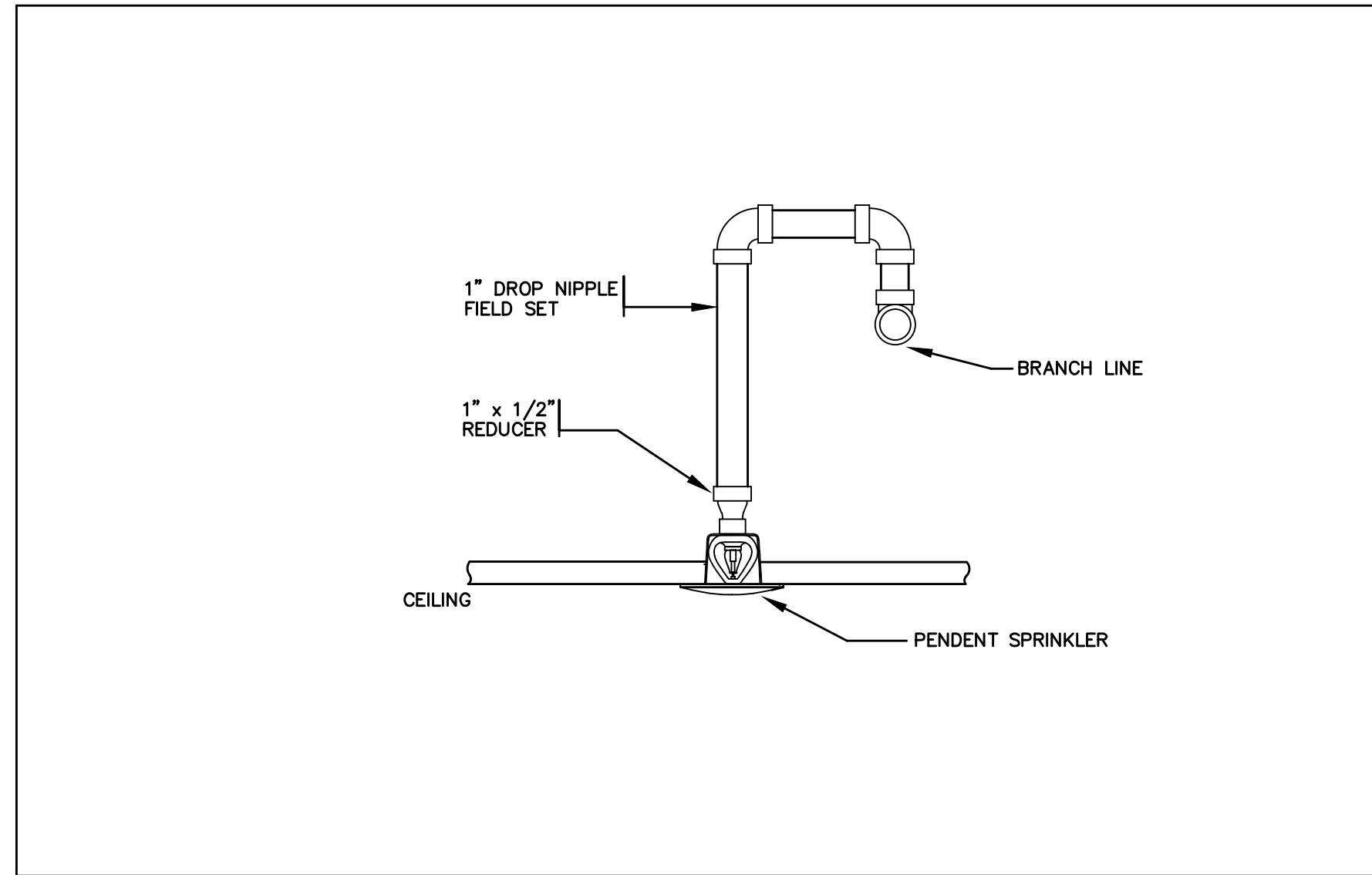
4 BACKFLOW PREVENTER
SCALE: NONE



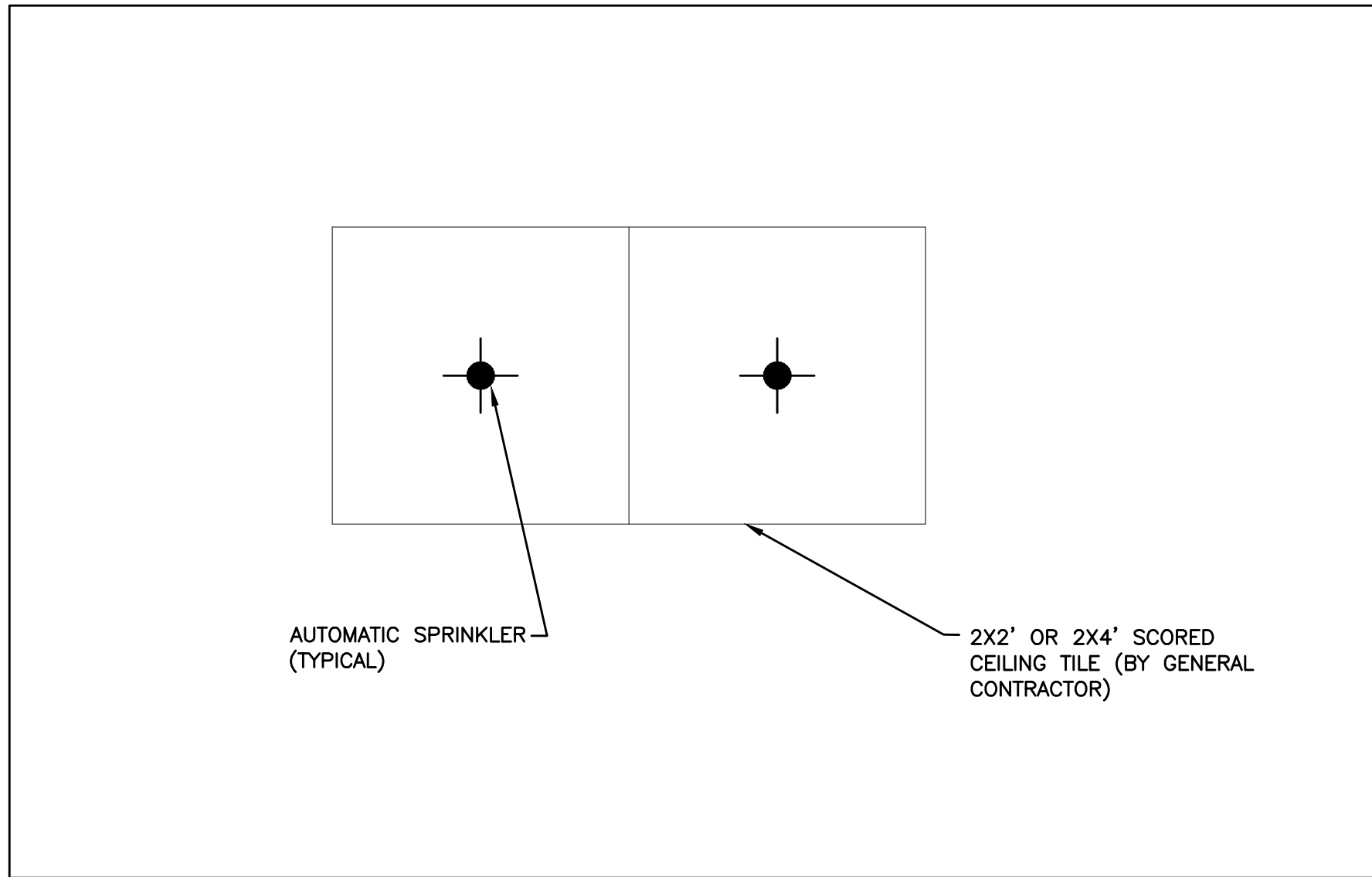
5 FIRE DEPARTMENT INLET CONNECTION
SCALE: NONE



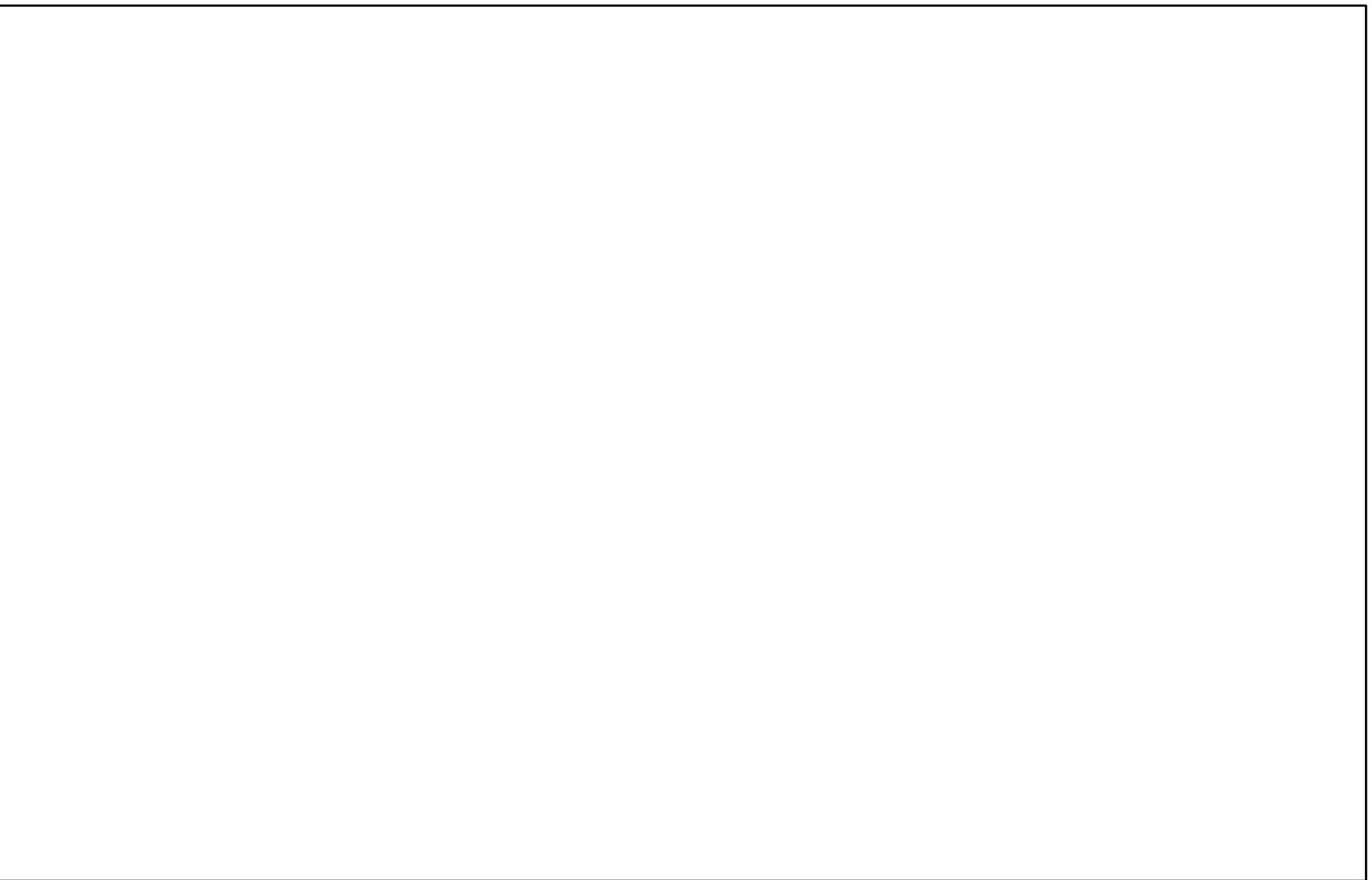
6 TYPICAL MINIMUM BRANCH PIPE SIZING
SCALE: NONE



7 SPRINKLER DROP TO CEILING
SCALE: NONE



8 SPRINKLER INSTALLATION IN ACOUSTIC CEILING TILE
SCALE: NONE

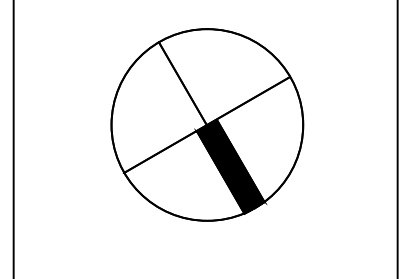


9 NOT USED
SCALE: NONE

KANG ASSOCIATES, INC.
339 BOSTON POST ROAD
SUDBURY, MA 01776



ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2
260 GROVE STREET, WALTHAM, MA



DATE: 08-08-12
SCALE: AS NOTED

FIRE PROTECTION
DETAILS

FP2.0

FIRE PROTECTION GENERAL NOTES

- 1) 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 SYSTEM CONCEPT, THE MAIN COMPONENTS OF THE SYSTEMS AND THE APPROXIMATE GEOMETRIC RELATIONSHIPS. BASED UPON THE SYSTEMS CONCEPT, THE MAIN COMPONENTS, AND THE APPROXIMATE GEOMETRIC RELATIONSHIPS, PROVIDE ALL OTHER COMPONENTS AND MATERIALS NECESSARY TO MAKE THE SYSTEMS FULLY COMPLETE AND OPERATIONAL.
- 2) MAKE REASONABLE AND NECESSARY MODIFICATIONS IN LAYOUTS AND COMPONENTS NEEDED TO PREVENT CONFLICT WITH WORK OF OTHER TRADES AND TO COORDINATE IN ACCORDANCE WITH SPECIFICATIONS.
- 3) MAINTAIN MAXIMUM HEADROOM AT ALL LOCATIONS. ALL PIPING TO BE AS TIGHT TO UNDERSIDE OF DECK AS POSSIBLE. ALL EXPOSED PIPING SHALL BE APPROVED BY ENGINEER AND SHALL MAINTAIN REQUIRED CLEARANCES.
- 4) SYSTEMS SHALL RUN IN A RECTILINEAR FASHION.
- 5) MAINTAIN COMPLETE AND SEPARATE SET OF INSTALLATION DRAWINGS ON SITE AT ALL TIMES. RECORD WORK COMPLETED AND ALL MODIFICATIONS CLEARLY AND ACCURATELY.
- 6) ALL SYSTEM COMPONENTS SHALL BE UL-LISTED IN ACCORDANCE WITH NFPA REQUIREMENTS, AND SHALL BE INSTALLED IN ACCORDANCE WITH LISTING REQUIREMENTS.
- 7) THREADED ROD SHALL NOT BE FORMED OR BENT. ALL BOMED, BENT OR OTHERWISE DEFORMED THREADED ROD SHALL BE REPLACED WITH NEW.
- 8) PROVIDE SUPERVISION AT ALL VALVES.
- 9) PROVIDE SIGNAGE AT ALL CONTROL VALVES.
- 10) PROVIDE FIREPROOF THROUGH PENETRATION ASSEMBLIES AT ALL PENETRATIONS OF SMOKE AND/OR FIRE RATED FLOORS AND WALLS IN ACCORDANCE WITH BUILDING CODE AND REQUIREMENTS

FIRE PROTECTION LEGEND

SYMBOL	DESCRIPTION
—	AGENT PIPING
○	AGENT RISER
⊙	ION TYPE SMOKE DETECTOR
⊕	PHOTO TYPE SMOKE DETECTOR
■	AGENT ABORT SWITCH
□	AGENT RELEASE SWITCH
▣	KEYED MAINTENANCE SWITCH
□	CONTROL PANEL
○	AGENT CYLINDER
—	PIPE DOWN OR DROP
◀	AGENT DISCHARGE STROBE
△	FIRE ALARM STROBE
●	DISCHARGE NOZZLE

FIRE PROTECTION SYSTEM INTENT

1. ALL WORK SHALL BE INSTALLED IN CONFORMANCE WITH NFPA.
2. PREPARE SHOP DRAWINGS AND AGENT CALCULATIONS. SHOP DRAWINGS AND HYDRAULIC CALCULATIONS SHALL BE SEALED BY AN ENGINEER REGISTERED IN MASSACHUSETTS.
3. SHOP DRAWINGS AND AGENT CALCULATIONS SHALL BE SUBMITTED BY A STATE LICENSED CONTRACTOR AND A PERMIT OBTAINED FROM THE WALTHAM FIRE DEPARTMENT PRIOR TO THE COMMENCEMENT OF WORK.

WIRING AND DEVICE NOTES

1. THE ELECTRICAL CONTRACTOR SHALL PROVIDE 120 VAC POWER TO THE AGENT RELEASE PANEL.
2. ALL DETECTORS AND WIRING ARE BY PROVIDED BY THE FIRE PROTECTION CONTRACTOR.
3. AGENT ABORT SWITCH AND WIRING PROVIDED BY THE FIRE PROTECTION CONTRACTOR.
4. THE ELECTRICAL CONTRACTOR SHALL PROVIDE A FIRE ALARM AND TROUBLE SIGNAL, CONNECTED TO THE AGENT RELEASE PANEL.
5. SMOKE DETECTOR TYPES SHALL BE STAGGERED AND SHALL PROVIDE A CROSS-ZONED DETECTION SYSTEM.
6. THE AGENT RELEASE PANEL SHALL INCLUDE A SEPARATE SET OF DRY CONTACTS FOR THE HVAC FAN SYSTEM SHUTDOWN, RELAY AND POWER WIRING BY THE ELECTRICAL CONTRACTOR.

AGENT SEQUENCE OF OPERATION

A) ACTIVATION OF ANY ONE DETECTOR IN VAULT SHALL:

- 1) ILLUMINATE LCD DISPLAY ON CONTROL PANEL
- 2) ILLUMINATE DETECTOR LIGHT
- 3) ACTIVATE ALARM HORN
- 4) ACTIVATE ALARM STROBE
- 5) ACTIVATE BUILDING FIRE ALARM TIE-IN – TROUBLE OR PRE-ALARM

B) ACTIVATION OF A SECOND DETECTOR IN THE VAULT CROSS ZONED AREA SHALL:

- 1) ILLUMINATE LCD DISPLAY ON CONTROL PANEL
- 2) ILLUMINATE DETECTOR LIGHT
- 3) ACTIVATE ALARM HORN
- 4) ACTIVATE ALARM STROBE
- 5) START DISCHARGE TIME DELAY. (TYP. 20 SECONDS, PROGRAM IN FIELD)
- 6) ILLUMINATE DISCHARGE TIME ON LCD
- 7) ACTIVATE CONTACT FOR VAULT HVAC/EXHAUST TIE-IN
- 8) ACTIVATE BUILDING FIRE ALARM TIE-IN – ALARM

C) DISCHARGE DELAY (ABORT STATION) ACTIVATION SHALL:

- 1) ABORT AGENT RELEASE
- 2) ILLUMINATE TROUBLE CONDITION AT CONTROL PANEL
- 3) ACTIVATE BUILDING FIRE ALARM TIE-IN – TROUBLE

D) UPON EXPIRATION OF INVESTIGATION AND EVACUATION OF TIME DELAYS AND FAILURE TO RESET PANEL, THE SYSTEM SHALL:

- 1) ACTIVATE ALARM HORN
- 2) ACTIVATE ALARM STROBE
- 3) ACTIVATE OUTSIDE DOOR STROBE
- 4) DISCHARGE AGENT

E) ACTIVATION OF A MANUAL RELEASE STATION SHALL:

- 1) ILLUMINATE LCD DISPLAY ON CONTROL PANEL
- 2) ACTIVATE ALARM HORN
- 3) ACTIVATE ALARM STROBE
- 4) ACTIVATE OUTSIDE DOOR STROBE
- 5) ACTIVATE CONTACT FOR VAULT HVAC/EXHAUST TIE-IN
- 6) ACTIVATE BUILDING FIRE ALARM TIE-IN – ALARM
- 7) DISCHARGE AGENT

F) ACTIVATION OF A TROUBLE CONDITION SHALL:

- 1) ILLUMINATE TROUBLE LCD AT CONTROL PANEL
- 2) ACTIVATE BUILDING FIRE ALARM TIE-IN – TROUBLE

G) ACTIVATION OF A KEY MAINTENANCE SWITCH SHALL:

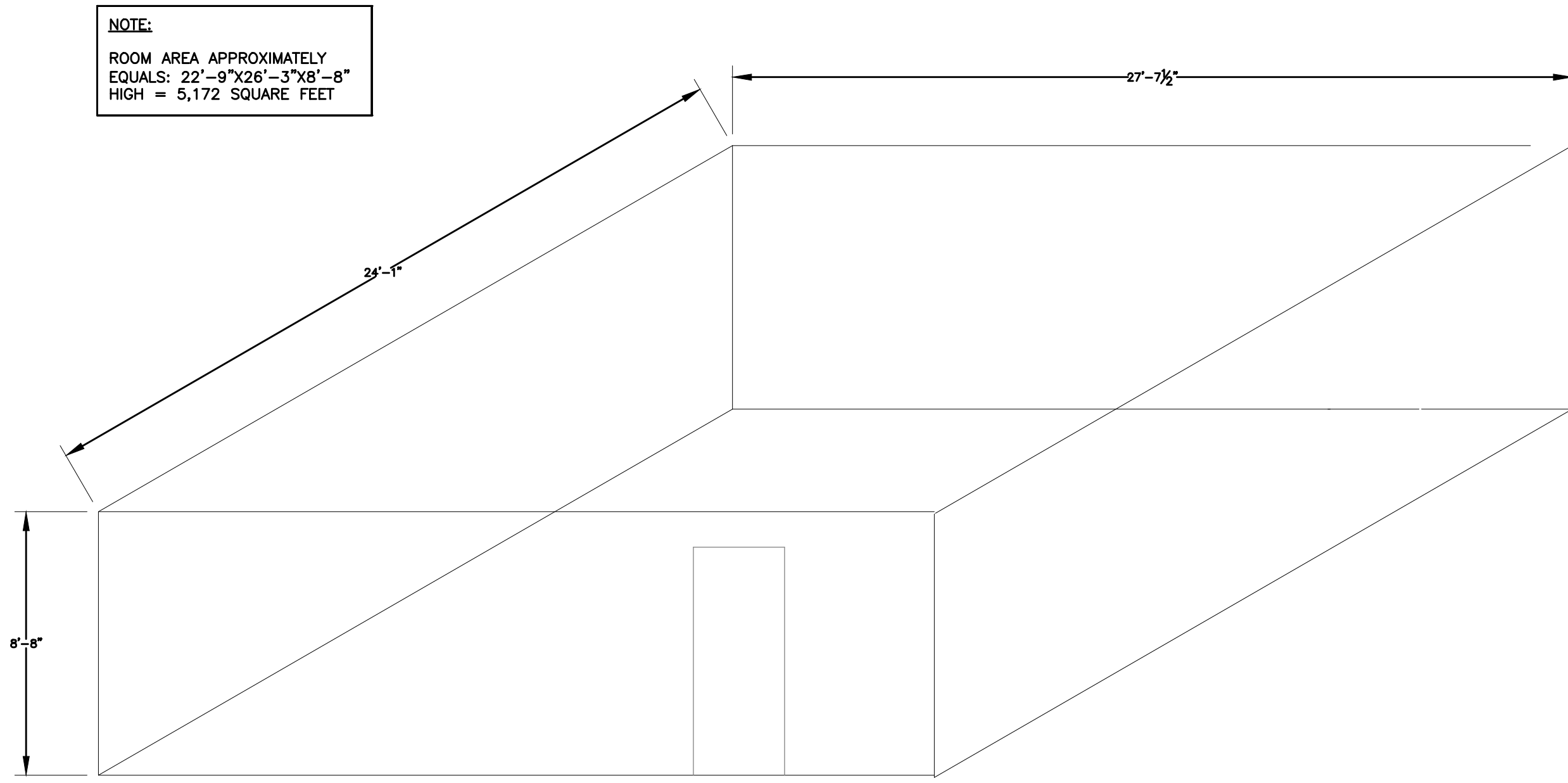
- 1) PUT SYSTEM INTO MAINTENANCE MODE
- 2) ILLUMINATE TROUBLE LCD AT CONTROL PANEL
- 3) ACTIVATE BUILDING FIRE ALARM TIE-IN – TROUBLE
- 4) CHANGE KEY SWITCH LED FROM GREEN TO RED

SYSTEM CONTRACTOR AND MANUFACTURER

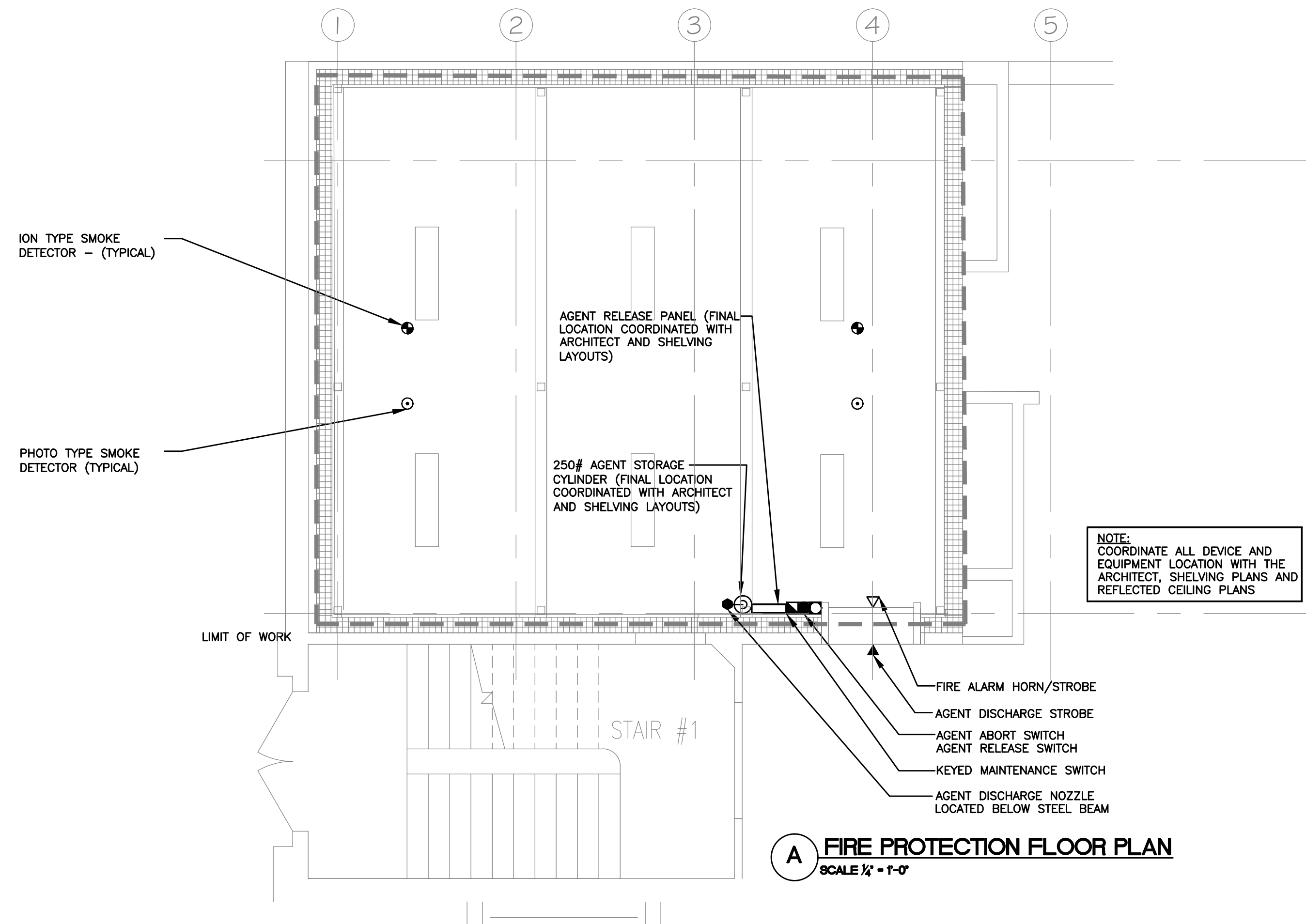
1. THIS DESIGN IS BASED ON A JANUS FIRE SYSTEMS NOVEC CLEAN AGENT FIRE EXTINGUISHING PACKAGED ASSEMBLY, WITH APPLICATION BASED PIPING AND NOZZLE DESIGN.

JANUS FIRE SYSTEMS
1102 RUPOICH DRIVE
MILLENIUM PARK
CROWN POINT, IN 46307
(219) 663-1600
2. LOCAL REPRESENTATION OF JANUS FIRE PROTECTION:

ADVANCED SAFETY SYSTEMS, INC.
141 SUMMIT STREET
PEABODY, MA 01960
978 532-5730
WWW.ADVANCEDSAFETYSYSTEMS.COM



B ARCHIVAL VAULT VOLUME ISOMETRIC
SCALE 1/4" = 1'-0"



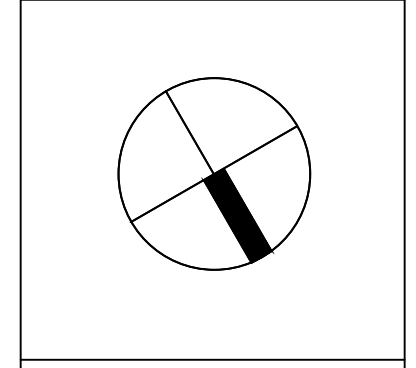
A FIRE PROTECTION FLOOR PLAN
SCALE 1/4" = 1'-0"

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**ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2**
260 GROVE STREET, WALTHAM, MA



DATE: 08-08-12
SCALE: AS NOTED

FIRE PROTECTION
VAULT

FP2.2

GENERAL NOTES AND SPECIFICATIONS

- THE PLUMBING DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATIVE OF THE WORK TO BE INSTALLED. FIELD VERIFY ALL EXISTING CONDITIONS. EXACT ROUTING AND LOCATION OF NEW AND EXISTING PIPE SHALL BE FIELD DETERMINED PRIOR TO THE INSTALLATION OF NEW WORK.
- THE CONTRACTOR SHALL COORDINATE HIS WORK WITH ALL TRADES AND THE OWNER'S REPRESENTATIVE.
- INSTALL ALL WORK IN ACCORDANCE WITH THE LAWS, ORDINANCES, CODES, RULES AND REGULATIONS OF THE COMMONWEALTH OF MASSACHUSETTS AND THE WALTHAM BUILDING AUTHORITIES. WHERE WORK SHOWN EXCEEDS THESE LAWS, THE PLANS SHALL GOVERN.
- APPLY AND PAY FOR ALL PERMITS, CERTIFICATES, INSPECTION, APPROVAL AND LICENSE FEES IN CONNECTION WITH THE WORK.
- PROTECT THE WORK FROM DAMAGE OF ANY CAUSE. REPLACE ANY NEW OR EXISTING WORK DAMAGED AT NO COST TO THE OWNER.
- THE PLUMBING CONTRACTOR SHALL GUARANTEE THE PERFORMANCE OF THE EQUIPMENT, MATERIAL AND INSTALLATION THEREOF FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE OF THE WORK.
- EXAMINATION OF THE SITE SHALL BE MADE BY THE PLUMBING CONTRACTOR WHO SHALL COMPARE IT WITH THE CONTRACT DRAWINGS TO DETERMINE THE EXACT AMOUNT OF WORK. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO THE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED AND GAIN COMPLETE KNOWLEDGE OF THE SCOPE OF HIS WORK TO PROVIDE A COMPLETE AND OPERABLE SYSTEM. NO ALLOWANCE SHALL SUBSEQUENTLY BE MADE IN HIS BEHALF FOR ANY EXTRA EXPENSE TO WHICH HE MAY BE OBLIGED DUE TO HIS FAILURE TO MAKE SUCH EXAMINATION AND TO INCLUDE THE REQUIRED MATERIALS AND LABOR IN HIS BID.
- ALL DRAIN PIPING 3" OR LESS SHALL PITCH @ 1/4" PER FOOT AND PIPING LARGER THAN 3" SHALL PITCH @ 1/8" PER FOOT UNLESS OTHERWISE NOTED.
- DRAIN PIPING SHALL BE:
 - ABOVE GROUND
 - HUBLESS CAST IRON SOIL PIPE, ASTM 88 AND CISPI 301.
 - HUBLESS HEAVY DUTY COUPLINGS AND GASKETS, ASTM C 1540 AND ASTM C564
 - LL ALL COUPLINGS IN ACCORDANCE WITH MANUFACTURER'S TORQUE RATINGS, UTILIZING A CALIBRATED TORQUE LIMITING DEVICE.
 - BELOW GROUND
 - SERVICE WEIGHT CAST IRON: ASTM A74.
 - B CAST IRON: CISPI 301 AND ASTM 88.
 - PIPE AND FITTINGS SHALL BE MARKED WITH THE CAST IRON SOIL PIPE INSTITUTE COLLECTIVE TRADEMARK AND LISTED BY NSF INTERNATIONAL.
 - RESILIENT GASKETS SHALL BE RUBBER: ASTM C564-70.
- HEAVY DUTY CAST IRON WITH PUSH-ON HUB & SPIGOT OR MECHANICAL CLAMP JOINTS. ALL PIPING, FITTINGS AND COUPLINGS SHALL BEAR THE TRADEMARK OF THE CAST IRON SOIL PIPING INSTITUTE.
- ALL DEMOLITION WORK SHALL BE PERFORMED BY A PLUMBER LICENSED IN THE COMMONWEALTH OF MASSACHUSETTS.
- THE PLUMBING CONTRACTOR SHALL SUBMIT FIVE COPIES, AND OBTAIN APPROVAL OF, SHOP DRAWINGS PRIOR TO COMMENCEMENT OF WORK. ALSO SUBMIT OPERATIONS AND MAINTENANCE MANUALS, AND AS-BUILT DRAWINGS AT PROJECT COMPLETION. OPERATIONS AND MAINTENANCE MANUALS SHALL CONTAIN SPECIFICATIONS AND MAINTENANCE DATA FOR ALL EQUIPMENT INSTALLED.
- THE PLUMBING CONTRACTOR SHALL FURNISH AND INSTALL STICK-ON COLOR-CODED PIPE IDENTIFICATION MARKERS ON ALL NEW PIPING. PROVIDE ARROW ON MARKER INDICATING DIRECTION OF FLOW. ALL MARKERS SHALL BE READ FROM THE FLOOR. INSTALL MAKERS AT TEN FOOT INTERVALS AND EACH CHANGE IN DIRECTION.
- PROVIDE ESCUTCHEON AND SEAL WATERTIGHT AT ALL PENETRATIONS THROUGH WALLS.
- DEMOLITION SHALL REQUIRE THE SAFE REMOVAL AND LEGAL DISPOSAL OF ALL PIPING, HANGERS AND APPURTENANCES OF AREAS INVOLVED.

LEGEND

- NEW PIPING
- EXISTING PIPING
- WASTE PIPING
- WASTE PIPING BELOW FLOOR
- - - VENT
- - - COLD WATER PIPING
- - - HOT WATER PIPING
- W&T/WASTE AND TRAP
- PIPE RISE OR UP
- PIPE DOWN OR DROP
- CONNECT TO EXISTING
- CLEANOUT
- ISOLATION (FULL-PORT BALL) VALVE
- UNION
- G GAS PROPANE PIPING
- HW HOT WATER
- INV INVERT ELEVATION
- S SANITARY WASTE
- VTR VENT THROUGH ROOF
- W WASTE
- DN DOWN
- DP DROP
- CW COLD WATER
- HW HOT WATER
- INV INVERT
- S SANITARY WASTE
- V VENT
- W WASTE
- WC-1 PLUMBING FIXTURE NUMBER

PLUMBING EQUIPMENT SCHEDULE

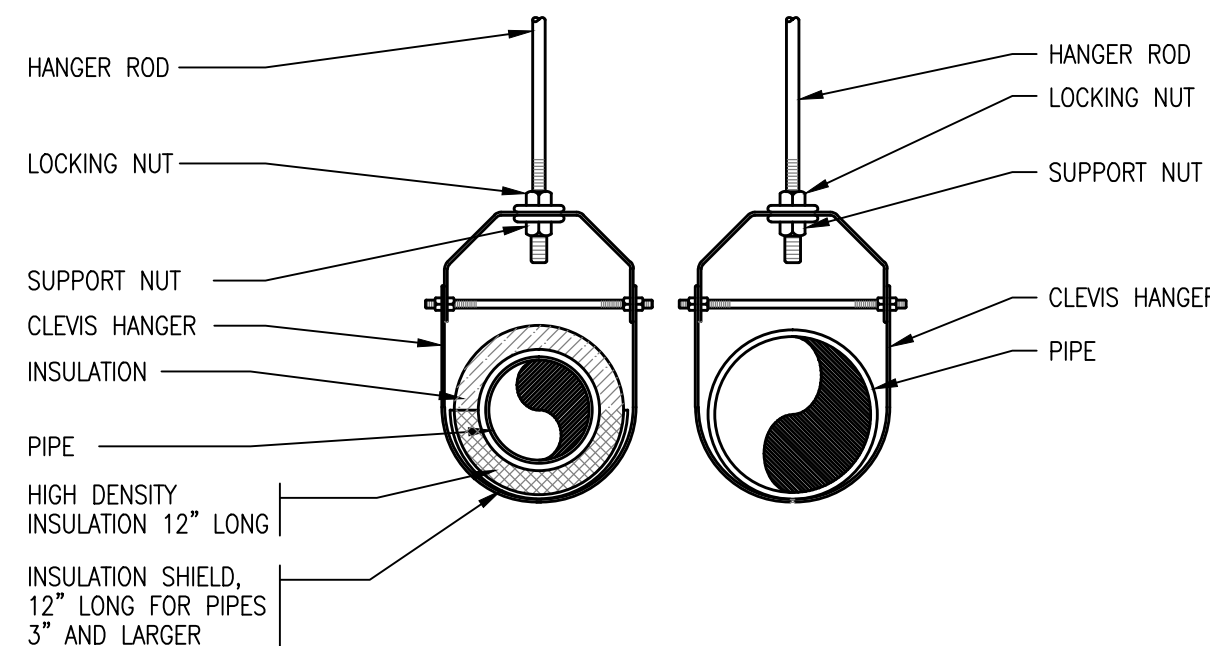
SYMBOL	DESCRIPTION	MANUFACTURER & MODEL	FITTINGS & ACESORIES	REMARKS
EJ-1	SUMP PUMP IN BASIN	ZOELLER DRAIN PUMP SYSTEM #105	PACKAGED SYSTEM FIVE GALLON POLYETHYLENE BASIN CONTROLS, PUMP	OFFSET TRAP AND PLUMBEREXX INSTALLATION KIT
L-1	ACCESSIBLE DROP-IN	GERBER 12-824 VITREOUS CHINA	SYMMONS 8-60-G-H "SCOTT" FAUCET	-
WC-1	FLOOR MOUNTED ACCESSIBLE WATER CLOSET	GERBER "ULTRA FLUSH" EF-21-31-8	-	TANIC TYPE
TP-1	TRAP PRIMER	PRECISION PLUMBING PRODUCTS MODEL PPS-1	-	-

PIPING MATERIAL AND INSULATION SCHEDULE

DESIGNATION	SYSTEM DESCRIPTION	PIPING		INSULATION	
		MATERIAL	JOINTS	MATERIAL	THICKNESS
HW	DOMESTIC HOT WATER	TYPE L COPPER	COPPER OR CAST BRASS, SWEAT	TYPE ASJ SSL FIBERGLASS PIPE INSULATION WITH INTEGRAL VAPOR BARRIER, ALL SERVICE JACKET AND SELF SEALING EDGE. PROVIDE FACTORY FORMED PVC COVERS ON ALL FITTINGS.	1"
CW	DOMESTIC COLD WATER	TYPE L COPPER	COPPER OR CAST BRASS, SWEAT		1"
S/W	SANITARY/ WASTE	SERVICE WEIGHT	HUB & SPIGOT WITH PUSH-ON JOINTS, OR MECHANICAL COUPLINGS	NONE	-

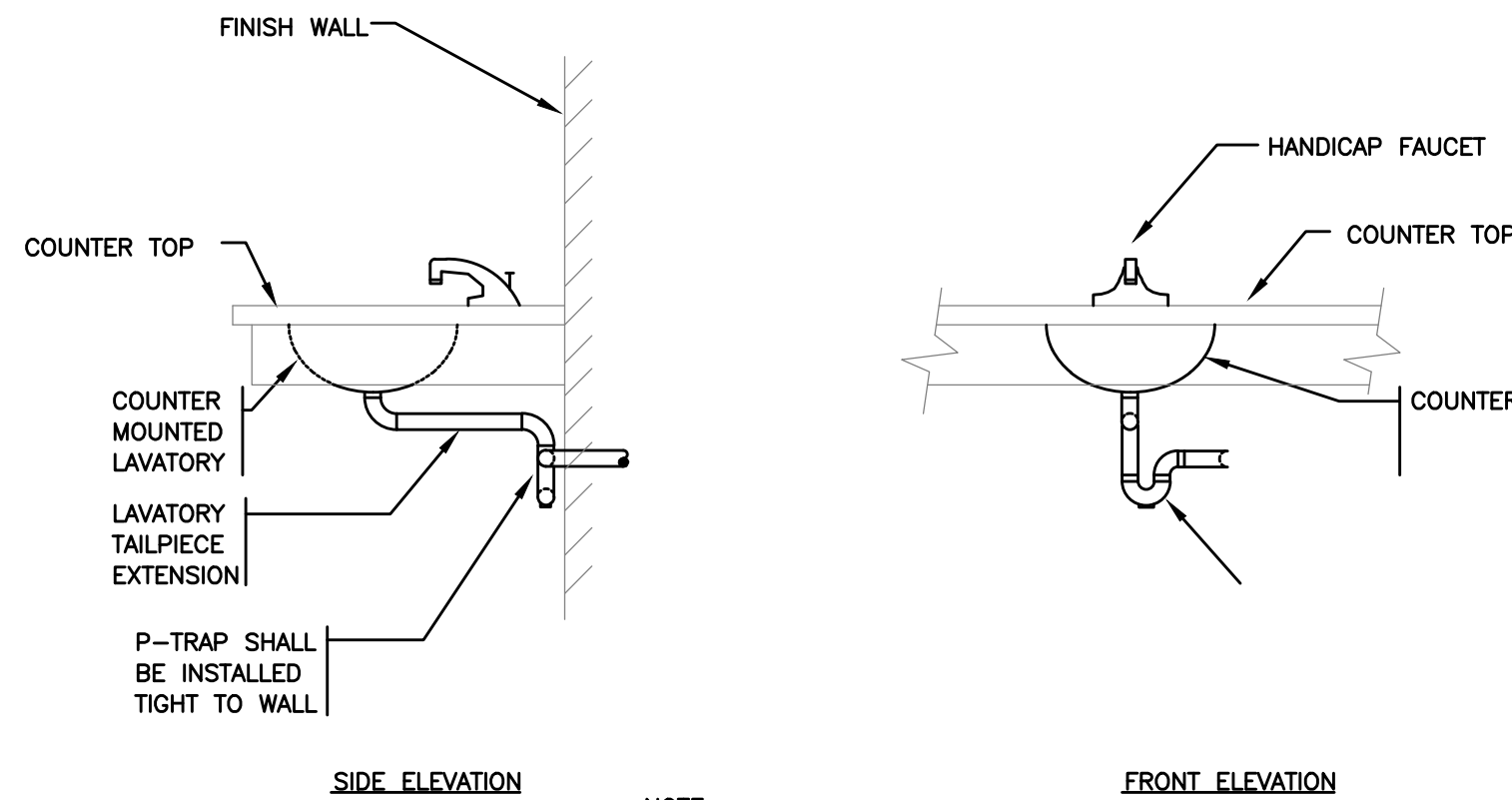
PLUMBING SCOPE

- THE PLUMBING SCOPE INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING:
- EXTEND EXISTING NPCW TO NEW VAULT HUMIDIFIER.
 - REMOVE EXISTING FIRST FLOOR TOILET ROOM FIXTURES AS INDICATED.
 - PROVIDE NEW FIRST FLOOR TOILET ROOM FIXTURES AS INDICATED.
 - CONNECT NEW PING TO EXISTING TO ACCOMMODATE NEW FIXTURES.
 - PROVIDE NEW SUMP PUMP IN CHAMBER TO ACCOMMODATE NEW FIRE PROTECTION DRAIN IN BASEMENT LEVEL.
 - PROVIDE STANDPIPE DRAIN WITH TRAP PRIMER FOR PRE-ACTION DRAIN
 - REMOVE AND REINSTALL BASEMENT DRINKING FOUNTAIN



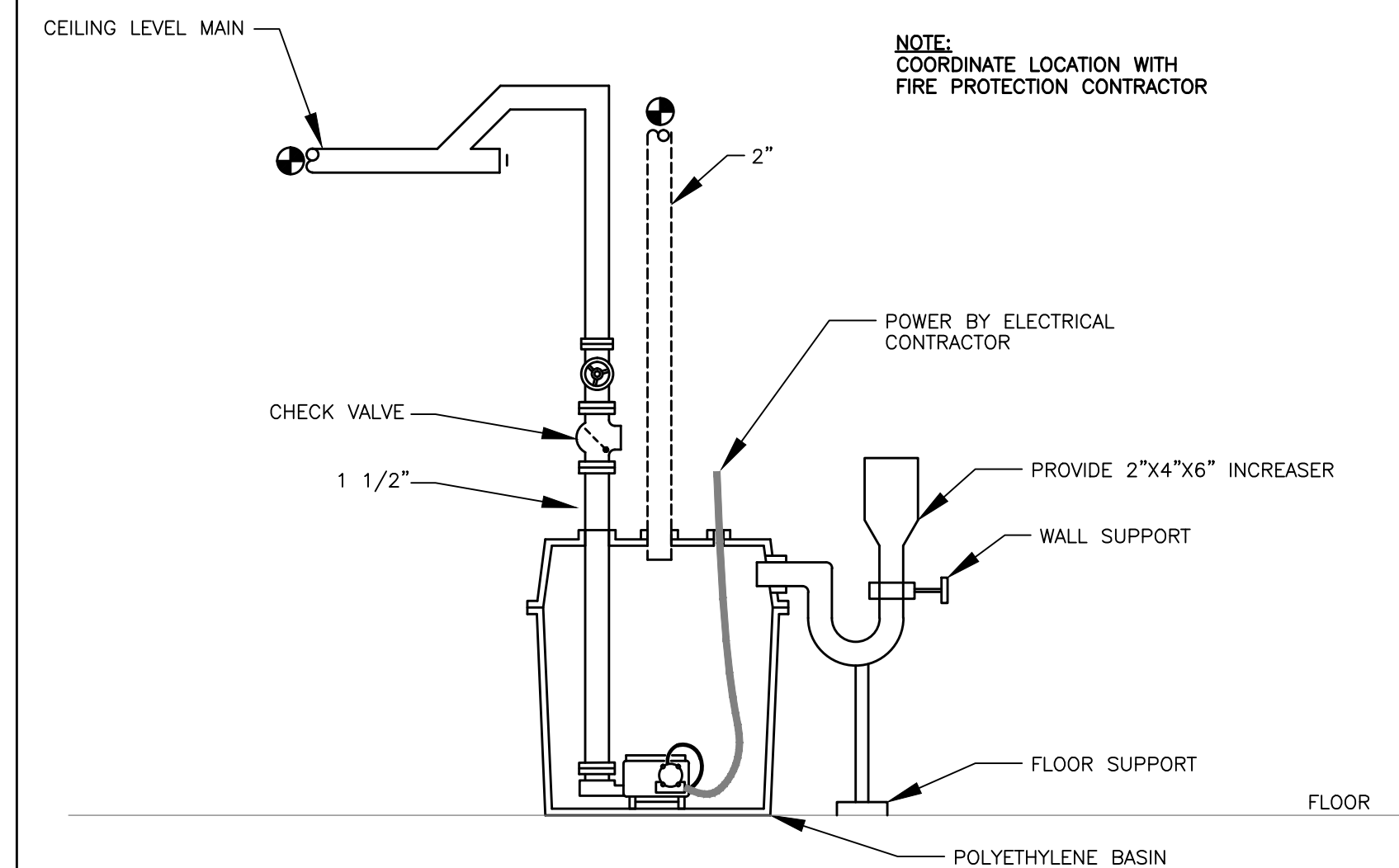
HANGER ROD SCHEDULE		HANGER ROD SPACING	
PIPE SIZE	ROD SIZE	PIPE SIZE	MAX. ALLOWABLE SPACING
UP TO 2"	3/8" DIA.	1"	7'
2 1/2" THRU 3"	1/2" DIA.	1 1/4"	8'
4" AND 5"	5/8"	1 1/2"	9'
6" THRU 8"	3/4"	2"	10'
12"	7/8"	2 1/2"	11'
		3" THRU 8"	12'
		10" & 12"	15'

1 PIPE HANGER DETAIL
SCALE: NONE

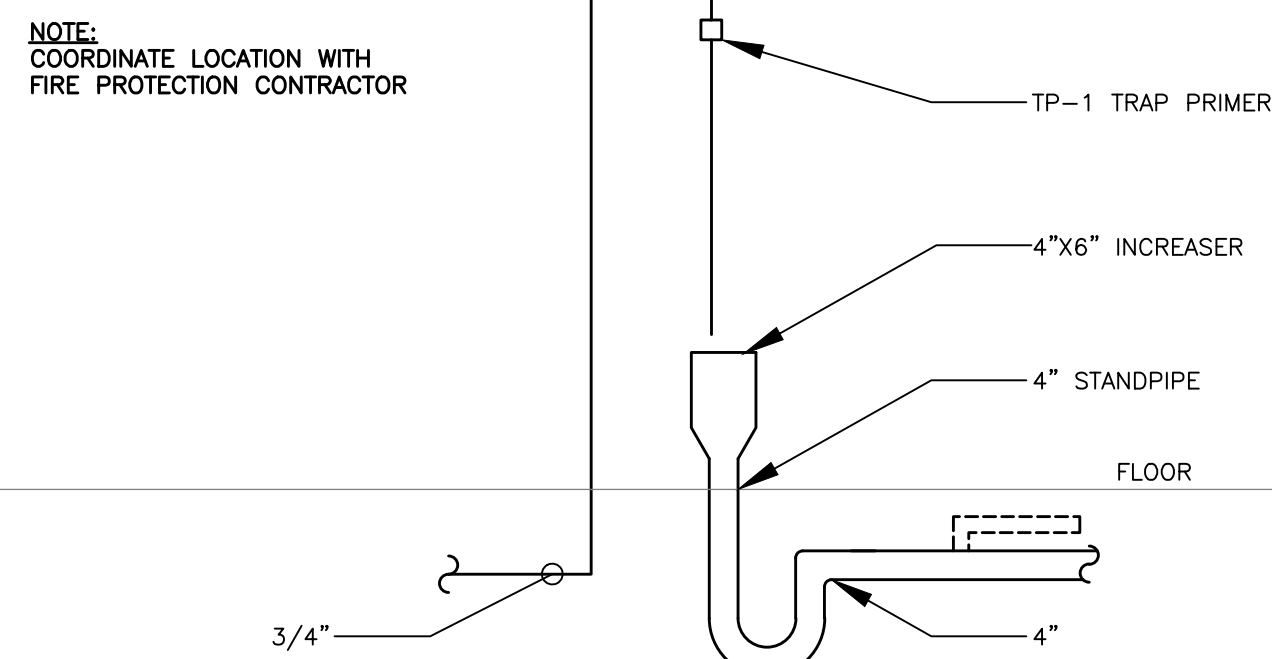


NOTE:
ALL LAVATORY PIPING, (SUPPLY AND WASTE) SHALL BE FULLY INSULATED. INSULATION IS NOT REQUIRED UNDER NON-ACCESSIBLE VANITY CABINET INSTALLATIONS

2 COUNTER MOUNTED SINK/LAVATORY DETAIL
SCALE: NONE



3 FIRE PROTECTION DRAIN SUMP PUMP
SCALE: NONE

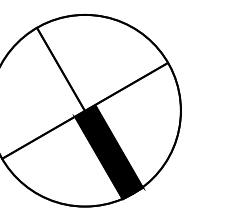


4 FIRE PROTECTION FUNNEL DRAIN DETAIL
SCALE: NONE

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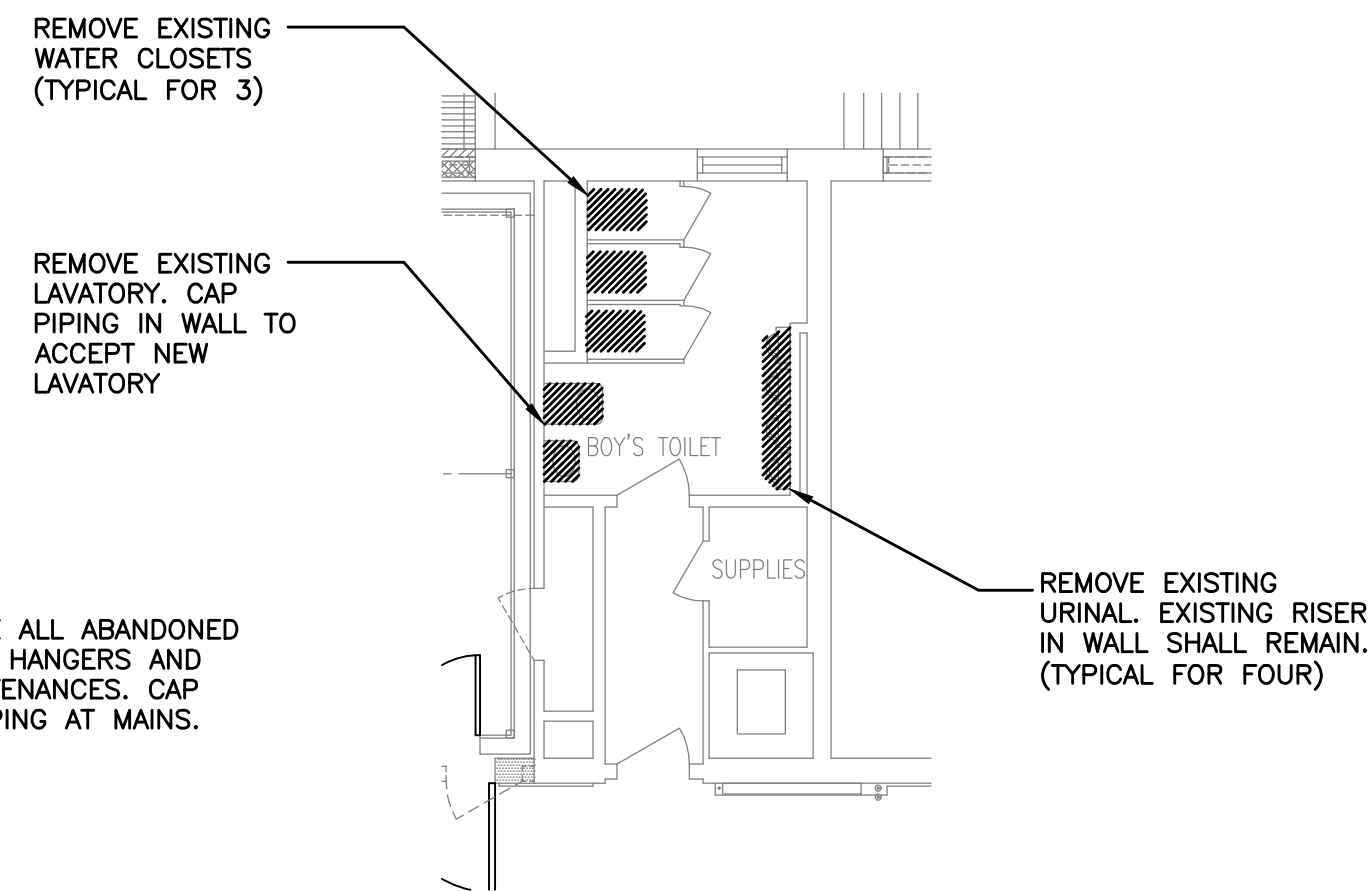
ARCHIVAL VAULT AT THE
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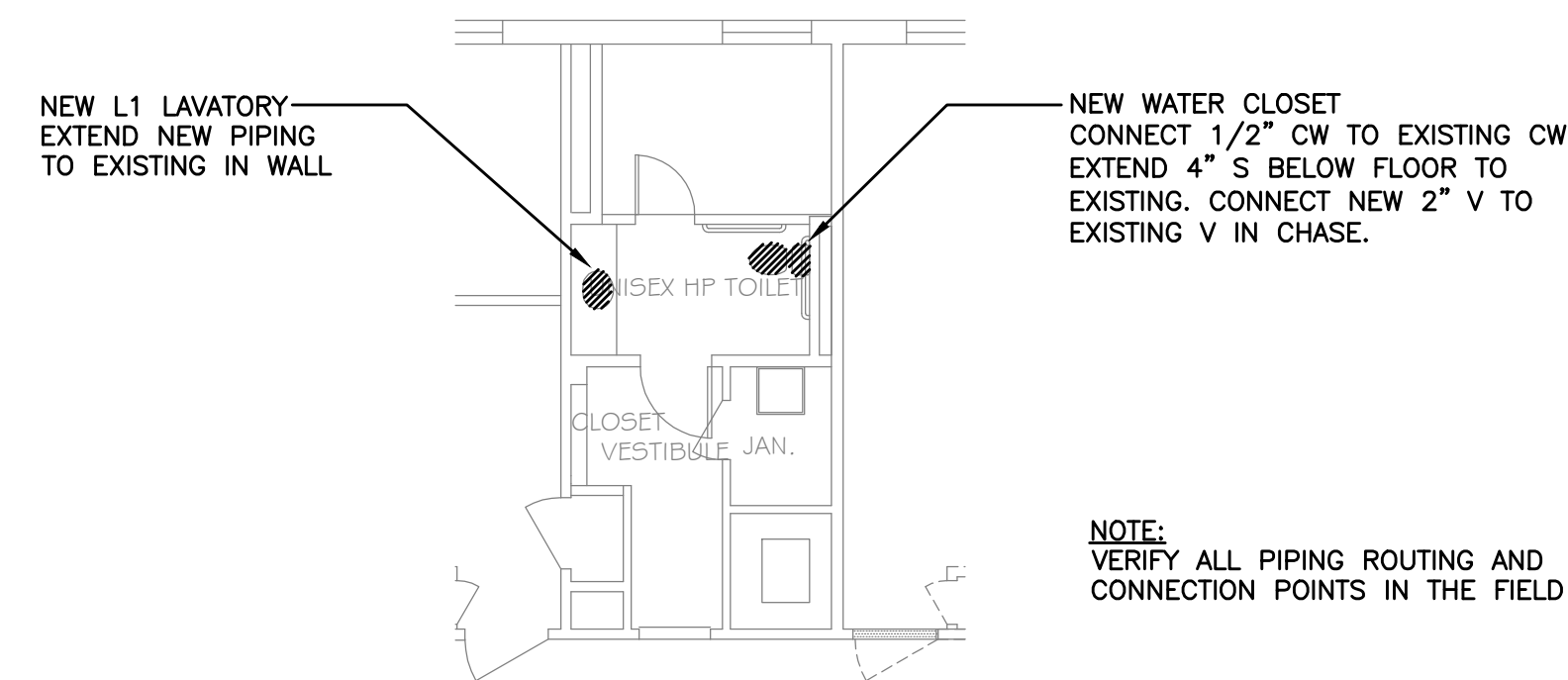
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SCALE: AS NOTED

PLUMBING PLANS,
NOTES & DETAILS

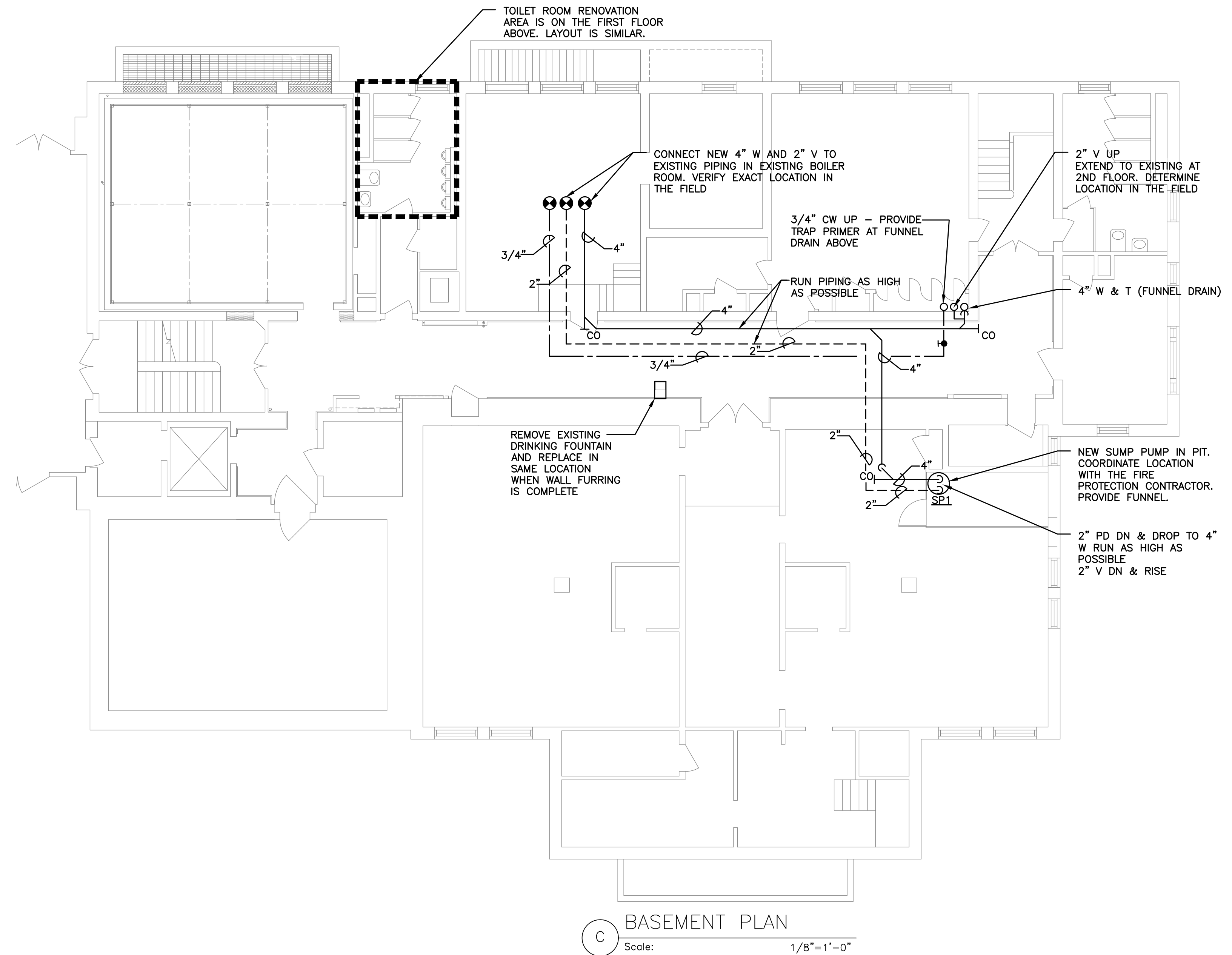
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A BASEMENT FLOOR TOILET DEMO PLAN
Scale: 1/8"=1'-0"



B FIRST FLOOR TOILET NEW WORK PLAN
Scale: 1/8"=1'-0"

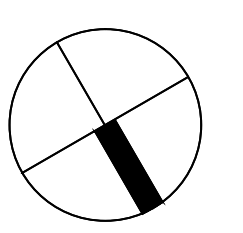


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ARCHIVAL VAULT AT THE
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DATE: 08-08-12

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PLUMBING
PLANS

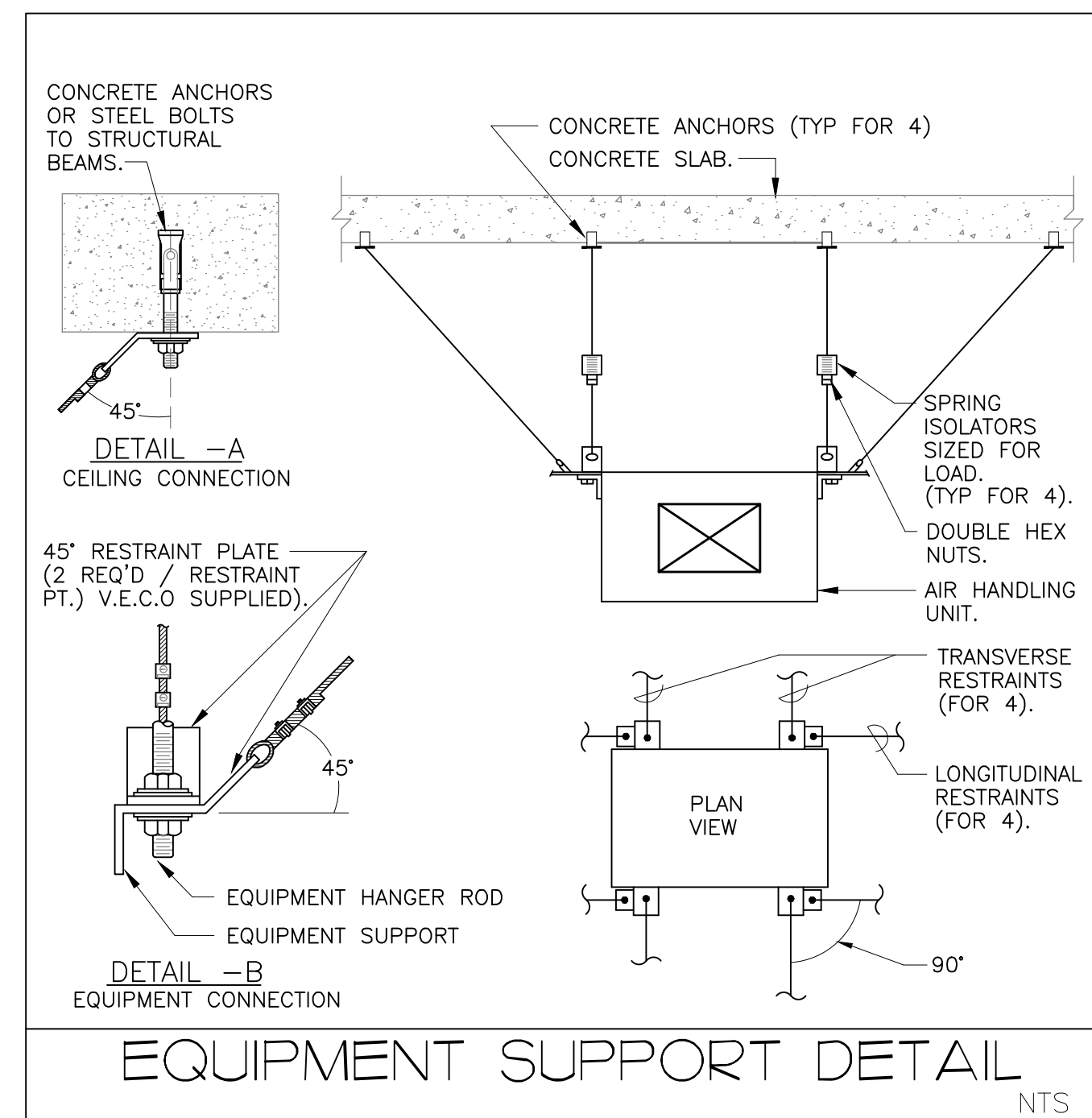
P1.0

GENERAL NOTES:

- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE MECHANICAL SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
- CONTRACT DOCUMENT DRAWINGS FOR MECHANICAL WORK ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
- INSTALL ALL MECHANICAL EQUIPMENT AND APPURTENANCES IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS, CONTRACT DOCUMENTS, AND APPLICABLE CODES AND REGULATIONS.
- PROVIDE VIBRATION ISOLATION FOR ALL MECHANICAL EQUIPMENT TO PREVENT TRANSMISSION OF VIBRATION TO BUILDING STRUCTURE.
- PROVIDE VIBRATION ISOLATORS FOR ALL PIPING SUPPORTS CONNECTED TO, AND WITHIN 50 FT. OF, ISOLATED EQUIPMENT (EXCEPT AT BASE ELBOW SUPPORTS AND ANCHOR POINTS) THROUGHOUT MECHANICAL EQUIPMENT ROOMS.
- THE LOCATION OF EXISTING UNDERGROUND UTILITIES 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.
- COORDINATE CONSTRUCTION OF ALL MECHANICAL WORK WITH ARCHITECTURAL, STRUCTURAL, CIVIL, ELECTRICAL WORK, ETC., SHOWN ON OTHER CONTRACT DOCUMENT DRAWINGS.
- MAINTAIN A MINIMUM 6"8" CLEARANCE TO THE UNDERSIDE OF PIPES, DUCTS, CONDUITS, SUSPENDED EQUIPMENT, ETC., THROUGHOUT ACCESS ROUTES IN MECHANICAL ROOMS.
- ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.
- LOCATE ALL TEMPERATURE, PRESSURE, AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH THE STRAIGHT SECTION OF PIPE OR DUCT UP- AND DOWNSTREAM AS RECOMMENDED BY THE MANUFACTURER FOR GOOD ACCURACY.
- TESTING, ADJUSTING, AND BALANCING AGENCY SHALL BE A MEMBER OF THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). TESTING, ADJUSTING, AND BALANCING SHALL BE PERFORMED IN ACCORDANCE WITH THE AABC STANDARDS.
- WHERE TWO OR MORE ITEMS OF THE SAME TYPE OF EQUIPMENT ARE REQUIRED, THE PRODUCT OF ONE MANUFACTURER SHALL BE USED.
- REINFORCEMENT, DETAILING, AND PLACEMENT OF CONCRETE SHALL CONFORM TO ASTM 315 AND ACI 318. CONCRETE SHALL CONFORM TO ASTM C94. CONCRETE WORK SHALL CONFORM TO ACI 318, PART ENTITLED "CONSTRUCTION REQUIREMENTS." COMPRESSIVE STRENGTH IN 28 DAYS SHALL BE 3,000 PSI. TOTAL AIR CONTENT OF EXTERIOR CONCRETE SHALL BE BETWEEN 5 AND 7 PERCENT BY VOLUME. SLUMP SHALL BE BETWEEN 3 AND 4 IN. CONCRETE SHALL BE CURED FOR 7 DAYS AFTER PLACEMENT.
- 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.
- ALL CONTROL WIRE AND CONDUIT SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE AND DIVISION 26 OF THE SPECIFICATION.
- CONCRETE HOUSEKEEPING PADS TO SUIT MECHANICAL EQUIPMENT SHALL BE SIZED AND LOCATED BY THE MECHANICAL CONTRACTOR. MINIMUM CONCRETE PAD THICKNESS SHALL BE 6 IN. PAD SHALL EXTEND BEYOND THE EQUIPMENT A MINIMUM OF 6 IN. ON EACH SIDE. CONCRETE HOUSEKEEPING PADS SHALL BE PROVIDED BY THE GENERAL CONTRACTOR. IT SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO COORDINATE THE SIZE AND LOCATION OF CONCRETE HOUSEKEEPING PADS WITH THE GENERAL CONTRACTOR.
- ALL MECHANICAL ROOM DOORS SHALL BE A MINIMUM OF 4'0" WIDE.
- WHERE BEAMS ARE INDICATED TO BE PENETRATED WITH DUCTWORK OR PIPING, COORDINATE DUCTWORK AND PIPING LAYOUT WITH BEAM OPENING SIZE AND OPENING LOCATIONS. COORDINATION SHALL BE DONE PRIOR TO THE FABRICATION OF DUCTWORK, CUTTING OF PIPING, OR FABRICATION OF BEAMS.
- WHEN MECHANICAL WORK (HVAC, PLUMBING, SHEET METAL, FIRE PROTECTION, ETC.) IS SUBCONTRACTED, IT SHALL BE THE MECHANICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE SUBCONTRACTORS AND THE ASSOCIATED CONTRACTS. WHEN DISCREPANCIES ARISE PERTAINING TO WHICH CONTRACTOR PROVIDES A PARTICULAR ITEM OF THE MECHANICAL CONTRACT OR WHICH CONTRACTOR PROVIDES FINAL CONNECTIONS FOR A PARTICULAR ITEM OF THE MECHANICAL CONTRACT, IT SHALL BE BROUGHT TO THE ATTENTION OF THE MECHANICAL CONTRACTOR, WHOSE DECISION SHALL BE FINAL.
- THE LOCATIONS OF ALL ITEMS SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS ARE DEFINITELY FIXED 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.
- ALL MISCELLANEOUS STEEL REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT (UNLESS OTHERWISE NOTED) SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
- 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.
- ALL EQUIPMENT, PIPING, DUCTWORK, ETC., SHALL BE SUPPORTED AS DETAILED, SPECIFIED, AND REQUIRED TO PROVIDE A VIBRATION-FREE INSTALLATION.
- ALL DUCTWORK, PIPING, AND EQUIPMENT SUPPORTED FROM 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.
- MECHANICAL EQUIPMENT, DUCTWORK, AND PIPING SHALL NOT BE SUPPORTED FROM A METAL DECK.
- 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.
- LOCATION AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED.
- ALL OPENINGS IN FIRE WALLS DUE TO DUCTWORK, PIPING, CONDUIT, ETC., SHALL BE FIRE STOPPED WITH A PRODUCT SIMILAR TO 3M OR AN APPROVED EQUAL.
- ALL AIR CONDITIONING CONDENSATE DRAIN LINES FROM EACH AIR HANDLING UNIT AND ROOFTOP UNIT SHALL BE PIPED FULL SIZE OF THE UNIT DRAIN OUTLET, WITH "P" TRAP, AND PIPED TO THE NEAREST DRAIN. SEE THE DETAILS SHOWN IN THE DRAWINGS OR THE CONTRACT SPECIFICATIONS FOR THE DEPTH OF THE AIR CONDITIONING CONDENSATE TRAP.
- REFER TO TYPICAL DETAILS FOR DUCTWORK, PIPING, AND EQUIPMENT INSTALLATION.

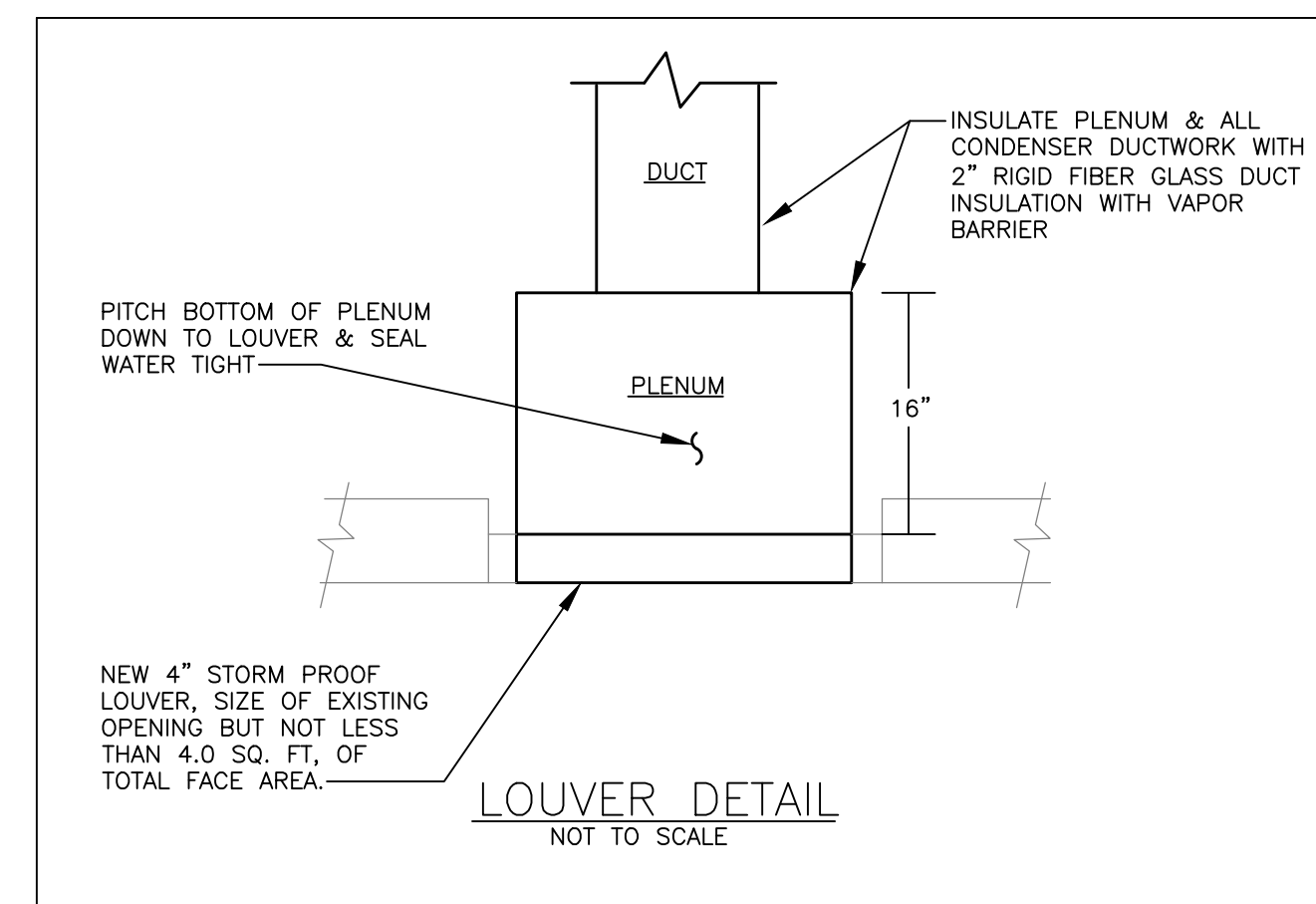
PIPING NOTES:

- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE PIPING SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
- ELEVATIONS AS SHOWN ON THE DRAWINGS ARE TO THE BOTTOM OF ALL PRESSURE PIPING AND TO THE INVERT OF ALL GRAVITY PIPING UNLESS OTHERWISE NOTED.
- MAINTAIN A MINIMUM OF 36" OF GROUND COVER OVER ALL UNDERGROUND HVAC PIPING.
- UNLESS OTHERWISE NOTED, ALL CHILLED WATER AND HEATING WATER PIPING SHALL BE 3/4" IN. SIZE.
- PROVIDE AN AIR VENT AT THE HIGH POINT OF EACH DROP IN THE HEATING-WATER, CHILLED-WATER, AND OTHER CLOSED-WATER PIPING SYSTEMS. ALL PIPING SHALL GRADE TO LOW POINTS. PROVIDE HOSE END DRAIN VALVES AT THE BOTTOM OF ALL RISERS AND LOW POINTS.
- UNLESS OTHERWISE NOTED, ALL PIPING IS OVERHEAD, TIGHT TO THE UNDERSIDE OF THE STRUCTURE OR SLAB, WITH SPACE FOR INSULATION IF REQUIRED.
- INSTALL PIPING SO ALL VALVES, STRAINERS, UNIONS, TRAPS, FLANGES, AND OTHER APPURTENANCES REQUIRING ACCESS ARE ACCESSIBLE.
- 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.
- ALL BALANCING VALVES AND BUTTERFLY VALVES SHALL BE PROVIDED WITH POSITION INDICATORS AND THE MAXIMUM ADJUSTABLE STOPS (MEMORY STOPS).
- PROVIDE CHAINWHEEL OPERATORS FOR ALL VALVES IN EQUIPMENT ROOMS MOUNTED GREATER THAN 7'0" ABOVE FLOOR LEVEL; CHAIN SHALL EXTEND TO 7'0" ABOVE FLOOR LEVEL.
- ALL VALVES (EXCEPT CONTROL VALVES) AND STRAINERS SHALL BE THE FULL SIZE OF THE PIPE BEFORE REDUCING IN SIZE TO MAKE CONNECTIONS TO EQUIPMENT AND CONTROLS.
- UNIONS AND/OR FLANGES SHALL BE INSTALLED AT EACH PIECE OF EQUIPMENT, IN BYPASSES, AND IN LONG PIPING RUNS (100 FT. OR MORE) TO PERMIT DISASSEMBLY FOR ALTERATION AND REPAIRS.
- INSTALL ALL PIPING WITHOUT FORCING OR SPRINGING.
- ALL PIPING SHALL CLEAR DOORS AND WINDOWS.
- ALL VALVES SHALL BE ADJUSTED FOR SMOOTH AND EASY OPERATION.
- ALL PIPING WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
- PROVIDE FLEXIBLE CONNECTIONS IN ALL PIPING SYSTEMS CONNECTED TO PUMPS, CHILLERS, COOLING TOWERS, AND OTHER EQUIPMENT WHICH REQUIRE VIBRATION ISOLATION EXCEPT WATER COILS. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AS CLOSE TO THE EQUIPMENT AS POSSIBLE OR AS INDICATED ON THE DRAWINGS.
- SLOPE REFRIGERANT PIPING ONE PERCENT IN THE DIRECTION OF OIL RETURN. LIQUID LINES MAY BE INSTALLED LEVEL.
- INSTALL HORIZONTAL REFRIGERANT HOT GAS DISCHARGE PIPING WITH 1/2" PER 10 FT. DOWNWARD SLOPE AWAY FROM THE COMPRESSOR.
- INSTALL HORIZONTAL REFRIGERANT SUCTION LINES WITH 1/2" PER 10 FT. DOWNWARD SLOPE TO THE COMPRESSOR, WITH NO LONG TRAPS OR DEAD ENDS THAT MAY CAUSE OIL TO SEPARATE FROM THE SUCTION GAS AND RETURN TO THE COMPRESSOR IN DAMAGING SLUGS.
- PROVIDE LINE SIZE LIQUID INDICATORS IN THE MAIN LIQUID LINE LEAVING THE CONDENSER OR RECEIVER. INSTALL MOISTURE-LIQUID INDICATORS IN LIQUID LINES BETWEEN FILTER DRYERS AND THERMOSTATIC EXPANSION VALVES, AND IN LIQUID LINE TO RECEIVER.
- PROVIDE A LINE SIZE STRAINER UPSTREAM OF EACH AUTOMATIC VALVE. PROVIDE A SHUTOFF VALVE ON EACH SIDE OF STRAINER.
- PROVIDE PERMANENT FILTER DRYERS IN LOW-TEMPERATURE SYSTEMS AND SYSTEMS USING HERMETIC COMPRESSORS.
- PROVIDE REPLACEABLE CARTRIDGE FILTER DRYERS WITH A THREE-VALVE BYPASS ASSEMBLY FOR SOLENOID VALVES, ADJACENT TO RECEIVERS.
- PROVIDE REFRIGERANT CHARGING VALVE CONNECTIONS IN THE LIQUID LINE BETWEEN THE RECEIVER SHUTOFF VALVE AND THE EXPANSION VALVE.



HVAC/SHEET METAL NOTES:

- PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE HVAC SYSTEMS AS INDICATED ON THE DRAWINGS, AS SPECIFIED AND AS REQUIRED BY CODE.
- CERTAIN ITEMS SUCH AS RISES AND DROPS IN DUCTWORK, ACCESS DOORS, VOLUME DAMPERS, ETC., ARE INDICATED ON THE CONTRACT DOCUMENT DRAWINGS FOR CLARITY FOR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THESE ITEMS.
- IN CORRIDORS WHERE CEILING SPEAKERS AND AIR DIFFUSERS ARE INDICATED BETWEEN THE SAME LIGHT FIXTURES, INSTALL BOTH DEVICES AT THE QUARTER POINTS BETWEEN THE SAME FIXTURE.
- UNLESS OTHERWISE SHOWN, LOCATE ALL ROOM THERMOSTATS AND HUMIDISTATS 4'-0" (CENTERLINE) ABOVE THE FINISHED FLOOR. NOTIFY THE ENGINEER OF ANY ROOMS WHERE THE PRECEDING LOCATION CANNOT BE MAINTAINED OR WHERE THERE IS A QUESTION ON LOCATION.
- ALL DUCTWORK SHALL CLEAR DOORS AND WINDOWS.
- ALL DUCTWORK DIMENSIONS, AS SHOWN ON THE DRAWINGS, ARE INTERNAL CLEAR DIMENSIONS AND DUCT SIZE SHALL BE INCREASED TO COMPENSATE FOR DUCT LINING THICKNESS.
- PROVIDE ALL 90-DEGREE SQUARE ELBOWS WITH DOUBLE RADIUS TURNING VANES UNLESS OTHERWISE INDICATED. ELBOWS IN DISHWASHER, KITCHEN, AND LAUNDRY EXHAUSTS SHALL BE OF UNVANED SMOOTH RADIUS CONSTRUCTION WITH A RADIUS EQUAL TO 1-1/2 TIMES THE WIDTH OF THE DUCT. PROVIDE ACCESS DOORS UPSTREAM OF ALL ELBOWS WITH TURNING VANES.
- COORDINATE DIFFUSER, REGISTER, AND GRILLE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS, LIGHTING, AND OTHER CEILING ITEMS AND MAKE MINOR DUCT MODIFICATIONS TO SUIT.
- FIELD-ERECTED AND FACTORY-ASSEMBLED AIR HANDLING UNIT COILS SHALL BE ARRANGED FOR REMOVAL FROM THE UPSTREAM SIDE WITHOUT DISMANTLING SUPPORTS. PROVIDE GALVANIZED STRUCTURAL STEEL SUPPORTS FOR ALL COILS (EXCEPT THE LOWEST COIL) IN BANKS OVER TWO COILS HIGH TO PERMIT THE INDEPENDENT REMOVAL OF ANY COIL.
- ALL AIR HANDLING UNITS SHALL OPERATE WITHOUT MOISTURE CARRYOVER.
- LOCATE ALL MECHANICAL EQUIPMENT (SINGLE DUCT, DUAL DUCT, VARIABLE VOLUME, CONSTANT VOLUME, AND FAN-POWERED BOXES, FAN COIL UNITS, CABINET HEATERS, UNIT HEATERS, UNIT VENTILATORS, COILS STEAM HUMIDIFIERS, ETC.) FOR UNOBSTRUCTED ACCESS TO UNIT ACCESS PANELS, CONTROLS, AND VALVING.
- FINNED TUBE RADIATION ENCLOSURES SHALL BE WALL-TO-WALL UNLESS OTHERWISE INDICATED.
- PROVIDE FLEXIBLE CONNECTIONS IN ALL DUCTWORK SYSTEMS (SUPPLY, RETURN, AND EXHAUST) CONNECTED TO AIR HANDLING UNITS, FANS, AND OTHER EQUIPMENT THAT REQUIRE VIBRATION ISOLATION. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT THE POINT OF CONNECTION TO THE EQUIPMENT UNLESS OTHERWISE INDICATED.
- UNLESS OTHERWISE NOTED, ALL DUCTWORK IS OVERHEAD, TIGHT TO THE UNDERSIDE OF THE STRUCTURE, WITH SPACE FOR INSULATION IF REQUIRED.
- RUNS OF FLEXIBLE DUCT SHALL NOT EXCEED 5 FT.
- 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 OWNER.
- PROVIDE ACCESS DOORS IN DUCTWORK TO PROVIDE ACCESS FOR ALL SMOKE DETECTORS, FIRE DAMPERS, SMOKE DAMPERS, VOLUME DAMPERS, HUMIDIFIERS, COILS, AND OTHER ITEMS LOCATED IN THE DUCTWORK THAT REQUIRE SERVICE AND/OR INSPECTION.
- PROVIDE ACCESS DOORS IN DUCTWORK FOR THE OPERATION, ADJUSTMENT, AND MAINTENANCE OF ALL FANS, VALVES, AND MECHANICAL EQUIPMENT.
- ALL DUCTS SHALL BE GROUNDED ACROSS FLEXIBLE CONNECTIONS WITH FLEXIBLE COPPER GROUNDING STRAPS. GROUNDING STRAPS SHALL BE BOLTED OR SOLDERED TO BOTH THE EQUIPMENT AND THE DUCT.
- SMOKE DETECTORS SHALL BE FURNISHED AND WIRED BY THE ELECTRICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR MOUNTING THE SMOKE DETECTOR IN DUCTWORK AS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS.
- TERMINATE GAS VENTS FOR UNIT HEATERS, WATER HEATERS, HIGH-PRESSURE PARTS WASHERS, HIGH-PRESSURE CLEANERS, AND OTHER GAS APPLIANCES A MINIMUM OF 30" ABOVE THE ROOF WITH RAIN CAP.
- SEE SPECIFICATIONS FOR DUCTWORK GAUGES, BRACING, HANGERS, AND OTHER REQUIREMENTS.
- EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. DETAILED DESCRIPTIONS ARE PROVIDED IN THE ARCHITECTURAL SPECIFICATIONS.
- EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. LOUVER SIZES, LOCATIONS, AND DETAILS SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR.
- EXTERIOR LOUVERS ARE INDICATED FOR INFORMATION ONLY. LOUVER SIZES, LOCATIONS, MOUNTING, AND DETAILS SHALL BE COORDINATED WITH OTHER TRADES INVOLVED.



MECHANICAL EQUIPMENT CALL OUTS

- FAN FILTER UNIT (GREENHECK OR APPROVED EQUAL)**
 - FAN - 800 CFM @ .5 TOTAL S.P. 12" F.C. FAN, 1100 RPM, 1/4 HP MOTOR, 120/1/60.
 - PRE-FILTER - 2" THICK 30% EFF, FARR 30/30 (OR EQUAL), 800 CFM. MAX P (CLEAN) .08" W.G.
 - ACTIVATED CHARCOAL FILTER - FARR RIGA-SORB 25 D OR EQUAL. ACTIVATED CHARCOAL FILTER .10 MAX Δ P @ 800 CFM.
- PACKAGED A.C. UNIT (LIEBERT OR APPROVED EQUAL)** - SELF CONTAINED AIR-COOLED UNIT EQUAL TO LIEBERT MMD-12A WITH DUCTED EVAPORATOR & COND.
 - EVAP CAPACITY 11,700 BTU TOTAL COOLING, 10,200 BTU SENSIBLE COOLING @ 72° FDB, 60°F WB ON HIGH SPEED.
 - TWO-SPEED EVAPORATOR FAN - 600 CFM/480 CFM (SET TO LOW SPEED). .2 BHP
 - CONDENSER FAN - 950 CFM. .25 BHP.
 - HUMIDIFIER - 2.5#/HR. .88 KW.
 - ELECTRIC RE-HEAT - 4.4 KW (14875 BTUH) W/SCR CONTROL. ELECTRICAL 208/1/60. FLA 31.8, WSA 37.7, OCP 40.0
- CONDENSATE PUMP** - 1 QUART RELIEVER, 35 G.P.H. @ 12 PT, 1/30 HP LITTLE GIANT MODEL VCC-20ULS OR EQUAL.
- WATER FILTER** - AQUA PURE MODEL - AP11T, 3/4" INLET AND OUTLET, WITH AP110 5 MICRON FILTER. PROVIDE TWO FILTERS AT INSTALLATION.
- TEMPERATURE/HUMIDITY 7 DAY RECORDER** - FURNISH AND INSTALL A TEMPERATURE/HUMIDITY RECORDER EQUAL TO DICKINSON MODEL TH805. UNIT SHALL BE WIRED FOR 120VAC WITH A 9 VOLT BACK UP. UNIT SHALL BE INSTALLED AS SHOWN AND INCLUDED REMOTE SENSORS AND AUDIO/VISIBLE ALARM. PROVIDE 50 SPARE CHARTS AND 12 SPARE PENS
- EXHAUST FAN (EF-1)** - GREENHECK (OR APPROVED EQUAL) MODEL SP-B70, 115V/1PH/60HZ, 50 CFM @ 0.375 IN. W.G. EXTERNAL STATIC, WITH ISOLATION KIT, BACKDRAFT DAMPER, TIME DELAY RELAY, ENERGY STAR RATED, UL LISTED
- AIR HANDLING UNIT (AHU-1)** - TRANE (OR APPROVED EQUAL) MODEL G4MS40C60M51SA MULTI-POSITION AIR HANDLER, 208V/1PH/60HZ, 2062 CFM @ 0.5 IN W.G. EXTERNAL STATIC, WITH SIDE RETURN KIT AND FILTER, 7-DAY PROGRAMMABLE T-STAT AND ECONOMIZER CONTROLS
- AIR-COOLED CONDENSING UNIT (ACC-1)** - TRANE (OR APPROVED EQUAL) MODEL 4TAS30603, 208V/3PH/60HZ, 6000 BTUH TOTAL/43,700 SENSIBLE @ 95 OD-AMB/80 ID-DB/67 ID-WB 5.19 KW, 13.75 SEER, 11 EER, WITH ANTI-SHORT CYCLE TIMER, RUBBER ISOLATOR KIT, INDOOR FAN DELAY KIT

SEQUENCE OF OPERATION

VAULT AIR CONDITIONING UNIT

THE FAN FILTER UNIT SHALL RUN CONTINUOUSLY TO CIRCULATE FILTERED AIR. AN AUXILIARY CONTACT PROVIDED WITH THE FIRE SUPPRESSION SYSTEM SHALL BE WIRED TO STOP THE UNIT IF FIRE IS DETECTED.

A DIFFERENTIAL PRESSURE SWITCH ACROSS THE FAN SHALL ACTIVATE A LABELED WARNING LIGHT OVER THE VAULT DOOR INDICATING "HVAC PROBLEM-SERVICE REQUIRED WHENEVER THE FAN IS NOT OPERATIONAL".

A PACKAGED AIR CONDITIONING UNIT SHALL CYCLE ON AND OFF TO MAINTAIN TEMPERATURE AND HUMIDITY CONTROL IN THE SPACE. THE A.C. UNIT SHALL INCLUDE ALL PACKAGED CONTROLS WIRED TO A REMOTE THERMOSTAT AND HUMIDISTAT. FAILURE OF ANY COMPONENT SHALL BE WIRED TO ACTIVATE THE WARNING LIGHT OVER THE VAULT DOOR.

THE UNIT SHALL CONTAIN DIRECT EXPANSION (DX) COOLING, ELECTRIC HEATING, DEHUMIDIFICATION WITH RE-HEAT AND HUMIDIFIER.

THE UNIT SHALL BE DUCTED AS INDICATED AND WIRED ON LOW SPEED (480 CFM).

THE PACKAGED A.C. UNIT SHALL NOT OPERATE IF AIR FLOW FROM THE FAN FILTER UNIT IS NOT ESTABLISHED. AN INTEGRAL CONTROL SHALL BE PROVIDED.

THE MOTORIZED DAMPERS SHALL BE TIED INTO THE FIRE SUPPRESSION SYSTEM AND SHALL CLOSE IF THE SYSTEM IS ACTIVATED.

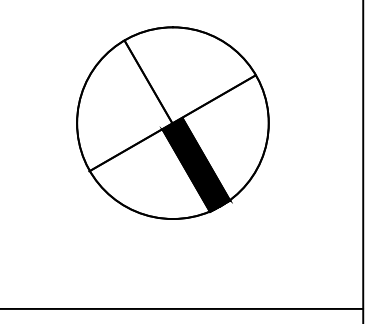
H.V.A.C. SYMBOLS

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	NEW RIGID DUCT OR EQUIPMENT		BALL VALVE
	EXISTING DUCTWORK TO REMAIN		PIPE UNION
	EXISTING TO BE REMOVED		HUMIDISTAT
	EXISTING TO BE REMOVED		THERMOSTAT
	COLD WATER		NEW SUPPLY DIFFUSER
	DRAIN		NEW RETURN DIFFUSER
	MOTORIZED DAMPER		NEW TRANSITION
	VOLUME DAMPER		
	FIRE DAMPER		
	RETURN OR EXHAUST FLOW		
	EQUIPMENT TAG DESIGNATION		

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ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2
260 GROVE STREET, WALTHAM, MA

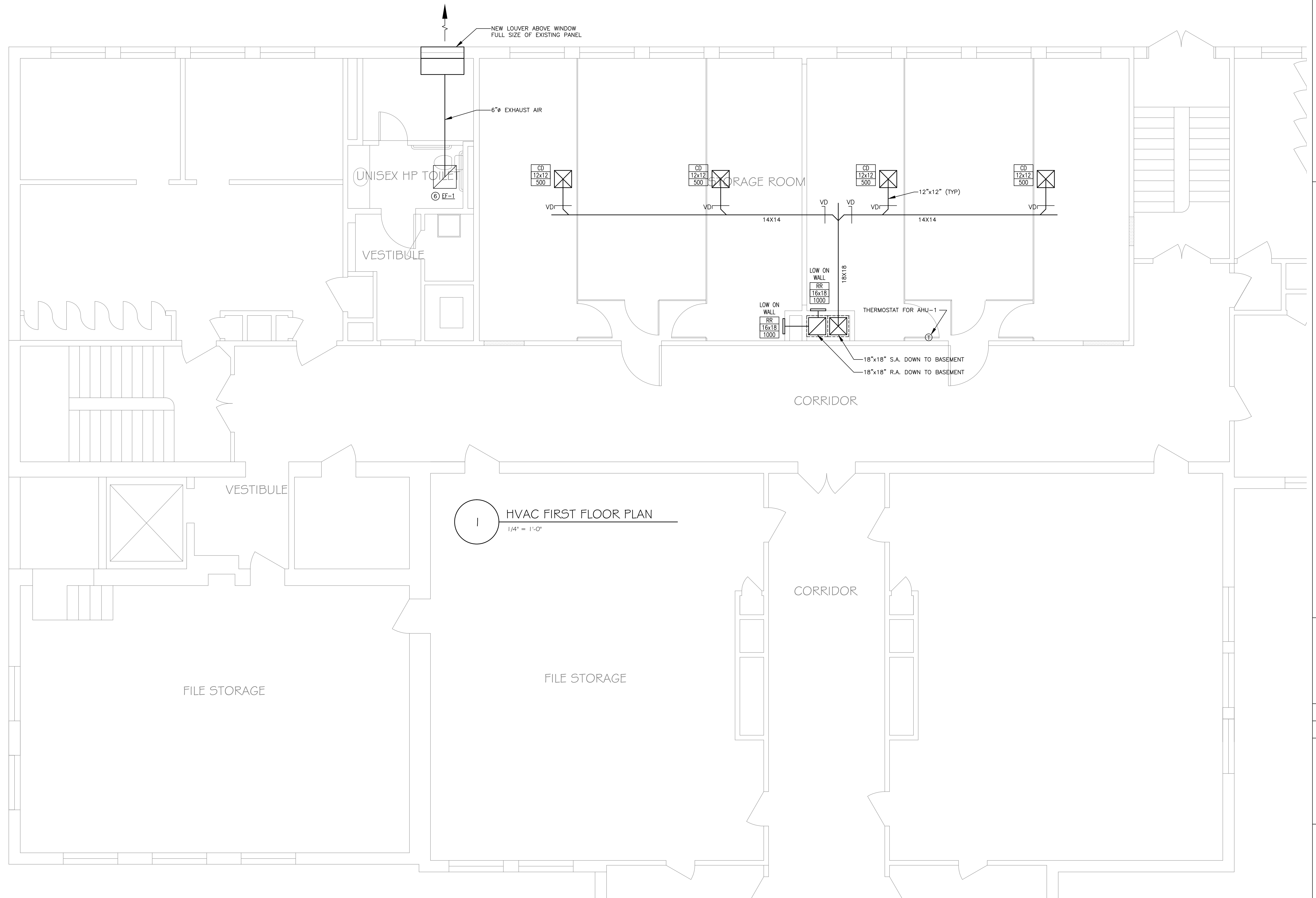


DATE: 08-08-12

SCALE: AS NOTED

HVAC NOTES, DETAILS & LEGEND

MO

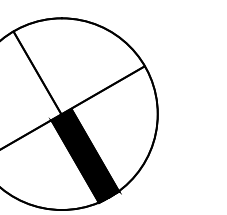


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ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2
260 GROVE STREET, WALTHAM, MA



DATE: 08-08-12

SCALE: AS NOTED

HVAC
FIRST FLOOR
PLAN

M2

ABBREVIATIONS

A	AMPS
ABV	ABOVE
AC	ALTERNATING CURRENT
AF	AMP FRAME
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
A/C	AIR CONDITIONING
AL	ALUMINUM
AMP	AMPERE
ANN	ANNUNCIATOR
ARCH	ARCHITECTURAL
ASYM	ASYMMETRICAL
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AVG	AVERAGE
BKR	BREAKER
BL	BLANK
BLDG	BUILDING
C	CONDUIT
CAT	CATALOG
CKT	CIRCUIT
CLG	CEILING
COL	COLUMN
CONC	CONCRETE
CT	CURRENT TRANSFORMER
CTE	CONNECT TO EXISTING
CU	COPPER
DIA	DIAMETER
DISC	DISCONNECT
DIST	DISTRIBUTION
DN	DOWN
DP	DISTRIBUTION PANEL
DET	DETAIL
DWG	DRAWING
E	EMERGENCY
EA	EACH
EC	ELECTRICAL CONTRACTOR
ELEC	ELECTRIC(AL)
ELEV	ELEVATOR
EM	EMERGENCY
EQ	EQUAL
EQUIP	EQUIPMENT
EW	ELECTRIC WATER COOLER
EXIST	EXISTING
FLR	FLOOR
F/A	FIRE ALARM
FBO	FURNISHED BY OWNER
FIN	FINISH
FIXT	FIXTURE
FL	FLUSH
FLUOR	FLUORESCENT
FT	FEET
G	GROUND
GA	GAUGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GFI	GROUND FAULT INTERRUPTER
GND	GROUND
H	HERMETIC
HGT	HEIGHT
HOA	HAND-OFF-AUTO
HORIZ	HORIZONTAL
HP	HORSEPOWER
HTG	HEATING
HVAC	HEATING, VENTILATION & AIR CONDITIONING
IN.	INCHES
INCD.	INCANDESCENT
J/JB	JUNCTION BOX
KW	KILOWATT
KVA	KILOVOLT-AMPERES
KWH	KILOWATT-HOURS
LA	LIGHTNING ARRESTOR
LTG	LIGHTING
MACH	MACHINE
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCM	THOUSAND CIRCULAR MILS
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTS	MANUAL TRANSFER SWITCH
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
P	POLE
PB	PULLBOX
PC	PLUMBING CONTRACTOR
PF	POWER FACTOR
PH	PHASE
PNL	PANEL
PRI	PRIMARY
PWR	POWER
PT	POTENTIAL TRANSFORMER
RCPT	RECEPTACLE
REQD	REQUIRED
RM	ROOM
RMS	ROOT MEANS SQUARE
SEC	SECONDARY
SP	SPARE
SPEC(S)	SPECIFICATION(S)
ST	SHUNT TRIP
SQ	SQUARE
STD	STANDARD
SURF	SURFACE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
SYS	SYSTEM
TEL	TELEPHONE
TELECO	TELEPHONE COMPANY
TEMP	TEMPERATURE
TERM	TERMINAL
TV	TELEVISION
TYP	TYPICAL
UC	UNDER CABINET
UL	UNDERWRITERS LABORATORY
UN	UNLESS OTHERWISE NOTED
V	VOLTS
W	WATTS
WP	WEATHERPROOF
XFMR	TRANSFORMER

EQUIPMENT

SYMBOL	DESCRIPTION
	JUNCTION AND/OR PULL BOX.
	30A, 250V, HORSEPOWER RATED, DISCONNECT/SERVICE SWITCH, POLES AS REQUIRED.
	DISCONNECT SWITCH, UNFUSED.
	DISCONNECT SWITCH, FUSED.
	CONNECTION TO MOTOR

WIRING DEVICES

SYMBOL	DESCRIPTION
	125 VOLT, 2 POLE, 3 WIRE, 20 AMP., DUPLEX RECEPTACLE. "2" DENOTES CIRCUIT NUMBER.
	125 VOLT, 2 POLE, 3 WIRE, 20 AMP., DUPLEX RECEPTACLE EQUIPPED WITH INTEGRAL GROUND FAULT INTERRUPTER.
	DOUBLE-DUPLEX RECEPTACLE.
	SQUARE INDICATES GFCI PROTECTED. SHADED CENTER INDICATES ABOVE COUNTER MOUNTING; TYPICAL FOR ALL RECEPTACLE TYPES
	125 VOLT, 2 POLE, 3 WIRE, 20 AMP., SIMPLEX RECEPTACLE. "2" DENOTES CIRCUIT NUMBER.
	SINGLE POLE TOGGLE SWITCH. "b" DENOTES SWITCH CONTROL. PROVIDE HUBBELL MODEL HBL1221 OR APPROVED EQUAL.
	THREE WAY TOGGLE SWITCH. PROVIDE HUBBELL MODEL HBL1223 OR APPROVED EQUAL.
	FOUR WAY TOGGLE SWITCH. PROVIDE HUBBELL MODEL HBL1224 OR APPROVED EQUAL.
	TWO POLE TOGGLE SWITCH WITH PILOT LIGHT. (PILOT LIGHT ON WHEN LOAD IS ON) PROVIDE HUBBELL MODEL HBL1222PL OR APPROVED EQUAL.
	CEILING MOUNTED OCCUPANCY SENSOR. PROVIDE HUBBELL MODEL ATD2000CRP WITH CU120A CONTROL UNIT.

LIGHTING EQUIPMENT

SEE LUMINAIRE SCHEDULE ON DRAWING E5.

SYMBOL	DESCRIPTION
	LUMINAIRES. REFER TO "LUMINAIRE SCHEDULE" THIS PAGE.
	CEILING MOUNTED OR WALL MOUNTED ILLUMINATED "EXIT" SIGN WITH BATTERY BACK-UP. PROVIDE DIRECTIONAL ARROWS AS INDICATED ON FLOOR PLANS.
	EMERGENCY LIGHTING BATTERY UNIT WITH HEADS AS INDICATED.

COMMUNICATION DEVICES

SYMBOL	DESCRIPTION
	WALL MOUNTED DATA OUTLET.
	TELEPHONE OUTLET.
	WALL MOUNTED COMBINATION TELE/DATA OUTLET.
	W DENOTES DEVICE MOUNTED AT 54" AFF. (WALL PHONE HEIGHT)
	C DENOTES DEVICE MOUNTED AT 42" AFF. (COUNTERTOP HEIGHT)
	CABLE TV OUTLET. COORDINATE LOCATION WITH OWNER.
	WIRELESS ACCESS POINT. COORDINATE WITH OWNER.

ELECTRICAL NOTES:

1. ALL WIRING SHALL BE RUN CONCEALED UNLESS SPECIFIED OTHERWISE.
2. ALL EXPOSED CONDUIT SHALL BE RUN FLUSH TO THE STRUCTURE IN A NEAT RECTILINEAR MANNER, ALWAYS PERPENDICULAR TO WALLS.
3. ALL COMPONENTS SHOWN ON THE RISER DIAGRAMS, BUT NOT ON THE PLAN OR VICE VERSA, SHALL BE INCLUDED AS IF SHOWN ON BOTH.
4. EXACT LOCATIONS OF HVAC AND PLUMBING EQUIPMENT THAT REQUIRE ELECTRICAL CONNECTIONS ARE SHOWN ON THE MECHANICAL AND PLUMBING DRAWINGS.
5. ALL RACEWAYS RUNNING THROUGH BUILDING EXPANSION JOINTS SHALL BE EQUIPPED WITH EXPANSION FITTINGS.
6. POWER WIRING CONDUITS SHOWN ON THE DRAWING WITH MORE THAN 3 CURRENT CARRYING CONDUCTORS ARE SHOWN DIAGRAMMATICALLY. THIS CONTRACTOR SHALL NOT INSTALL MORE THAN 3 CURRENT CARRYING CONDUCTORS IN A RACEWAY UNLESS DONE SO STRICTLY BY THE NATIONAL ELECTRIC CODE.

LUMINAIRE NOTES:

1. THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL FIXTURES COMPLETE WITH MOUNTING ACCESSORIES TO MEET JOB CONDITIONS.
2. THE ELECTRICAL CONTRACTOR SHALL VERIFY FIXTURE MOUNTING AND LOCATION AGAINST PLANS, ELEVATIONS AND DETAIL DRAWINGS. EXACT LOCATIONS OF ALL FIXTURES SHALL BE CONFIRMED WITH THE ARCHITECT PRIOR TO ROUGHING-IN.
3. ALL FLUORESCENT LAMPS ARE TO BE 3500°K, T8 OCTRON, UNLESS OTHERWISE SPECIFIED. BALLASTS ARE TO BE ELECTRONIC TYPE W/ <20% THD, UNLESS OTHERWISE SPECIFIED.
4. ALL INCANDESCENT LAMPS SHALL BE RATED AT 130 VOLTS UNLESS OTHERWISE SPECIFIED.
5. ALL FIXTURES SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE, INDEPENDENT OF HUNG CEILINGS.
6. SEE LUMINAIRE SCHEDULE ON DRAWING E5.

CIRCUITRY, RACEWAYS AND FEEDERS

SYMBOL	DESCRIPTION
	PP1 HOMERUN TO PANEL "PP1", POLE 37, VIA 1 POLE C/B. EACH 120 VOLT CIRCUIT SHALL HAVE A DEDICATED NEUTRAL AND SEPARATE GROUNDING CONDUCTOR.
	BP2 HOMERUN TO PANEL "BP2", POLES 7 & 9 VIA 2 POLE CIRCUIT BREAKER.
	MDP HOMERUN TO PANEL "MDP", POLES 2, 4 & 6 VIA 3 POLE CIRCUIT BREAKER.
	MULTIWIRE BRACH CIRCUITS SHALL NOT BE PERMITTED. (NO NETWORKS)

	TYPICAL EQUIPMENT TAGS. PROVIDE WIRING, DEVICES AND CONNECTIONS AS SHOWN ON SCHEDULE.
--	---------------------------------------------------------------------------------------

NOTATIONS:

	DENOTES EXISTING TO BE DEMOLISHED
	DENOTES EXISTING TO REMAIN
	DENOTES NEW EQUIPMENT OR WIRING

	CIRCUITRY TURNING UP.
	CIRCUITRY TURNING DOWN.

	XM - EXISTING TO REMAIN
	XD - EXISTING TO BE DEMOLISHED
	XR - EXISTING TO BE RELOCATED
	XL - EXISTING SHOWN RELOCATED

FIRE ALARM NOTES:

1. REFER TO FLOOR PLAN FOR EXACT QUANTITIES AND LOCATIONS OF DEVICES. COORDINATE EXACT MTG. LOCATION AND HEIGHT WITH ARCHITECTURAL DRAWINGS.
2. ALL COMPONENTS SHOWN ON THE RISER DIAGRAMS, BUT NOT ON THE PLAN OR VICE VERSA, SHALL BE INCLUDED AS IF SHOWN ON BOTH.
3. ALL IDC AND NAC WIRING SHALL BE CLASS 'A', WIRED PER MANUFACTURER'S SPECIFICATIONS. WIRING SHALL BE PER NFPA 70 AND PER NFPA 72. WIRING SHALL BE RUN CONCEALED OR IN EMT WHERE EXPOSED.
4. ALL WIRING SHALL BE RUN CONCEALED UNLESS SPECIFIED OTHERWISE. EXPOSED WIRING SHALL BE IN CONDUIT AND RUN FLUSH TO THE STRUCTURE IN A NEAT RECTILINEAR MANNER, ALWAYS PERPENDICULAR TO WALLS.
5. ALL RACEWAYS RUNNING THROUGH BUILDING EXPANSION JOINTS SHALL BE EQUIPPED WITH EXPANSION FITTINGS. COORDINATE WITH ARCHITECTURAL AND STRUCTURAL PLANS.
6. ALL RACEWAYS OR CONDUITS, RUNNING THROUGH BUILDING FIRE WALLS SHALL BE SEALED AROUND WITH APPROVED FIRE SEALANT, BY THE FIRE ALARM SYSTEM INSTALLER. COORDINATE WITH ARCHITECTURAL PLANS.
7. COORDINATE FIRE ALARM SYSTEM REQUIREMENTS WITH FIRE PROTECTION OFFICER OF LOCAL FIRE DEPARTMENT PRIOR TO SUBMITTING SHOP DRAWINGS TO ARCHITECT FOR APPROVAL.
8. THE EXISTING FIRE ALARM SYSTEM SHALL REMAIN IN PLACE AND IN OPERATION. THE NEW FIRE ALARM WORK WILL TIE INTO EXISTING FIRE ALARM SYSTEM WIRING AT THE EXISTING FIRE ALARM PANEL IN THE BASEMENT. THE FIRE SUPPRESSION SYSTEMS FOR THE NEW VAULTS WILL TIE INTO THE EXISTING SUPERVISORY AND ALARM POINTS. THE NEW DUCT SMOKE DETECTOR SHALL TIE INTO THE EXISTING IDC IN THE BOILER ROOM. SHUT DOWN OF THE FFU-1 AND AHU-1 SHALL BE BY EITHER THEIR RESPECTIVE DUCT SMOKE DETECTOR OR AN ALARM SIGNAL FROM THE SUPPRESSION SYSTEM IN THE VAULT THAT THE UNIT SERVES.

FIRE ALARM SYMBOL LEGEND

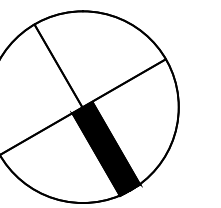
SYMBOL	DESCRIPTION
	MANUAL PULL STATION.
	PHOTOELECTRIC SMOKE DETECTOR.
	HEAT DETECTOR. PROVIDE 135°F UNLESS NOTED OTHERWISE.
	PHOTOELECTRIC DUCT SMOKE DETECTOR.
	PROVIDE WIRING AND CONNECTION TO SPRINKLER SYSTEM FLOW SWITCH. SWITCH PROVIDED BY F.P. CONTR.
	PROVIDE WIRING AND CONNECTION TO SPRINKLER SYSTEM TAMPER SWITCH. SWITCH PROVIDED BY F.P. CONTR.
	PROVIDE WIRING AND CONNECTION TO SPRINKLER SYSTEM PRESSURE SWITCH. SWITCH PROVIDED BY F.P. CONTR.
	FIRE ALARM SYSTEM RELAY.
	AUDIBLE AND VISUAL ALARM SIGNAL.
	AUDIBLE ONLY ALARM SIGNAL. (SAME SIZE AS HORN/STROBE DEVICES)
	SMALL AUDIBLE ONLY ALARM SIGNAL. (MINI-HORN; REQUIRED IN ALL OFFICES)
	VISUAL ONLY ALARM SIGNAL.
	"# " DENOTES MINIMUM CANDELA RATING. "C" DENOTES CEILING MOUNTED DEVICE. "MH" DENOTES DEVICE INTENDED TO FIT INTO A SINGLE GANG DEVICE BOX (MINI-HORN).
	FIRE ALARM NAC EXTENDER WITH BATTERIES.
	KEYED DUCT SMOKE DETECTOR TEST SWITCH WITH REMOTE ANNUNCIATOR. LOCATE PER LOCAL FIRE DEPARTMENT
	PROVIDE 24VDC CONNECTION TO ELECTRIC WATER FLOW BELL (BY FP CONTRACTOR) FROM FACP BATTERIES. TWO POLE FLOW SWITCH BY FP CONTRACTOR AS WELL.
	FIRE ALARM SYSTEM CONTROL PANEL.
	FIRE ALARM SYSTEM REMOTE ANNUNCIATOR.
	FIRE EXTINGUISHING SYSTEM (AGENT RELEASE) CONTROL PANEL.
	DRY (SPRINKLER) SYSTEM CONTROL PANEL.
	PREACTION (SPRINKLER) CONTROL PANEL.
	FIRE DEPARTMENT MASTER BOX

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ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2
260 GROVE STREET, WALTHAM, MA

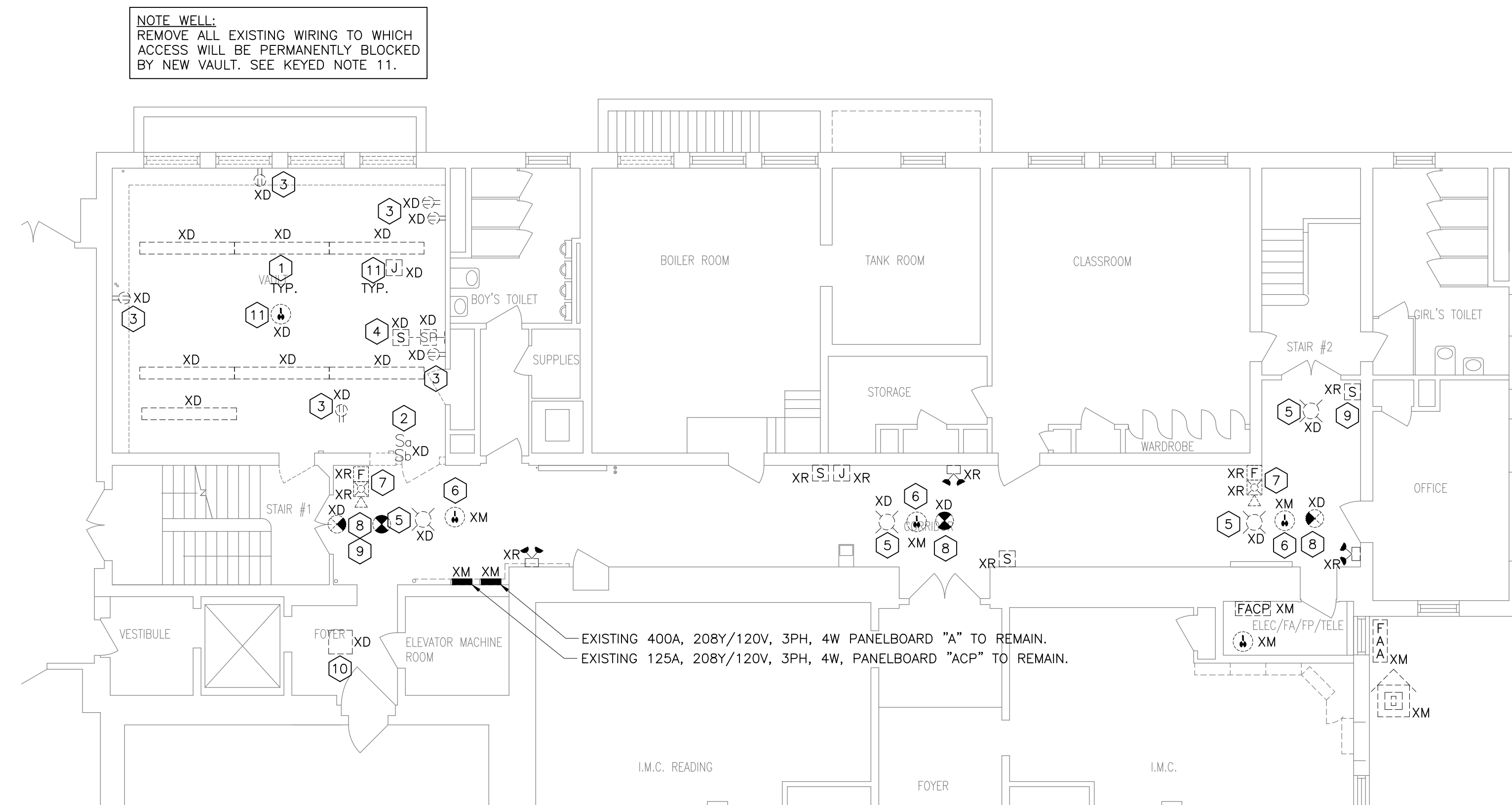


DATE: 08-08-12

SCALE: AS NOTED

ELECTRICAL
LEGEND
SHEET

E1



1 ELECTRICAL BASEMENT DEMOLITION PART PLAN
SCALE: 1/8" = 1'-0"

KEYED DEMOLITION NOTES:

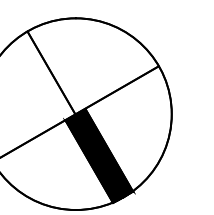
- ① DEMO TWO (2) ROWS OF 3x8' PENDANT MOUNTED FLUORESCENT SCHOOLHOUSE LIGHTS. MAKE EXISTING WIRING SAFE AND PROVIDE STEEL CANOPY TYPE BLANK PLATES.
- ② DEMO AND MAKE SAFE EXISTING SWITCHING. PROVIDE NEW STEEL BLANK PLATES.
- ③ DEMO EXISTING SURFACE MOUNTED DUPLEX RECEPTACLE AND APPROXIMATELY 20'-0" OF SURFACE METAL RACEWAY FOR EACH. MAKE EXISTING POWER WIRING SAFE AND PROVIDE BLANK PLATES.
- ④ DEMO SCHOOL SPEAKER AND RELATED CONTROLLER.
- ⑤ DEMO KEYLESS PORCELAIN INCANDESCENT FIXTURES LOCATED ON HIGH CEILING. SALVAGE EXISTING LIGHTING FEED FOR NEW LIGHTING. MAKE EXISTING WIRING SAFE WHERE NOT USED FOR NEW LIGHTING AND PROVIDE CANOPY TYPE BLANK PLATES. EXISTING SWITCHING TO REMAIN.
- ⑥ EXISTING HEAT DETECTORS TO REMAIN.
- ⑦ INTERCEPT AND EXTEND EXISTING FIRE ALARM IDC AND NAC WIRING. RELOCATED EXISTING DEVICES ±24" LOWER TO ADA CODE COMPLIANT MOUNTING HEIGHTS; SEE DETAIL #2 ON DRAWING E-6.
- ⑧ DEMO EXISTING EXIT SIGNS. INTERCEPT AND EXTEND EXISTING 120VAC EXIT SIGN FEEDS TO NEW SIGN LOCATIONS.
- ⑨ INTERCEPT AND EXTEND EXISTING SWITCHING TO ACCOMMODATE NEW WALL COVERINGS. PROVIDE NEW STEEL EXTENSION RINGS, THREE WAY SWITCHES AND WALL PLATES.
- ⑩ DEMO EXISTING 2'x2' ACRYLIC LENS TROFFER. SALVAGE EXISTING LIGHTING FEED FOR NEW LIGHTING.
- ⑪ INTERCEPT AND EXTEND EXISTING WIRING IN CEILING TO OUTSIDE OF NEW VAULT ROOM. COORDINATE OPENING OF CEILING AND WALLS WITH GENERAL CONTRACTOR. REMOVE ALL EXISTING WIRING TO WHICH ACCESS WILL BE PERMANENTLY BLOCKED BY NEW VAULT.

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**ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2**
260 GROVE STREET, WALTHAM, MA

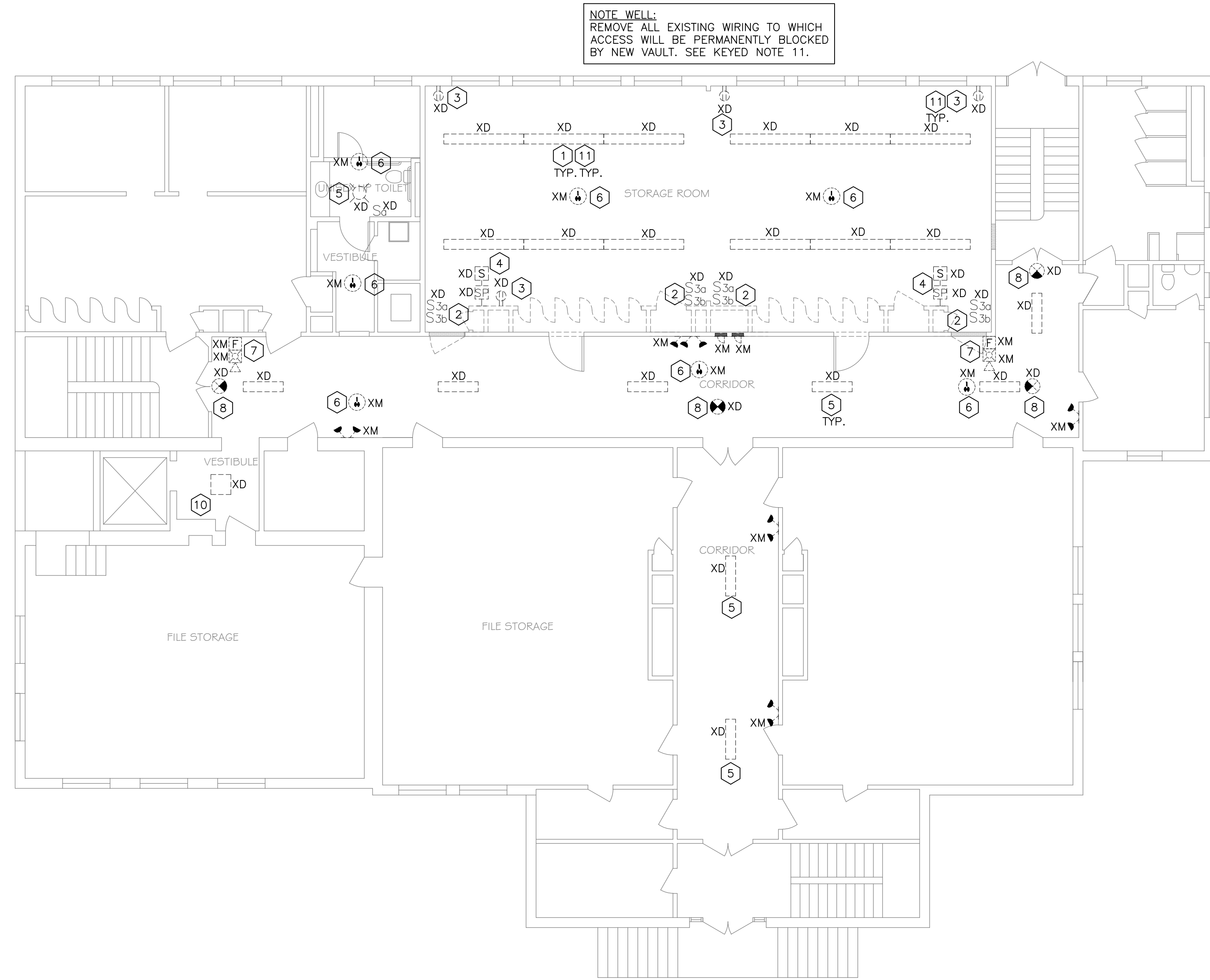


DATE: 08-08-12

SCALE: AS NOTED

ELECTRICAL
BASEMENT
DEMOLITION
PLAN

E2



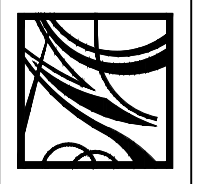
1 ELECTRICAL
FIRST FLOOR DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

KEYED DEMOLITION NOTES:

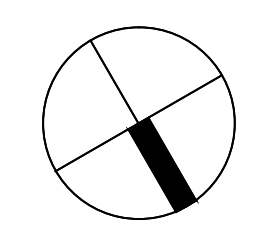
- ① DEMO FOUR (4) ROWS OF 3x8" PENDANT MOUNTED FLUORESCENT SCHOOLHOUSE LIGHTS. SALVAGE EXISTING LIGHTING FEED FOR NEW LIGHTING. MAKE EXISTING CANOPY WIRING SAFE WHERE NOT USED FOR NEW LIGHTING AND PROVIDE CANOPY TYPE BLANK PLATES.
- ② DEMO AND MAKE SAFE EXISTING SWITCHING. PROVIDE NEW STEEL BLANK PLATES.
- ③ DEMO EXISTING SURFACE MOUNTED DUPLEX RECEPTACLES AND APPROXIMATELY 20'-0" OF SURFACE METAL RACEWAY FOR EACH. MAKE EXISTING POWER WIRING SAFE AND PROVIDE BLANK PLATES.
- ④ DEMO SCHOOL SPEAKER AND RELATED CONTROLLER.
- ⑤ DEMO 1'x4' SURFACE MOUNTED WRAP AROUND FLUORESCENT FIXTURES LOCATED ON HIGH CEILING. SALVAGE EXISTING LIGHTING FEED FOR NEW LIGHTING. MAKE EXISTING WIRING SAFE WHERE NOT USED FOR NEW LIGHTING AND PROVIDE CANOPY TYPE BLANK PLATES. EXISTING SWITCHING TO REMAIN.
- ⑥ EXISTING HEAT DETECTORS TO REMAIN.
- ⑦ EXISTING PULL STATION AND HORN/STROBE TO REMAIN.
- ⑧ DEMO EXISTING EXIT SIGNS. INTERCEPT AND EXTEND EXISTING 120VAC EXIT SIGN FEEDS TO NEW SIGN LOCATIONS.
- ⑨ DEMO FOUR (2) ROWS OF 3x8" PENDANT MOUNTED FLUORESCENT SCHOOLHOUSE LIGHTS. SALVAGE EXISTING LIGHTING FEED FOR NEW LIGHTING. MAKE EXISTING CANOPY WIRING SAFE WHERE NOT USED FOR NEW LIGHTING AND PROVIDE CANOPY TYPE BLANK PLATES.
- ⑩ DEMO EXISTING 2'x2' ACRYLIC LENS TROFFER. SALVAGE EXISTING LIGHTING FEED FOR NEW LIGHTING.
- ⑪ INTERCEPT AND EXTEND EXISTING WIRING IN CEILING TO OUTSIDE OF NEW VAULT ROOM. COORDINATE OPENING OF CEILING AND WALLS WITH GENERAL CONTRACTOR. REMOVE ALL EXISTING WIRING TO WHICH ACCESS WILL BE PERMANENTLY BLOCKED BY NEW VAULT.

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**ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2**
260 GROVE STREET, WALTHAM, MA



DATE: 08-08-12

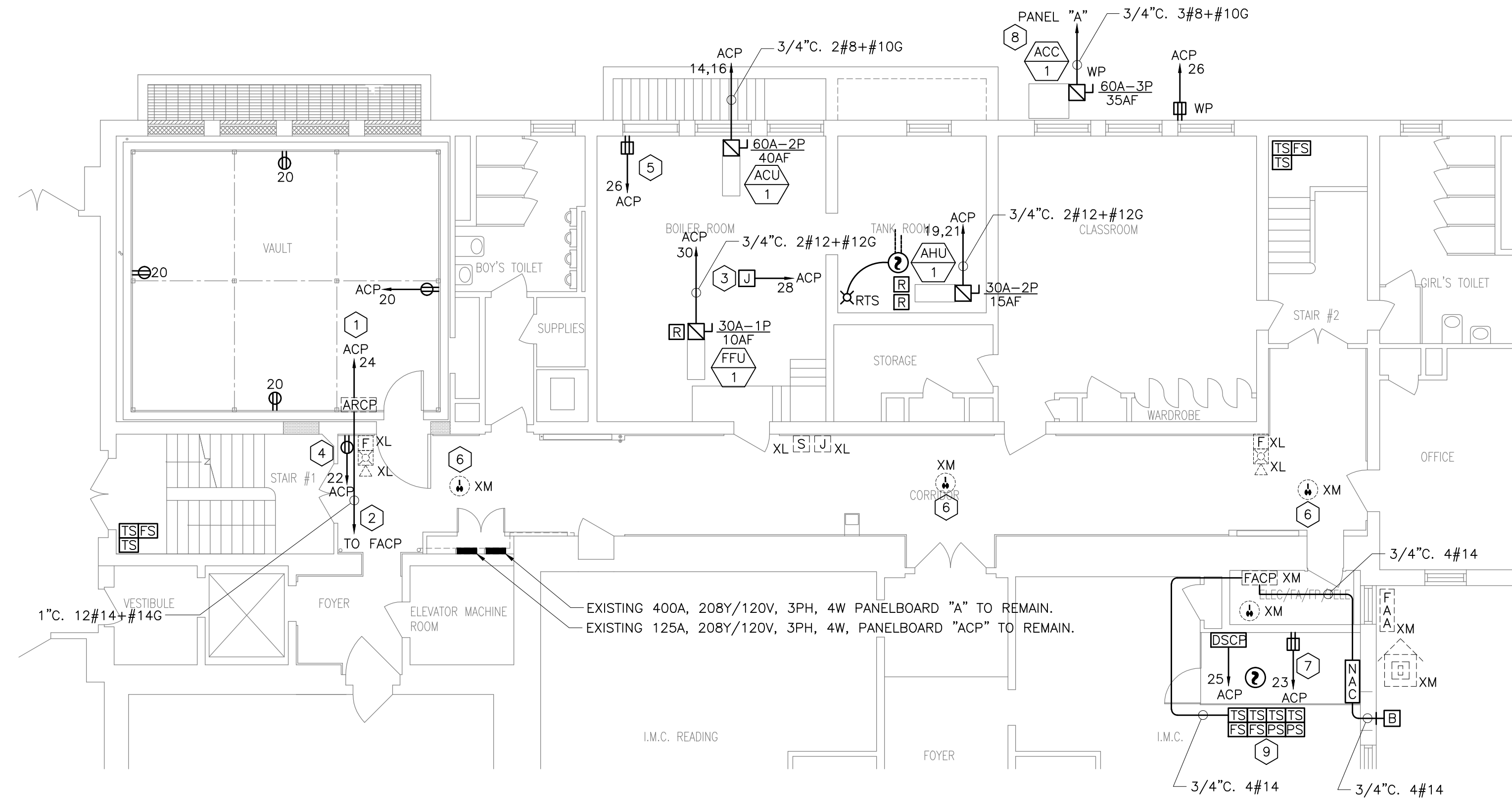
SCALE: AS NOTED

ELECTRICAL
1ST FLOOR
DEMOLITION
PLAN

E3

KEYED POWER NOTES:

- 1 PROVIDE A DEDICATED 20 AMP, 120 VOLT BRANCH CIRCUIT TO THE NEW FIRE EXTINGUISHING SYSTEM CONTROL PANEL.
- 2 PROVIDE FIRE ALARM SYSTEM MONITORING OF THE NEW FIRE EXTINGUISHING SYSTEM CONTROL PANEL'S TROUBLE ALARMS, SUPERVISORY ALARMS AND DISCHARGE ALARM. PROVIDE A RELAY AT THE EXISTING FACP TO ACTIVATE THIS PANEL'S NOTIFICATION APPLIANCES IN THE EVENT OF A GENERAL ALARM BY THE SCHOOL'S MAIN FIRE ALARM CONTROL PANEL. PROVIDE A PONY RELAY TIED INTO THE ALARM CONTACTS WHICH WILL PROVIDE CONTACTS WHICH WILL SHUT DOWN FF-1 IN THE EVENT THAT THE EXTINGUISHING SYSTEM GOES INTO ALARM. PROVIDE 3 PAIRS OF #14 CONDUCTORS FOR MONITORING, 1 PAIR FOR ACTIVATION AND 2 PAIRS OF SPARE CONDUCTORS.
- 3 PROVIDE A 20 AMP, 120 VOLT DEDICATED BRANCH CIRCUIT TO A JUNCTION BOX WITH A BLANK COVER FOR CONTINUATION BY HVAC CONTROLS CONTRACTOR (POWER FOR CONTROLS AND MOTORIZED DAMPERS).
- 4 PROVIDE A 20 AMP, 120 VOLT DEDICATED BRANCH CIRCUIT TO A DUPLEX RECEPTACLE MOUNTED FLUSH IN THE NEW CORRIDOR WALL FOR THE HVAC CHART RECORDER.
- 5 PROVIDE A 20 AMP, 120 VOLT DEDICATED BRANCH CIRCUIT TO A DUPLEX GFCI RECEPTACLE FOR HVAC EQUIPMENT; COORDINATE EXACT LOCATIONS WITH HVAC CONTRACTOR.
- 6 EXISTING HEAT DETECTORS TO REMAIN.
- 7 PROVIDE A 20 AMP, 120 VOLT DEDICATED BRANCH CIRCUIT TO A DUPLEX GFCI RECEPTACLE FOR POWER TO THE SUMP PUMP; COORDINATE EXACT LOCATION WITH PLMG. CONTRACTOR.
- 8 PROVIDE A NEW GE TYPE "TQB" 40 AMP, 208 VOLT, 3 PHASE DEDICATED BRANCH CIRCUIT TO ACC-1 FROM THE EXISTING 400 AMP PANEL "A" LOCATED ADJACENT TO THE EXISTING 400 AMP PANEL "ACP" IN THE BASEMENT CORRIDOR NEAR THE TWO VAULTS. EXISTING PANEL IS A "GE" PANELBOARD.
- 9 CONNECT NEW TAMPER SWITCHES TO EXISTING SUPERVISORY CIRCUITRY. CONNECT ALL NEW FLOW AND PRESSURE SWITCHES TO EXISTING WATER FLOW ALARM ZONE.



1 ELECTRICAL BASEMENT POWER WIRING PART PLAN
SCALE: 1/8" = 1'-0"

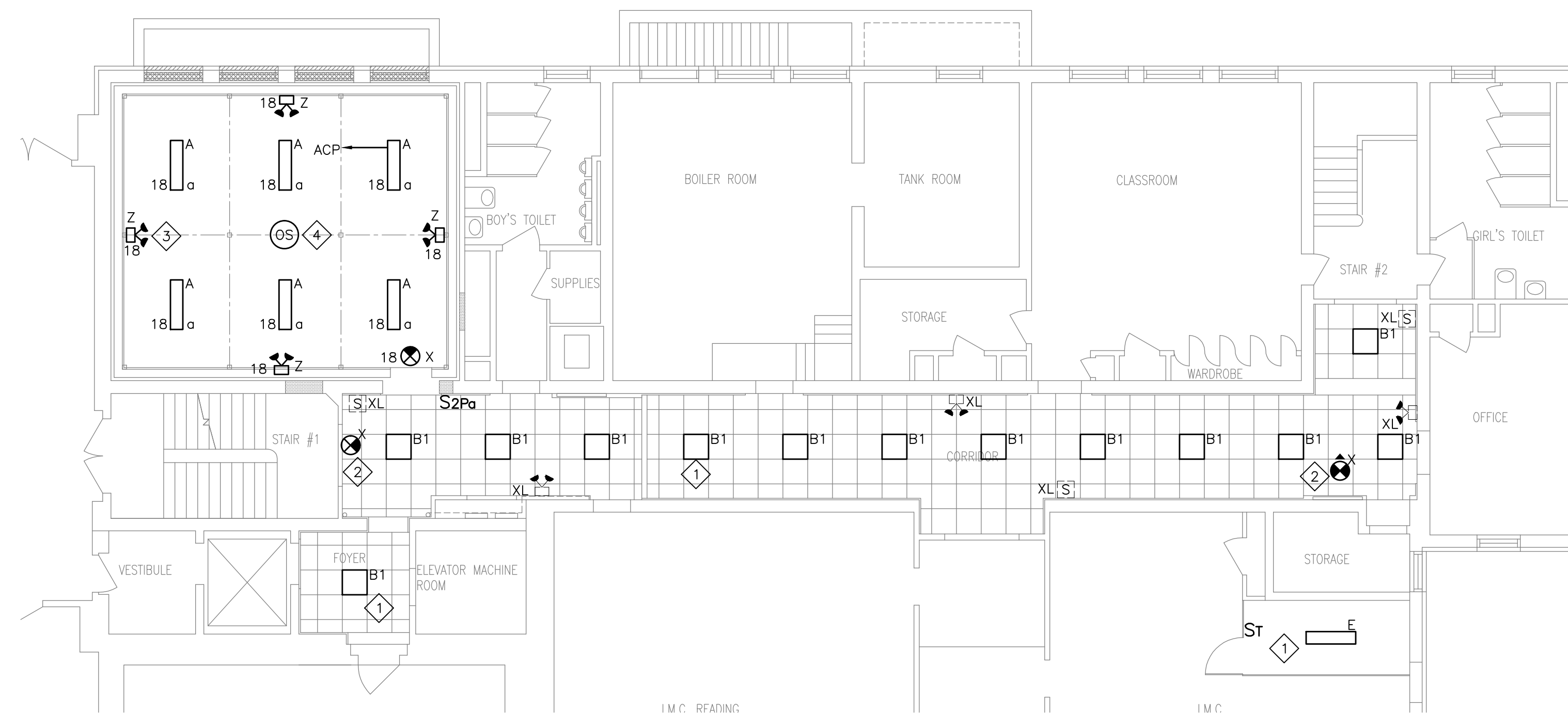
GENERAL VAULT NOTES:

1. POWER, LIGHTING AND FIRE ALARM WIRING AND CONNECTIONS SHALL BE MADE THROUGH "ROUTES" IN THE VAULT WALL SYSTEM PROVIDED BY THE VAULT MANUFACTURER/INSTALLER. ALL ELECTRICAL AND FIRE ALARM CONNECTIONS SHALL BE MADE IN COORDINATION WITH THE VAULT INSTALLER AND THE GENERAL CONTRACTOR.
2. NEW ELECTRICAL WIRING INSIDE THE VAULT SHALL BE INSTALLED IN EMT, NEW BOXES SHALL BE 1-1/2" DEEP MAX AND SHALL BE INSTALLED FLUSH IN THE NEW SHEETROCK WALL.

KEYED LIGHTING NOTES:

SEE LUMINAIRE SCHEDULE ON DRAWING E5.

- 1 CONNECT NEW LIGHTING TO EXISTING LIGHTING FEED AND SWITCHING.
- 2 CONNECT NEW EXIT SIGNS TO EXISTING EXIT SIGN CIRCUITRY SALVAGED FROM DEMOLITION.
- 3 CONNECT NEW EMERGENCY BATTERY LIGHTING UNIT TO EXISTING LOCAL LIGHTING CIRCUIT AHEAD OF ANY SWITCHING.
- 4 PROVIDE CEILING MOUNTED OCCUPANCY SENSOR WIRED IN SERIES WITH PILOT LIGHT WALL SWITCH; SWITCH TURNS OFF POWER TO SENSOR AND LIGHTS.



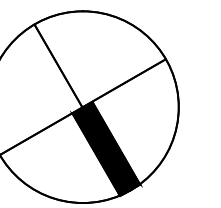
2 ELECTRICAL BASEMENT LIGHTING PART PLAN
SCALE: 1/8" = 1'-0"

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**ARCHIVAL VAULT AT THE
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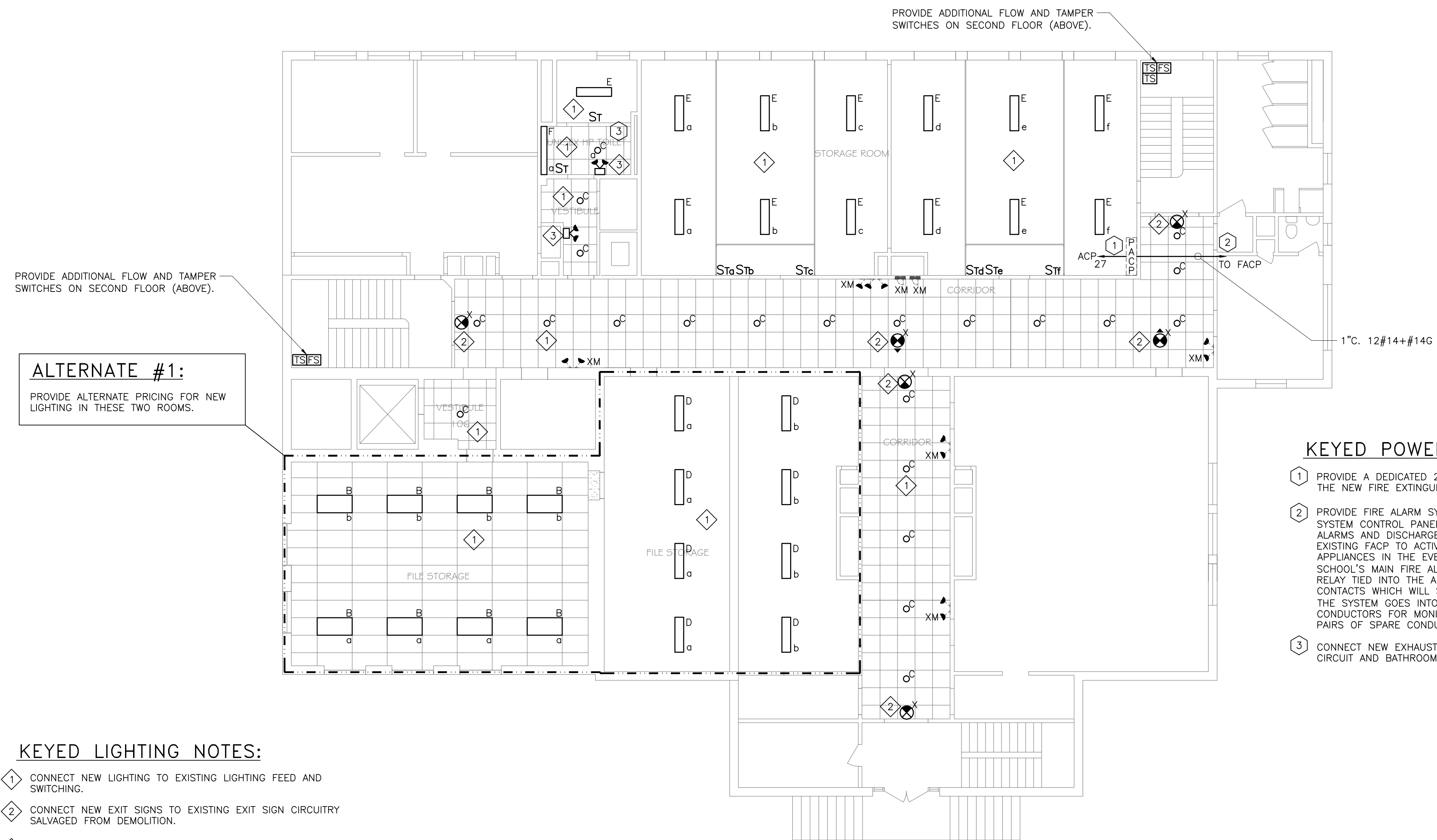


DATE: 08-08-12

SCALE: AS NOTED

ELECTRICAL
BASEMENT
NEW WORK
PART PLANS

E4



PROVIDE ADDITIONAL FLOW AND TAMPER SWITCHES ON SECOND FLOOR (ABOVE).

ALTERNATE #1:
PROVIDE ALTERNATE PRICING FOR NEW LIGHTING IN THESE TWO ROOMS.

PROVIDE ADDITIONAL FLOW AND TAMPER SWITCHES ON SECOND FLOOR (ABOVE).

KEYED POWER NOTES:

- 1 PROVIDE A DEDICATED 20 AMP, 120 VOLT BRANCH CIRCUIT TO THE NEW FIRE EXTINGUISHING SYSTEM CONTROL PANEL.
- 2 PROVIDE FIRE ALARM SYSTEM MONITORING OF THE NEW PREACTION SYSTEM CONTROL PANEL'S TROUBLE ALARMS, SUPERVISORY ALARMS AND DISCHARGE ALARM. PROVIDE A RELAY AT THE EXISTING FACP TO ACTIVATE THIS PANEL'S NOTIFICATION APPLIANCES IN THE EVENT OF A GENERAL ALARM BY THE SCHOOL'S MAIN FIRE ALARM CONTROL PANEL. PROVIDE A PONY RELAY TIED INTO THE ALARM CONTACTS WHICH WILL PROVIDE CONTACTS WHICH WILL SHUT DOWN AHU-1 IN THE EVENT THAT THE SYSTEM GOES INTO ALARM. PROVIDE 3 PAIRS OF #14 CONDUCTORS FOR MONITORING, 1 PAIR FOR ACTIVATION AND 2 PAIRS OF SPARE CONDUCTORS.
- 3 CONNECT NEW EXHAUST FAN (BY HVAC) TO EXISTING LIGHTING CIRCUIT AND BATHROOM LIGHT SWITCH.

KEYED LIGHTING NOTES:

- 1 CONNECT NEW LIGHTING TO EXISTING LIGHTING FEED AND SWITCHING.
- 2 CONNECT NEW EXIT SIGNS TO EXISTING EXIT SIGN CIRCUITRY SALVAGED FROM DEMOLITION.
- 3 CONNECT NEW EMERGENCY BATTERY LIGHTING UNIT TO EXISTING LOCAL LIGHTING CIRCUIT AHEAD OF ANY SWITCHING.

1 ELECTRICAL FIRST FLOOR NEW WORK PLAN
SCALE: 1/8" = 1'-0"

LUMINAIRE SCHEDULE

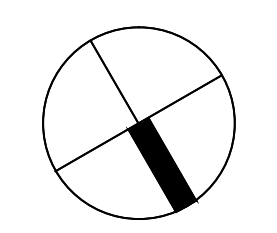
TYPE	DESCRIPTION	MANUFACTURER AND CATALOG NUMBER	LAMPS		VOLT.
			QTY.	TYPE	
A	ENCLOSED AND GASKETED FIBERGLASS INDUSTRIAL VAPORPROOF WITH ACRYLIC LENS	COLUMBIA LIGHTING LUN4-232-EU-SSL	2	32W TB	UNV
B	2'x4' PARABOLIC TROFFER 12 CELL ENERGY EFFICIENT	COLUMBIA LIGHTING EMX24-232-G-M5-26-S-E-U-F0835	2	32W TB	UNV
B1	2'x4' PARABOLIC TROFFER 12 CELL ENERGY EFFICIENT	COLUMBIA LIGHTING EMX22-232U6-G-M5-23-S-E-U-F0835	2	32WU6 TB	UNV
C	8" LED RECESSED DOWNLIGHT (MIN. 2800 LUMENS)	PRESCOLITE C6042E-6001-LI-WF	-	LED	120
D	96" DIRECT/INDIRECT PENDANT (20% UPLIGHT/80% DOWNLIGHT)	ALERA LIGHTING ALS-8-20/80-CM-LD18-EU-CBA-	6	32W TB	UNV
E	SPECIFICATION GRADE ACRYLIC WRAPAROUND	COLUMBIA LIGHTING WC4-232-EU	2	32W TB	UNV
F	48"x6" FLUORESCENT LAY-IN FIXTURE	ALERA LIGHTING L6-4-1T8-GFFS-LD-EU	1	32W TB	UNV
X	LED STYLE EXIT SIGN	DUAL-LITE LXURWE-1	-	LED	UNV
Z	EMERGENCY BATTERY LIGHTING UNIT (WALL MOUNTED)	DUAL-LITE EZ-2-1	2	7.2W 6VDC	UNV

NOTES:
 1. FLUORESCENT LAMPS SHALL BE 3500° KELVIN IN COLOR TEMPERATURE AND HAVE A MINIMUM COLOR RENDERING INDEX (CRI) OF 82 UNLESS OTHERWISE NOTED.
 2. ALL LUMINAIRE FINISHES SHALL BE AS SELECTED BY THE ARCHITECT. PROVIDE COLOR AND FINISH CHARTS AND/OR SAMPLES AS REQUESTED BY THE ARCHITECT OR ENGINEER.
 3. ALL FIXTURES SHALL BE AS SPECIFIED OR AN APPROVED EQUAL FROM: H.E. WILLIAMS, LIGHTOLIER OR LITHONIA.

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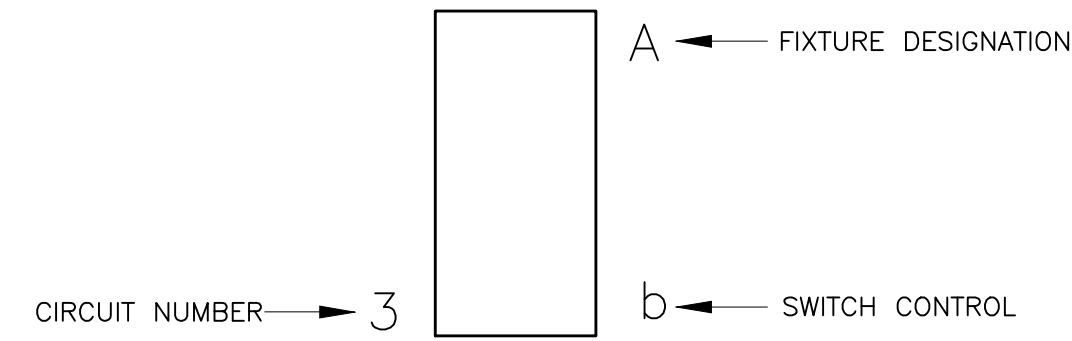


DATE: 08-08-12

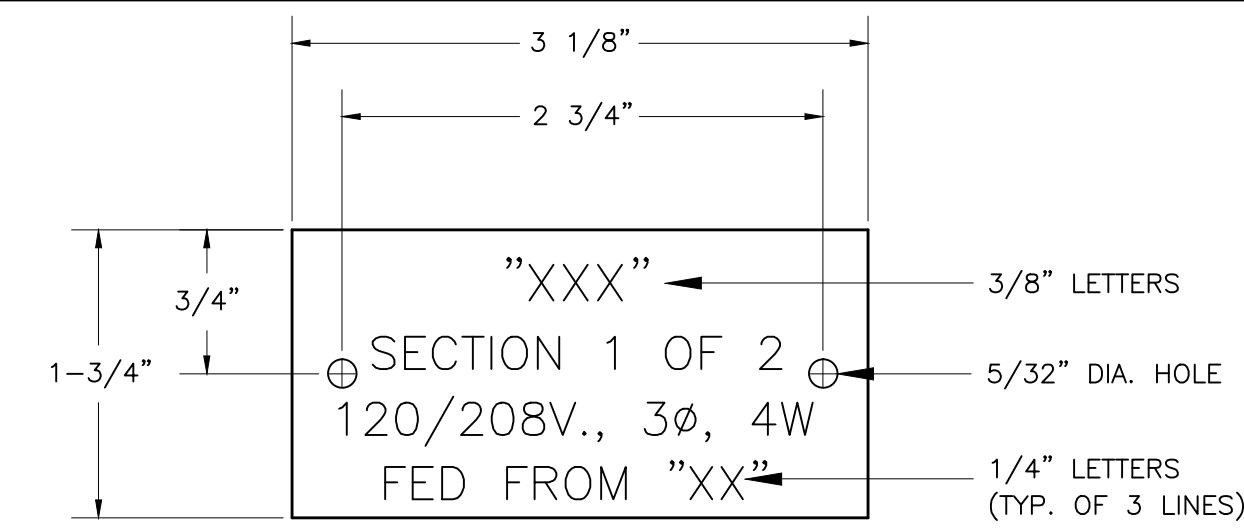
SCALE: AS NOTED

ELECTRICAL 1ST FLOOR NEW WORK PLAN

E5

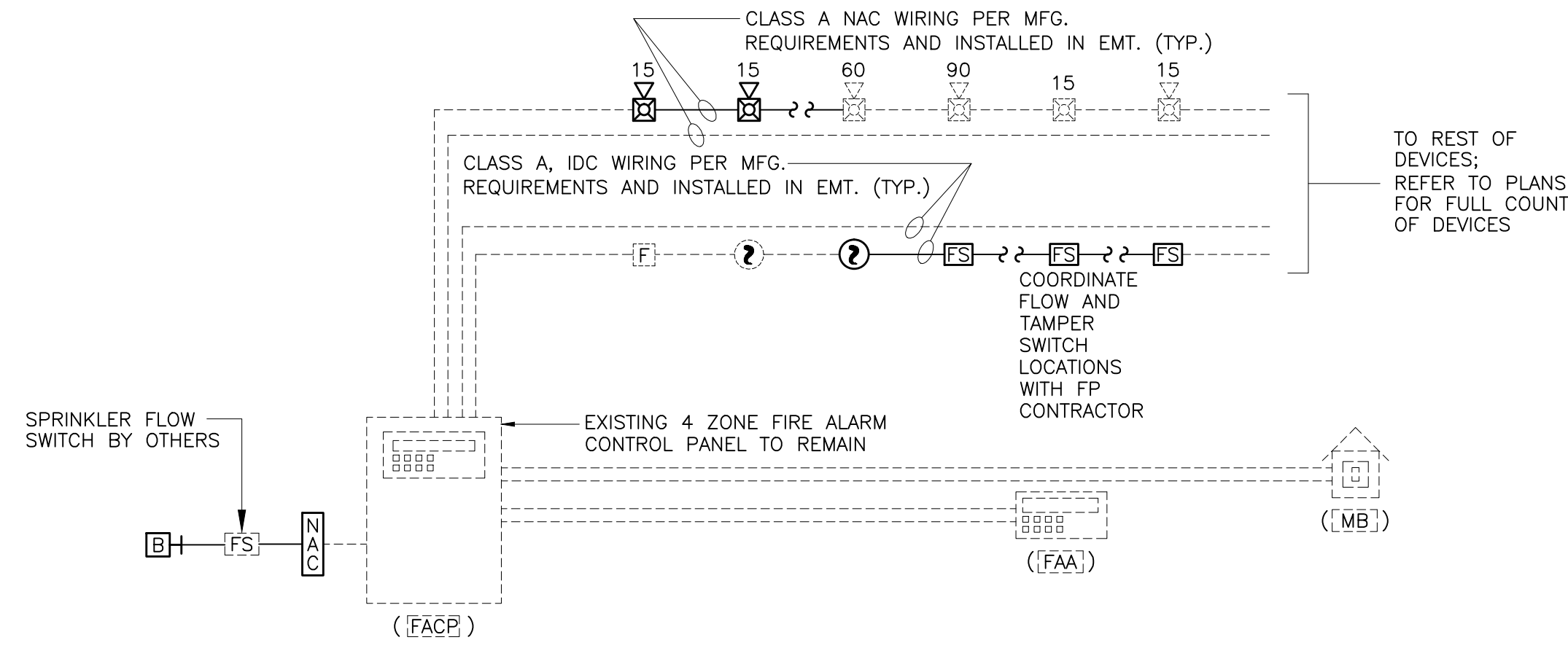


4 TYPICAL LUMINAIRE DESIGNATIONS
SCALE: N/A

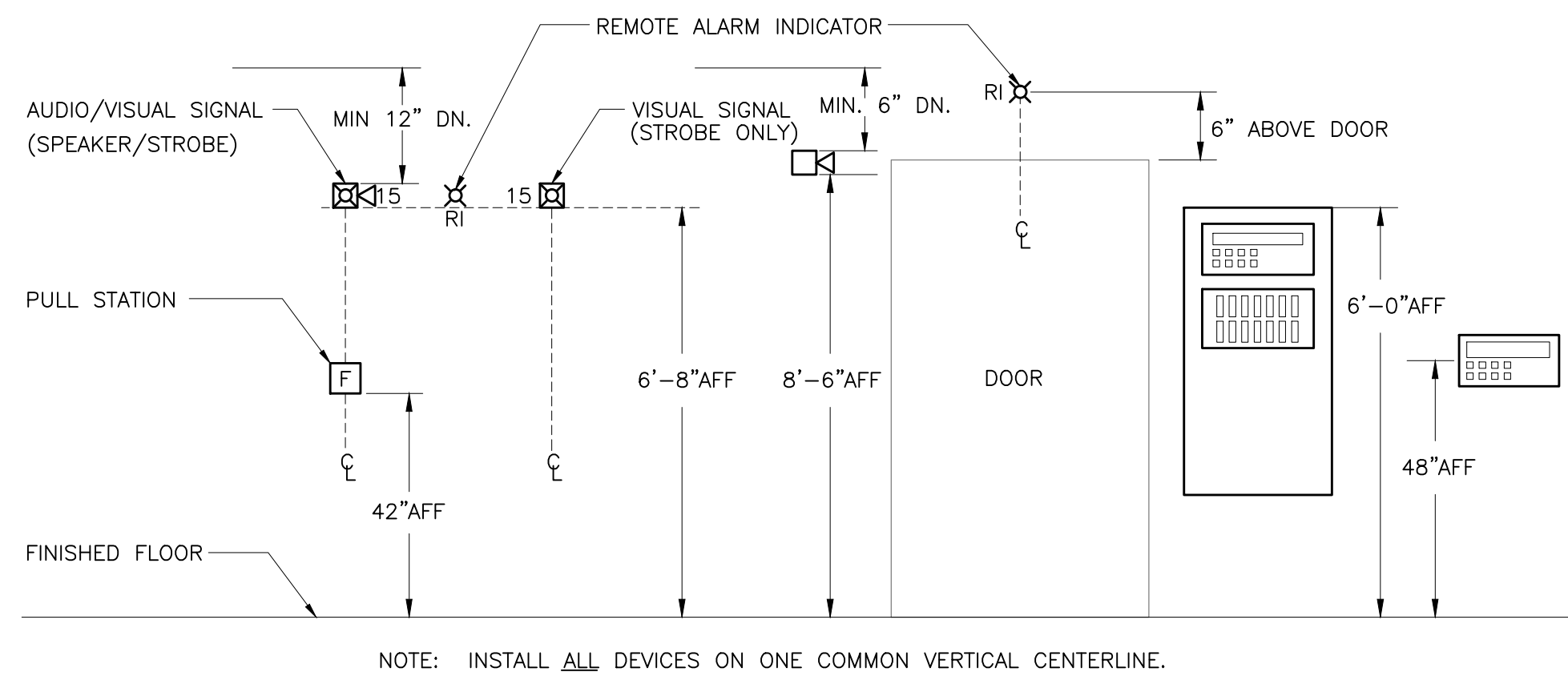


- NOTES:**
- REFER TO SPECIFICATIONS FOR ADDITIONAL NAMEPLATE REQUIREMENTS.
 - NAMEPLATE TO BE 1/16" WHITE PLASTIC WITH BLACK CENTER LAMINATION. FACE TO BE WHITE, ENGRAVED LETTERS TO BE BLACK.
 - SECURE NAMEPLATE TO SURFACES WITH (2) FLAT HEAD BRASS SCREWS. ADHESIVE CEMENT WILL NOT BE ALLOWED.
 - AT A MINIMUM, ALL PANELBOARDS, DISCONNECT SWITCHES, FEEDER JUNCTION / PULL BOXES, TRANSFORMERS, AND TRANSFER SWITCHES SHALL BE PROVIDED WITH ENGRAVED LABELS.

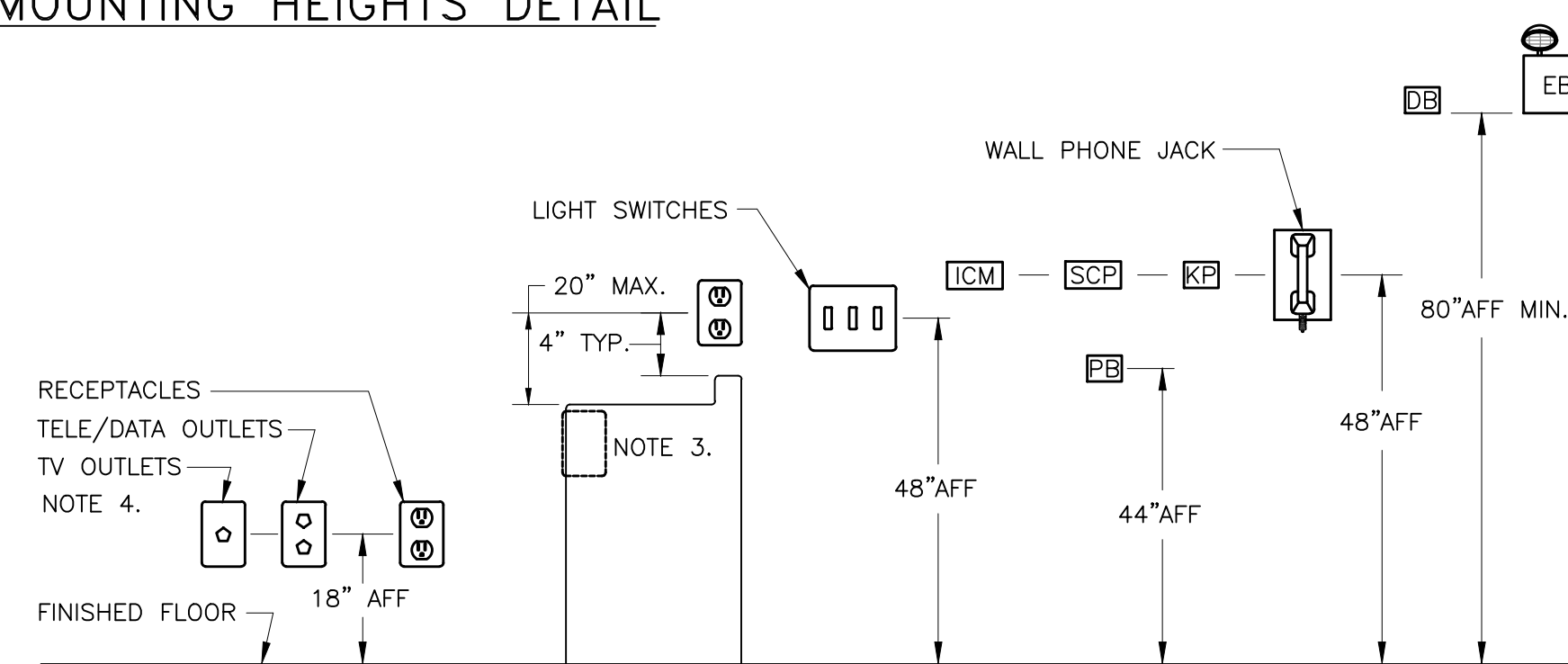
5 TYPICAL EQUIPMENT LABEL DETAIL
SCALE: N/A



3 TYPICAL FIRE ALARM RISER DIAGRAM DETAIL
NOT TO SCALE



2 TYPICAL DEVICE MOUNTING HEIGHTS DETAIL
NOT TO SCALE



- NOTES:**
- INSTALL DEVICES ON ONE COMMON VERTICAL CENTERLINE.
 - INSTALL DEVICES AT THIS HEIGHT WHEREVER APPLICABLE.
 - DO NOT INSTALL DEVICES IN CABINET FACE WITHOUT APPROVAL FROM ARCHITECT.
 - INSTALL DEVICES AT 24" AFF FOR NURSING HOMES AND HOSPITALS.

1 DETAIL OF TYPICAL DEVICE MOUNTING HEIGHTS
SCALE: N/A

EXISTING PANELBOARD: ACP

VOLTAGE: 480Y/277V, 3Ø, 4W 208Y/120V, 3Ø, 4W

AMPERE RATING: 125A 250A 400A _____

MAINS: MLO MCB 100A _____

MOUNTING: SURFACE FLUSH

BUSSING: COPPER ALUMINUM

TUB: SINGLE DOUBLE

LUGS: FEED-THRU SUB-FEED

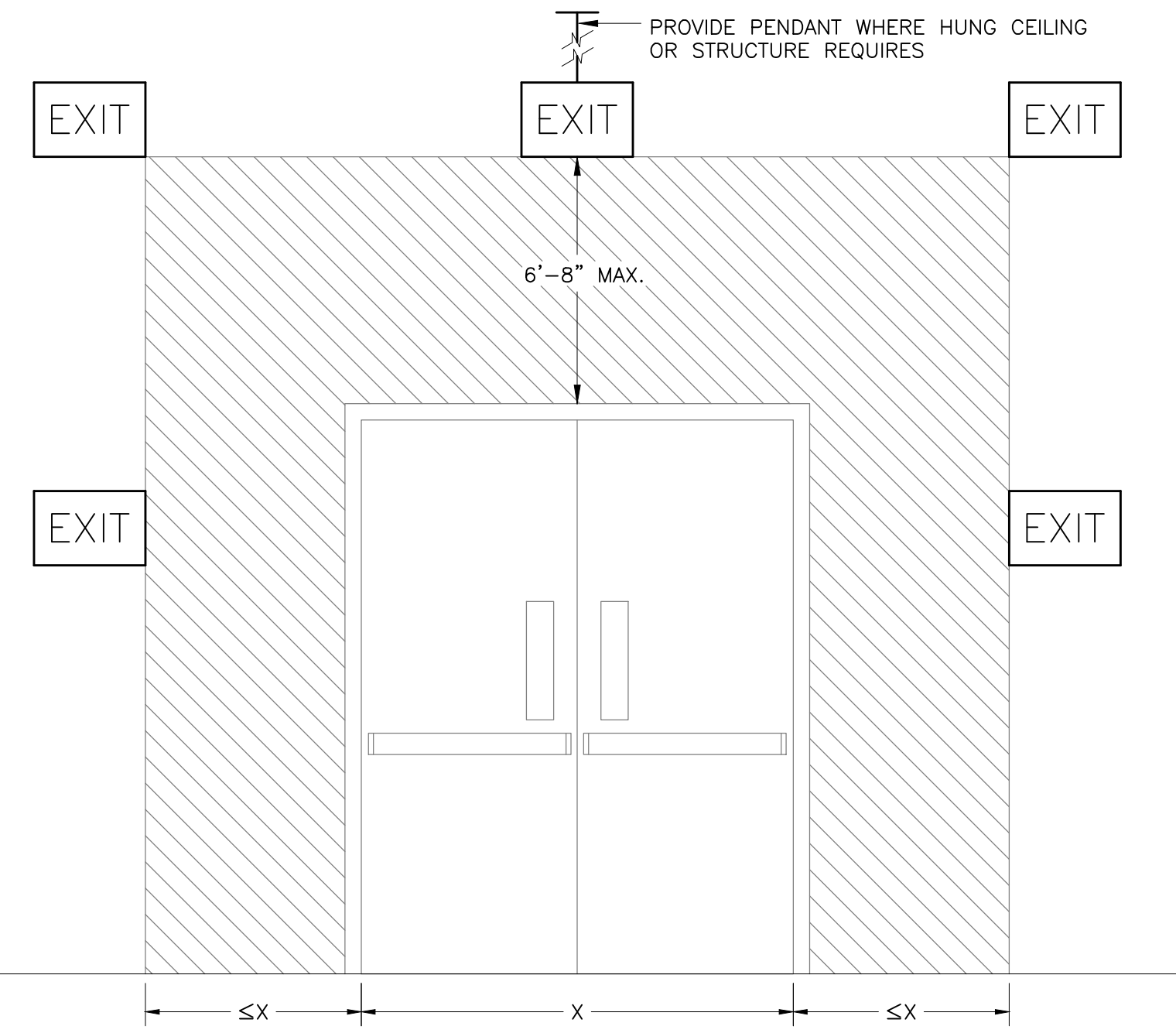
NEUTRAL BUS: 100% 200%

GROUND BUS: EQUIPMENT ISOLATED

AIC RATING: 10K 14K 22K 35K 65K _____

LOAD DESCRIPTION	LOAD KVA	CIRCUIT TYPE	BREAKER AMP/POLE	CKT. NO.	Ø	CKT. NO.	CIRCUIT BREAKER AMP/POLE TYPE	LOAD KVA	LOAD DESCRIPTION
VAULT #1 FAN FILTER UNIT		STD	20/1	1	A	2	20/1	STD	VAULT #1 RECEPTACLE (COND. PUMP)
AIR CONDITIONING UNIT		STD	40/2	3	B	4	20/1	STD	VAULT #1 HVAC CONTROLS POWER
				5	C	6	20/1	STD	VAULT #1 EXTINGUISHING SYSTEM PANEL
RELOCATED EXISTING CIRCUIT		STD	20/1	7	A	8	20/3	STD	SPARE
RELOCATED EXISTING CIRCUIT		STD	20/1	9	B	10			
RELOCATED EXISTING CIRCUIT		STD	20/1	11	C	12			
VAULT #1 LIGHTING		AFCI	20/1	13	A	14	40/2	STD	VAULT #2 AIR CONDITIONING UNIT
VAULT #1 RECEPTACLES		AFCI	20/1	15	B	16			
VAULT #1 RECORDER (HVAC)		AFCI	20/1	17	C	18	20/1	AFCI	VAULT #2 LIGHTING
RECORDS STORAGE AHU-1		STD	20/2	19	A	20	20/1	AFCI	VAULT #2 RECEPTACLES
				21	B	22	20/1	STD	VAULT #2 RECORDER (HVAC)
SUMP PUMP		STD	20/1	23	C	24	20/1	AFCI	VAULT #2 EXTINGUISHING SYSTEM PANEL
DRY (SPRINKLER) SYSTEM C. P.		STD	20/1	25	A	26	20/1	STD	VAULT #2 RECEPTACLE (COND. PUMP)
VAULT #3 EXTINGUISHING SYSTEM PANEL		STD	20/1	27	B	28	20/1	STD	VAULT #2 HVAC CONTROLS POWER
SPARE		STD	20/1	29	C	30	20/1	STD	VAULT #2 FAN FILTER UNIT

- NOTES:**
- PANELBOARD AND BRANCH BREAKERS ARE EXISTING FROM PHASE 1 WORK EXCEPT WHERE NOTED BELOW.
 - PROVIDE NEW BREAKERS LISTED FOR USE IN THE EXISTING "GE" PANELBOARD; REPLACE EXISTING BREAKERS AND RETURN TO OWNER.
 - PROVIDE ARC FAULT TYPE BRANCH CIRCUIT BREAKERS FOR ALL CIRCUITS FEEDING DEVICES, EQUIPMENT OR WIRING LOCATED INSIDE THE VAULT ROOM PER VAULT MANUFACTURER'S SPECIFICATIONS.



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**ARCHIVAL VAULT AT THE
FORMER BRIGHT SCHOOL- PHASE 2**
260 GROVE STREET, WALTHAM, MA

DATE: 08-08-12
SCALE: AS NOTED

ELECTRICAL
AND
FIRE ALARM
DETAILS

E6