



Invitation to Quote

Date: October 1, 2020
Project: Library Services Center – Boiler 2 Replacement

Location: Library Services Center
2450 N. Meridian Street
Indianapolis, IN 46208

Vendors: Greiner Brothers
Sexson Mechanical
Irish Mechanical Services
Perfection Group

I. Invitation:

An invitation is hereby given to Vendors to submit a lump-sum Quote to replace boiler 2 at Library Services Center ("Project").

Quotes will be received by The Indianapolis Public Library at the

Library Services Center
2450 North Meridian Street
Indianapolis, IN 46208
October 20, 2020 at 11:00 am local time.

Quotes may be delivered to the noted location or submitted by e-mail to kthomas@indypl.org in a .pdf format with a paper copy to follow if requested.

Quotes shall be submitted on the attached Vendor Quote Sheet and Non-collusion Affidavit. The received Quotes will be opened publically and read aloud via Zoom at this time. Link to attend quote opening is in project schedule. Quotes received after this time will not be considered.

The Quotes may be held by the Indianapolis Public Library ("IndyPL") for a period not to exceed sixty (60) days before awarding a purchase order. IndyPL reserves the right to reject any or all quotes, and the right to waive any irregularities in the process.

IndyPL shall award the Project to the lowest, responsible, and responsive Vendor pursuant to Indiana Code § 36-1-12-5.

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II. Attachments:

Attachment A	Vendor Quote Sheet and Non-Collusion Affidavit.
Attachment B	E-Verify Affidavit.
Attachment C	CMID Drawings – Issued for Quote - Date: 09/21/20
Attachment D	CMID Boiler Replacement Project Manual – Date: 09/21/20
Attachment C	Original Construction Drawings – Date: 6/20/19

III. Project Schedule:

October 1, 2020 Invitation to Quote distributed to Vendors.
October 8, 2020 11:00 a.m. Pre-bid meeting via Zoom at invitation below.

Kevin Thomas is inviting you to a scheduled Zoom meeting.

Topic: LSC Boiler Replacement Pre-Bid

Time: Oct 8, 2020 11:00 AM Indiana (East)

Join Zoom Meeting

<https://zoom.us/j/92859891732?pwd=aHJsQjIwZTR6MVhDbU1qV1hSNE4xdz09>

Meeting ID: 928 5989 1732

Passcode: 1wAh8j

October 9, 2020 9:00 a.m. – 4:00 p.m. Site visit for contractor. Visits will be scheduled with one contractor per visit to allow social distancing. Contact Kevin Thomas at kthomas@indypl.org to schedule a time this day for a site visit.

October 13, 2020 2:00 p.m. deadline for questions from Vendors.

October 15, 2020 2:00 p.m., IndyPL responses to questions distributed to Vendors.

October 21, 2020 Quotes due at the time and location noted above.

Public quote opening via zoom invitation below.

Kevin Thomas is inviting you to a scheduled Zoom meeting.

Topic: LSC Boiler Replacement - Quote Opening

Time: Oct 21, 2020 11:00 AM Indiana (East)

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Join Zoom Meeting

<https://zoom.us/j/96325759888?pwd=dXRIRFYzbHdNWFN6SWNTUnhTSXIDQT0>
9

Meeting ID: 963 2575 9888

Passcode: vStyA9

October 27, 2020 Target date to issue a Notice of Intent to Issue Purchase Order.
December 23, 2020 Target substantial completion date of the Project.

IV. Project Scope and General Description:

The Project is to perform minor modifications to existing Boiler No. 1 and replace Boiler No. 2 with new condensing gas-fired hot water boiler and associated piping, valves, flue and power wiring and other Work indicated in the Contract Documents.

V. Notes:

1. Provide all materials, accessories, and equipment required for the Project.
2. Remove all debris off site daily. Use of IndyPL's dumpster is not allowed.
3. The installation shall occur during normal business hours with the exception of items that would impact building occupant safety such as overhead loads suspended by crane.
4. IndyPL as a Municipal Corporation is Indiana State Sales tax-exempt, and will provide the tax-exempt certificate and supporting documentation upon Notice of Intent to Issue Purchase Order.
5. The Vendor shall be responsible for the security of all their equipment, supplies, and materials during the Project.
6. Vendor is to provide all necessary protection for adjacent surfaces and materials.

VI. Diversity, Equity, and Inclusion:

1. IndyPL is committed to supporting and encouraging economic growth and business opportunities in Marion County by strengthening IndyPL's relationships with Minority, Women, Disability, or Veteran Owned Business ("XBE") by providing an equal opportunity for participation in all IndyPL business.
2. The IndyPL Board of Trustees, with Resolution 28-2020, has adopted Minority/Women/Disability/Veteran-Owned Business Enterprise Utilization Goals.
 - The utilization goal for Minority-owned Business Enterprises (MBE) is fifteen percent (15%).
 - The utilization goal for Women-owned Business Enterprises (WBE) is eight percent (8%).

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- The utilization goal for Disability-owned Business Enterprises (DOBE) is one percent (1%).
 - The utilization goal for Veteran-owned Business Enterprises (VBE) is three percent (3%).
3. Vendors who meet the City of Indianapolis or State of Indiana criteria of Minority, Women, Disability, or Veteran Owned Business ("XBE") or similar requirements for out-of-state firms, may indicate the appropriate certification, with a copy of such certification included in their Quote.

VII. Questions:

1. To ensure consistency of the process, Vendors shall direct all questions concerning the Invitation to Quote and the Project via e-mail to Kevin Thomas, kthomas@indypl.org.
2. All questions shall be received by the deadline noted above. IndyPL responses will be shared with all known Vendors via e-mail.

VIII. Form of the Quote:

1. Submit on the attached Vendor Quote Sheet and Non-Collusion Affidavit including acknowledgement of the receipt of any IndyPL issued addenda used in the preparation of the Quote.
2. Submit a notarized version of the E-Verify Affidavit (Attachment B).
3. Submit a notarized version of the Non-collusion Affidavit.
4. Provide 1 original of the Quote for use by IndyPL.
5. Quotes may be submitted by e-mail to kthomas@indypl.org in a .pdf format with a paper copy to follow if requested.

IX. Vendor Requirements:

1. By submission of a Quote, the Vendor certifies that:
 - a. The Vendor has not paid or agreed to pay any fee, commission, or any other item of value contingent on the award of a purchase order to any employee, official or current contracting consultant of IndyPL.
 - b. No person or selling agent has been employed or retained to solicit or secure the work upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee.
 - c. Pursuant to Indiana Code § 5-22-16.5-13(b), the Vendor is not engaged in any investment activities in Iran.
2. For breach or violation of these certifications, IndyPL shall have the right to annul the purchase order without liability.
3. Vendors are advised that all materials submitted in response to this ITO become the property of IndyPL and shall be subject to disclosure under the Indiana Public Records Act, IC 5-14-3 et seq. ("IPRA"). After the purchase order

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award, the entire Quote may be viewed and copied by any member of the public, including news agencies and competitors. Vendors claiming a statutory exception from disclosure under the IRPA of information included in its Quote must:

- a. Place all documents they consider confidential (including the requisite number of copies) in a sealed envelope clearly marked "Confidential" with the Vendor Name, IndyPL Point of Contact Name, and the ITQ Title.
- b. Indicate in the transmittal letter for the Quote that confidential information or materials are included in the submission along with a general description of the information for which confidential treatment is sought.
- c. Indicate in the transmittal letter which statutory exception(s) provision of the IRPA applies to each listed confidential material item.
- d. Provide a redacted version of the Quote section to properly identify (and black-out) those sections of the Quote for which Vendor claims an exception from disclosure under the IRPA.

IndyPL reserves the right to make determinations of confidentiality upon consultation with legal counsel. If IndyPL does not agree with the claim that the information designated is confidential under one of the cited disclosure exceptions to the IRPA, it may either discuss its interpretation of the allowable exceptions with the Vendor or reject the Quote. If agreement can be reached on the nature of the requested confidential materials, the Quote will be considered. If agreement cannot be reached, IndyPL will remove the Quote from consideration for award and return the entire "Confidential" package to the Vendor. The rest of the Quote and other supporting documentation will not be returned to Vendor and remain part of the ITQ file. IndyPL will not consider prices, fees, or wage rates to be confidential information. By submission of its Quote a Vendor acknowledges that IndyPL is required to make disclosures as required by law, and nothing herein shall obligate IndyPL to defend a Vendor's designation of its Quote or portions thereof as confidential and excepted from disclosure. IndyPL shall not be liable for disclosures required by law.

4. Insurance. Contractor shall secure, pay for and maintain the following insurance policies in full force and effect throughout the term of an Agreement that may be entered between Contractor and IndyPL, which policies shall protect against any loss or claim arising from or relating to the Agreement, Contractor's Service and activities, or presence at IndyPL facilities, and any act or omission of Contractor or its employees and/or agents or Subcontractors in connection with the Services provided under the Agreement, and shall cover the contractual indemnification liability assumed by Contractor pursuant to the Agreement:

- a. Commercial General Liability Insurance with limits of not less than One Million Dollars (\$1,000,000) per occurrence for bodily injury (including death), personal injury, property damage, fire legal liability, contractual liability and products and completed operations, and Two Million Dollars (\$2,000,000)

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general aggregate. The policy shall be written on an occurrence basis. The policy shall also not have exclusions for any of Contractor's activities at the facilities. Any deductible shall be at Contractor's expense.

- b. Business automobile coverage, including coverage for owned, leased, and hired vehicles, which shall include vehicle and property (cargo) damage, and bodily injury, in an amount not less than One Million Dollars (\$1,000,000.00.)
- c. Workers' Compensation insurance, affording coverage in excess of the applicable state laws covering all of Contractor's employees, and Employer's Liability coverage in excess of the applicable state laws but no less than One Million Dollars (\$1,000,000.00) each accident, One Million Dollars (\$1,000,000.00) each employee and Two Million Dollars (\$2,000,000.00) policy limit.
- d. Property Insurance coverage for all materials, equipment, and other items owned, borrowed, or leased by Contractor shall be Contractor's responsibility. IndyPL shall not be responsible for such materials, equipment, and other items owned, borrowed, or leased by Contractor.
- e. Umbrella Liability insurance at not less than Five Million Dollars (\$5,000,000) limit for each occurrence providing for excess coverage over the limits and coverage prescribed above in sections (a), (b), (c) and (d) above, which such policy shall be written on an occurrence basis.
- f. All insurance policies addressed in Sections 6. (a), (b), and (e) above shall be endorsed to name the following as additional insured's:

Indianapolis-Marion County Public Library and its trustees, directors, officers, employees, representatives, volunteers, agents, contractors, licensees, and successors.
- g. All insurance policies required hereunder: (1) shall be endorsed to state that the insurance is primary and not contributive to any other insurance available to IndyPL; (2) shall provide for a waiver of rights of subrogation against the additional insurers on the part of the insurance carriers; (3) shall be written with insurance companies licensed to do business in the State of Indiana and rated no lower than A-VII in the most current edition of A.M. Best's Property-Casualty Key Rating Guide, and (4) shall provide for no less than thirty (30) days advance written notice to IndyPL prior to cancellation, non-renewal or material modification.

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- h. Contractor shall deliver to IndyPL, prior to commencement of the Services under an Agreement, Certificates of Insurance confirming the existence or issuance of all insurance policies required to be carried hereunder ("Certificates of Insurance"). If any such policy is not obtained, or if all Certificates of Insurance are not delivered to IndyPL by the aforementioned time, or if any of such policies are canceled, IndyPL shall have the right to terminate the Agreement immediately and/or deny Contractor access to IndyPL facilities.
 - i. These insurance provisions are minimum requirements and shall not relieve Contractor of its indemnity, defense and hold harmless obligations.
- 4. The Project will be contracted with an AIA Document A105, Standard Form of Agreement Between Owner and Contractor for a Residential or Small Commercial Project.
- 5. The Vendor shall provide documentation to IndyPL evidencing all necessary business licenses to provide the Services prior to the awarding of the contract.
- 6. Vendor in performing work under a AIA Document A105, Standard Form of Agreement Between Owner and Contractor for a Residential or Small Commercial Project resulting from this ITQ shall not discriminate against any worker, employee or applicant because of race, creed, color, religion, gender, national origin, age or disability or veteran status, nor otherwise commit an unfair employment practice. The Vendor will take affirmative action to ensure that applicants are employed, and that employees are dealt with during employment, without regard to their race, creed, color, religion, gender, national origin, age, disability or veteran status.

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ATTACHMENT A
Vendor Quote Sheet and Non-Collusion Affidavit
Library Services Center – Boiler 2 Replacement
Vendor Quote Sheet

Vendor: _____

Address: _____

City/State: _____

Date: _____

Vendor Certification:

The undersigned acknowledges that I/we have received and thoroughly reviewed the Invitation to Quote ("ITQ") dated October 18, 2020 and understands the entire scope of the Project, and shall provide the Project fully in accordance with the requirements of the ITQ.

Acknowledgment of Receipt of Addenda:

I/We have received and reviewed the Addenda I/we have listed below, and have included the provisions thereof in the Quote:

Lump Sum Quote:

\$ _____ Written Amount: _____

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ATTACHMENT A (continued)
Vendor Quote Sheet and Non-Collusion Affidavit
Lawrence Branch Library - Seal and Stripe Parking Lot Project
Non-Collusion Affidavit

The undersigned, on behalf of the Vendor, being first duly sworn, deposes and states that the Vendor has not, nor has any other member, representative, employee or agent of the Vendor, entered into any combination, collusion or agreement with any person relative to the fees to be quoted by anyone at such letting, to prevent any person from submitting a quote, or to induce anyone to refrain from submitting a quote.

The undersigned further deposes and states that this Quote is made without reference to any other quote and without any agreement, understanding or combination with any other person referring to such quote.

The undersigned further deposes and states that no person, firm or entity has or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such Quote.

I affirm, under the penalties for perjury, that the foregoing representations are true.

(Vendor): _____

By (Written Signature):

(Printed Name):

(Title):

Important – Notary Signature and Seal Required in the Space Below

STATE OF _____

Seal:

COUNTY OF _____

Subscribed and sworn to before me this _____ day of _____ 2020.

My commission expires: _____ (Signed) _____

Residing in _____ County, State of _____

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ATTACHMENT B
E-Verify Affidavit
Library Services Center – Boiler 2 Replacement

Pursuant to Indiana Code 22-5-1.7-11, the Vendor entering into a purchase order with the Indianapolis-Marion County Public Library is required to enroll in and verify the work eligibility status of all its newly hired employees through the E-Verify program. The Vendor is not required to verify the work eligibility status of all its newly hired employees through the E-Verify program if E-Verify no longer exists.

1. Vendor affirms that Vendor does not knowingly employ an unauthorized alien.
2. Vendor affirms under the penalties of perjury that it has enrolled and is participating in the E-Verify program. Vendor is not required to participate should the E-Verify program cease to exist.
3. Vendor agrees to provide documentation demonstrating that Vendor has enrolled and is participating in the E-Verify program.
4. IndyPL may terminate for default if Vendor fails to cure a breach of this provision no later than thirty (30) days after being notified.

I affirm, under the penalties for perjury, that the foregoing representations are true.

(Vendor): _____

By (Written Signature):

(Printed Name):

(Title):

Important – Notary Signature and Seal Required in the Space Below

STATE OF _____

Seal:

COUNTY OF _____

Subscribed and sworn to before me this _____ day of _____ 2020.

My commission expires: _____ (Signed) _____

Residing in _____ County, State of _____

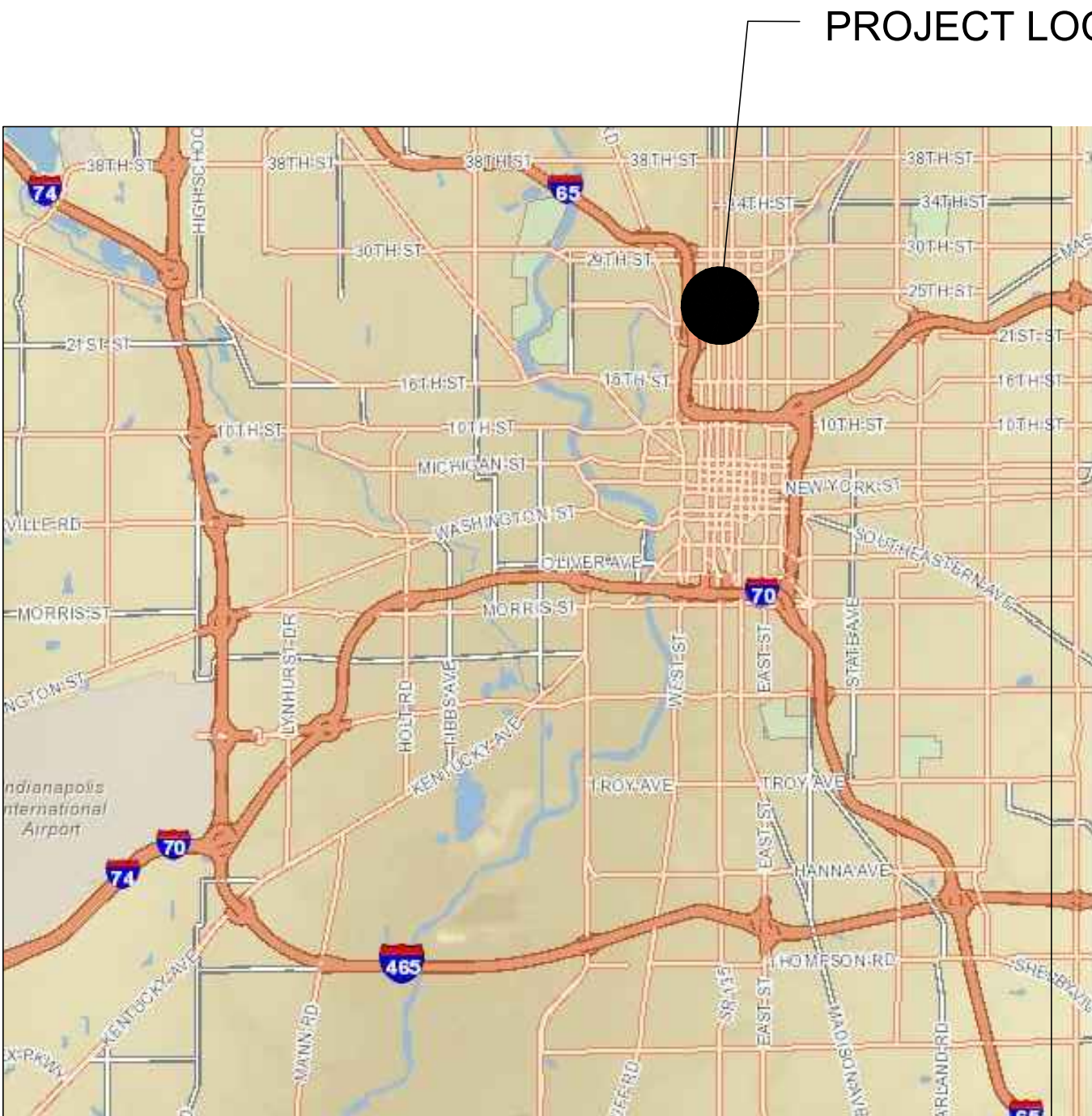


THE INDIANAPOLIS PUBLIC LIBRARY LIBRARY SERVICES CENTER

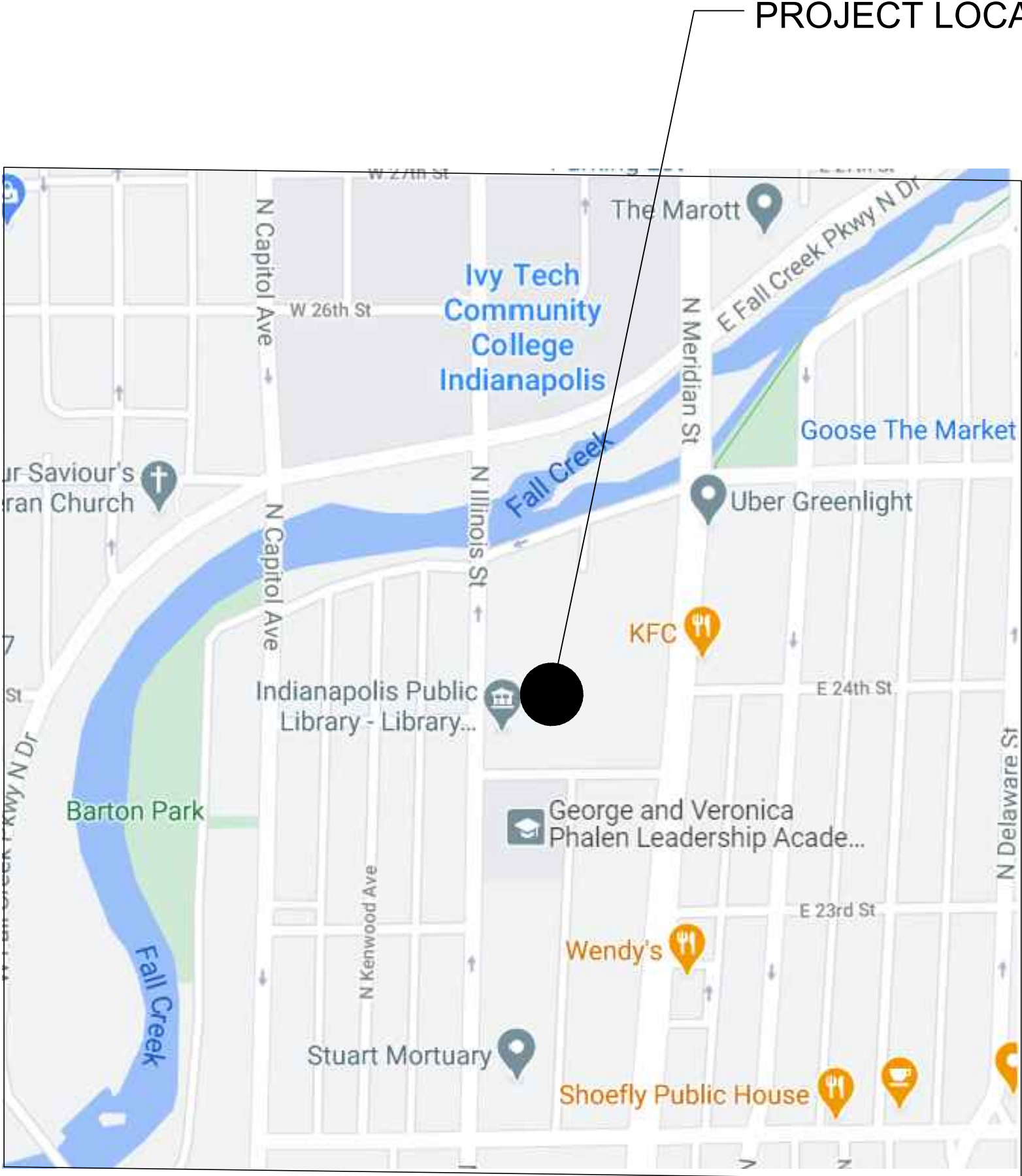
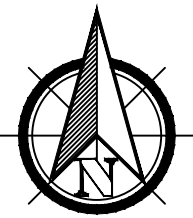
2450 N. MERIDIAN ST.
INDIANAPOLIS, IN 46208

BOILER REPLACEMENT
INDIANAPOLIS PUBLIC LIBRARY
COVER SHEET

No.	Issue Description	Date
-	ISSUED FOR QUOTE	09/21/20



VICINITY MAP
NOT TO SCALE



SITE LOCATION MAP
NOT TO SCALE

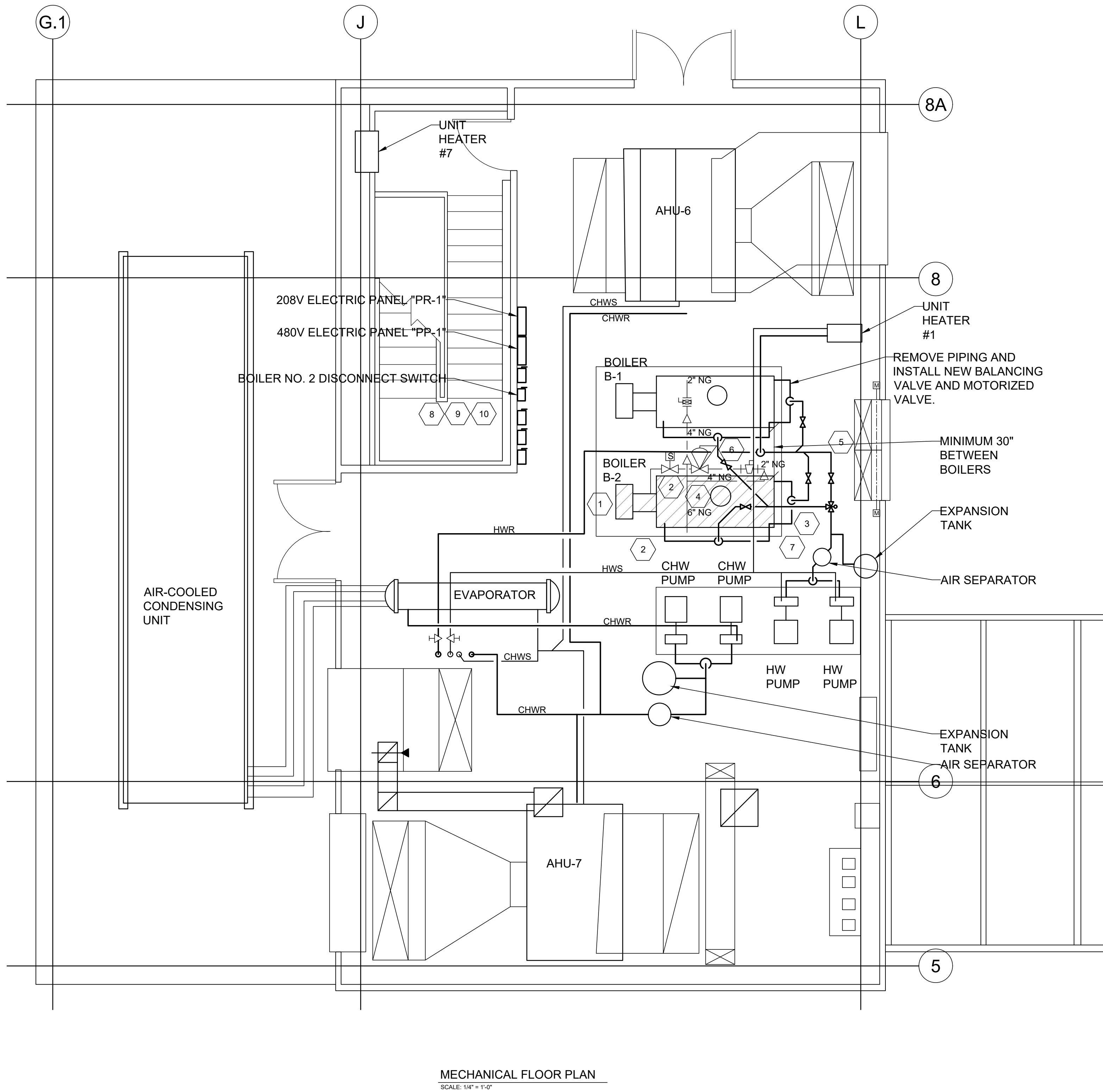
SHEET INDEX	
Cover	COVER SHEET
M/E-1	MECHANICAL AND ELECTRICAL PLAN VIEW
M-2	DETAILS AND SCHEDULES


Edward George & Associates


ENGINEERS | ARCHITECTS | LAND SURVEYORS

1402 N. Capitol Ave.
Suite 250
Indianapolis, Indiana 46202
Phone (317) 917-4244
Fax (317) 917-4254
www.cmidinc.com

Plotted On: Monday, 9/21/2020 - 12:14 PM By: RHAMERSLEY
Drawing: Last Modified On: Tuesday, September 15, 2020 By: RHAMERSLEY
Client: Indiana Public Library Services
Drawing Path: C:\Users\RHAMERSLEY\Documents\2020\19-0011-17 Library Services Center Boiler Replacement\2020\19-0011-17 MECHANICAL PLANT.dwg

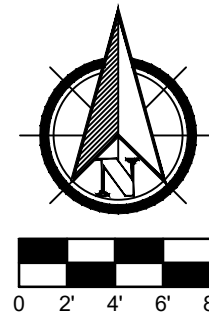


MECHANICAL
PLAN NOTES:

1. REMOVE EXISTING BOILER AND REPLACE WITH NEW.
2. REMOVE GAS PIPING FROM EXISTING BOILER BACK TO MAIN. FURNISH AND INSTALL NEW VALVE. ROUTE PIPING TO NEW BOILER FROM VALVE.
3. REMOVE EXISTING HOT WATER SUPPLY AND RETURN PIPING TO NEAREST VALVE AND REPLACE, ROUTING TO NEW BOILER.
4. REMOVE EXISTING FLUE AND INSTALL NEW FLUE FROM NEW BOILER UP THROUGH ROOF.
5. INSTALL OUTSIDE COMBUSTION AIR DUCT FROM OUTSIDE AIR INTAKE TO NEW BOILER.
6. FURNISH AND INSTALL NEW GAS REGULATOR WITH A CAPACITY OF 2,000 CFH FROM 2 PSIG TO 14-16 IN. W.C. SENSUS OR APPROVED EQUAL. VERIFY NATURAL GAS PRESURE WITH THE GAS COMPANY BEFORE ORDERING VALVE.
7. FURNISH AND INSTALL DISCHARGE PIPING FROM BOILER DRAINS, PRESSURE RELIEF VALVE AND AUTOMATIC AIR VENTS FROM OUTLET TO NEAREST FLOOR DRAIN.

ELECTRICAL
PLAN NOTES:

8. REMOVE ONE (1) 3/4" EMT CONDUIT WITH FOUR (4) NO. 12 CONDUCTORS BETWEEN 30A, 480V DISCONNECT SWITCH AND BOILER NO. 2 CONTROL PANEL. REMOVE THREE (3) EXISTING 4A FUSES IN DISCONNECT SWITCH AND REPLACE WITH TWO (2) 5A FUSES.
9. FURNISH AND INSTALL 2.0 KVA SEALED SINGLE PHASE TRANSFORMER LIKE SQUARE D CATALOG NO. 2S1F OR APPROVED EQUAL AND 120V, 20A SINGLE POLE CIRCUIT BREAKER IN NEMA 1 ENCLOSURE LIKE SQUARE D CATALOG NO. QO24L50TTS OR APPROVED EQUAL BELOW 480V, 30A DISCONNECT SWITCH.
10. FURNISH AND INSTALL ONE (1) 3/4" EMT CONDUIT WITH TWO (2) NO. 10 THHN CONDUCTORS (BLACK, WHITE), ONE (1) NO. 12 GROUND (GREEN) BETWEEN NEW 20A CIRCUIT BREAKER AND NEW BOILER NO. 2 CONTROL PANEL.




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**1402 N. Capitol Ave.
Suite 250
Indianapolis, Indiana 46202**
Phone (317) 917-4244
Fax (317) 917-4254
www.cmidinc.com

Client:
**THE INDIANAPOLIS
PUBLIC LIBRARY**
2450 N. MERIDIAN ST
INDIANAPOLIS
INDIANA
46208

No.	Issue Description	Date
1	ISSUED FOR QUOTE	09/21/20

**LIBRARY SERVICES CENTER
BOILER REPLACEMENT**

MECHANICAL/ELECTRICAL PLAN

Professional Seal

Drawn by: RAH	09/21/20
Checked by: REB	09/21/20
Approved by: REB	09/21/20
Client Project No:	
CMID Project No: 19-0011-17	
Plot date: 09/21/20	
Scale: 1/4"=1'-0"	
Drawing Number:	Revision:
M/E1	A



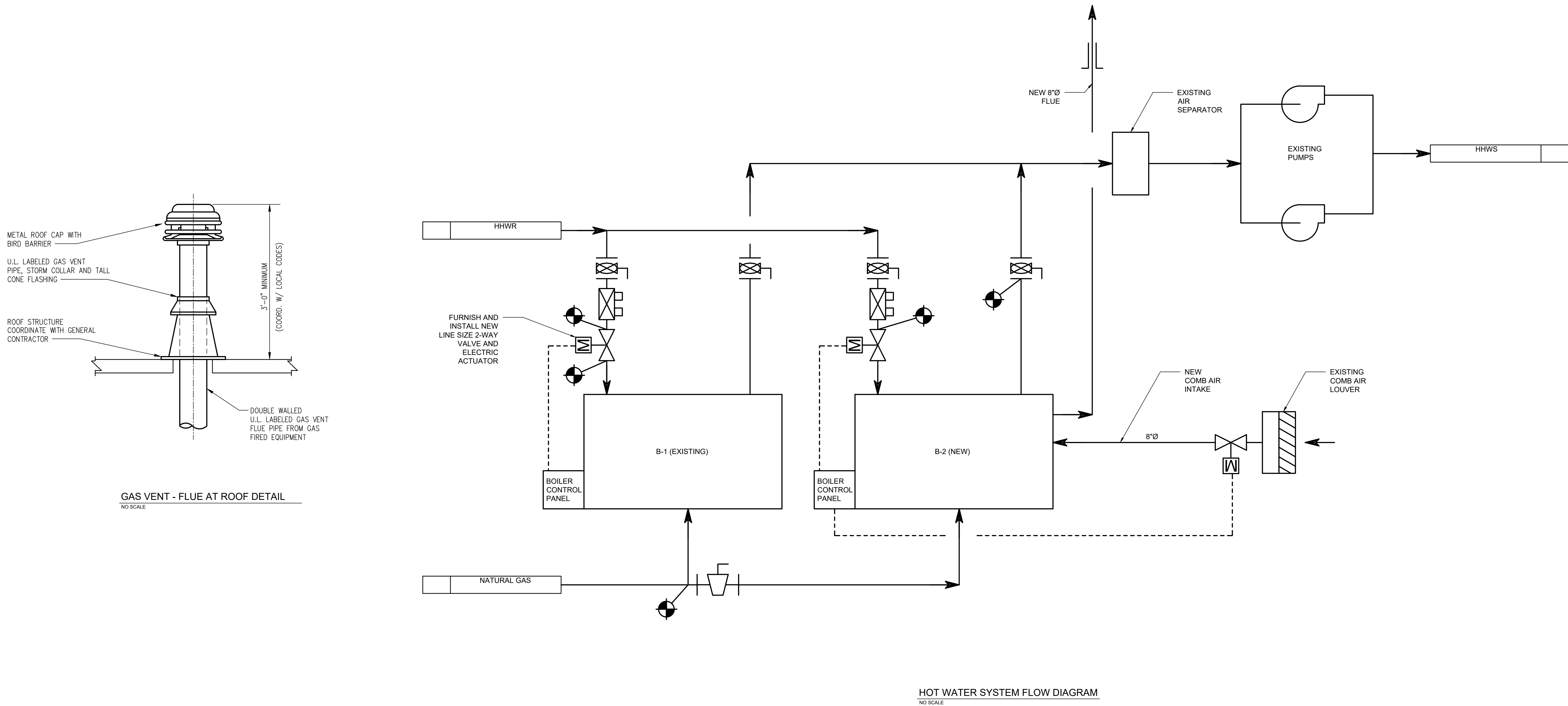
No.	Issue Description	Date
-	ISSUED FOR QUOTE	09/21/20

LIBRARY SERVICES CENTER BOILER REPLACEMENT

SCHEDULES & DETAILS

Professional Sea

Drawn by: RAH	09/21/20
Checked by: REB	09/21/20
Approved by: REB	09/21/20
Client Project No:	
CMID Project No: 19-0011-17	
Plot date: 09/21/20	
Scale: NONE	
Drawing Number:	Revision:
M-2	A

[illegible]

BOILER REPLACEMENT

PROJECT MANUAL

DATE: September 21, 2020

OWNER:



The Indianapolis Public Library
Library Services Center
2450 N. Meridian Street
Indianapolis, IN 46208

OWNER'S REPRESENTATIVE:



EGA
Edward George & Associates

1402 N. Capitol Ave.
Suite 250
Indianapolis, IN 46202

CMID Project No.: 19-0011

Boiler Replacement
Indianapolis Public Library
Library Services Group
2450 N. Meridian Street
Indianapolis, IN 46208
CMID Project No.: 19-0011

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Facility Construction

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PART 1 - GENERAL

1.1 SUMMARY

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1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under Owner's separate contracts.
5. Owner-furnished/Contractor-installed (OFICI) products.
6. Contractor's use of site and premises.
7. Coordination with occupants.
8. Work restrictions.
9. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Boiler Replacement, The Indianapolis Public Library, Library Services Center.

1. Project Location: 2450 N. Meridian Street, Indianapolis, IN 46208

B. Owner: The Indianapolis Public Library.

1. Owner's Representative: Kevin Thomas.

C. Engineer: CMID, Inc. and Edward George and Associates (EGA).

1. EGA's Representative: Jack Leicht (317) 490-1961
2. CMID's Representative: Ron Buckley (317) 917-4236

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. In general, perform minor modifications to existing Boiler No. 1 and replace Boiler No. 2 with new condensing gas-fired hot water boiler and associated piping, valves, flue and power wiring and other Work indicated in the Contract Documents. This will include the following:
 - a. Measure and record water flows of existing heating hot water distribution system throughout the entire building before construction is initiated.
 - b. Furnish and install new 2-way motorized valve and manual balance valve in Boiler No. 1 return line. Reinsulate piping after valves are installed. Furnish and install wiring from existing Boiler No. 1 control panel to new 2-way valve operator.
 - c. Disconnect piping, conduits and flue from Boiler No. 2 and remove boiler in its entirety. Dispose of boiler and materials in accordance with all local, state and federal regulations.
 - d. Furnish and install new boiler on existing concrete pad in boiler room. Contractor shall be responsible for all lifting costs including temporary removal of outside door.
 - e. Furnish and install new motorized 2-way isolation valve in Boiler No. 2 return line and extend return, supply and natural gas piping to connections on new Boiler No.2. Connect vent piping from gas valve to existing piping that extends through the roof.
 - f. Furnish and install new double wall flue from Boiler No.2 up through existing roof opening. Match Boiler No. 1 height above roof. Utilize independent roofing contractor employed in the trade who is authorized to honor the existing roof warranty.
 - g. Furnish and install new combustion air duct with 2-way motorized damper from existing outside air intake to Boiler No. 2 connection.
 - h. Furnish and install control wiring from Boiler No. 2 control panel to new 2-way motorized valve and damper operators.
 - i. Insulate all new piping matching existing material and thickness.
 - j. Rebalance heating hot water distribution system to flows originally measured before construction.
 - k. Furnish and install in-line missing thermometers in their original positions.
 - l. Furnish and install labels for all new piping, valves and equipment in boiler room. Match existing. If valve tags are found to be missing during the original hot water flow measurements, install replacement tags to match existing.
 - m. Furnish and install new power wiring to Boiler No. 2.

B. Type of Contract:

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

1.4 PHASED CONSTRUCTION - NONE

1.5 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner will award separate contract for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. HVAC Controls: To Edward George and Associates for engineering design.

1.6 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS - NONE

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits on Use of Site: Confine construction operations to penthouse primarily. Water balance will require full access to facility.
 - 2. Driveways, Walkways, and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and

facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1.9 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 6:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages and other controlled substances within the existing building, on Project site and on Owner's property is not permitted.
- F. Employee Identification: Owner will provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Engineer.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.

7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Engineer.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Engineer on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package, and transmit to Engineer by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Engineer.
 2. Paper: Prepare submittals in paper form, and deliver to Engineer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow five (5) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Resubmittal Review: Allow five (5) days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's action stamp.

1.6 SUBMITTAL REQUIREMENTS

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

5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Engineer's digital data drawing files is otherwise permitted.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 11 by 17 inches, but no larger than 24 by 36 inches.
 - a. Two (2) opaque (bond) copies of each submittal. Engineer will return one (1) copy.
- C. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- E. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- F. Certificates:
 1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

G. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES - NONE

1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Engineer will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ENGINEER'S REVIEW

- A. Action Submittals: Engineer will review each submittal, indicate corrections or revisions required, and return it.
 - 1. PDF Submittals: Engineer will indicate, via markup on each submittal, the appropriate action.
 - 2. Paper Submittals: Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Engineer will return without review or discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Engineer without action.

Boiler Replacement
Indianapolis Public Library
Library Services Group
2450 N. Meridian Street
Indianapolis, IN 46208
CMID Project No.: 19-0011

01 33 00
SUBMITTAL PROCEDURES

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 01 78 23 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 2. Section 01 79 00 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

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

1.3 CLOSEOUT SUBMITTALS

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

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Engineer. Label with manufacturer's name and model number.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - 6. Advise Owner of changeover in utility services.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements.
 - 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
 - 1. Submit a final Application for Payment.
 - 2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of ten (10) days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS - NONE

1.7 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Perform final cleaning. Conduct cleaning and waste-removal operations.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Remove debris and surface dust from limited-access spaces, including roofs and similar spaces.
 - c. Remove labels that are not permanent.
 - d. Clean strainers.
 - e. Leave Project clean.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Engineer will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit by email to Engineer. Enable reviewer comments on draft submittals.
 - 2. Submit three (3) paper copies. Engineer will return two (2) copies.
- C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least ten (10) days before commencing demonstration and training. Engineer will return copy with comments.
 - 1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within ten (10) days of receipt of Engineer's comments and prior to commencing demonstration and training.
- D. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.3 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - 2. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.4 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

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

6. Name and contact information for Engineer.
 7. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 8. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.5 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.

3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds, as described below.
- C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.
- H. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1.8 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.

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01 78 23
OPERATION AND MAINTENANCE DATA

4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 78 23

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two (2) copies within seven (7) days of end of each training module.
 - 1. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 01 78 23 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.

- f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven (7) days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 79 00

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 800 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient, as defined in NEMA MG 1.

- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
 - 2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
 2. Split phase.
 3. Capacitor start, inductor run.
 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 05 13

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Hydronic Piping Systems:
 - a. Constant-flow hydronic systems.
 - b. Variable-flow hydronic systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
 2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.
- B. TAB Specialists Qualifications: Certified by NEBB or TABB.
1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
 2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB as a TAB technician.
- C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices and balancing valves and fittings. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including pump curves.
 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 1. Hydronics:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
 - b. Piping is complete with terminals installed.
 - c. Water treatment is complete.
 - d. Systems are flushed, filled, and air purged.
 - e. Strainers are pulled and cleaned.

- f. Control valves are functioning per the sequence of operation.
- g. Shutoff and balance valves have been verified to be 100 percent open.
- h. Pumps are started and proper rotation is verified.
- i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
- j. Variable-frequency controllers' startup is complete and safeties are verified.
- k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' "as-built" piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
 - 1. Check liquid level in expansion tank.
 - 2. Check highest vent for adequate pressure.
 - 3. Check flow-control valves for proper position.
 - 4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
 - 5. Verify that motor starters are equipped with properly sized thermal protection.
 - 6. Check that air has been purged from the system.

3.5 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design gpm.
 - 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gage heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - 3. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - 1. Measure flow in main and branch pipes.
 - 2. Adjust main and branch balance valves for design flow.
 - 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - 1. Measure flow at terminals.
 - 2. Adjust each terminal to design flow.
 - 3. Re-measure each terminal after it is adjusted.
 - 4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent valves at terminals:
 - 1. Measure differential pressure and verify that it is within manufacturer's specified range.
 - 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:

1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

G. Verify that memory stops have been set.

3.6 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:

1. Verify that the differential-pressure sensor is located as indicated.
2. Determine whether there is diversity in the system.

C. For systems with no diversity:

1. Adjust pumps to deliver total design gpm.

a. Measure total water flow.

- 1) Position valves for full flow through coils.
- 2) Measure flow by main flow meter, if installed.
- 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

b. Measure pump TDH as follows:

- 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
- 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
- 3) Convert pressure to head and correct for differences in gage heights.
- 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
- 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

- c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
 2. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
 4. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 5. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
 6. Prior to verifying final system conditions, determine the system differential-pressure set point.
 7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 8. Mark final settings and verify that all memory stops have been set.
 9. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
 10. Verify that memory stops have been set.
- D. For systems with diversity:

1. Determine diversity factor.
2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
3. Adjust pumps to deliver total design gpm.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.
 - 2) Measure flow by main flow meter, if installed.
 - 3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.
 - b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gage heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.
 - c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.
4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure, and verify that it is within manufacturer's specified range.

- b. Perform temperature tests after flows have been verified.
- 7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
- 8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
- 9. Prior to verifying final system conditions, determine system differential-pressure set point.
- 10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
- 11. Mark final settings and verify that memory stops have been set.
- 12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
 - c. Mark final settings.
- 13. Verify that memory stops have been set.

3.7 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Heating-Water Flow Rate: Plus or minus 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.8 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.

2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report.
Number each page in the report.
11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.

D. System Diagrams: Include schematic layouts of hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Water flow rates.
2. Pipe and valve sizes and locations.
3. Terminal units.
4. Balancing stations.
5. Position of balancing devices.

E. Gas- Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.

- f. Fuel type in input data.
 - g. Output capacity in Btu/h.
 - h. Ignition type.
 - i. Burner-control types.
 - j. Motor horsepower and rpm.
 - k. Motor volts, phase, and hertz.
 - l. Motor full-load amperage and service factor.
- F. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:
 - 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Service.
 - d. Make and size.
 - e. Model number and serial number.
 - f. Water flow rate in gpm.
 - g. Water pressure differential in feet of head or psig.
 - h. Required net positive suction head in feet of head or psig.
 - i. Pump rpm.
 - j. Impeller diameter in inches.
 - k. Motor make and frame size.
 - l. Motor horsepower and rpm.
 - m. Voltage at each connection.
 - n. Amperage for each phase.
 - o. Full-load amperage and service factor.
 - p. Seal type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Static head in feet of head or psig.
 - b. Pump shutoff pressure in feet of head or psig.
 - c. Actual impeller size in inches.
 - d. Full-open flow rate in gpm.
 - e. Full-open pressure in feet of head or psig.
 - f. Final discharge pressure in feet of head or psig.
 - g. Final suction pressure in feet of head or psig.
 - h. Final total pressure in feet of head or psig.
 - i. Final water flow rate in gpm.
 - j. Voltage at each connection.
 - k. Amperage for each phase.
- G. Instrument Calibration Reports:
 - 1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.9 VERIFICATION OF TAB REPORT

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

3.10 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 51 23 - GAS VENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Listed double-wall vents.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For vents.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail fabrication and assembly of hangers and seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Sample Warranty: For special warranty.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents.
- B. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations.

2.1 LISTED SPECIAL GAS VENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Duravent
 - 2. Selkirk Corporation
- B. Description: Double-wall metal vents tested according to UL 1738 and rated for 480 deg F continuously, with positive or negative flue pressure complying with NFPA 211.
- C. Construction: Inner shell and outer jacket separated by at least a 1/2-inch airspace.
- D. Inner Shell: ASTM A959, Type 29-4C stainless steel.
- E. Outer Jacket: Stainless steel.
- F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
 - 1. Termination: Stack cap designed to exclude minimum 90 percent of rainfall.
 - 2. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.
 - 3. Termination: Exit cone with drain section incorporated into riser.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Listed Special Gas Vent: Condensing gas appliances.

3.2 INSTALLATION OF LISTED VENTS

- A. Comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- D. Lap joints in direction of flow.

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23 51 23
GAS VENTS

- E. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

END OF SECTION 23 51 23

SECTION 23 52 16 - CONDENSING BOILERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes gas-fired, fire-tube, floor-mounted condensing boilers, trim, and accessories for generating hot water.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For boilers, boiler trim, and accessories.
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For each boiler.
 - 1. Design calculations and vibration isolation base details, signed and sealed by a qualified professional engineer.
 - a. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - b. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and sections, drawn to scale and coordinated with each other, using input from installers of the items involved.
- B. Seismic Qualification Data: Certificates, for boiler, accessories, and components, from manufacturer.
- C. Source quality-control reports.
- D. Field quality-control reports.

E. Sample warranty.

F. Product Certificates:

1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period. Where "prorated" is indicated, the boiler manufacturer will cover the indicated percentage of cost of replacement parts. With "prorated" type, covered cost decreases as age of equipment increases.

1. Warranty Period for Floor-Mounted Fire-Tube Condensing Boilers:

- a. Heat Exchanger and Tank: Free from defects in material and workmanship.
- b. Warranty Coverage: Heat exchanger ten (10) years, parts 18 months from date of Substantial Completion. Labor not included.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.
- C. ASHRAE/IES 90.1 Compliance: Boilers shall have minimum efficiency in accordance with Table 6.8.1-6 and other requirements in Ch. 6 of ASHRAE/IES 90.1.
- D. Mounting Base: For securing boiler to concrete base.

2.2 FLOOR-MOUNTED, FORCED-DRAFT, FIRE-TUBE CONDENSING BOILERS

A. Acceptable Manufacturers:
Cleaver-Brooks Series CFC-E

- B. Factory-fabricated, -assembled, and -tested, fire-tube, forced-draft, condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Units are to be for water-heating service only.
- C. Primary Heat Exchanger: Corrosion-resistant Duplex 316 stainless steel.
- D. Combustion Chamber and Flue Pipes: Corrosion-resistant stainless steel.
- E. Pressure Vessel: Carbon steel with welded heads and tube connections.
- F. Burner: Natural gas, forced draft.
- G. Blower: Centrifugal fan to operate during each burner-firing sequence and to prepurge and postpurge the combustion chamber.
 - 1. Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - a. Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.
- H. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
- I. Ignition: Direct-spark ignition or silicone carbide hot-surface ignition with 100 percent main-valve shutoff and electronic flame supervision.
- J. Casing:
 - 1. Jacket: Sheet metal, with snap-in or interlocking closures.
 - 2. Control Compartment Enclosures: NEMA 250, Type 1A.
 - 3. Finish: Baked-enamel, Powder-coated protective finish.
 - 4. Insulation: Minimum 2-inch-thick, mineral-fiber insulation surrounding the heat exchanger.
 - 5. Combustion-Air Connections: Inlet and vent duct collars.
- K. Capacities and Characteristics:
 - 1. Heating Medium: Hot water.
 - 2. Design Water-Pressure Rating: 125 psig.
 - 3. Safety Relief Valve Setting: TBD psig.
 - 4. Entering-Water Temperature: 120 deg F.
 - 5. Leaving-Water Temperature: 160 deg F.
 - 6. Design Water Flow Rate: See Drawings.
 - 7. Minimum Water Flow Rate: See Drawings.

8. Design Pressure Drop: 5 psig.
9. AGA Input: See Drawings.
10. Gas Input: See Drawings.
11. AGA Output Capacity: See Drawings.
12. Electrical Characteristics:
 - a. Volts: See Drawings.
 - b. Phase: See Drawings.
 - c. Hertz: 60 Hz.
 - d. Full-Load Amperes: See Drawings.
 - e. Minimum Circuit Ampacity: See Drawings.
 - f. Maximum Overcurrent Protection: See Drawings.

2.3 TRIM - FOR HOT-WATER BOILERS

- A. Include devices sized to comply with ASME B31.1.
- B. Aquastat Controllers: Operating, firing rate, and high limit with manual reset.
- C. Safety Relief Valve: ASME rated.
- D. Pressure and Temperature Gauge: Minimum 3-1/2-inch- diameter, combination water-pressure and -temperature gauge. Gauges shall have operating-pressure and -temperature ranges, so normal operating range is about 50 percent of full range.
- E. High and low gas-pressure switches.
- F. Alarm bell with silence switch.
- G. Boiler Air Vent: Automatic.
- H. Drain Valve: Minimum NPS 3/4 hose-end gate valve.

2.4 CONTROLS

- A. CMID / EGA will provide controls design and sequence of operation.
- B. Boiler operating controls shall include the following devices and features:
 1. Control transformer.
 2. Set-Point Adjust: All set points shall be adjustable.
 3. Electric, factory-fabricated and factory-installed panel to modulate burner and control burner-firing rate to maintain supply water temperature.

- a. Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and to provide equal runtime for boilers.
- C. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.
 - 1. High Cutoff: Manual reset stops burner if operating conditions rise above maximum boiler design temperature.
 - 2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual-reset type.
 - 3. Blocked Inlet Safety Switch: Manual-reset pressure switch factory mounted on boiler combustion-air inlet.
 - 4. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.
- D. Building Automation System Interface: Work to be performed by EGA.

2.5 ELECTRICAL POWER

- A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are shown on Drawings and specified in electrical Sections.
- B. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

2.6 VENTING KITS

- A. Kit: Complete system, ASTM A959, Type 29-4C stainless steel pipe, vent terminal, thimble, indoor plate, vent adapter, condensate trap and dilution tank, and sealant.
- B. Combustion-Air Intake: Complete system, stainless steel pipe, vent terminal with screen, inlet air coupling, and sealant.

2.7 CONDENSATE-NEUTRALIZATION UNITS

- A. Provided by Boiler Manufacturer.

2.8 SOURCE QUALITY CONTROL

- A. UL Compliance: Test gas-fired boilers having input of more than 400,000 Btu/h for compliance with UL 795. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

- B. UL Compliance, Gas-Fired: Test gas-fired boilers for compliance with UL 2764. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.
- C. Performance Testing: Test and label boilers for efficiency to comply with AHRI 1500.
- D. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
- E. Test and inspect factory-assembled boilers, before shipping, in accordance with 2017 ASME Boiler and Pressure Vessel Code. Factory test boilers for safety and functionality; fill boiler with water, and fire throughout firing range, to prove operation of all safety components.

PART 3 - EXECUTION

3.1 BOILER INSTALLATION

- A. Equipment Mounting:
 - 1. Install floor-mounted boiler on existing cast-in-place concrete equipment base(s). Retain one of two subparagraphs below.
 - 2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- B. Install gas-fired boilers according to NFPA 54.
- C. Assemble and install boiler trim.
- D. Install electrical devices furnished with boiler but not specified to be factory mounted.
- E. Install control wiring to field-mounted electrical devices.

3.2 PIPING CONNECTIONS

- A. Comply with requirements for hydronic piping specified in Section 232113 "Hydronic Piping."
- B. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Section 232116 "Hydronic Piping Specialties."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. When installing piping adjacent to boiler, allow space for service and maintenance of condensing boilers. Arrange piping for easy removal of condensing boilers.

- E. Install condensate drain piping to condensate-neutralization unit and from neutralization unit to nearest floor drain. Piping shall be at least full size of connection. Install piping with a minimum of 2 percent downward slope in direction of flow.
- F. Install condensate piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Install piping with a minimum of 2 percent downward slope in direction of flow.
- G. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.
- H. Connect hot-water piping to supply- and return-boiler tapings with shutoff valve, and union or flange at each connection.
- I. Install piping from safety relief valves to nearest floor drain.

3.3 DUCT CONNECTIONS

- A. Boiler Venting:
 - 1. Install flue-venting kit and combustion-air intake.
 - 2. Comply with all boiler manufacturer's installation instructions.
 - 3. Field fabricate and install boiler vent and combustion-air intake.
 - 4. Utilize vent and intake duct material, size, and configuration as indicated in boiler manufacturer's instructions and to comply with UL 1738.
 - 5. Comply with all boiler manufacturer's installation instructions.
 - 6. Connect boiler vent full size to boiler connections.
 - 7. Comply with requirements in Section 235123 "Gas Vents."
 - 8. Comply with all boiler manufacturer's installation instructions.

3.4 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 - 1. Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

3.5 CONTROL CONNECTIONS

- A. To be provided by EGA.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency, Owner: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Testing Agency, Contractor: Engage a qualified testing agency to perform tests and inspections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative:
- D. Tests and Inspections:
 - 1. Perform installation and startup checks in accordance with manufacturer's written instructions.
 - 2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
 - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- E. Boiler will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

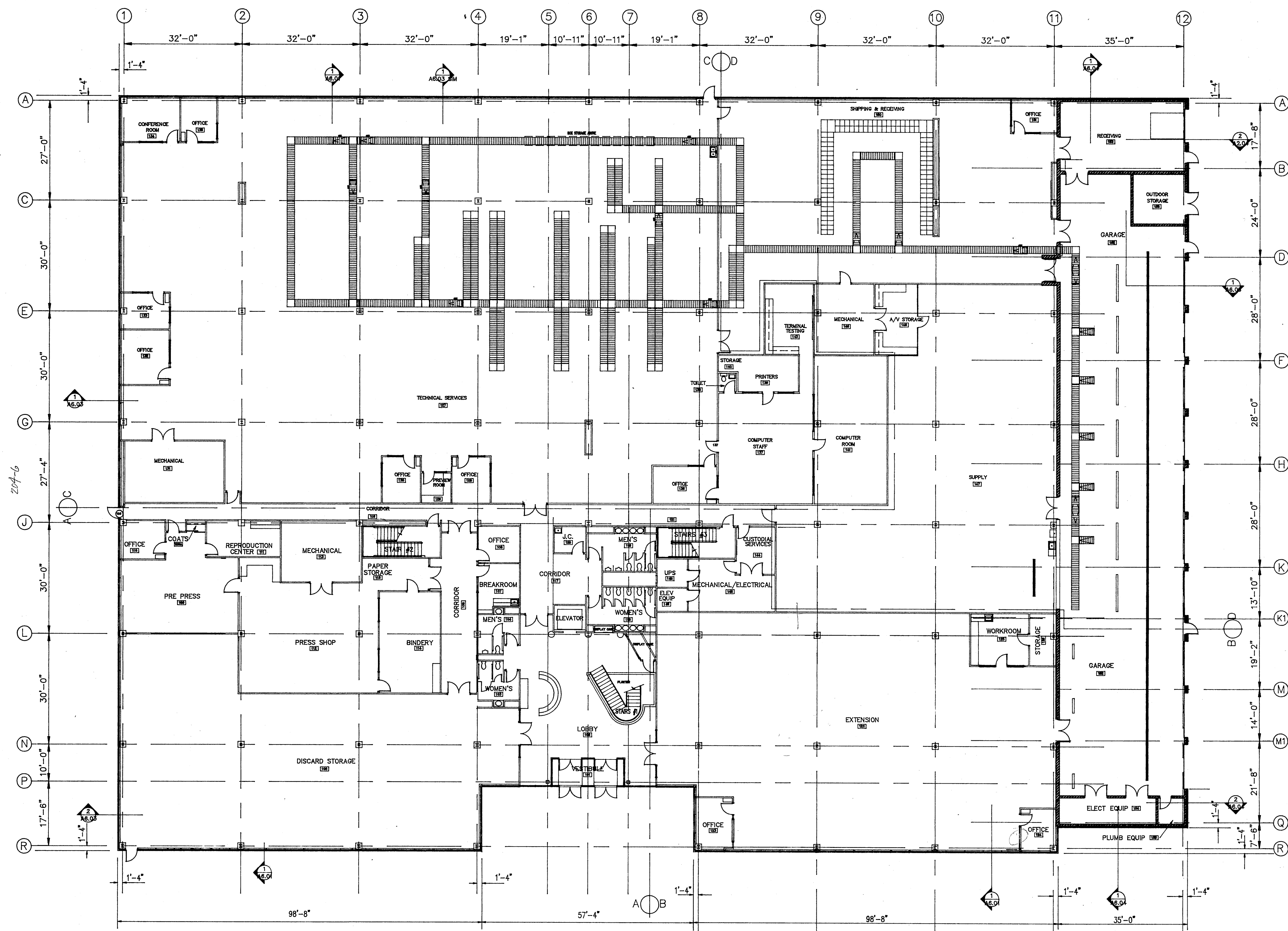
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boiler.
 - 1. Instructor shall be factory trained and certified.
 - 2. Provide not less than two hours of training.
 - 3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
 - 4. Provide instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.

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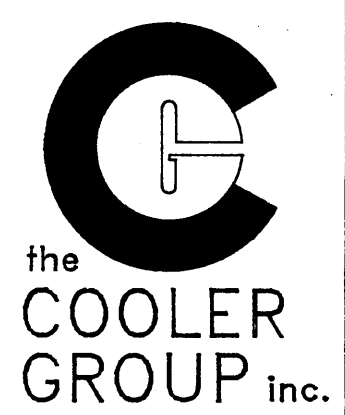
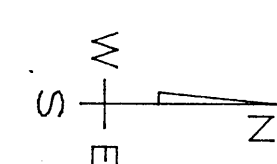
23 52 16
CONDENSING BOILERS

5. Obtain Owner sign-off that training is complete.
6. Owner training shall be held at Project site.

END OF SECTION 23 52 16



OVERALL FIRST FLOOR PLAN
SCALE: 1/16"=1'-0"



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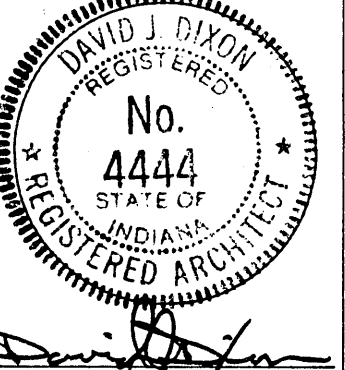
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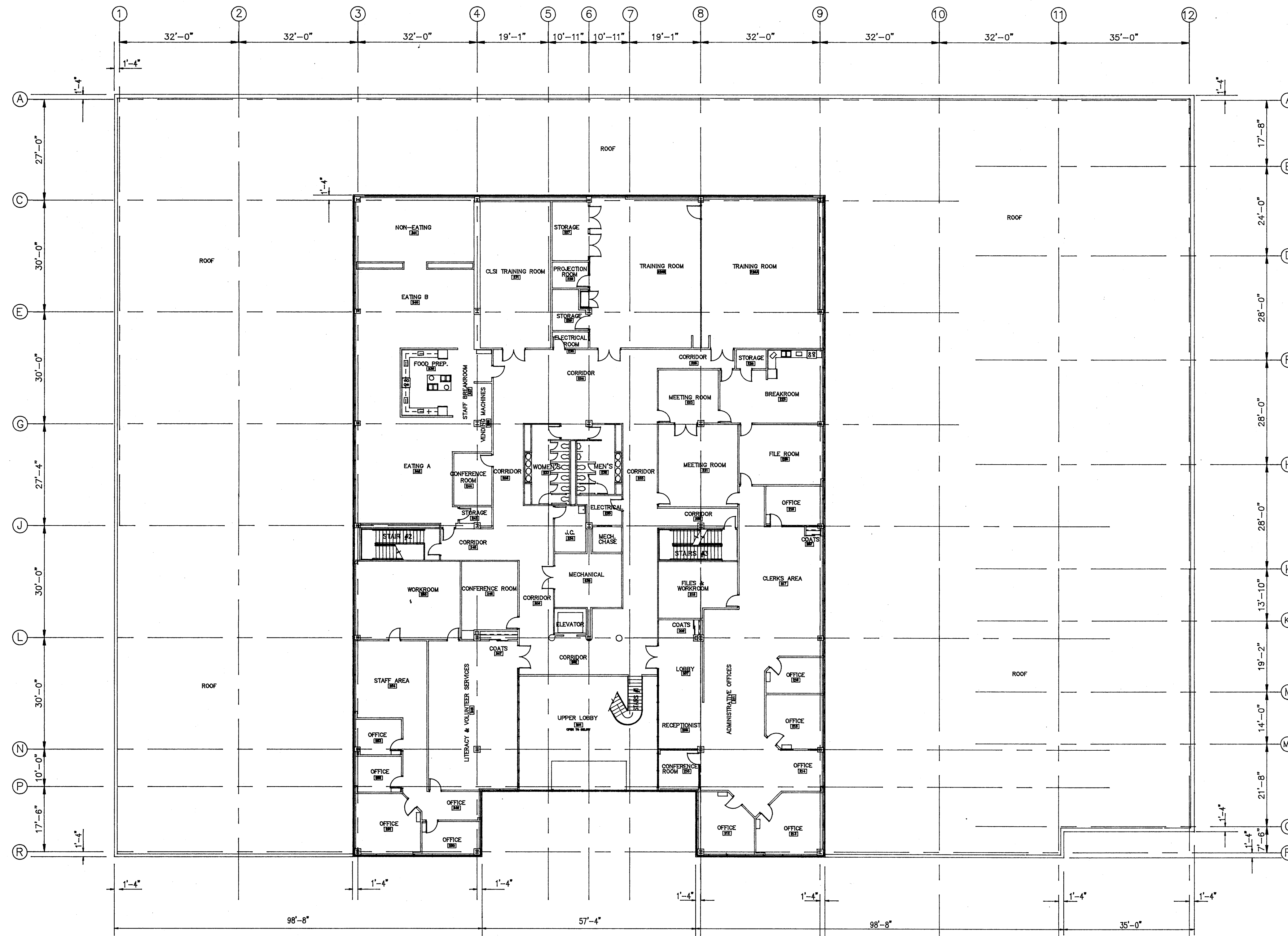
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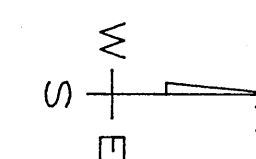
OVERALL
FIRST FLOOR PLAN

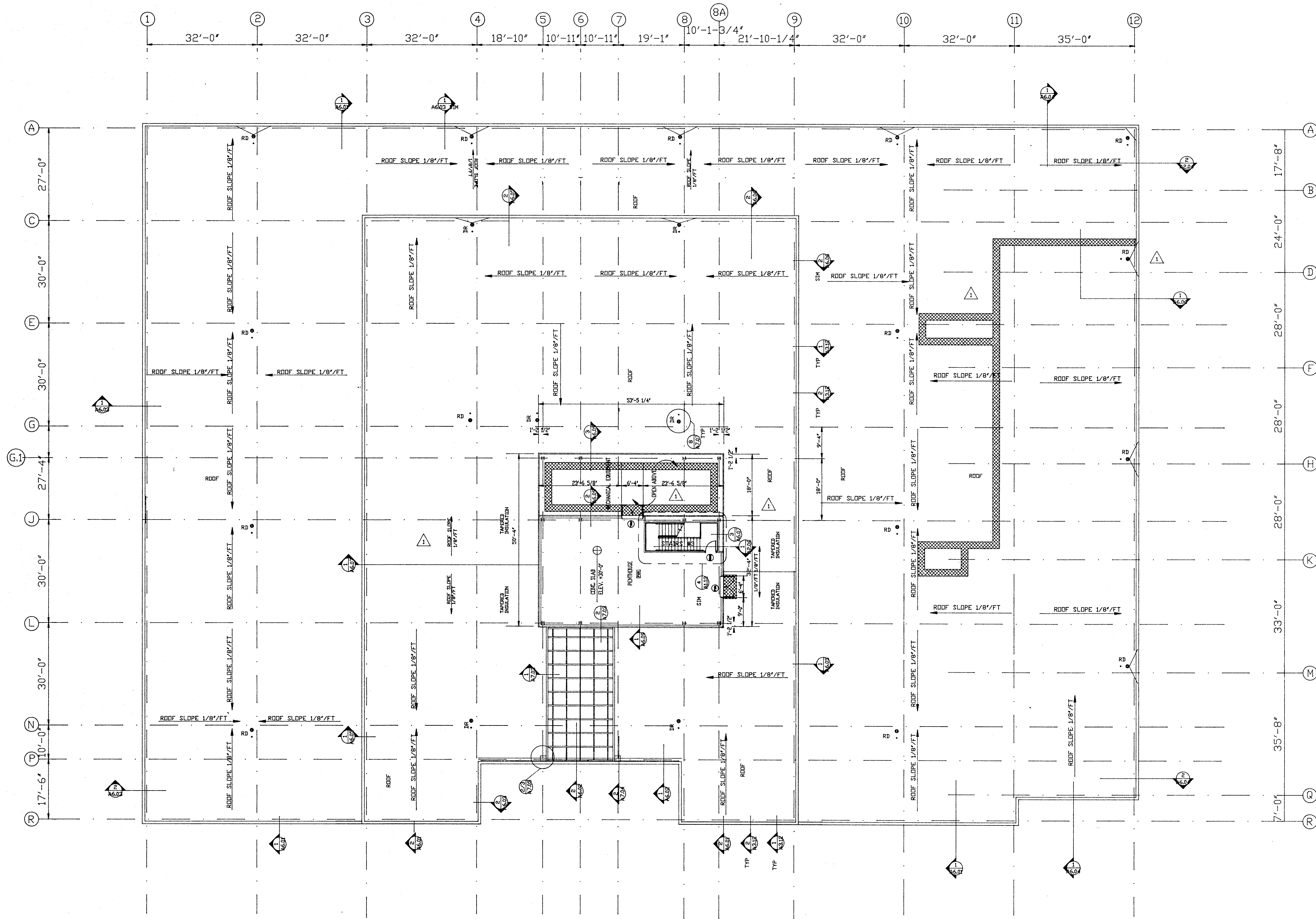
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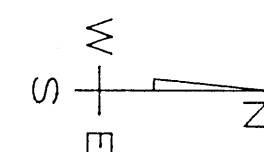


OVERALL SECOND FLOOR PLAN
SCALE: 1/16"=1'-0"





ROOF/PENTHOUSE PLAN
SCALE: 1/16"=1'-0"



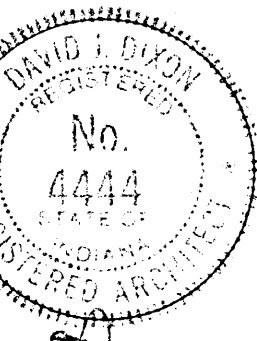
1. SEE MECHANICAL, ELECTRICAL
AND PLUMBING DRAWINGS
FOR ROOF PENETRATIONS

2. SEE SHEET A7.07 FOR
TYPICAL ROOF PENETRATIONS
FLASHING DETAILS



ROOF WALK PADS - INSTALL AS
INDICATED, COORDINATE LOCATION AND
AREA WITH MECHANICAL EQUIPMENT.

CERTIFIED BY:



DATE:	DRAWN BY:
6/20/91	LWC
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ACCT. NO.:	CHECKED BY:
P1090	DJD

REVISIONS

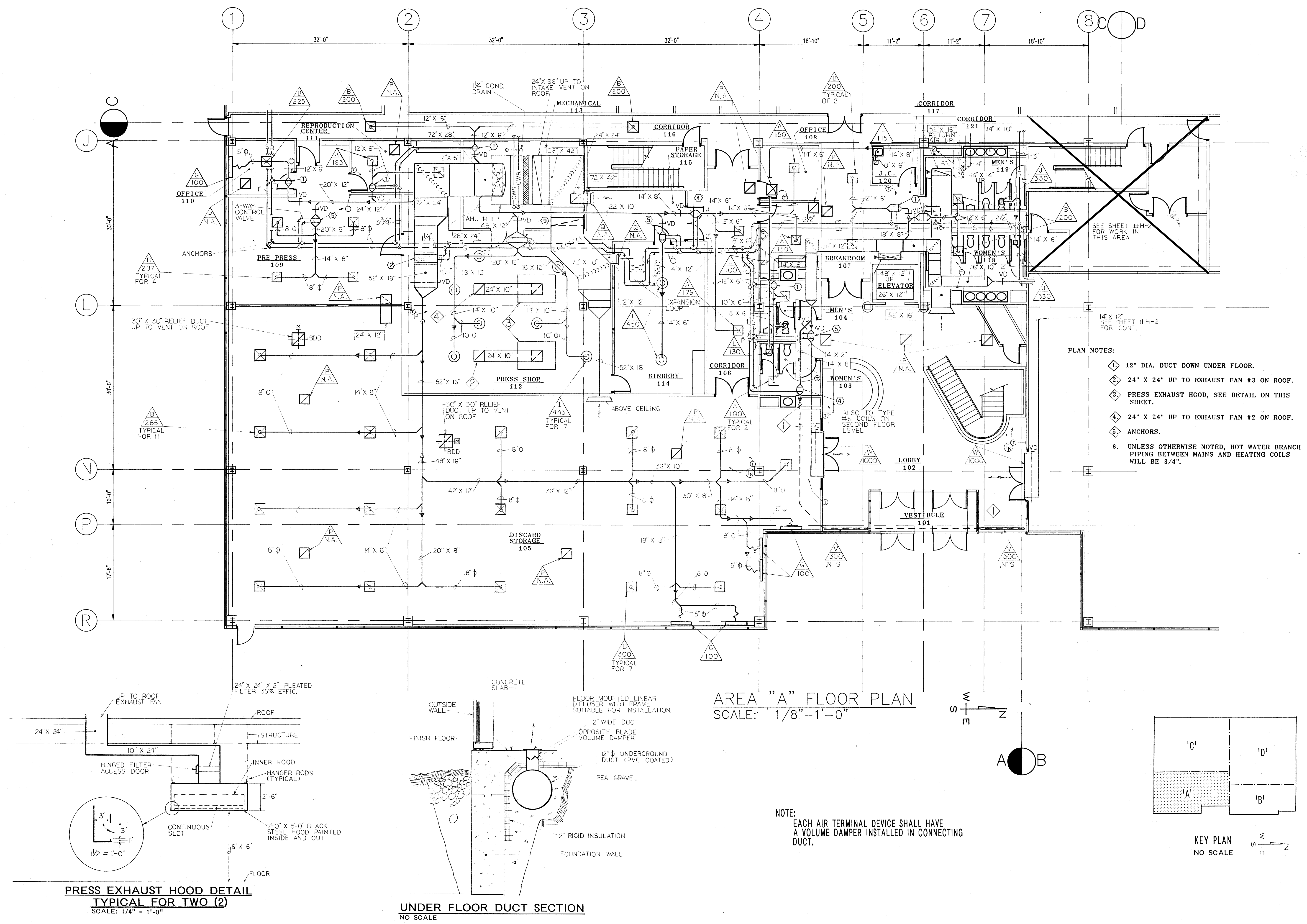
1	WALK PADS, TAPERED INSUL.
2	ROOF DRAIN
	7/11/91

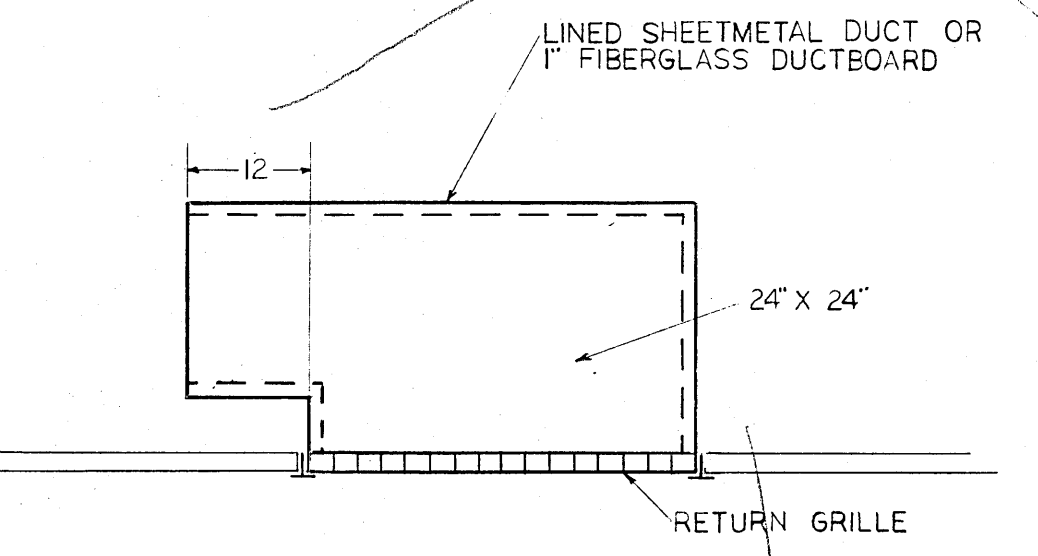
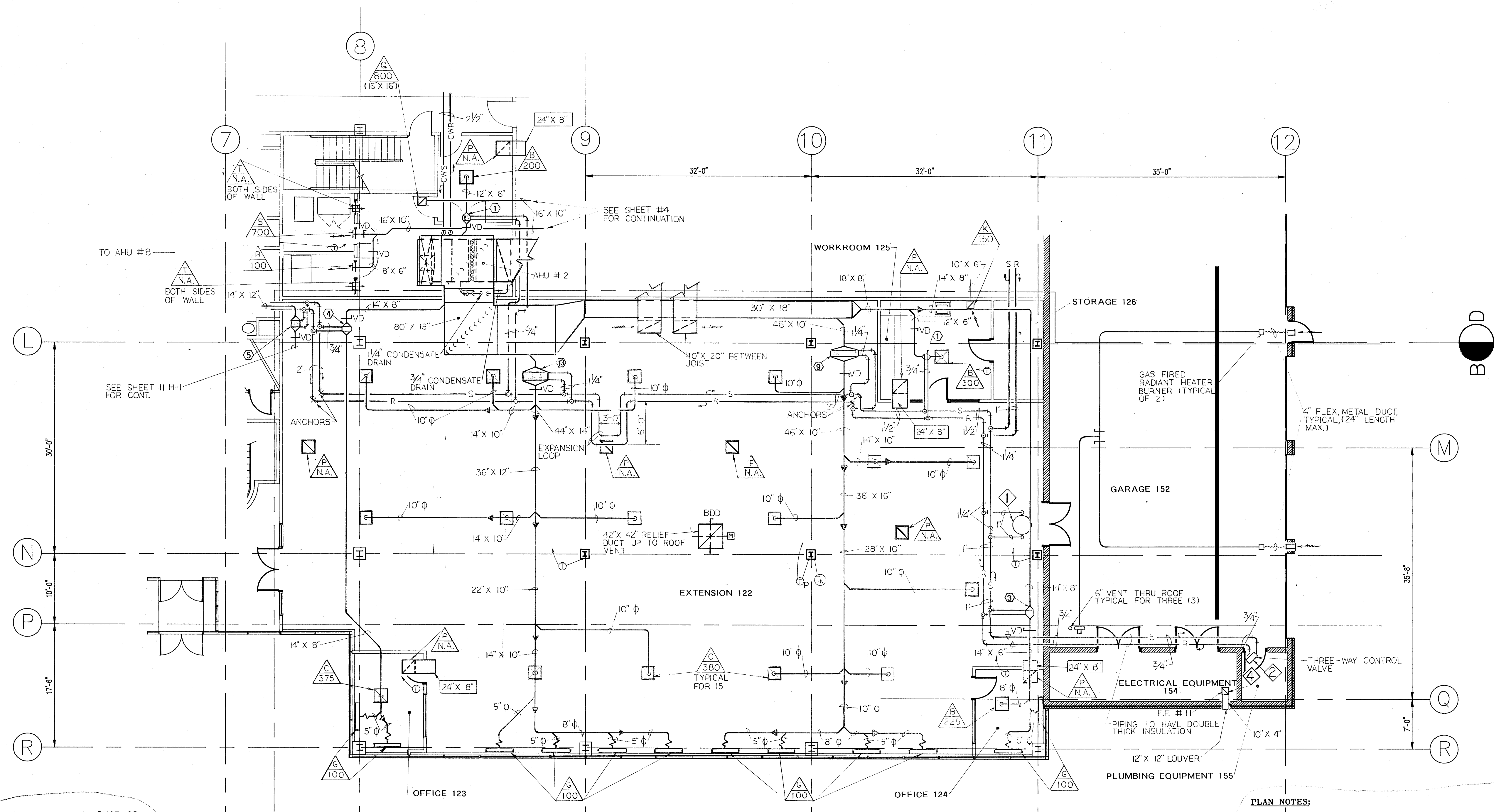
ROOF PLAN
&
PENTHOUSE PLAN

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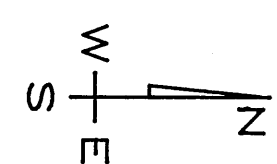




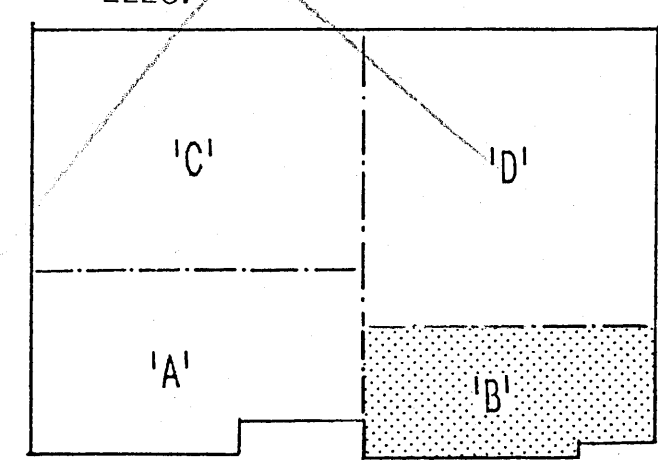
RETURN GRILLE "SOUND HAT" DETAIL
NO SCALE

NOTE:
INSTALL SOUND HAT ON ALL RETURN GRILLE
EXCEPT THOSE IN ROOMS 102, 105, 122, 127, 147 & 150.

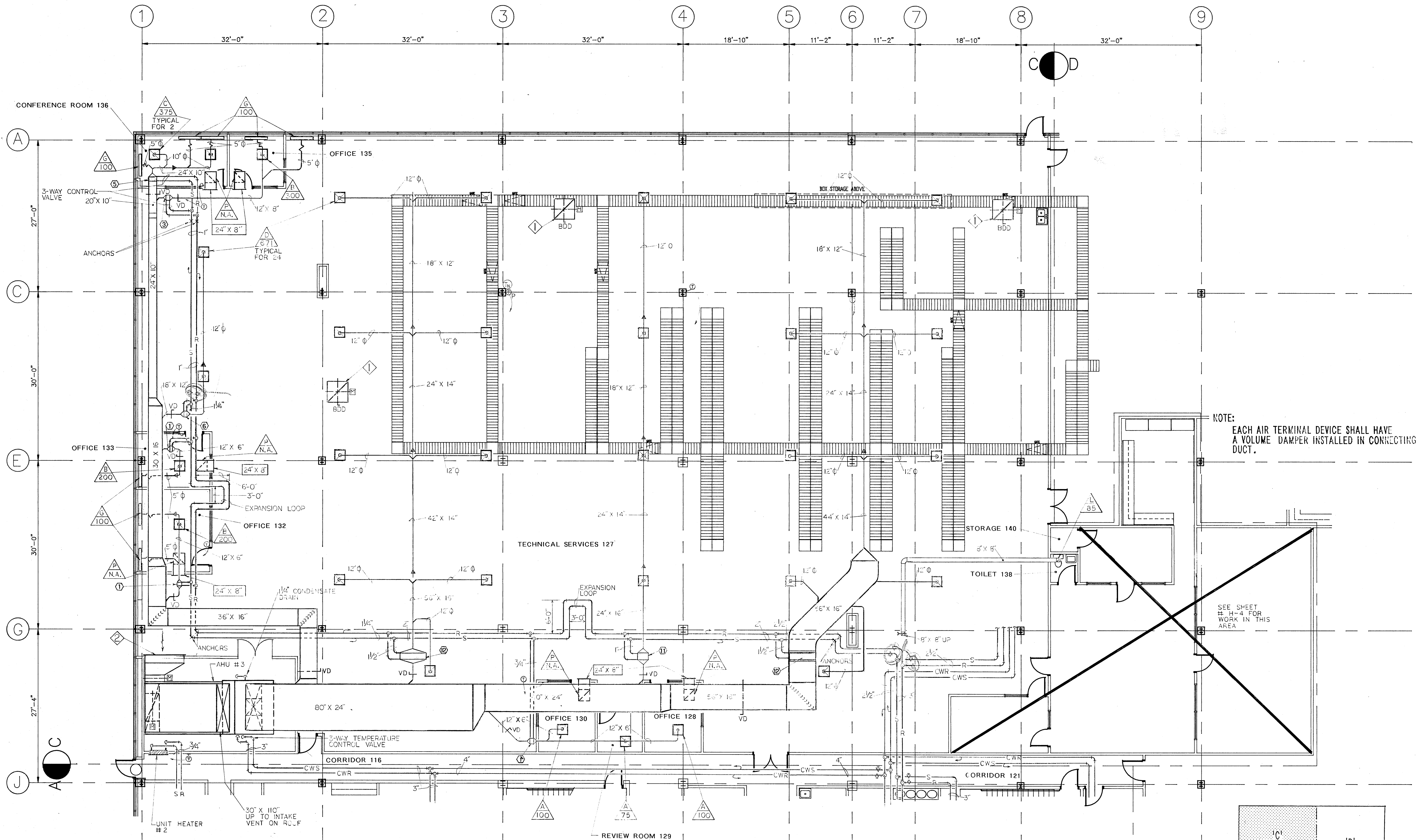
AREA "B" FLOOR PLAN
SCALE: 1/8"=1'-0"



- PLAN NOTES:
- UNIT HEATER #5 ABOVE 2 PANELS 2' X 4' ALUMINUM EGG CRATE GRILLE, SEE DETAIL.
 - UNIT HEATER #6, PROVIDE THREE-WAY VALVE TO MAINTAIN CONSTANT FLOW IN PIPING.
 - UNLESS OTHERWISE NOTED, HOT WATER BRANCH PIPING BETWEEN MAINS AND HEATING COILS WILL BE 3/4".
 - COORDINATE EXH. FAN #11 LOCATION WITH ELEC.



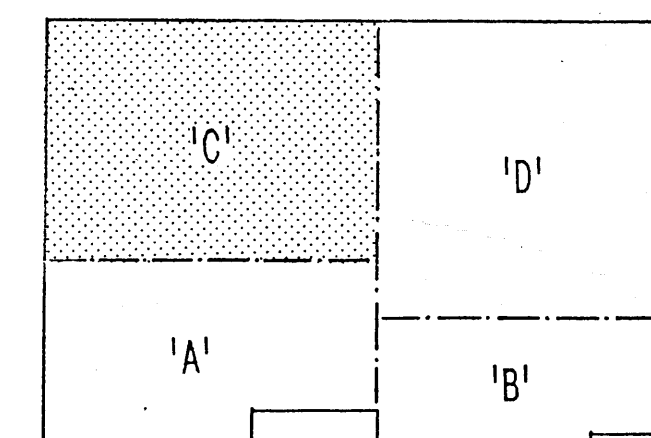
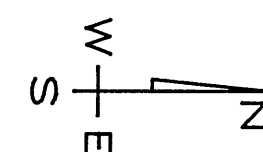
KEY PLAN
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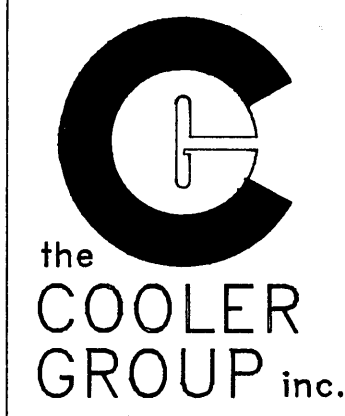
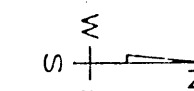
PLAN NOTES:

1. 42" X 42" RELIEF DUCT UP TO VENT ON ROOF.
2. 72" X 72" RETURN AIR GRILLE GYM TYPE - HEAVY DUTY, BOTTOM @ +6" A.F.F.
3. UNLESS OTHERWISE NOTED, HOT WATER BRANCH PIPING BETWEEN MAINS AND HEATING COILS WILL BE 3/4".

AREA "C" FLOOR PLAN
SCALE: 1/8"=1'-0"



KEY PLAN
NO SCALE

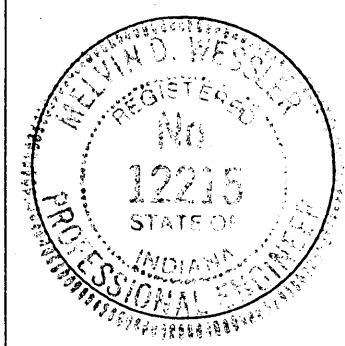


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PLUMBING, HVAC & ELECTRICAL ENGINEERS

A D & S, Inc.
Consulting Mechanical & Electrical Engineers
5342 Elmwood Avenue
Suite A
Indianapolis, IN 46203

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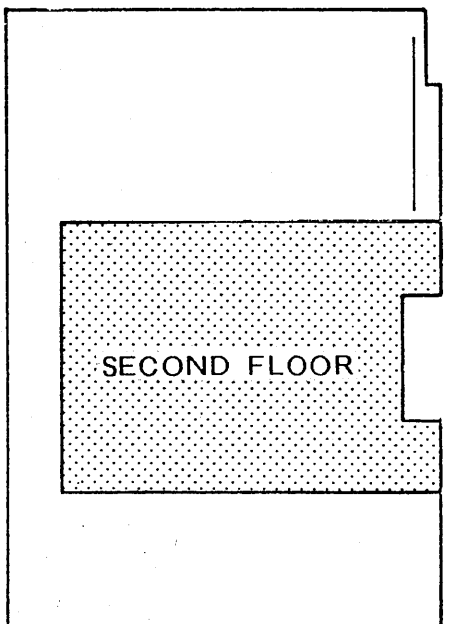
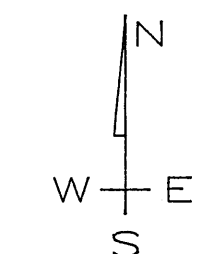
PLAN NOTES:

1. 14" X 14" UP AND DOWN.
2. 8" X 8" UP TO EXHAUST FAN #4 ON ROOF.
3. UP TO EXHAUST FAN #5 ON ROOF.
4. 12" X 12" UP TO EXHAUST FAN #7 ON ROOF.
5. 24" X 10" INSULATED SLEEVE ABOVE CEILING FOR RETURN AIR.
6. 48" X 12" INSULATED SLEEVE ABOVE CEILING FOR RETURN AIR.
7. 42" X 42" DUCT UP TO VENT ON ROOF.
8. UP TO EXHAUST FAN #8 ON ROOF.
9. UP TO EXHAUST FAN #10 ON ROOF.
10. UNLESS OTHERWISE NOTED HOT WATER BRANCH PIPING BETWEEN MAINS AND HEATING COILS WILL BE 3/4".
11. UNLESS OTHERWISE NOTED, RETURN AIR GRILLES INDICATED ON THIS DRAWING SHALL BE TYPE "P".
12. 22" X 12" UP TO PENTHOUSE.
13. 22" X 12" DOWN FROM PENTHOUSE.
14. PROVIDE 3-WAY TEMPERATURE CONTROL VALVE.

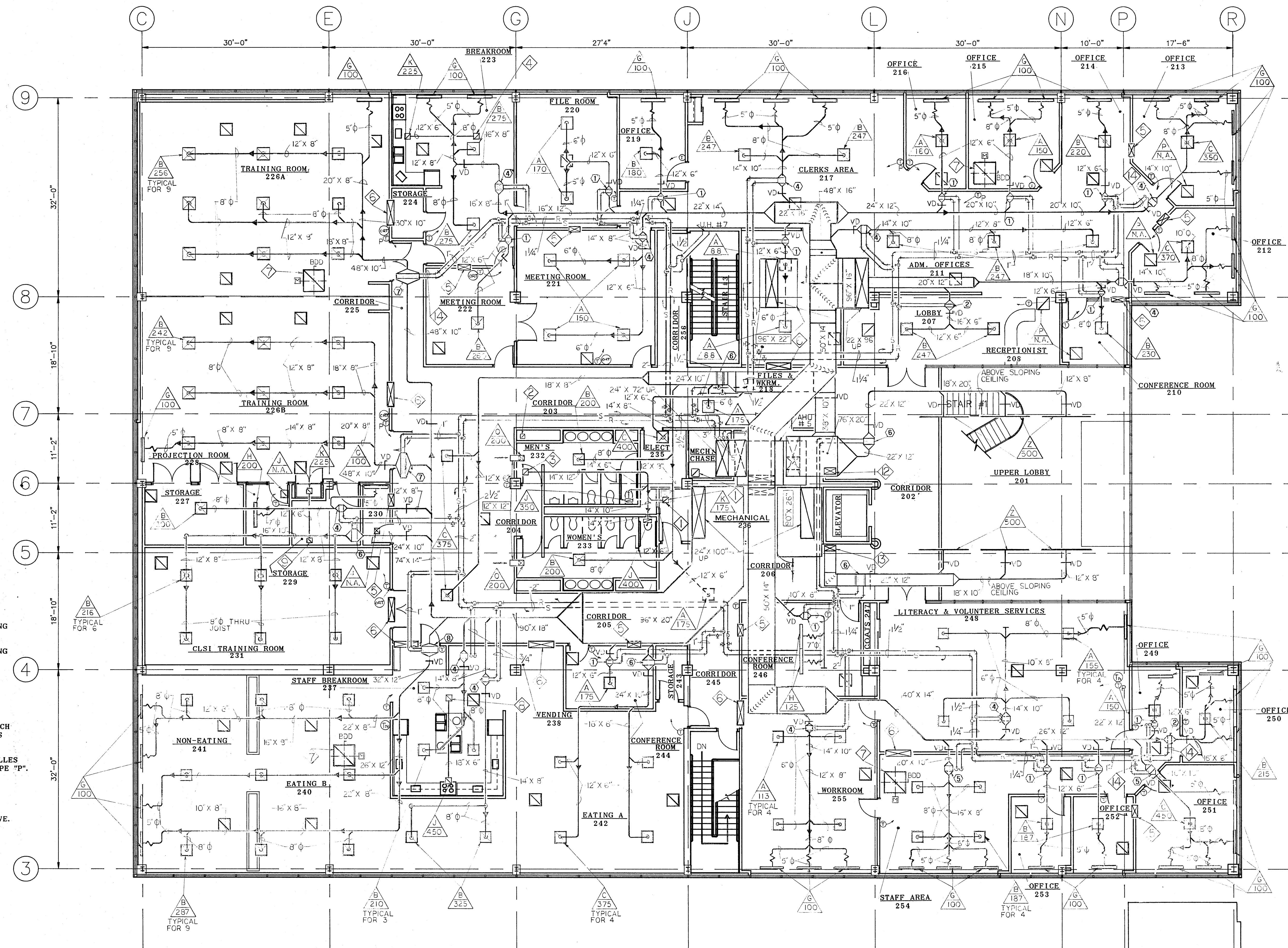
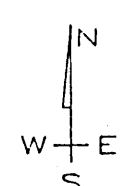
NOTE:
EACH AIR TERMINAL DEVICE SHALL HAVE A VOLUME DAMPER INSTALLED IN CONNECTING DUCT.

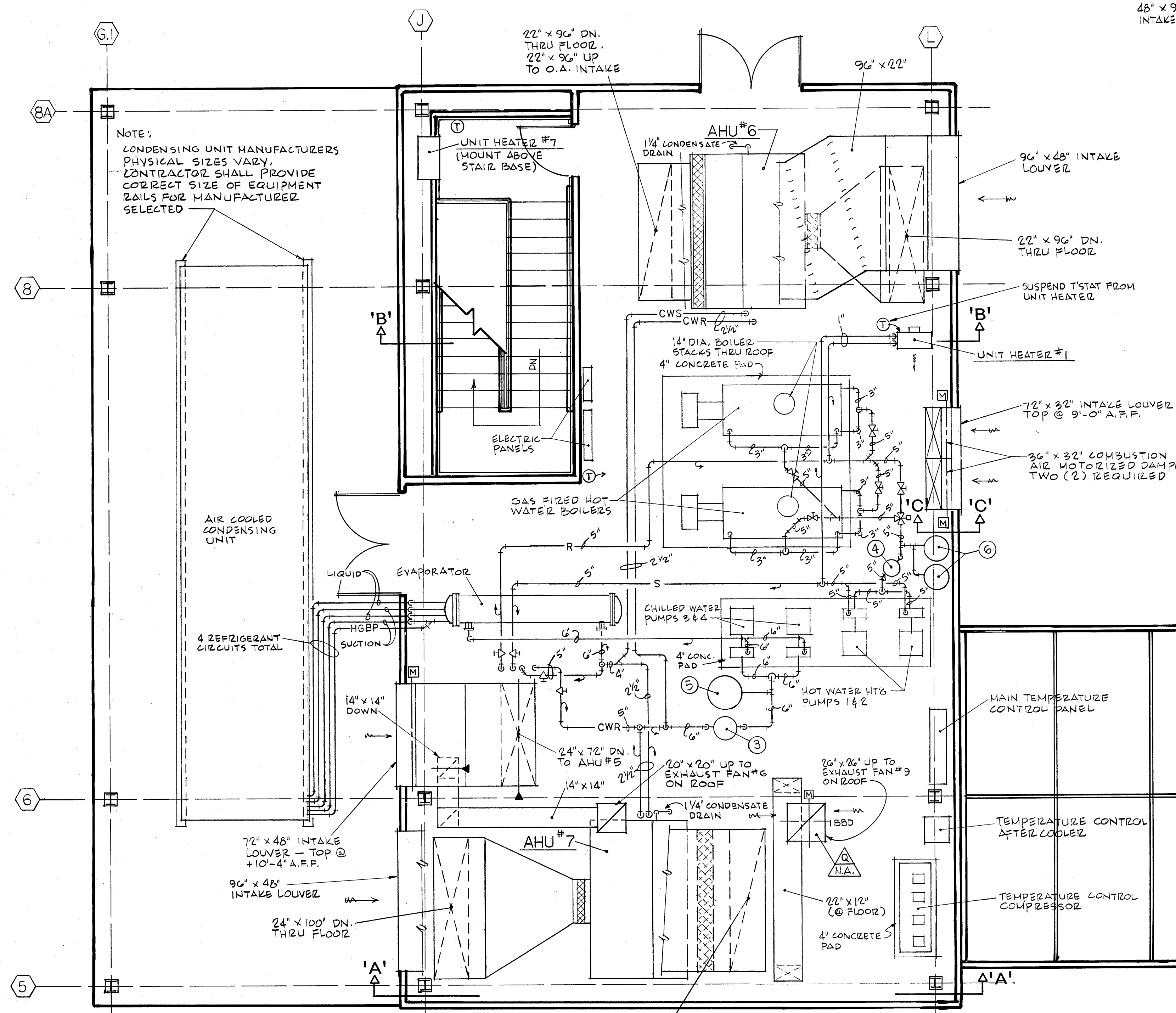
SECOND FLOOR PLAN

SCALE: 1/8"=1'-0"



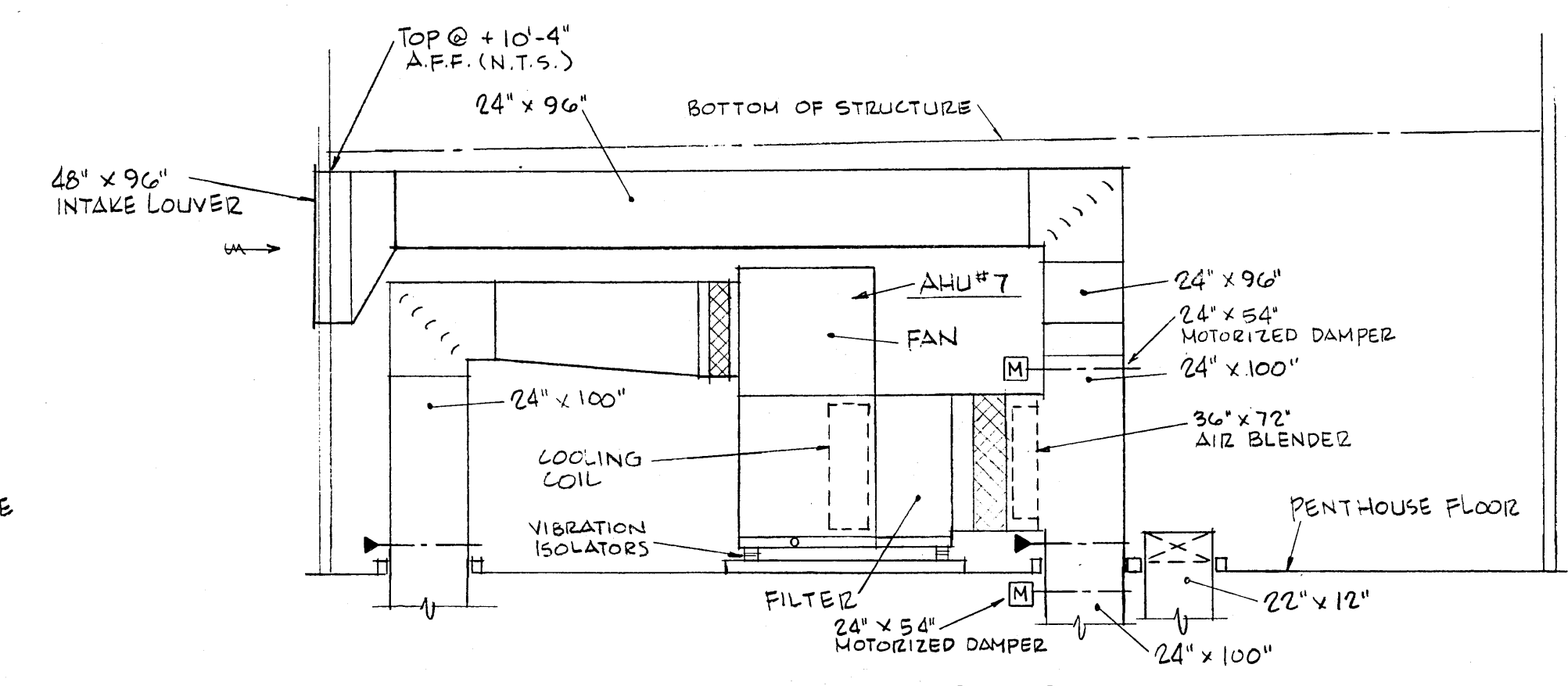
KEY PLAN
NO SCALE



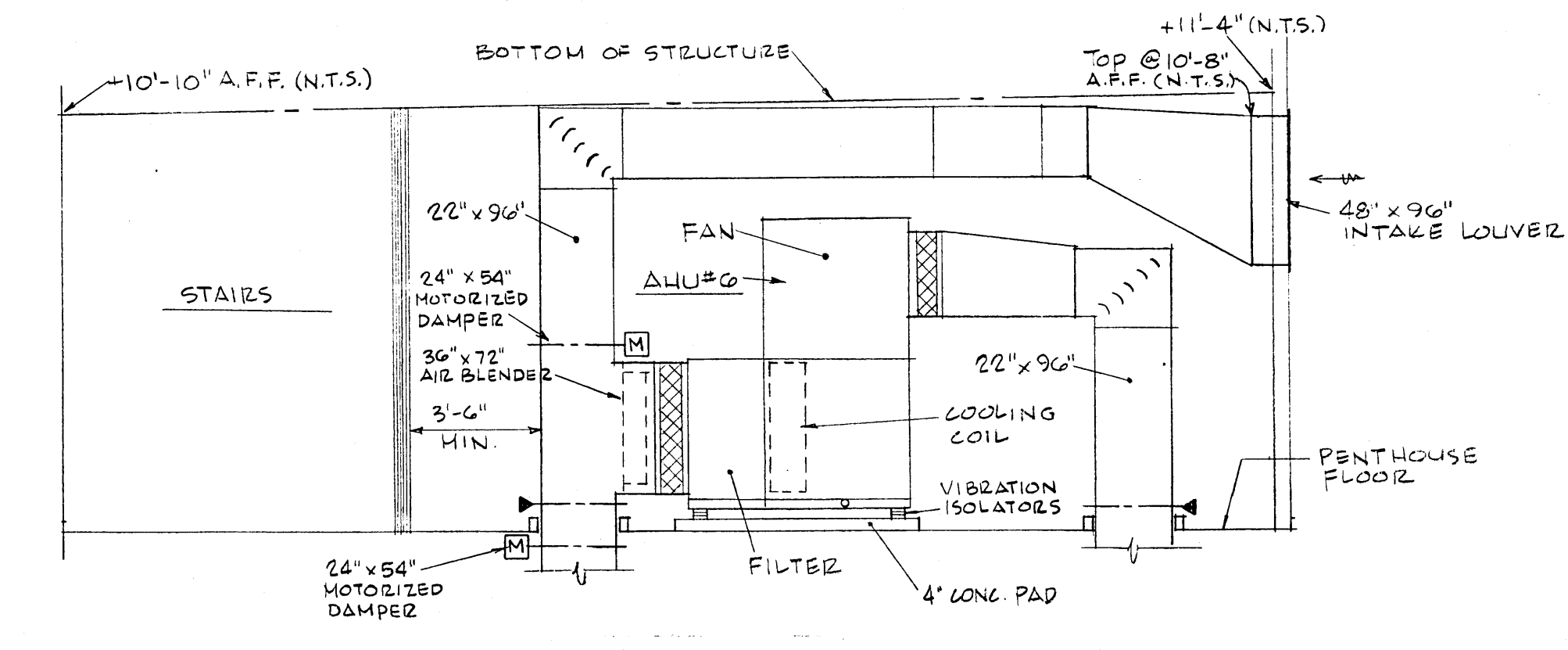


PENTHOUSE PLAN
SCALE: 1/4" = 1'-0"

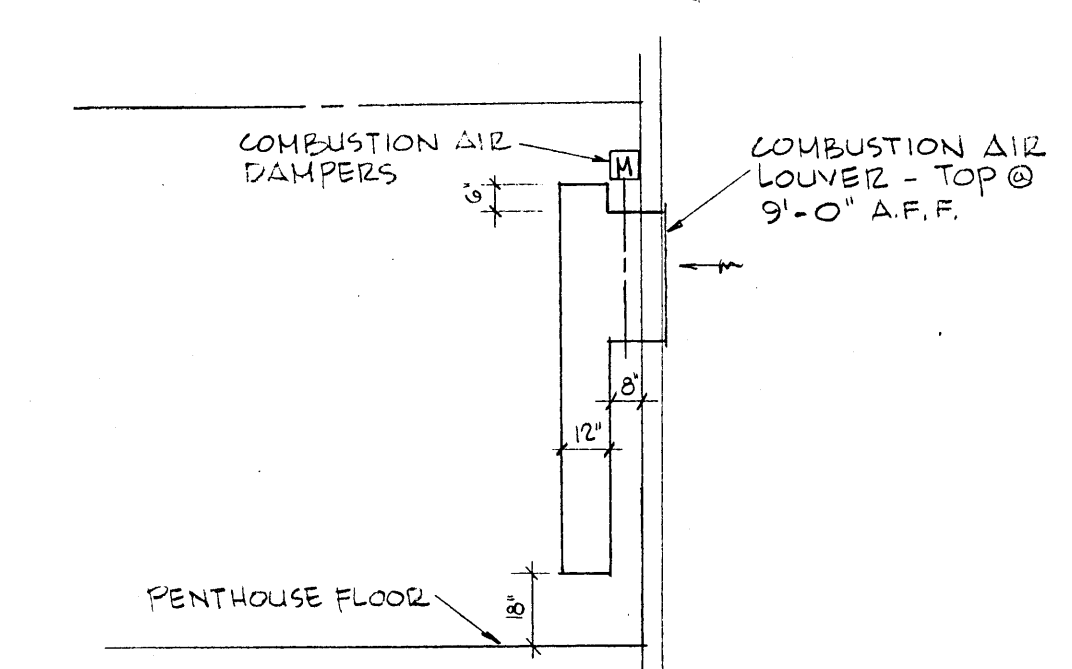
- NOTES:**
1. PROVIDE 4" HIGH (MIN) CURBS AROUND ALL DUCT AND PIPE OPENINGS THRU FLOOR.
 2. MOUNT BASEMOUNTED PUMPS ON SPRING VIBRATION ISOLATORS.
 3. AIR SEPARATOR LIKE TACO MODEL NO. AC6.
 4. AIR SEPARATOR LIKE TACO MODEL NO. AC5.
 5. EXPANSION TANK LIKE TACO MODEL NO. CAX 30.
 6. EXPANSION TANK LIKE TACO MODEL NO. CAX 425.



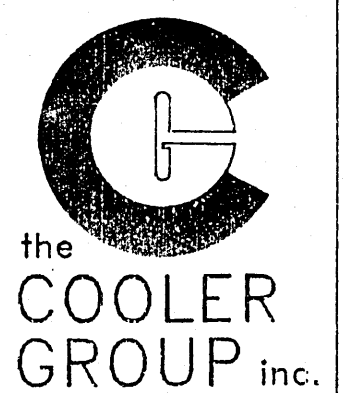
SECTION 'A-A'
SCALE: 1/4" = 1'-0"



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



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



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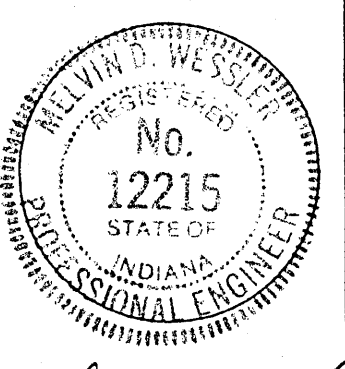
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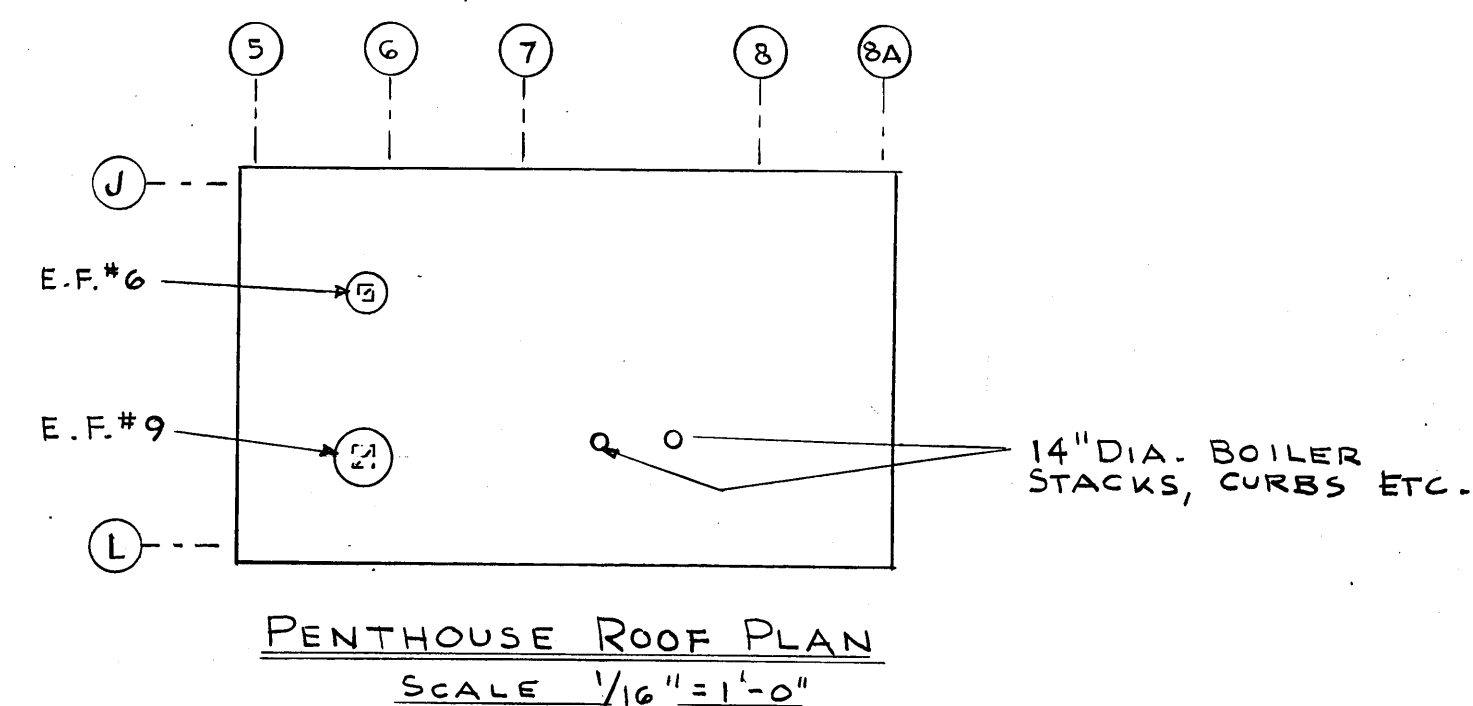
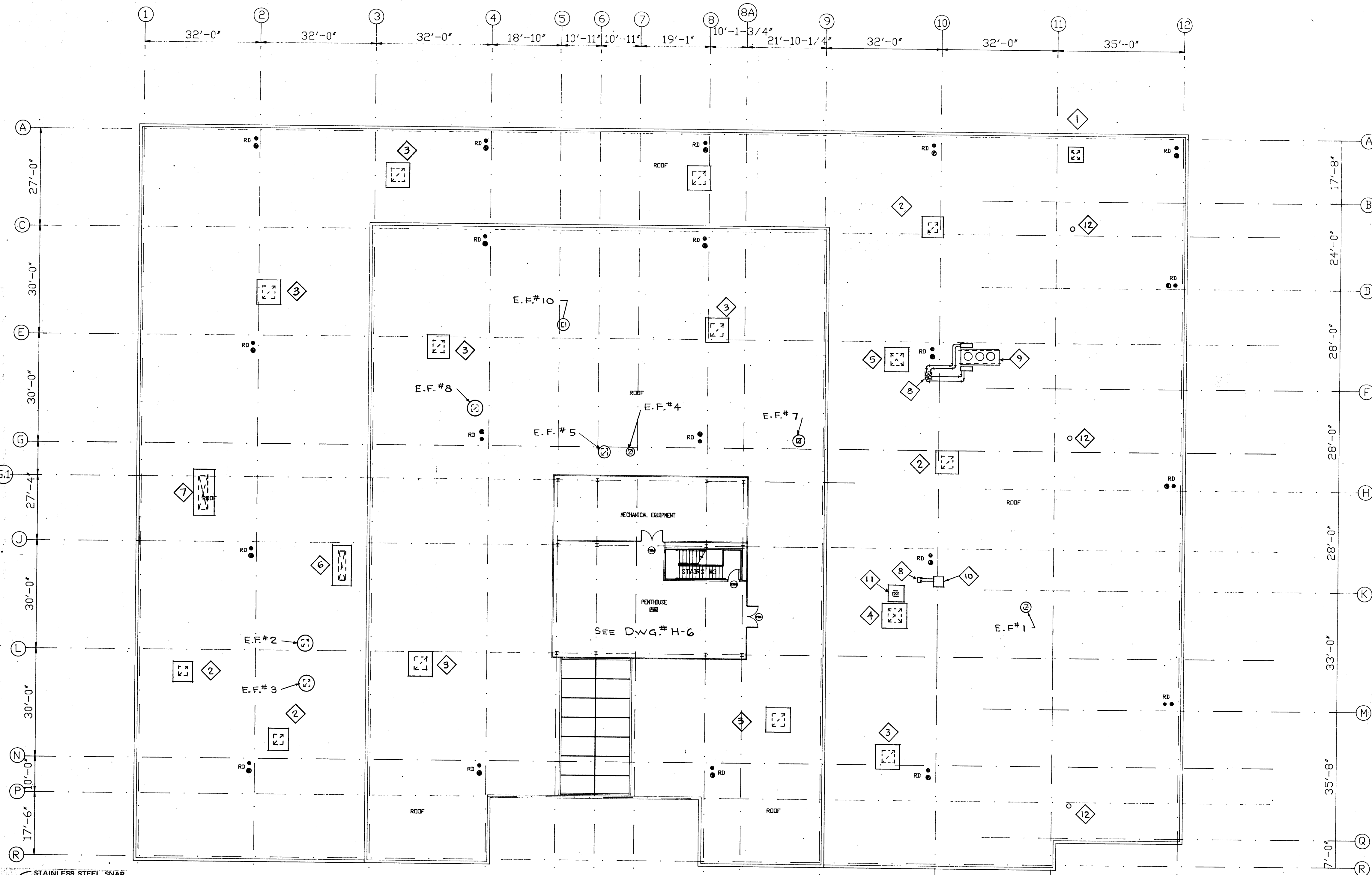
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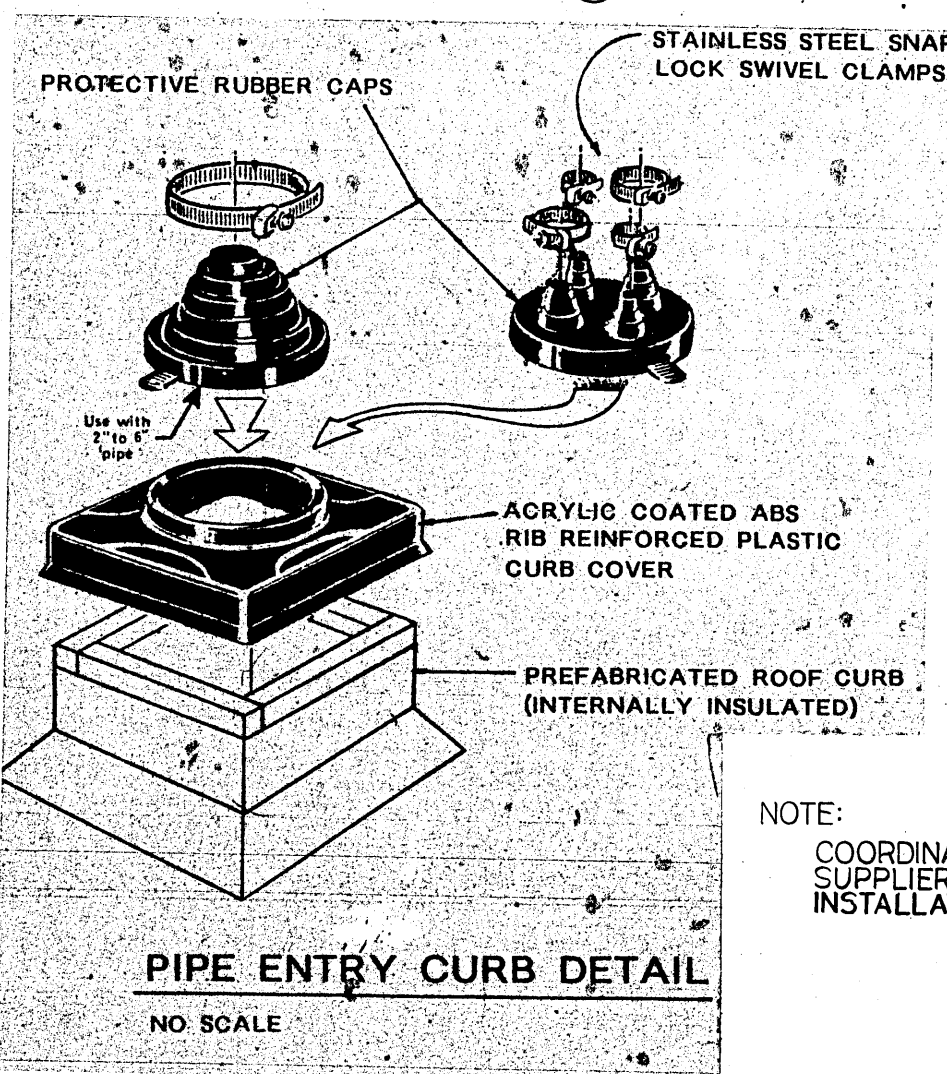
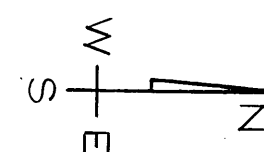
SHEET

H-6

OF 10



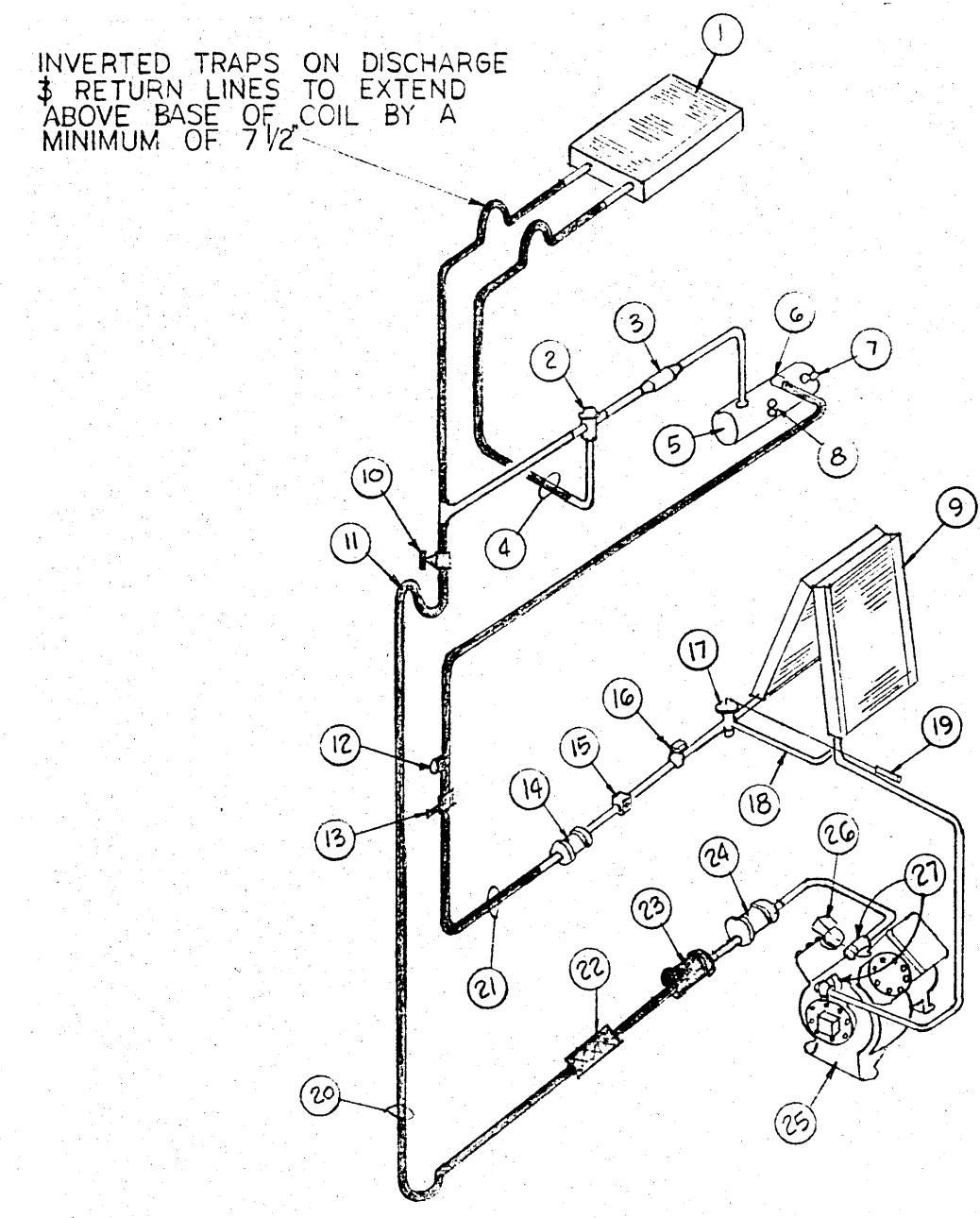
**ROOF PLAN
PENTHOUSE PLAN**
SCALE: 1/16"=1'-0"



NOTE: COORDINATE WITH ROOFING SUPPLIER FOR ACCEPTABLE INSTALLATION.

PLAN NOTES:

- 1 INTAKE VENT AND CURB FOR AHU#9 (28" X 28" DUCT).
- 2 RELIEF VENT AND CURB 30" X 30" DUCT.
- 3 RELIEF VENT AND CURB 42" X 42" DUCT.
- 4 INTAKE VENT AND CURB FOR AHU#2 (42" X 42" DUCT).
- 5 INTAKE VENT AND CURB FOR AHU#4 (42" X 42" DUCT).
- 6 INTAKE VENT AND CURB FOR AHU#1 (24" X 96" DUCT).
- 7 INTAKE VENT AND CURB FOR AHU#3 (30" X 110" DUCT).
- 8 PIPE ENTRY PORTALS.
- 9 COMPUTER ROOM AIR COOLED CONDENSER INSTALLED ON EQUIPMENT MOUNTING RAILS.
- 10 CONDENSING UNIT FOR AHU#8 INSTALLED ON EQUIPMENT MOUNTING RAILS.
- 11 INTAKE VENT AND CURB FOR AHU#8 (16" X 16" DUCT).
- 12 6" FLUE AND VENT CAP FOR RADIANT HEATER, PROVIDE CURB, FLASHING, ETC.

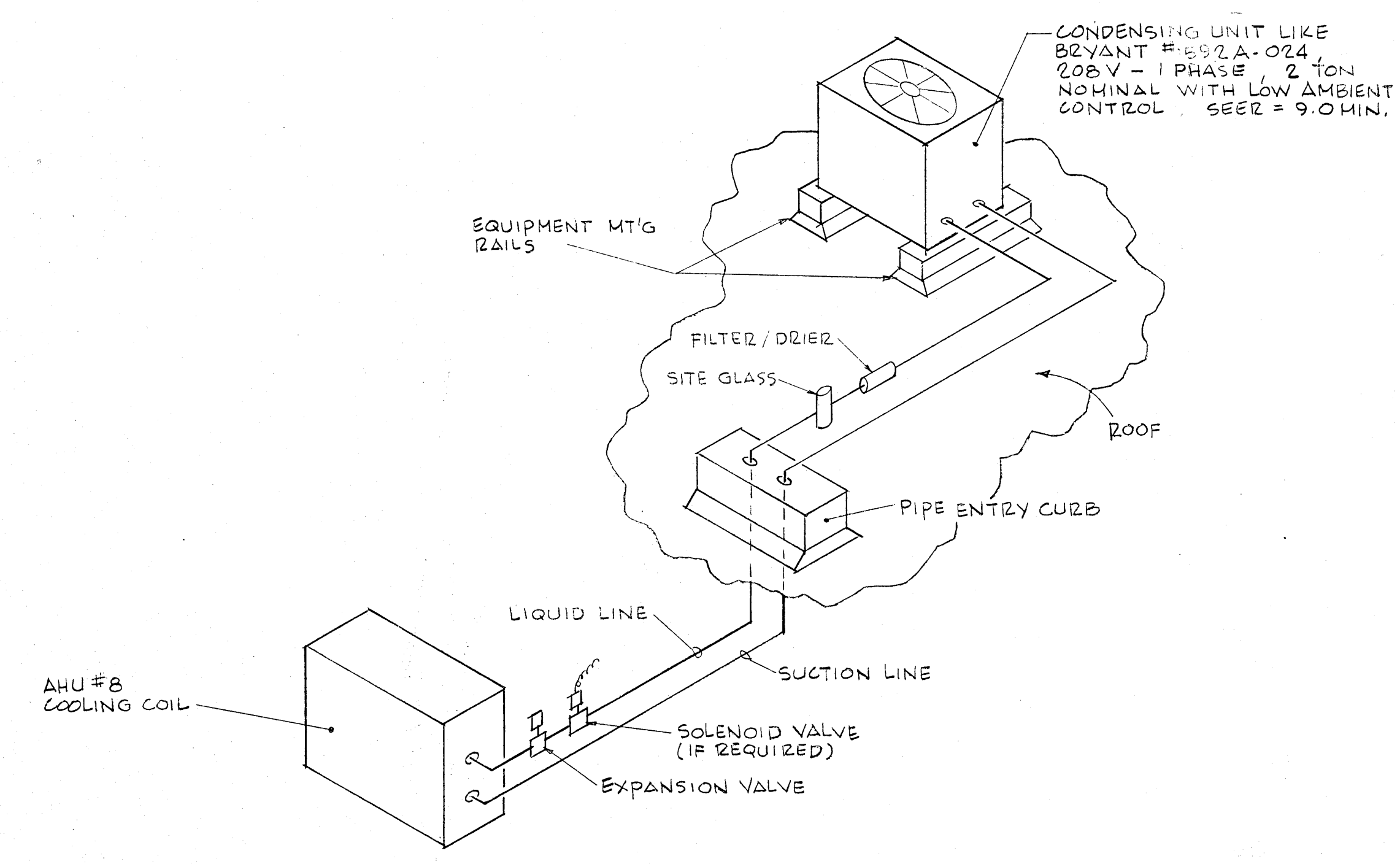


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| 3. CHECK VALVE | 17. EXPANSION VALVE |
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| 10. HOT GAS SHUT-OFF VALVE (MUELLER EXTENDED TIP) | 24. MUFFLER |
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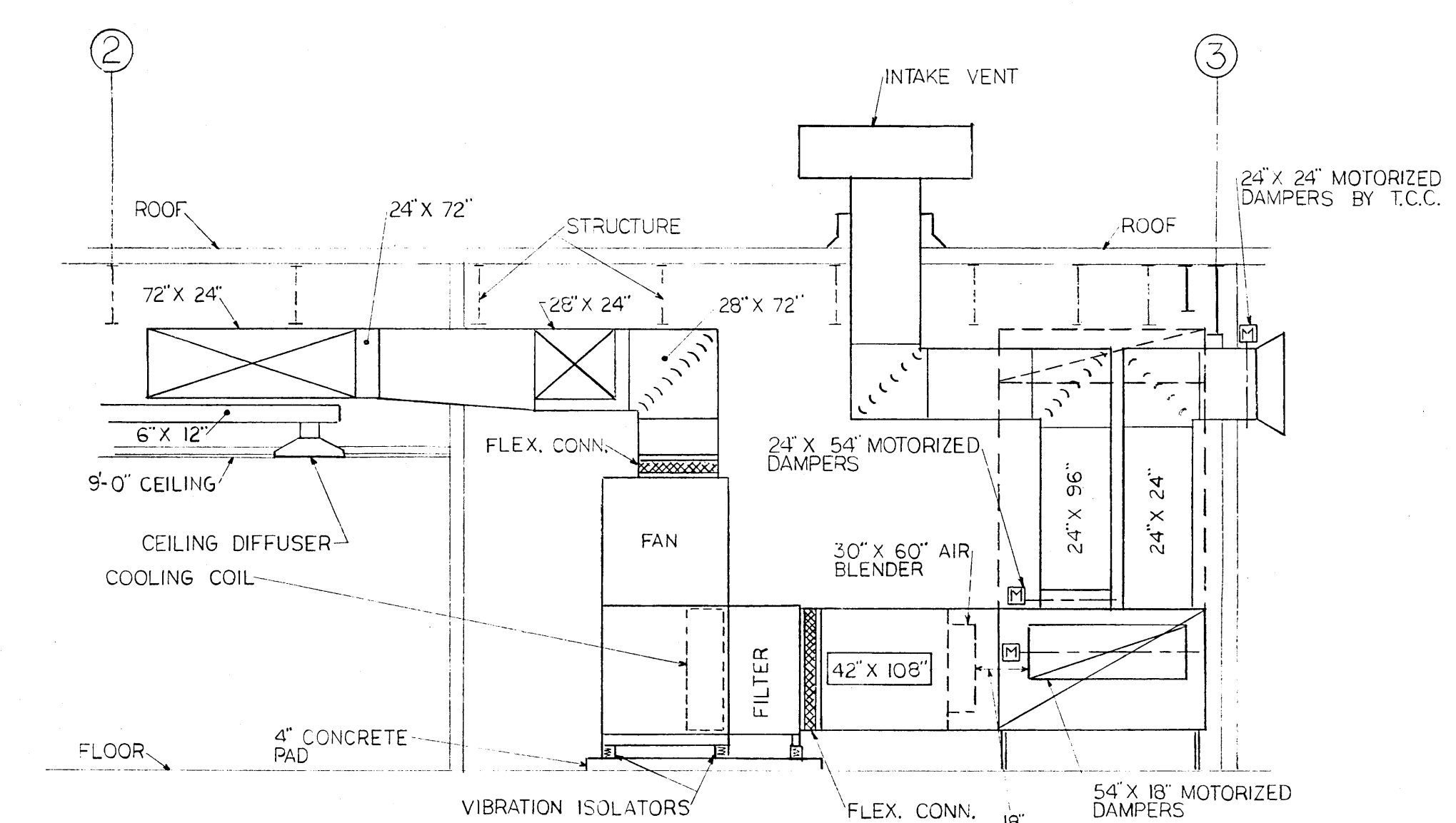
**COMPUTER ROOM ENVIRONMENTAL UNIT
REFRIGERATION PIPING DIAGRAM**

(TWO REQUIRED FOR EACH UNIT) NO SCALE

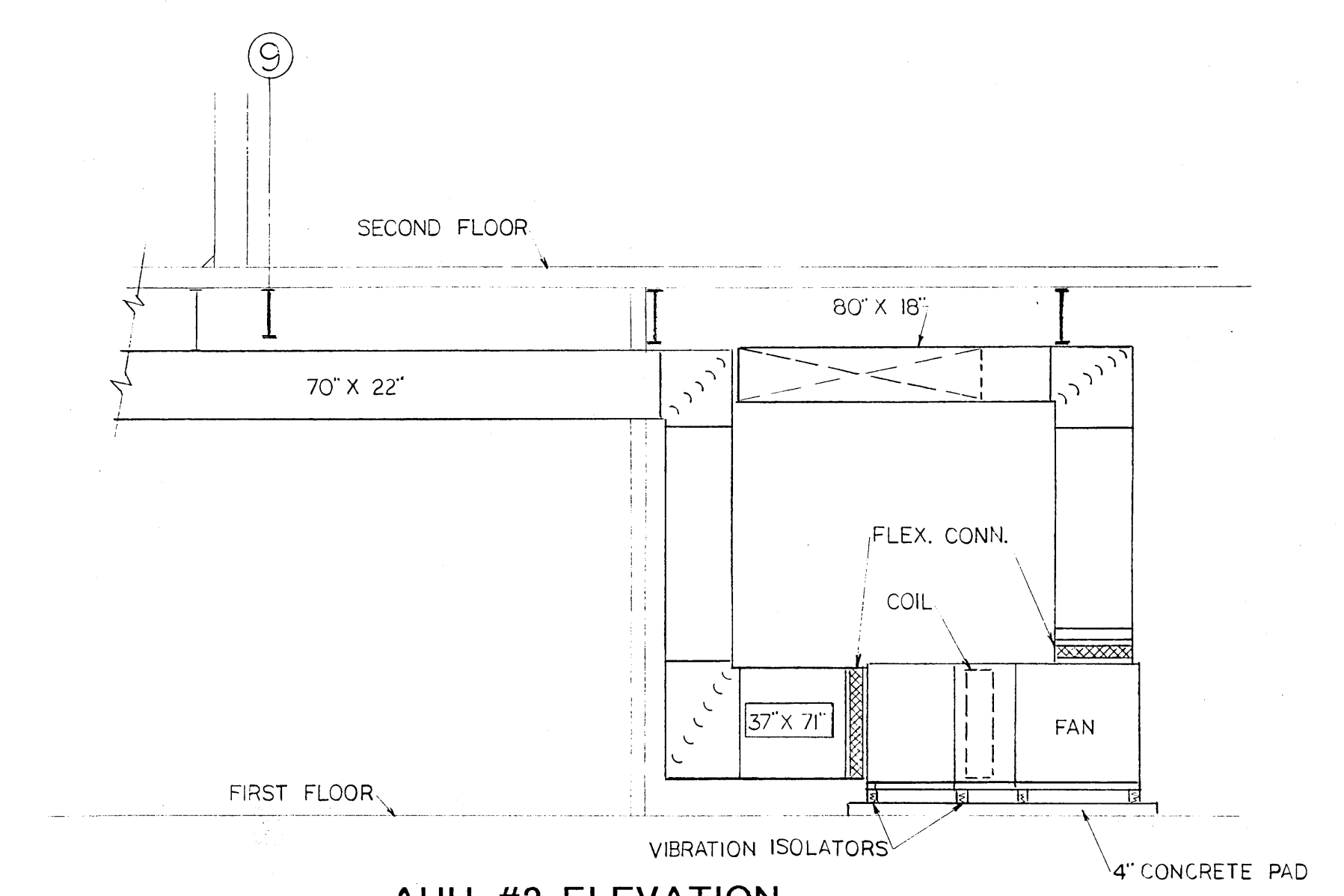


REFRIGERATION PIPING FOR AHU #8
NO SCALE

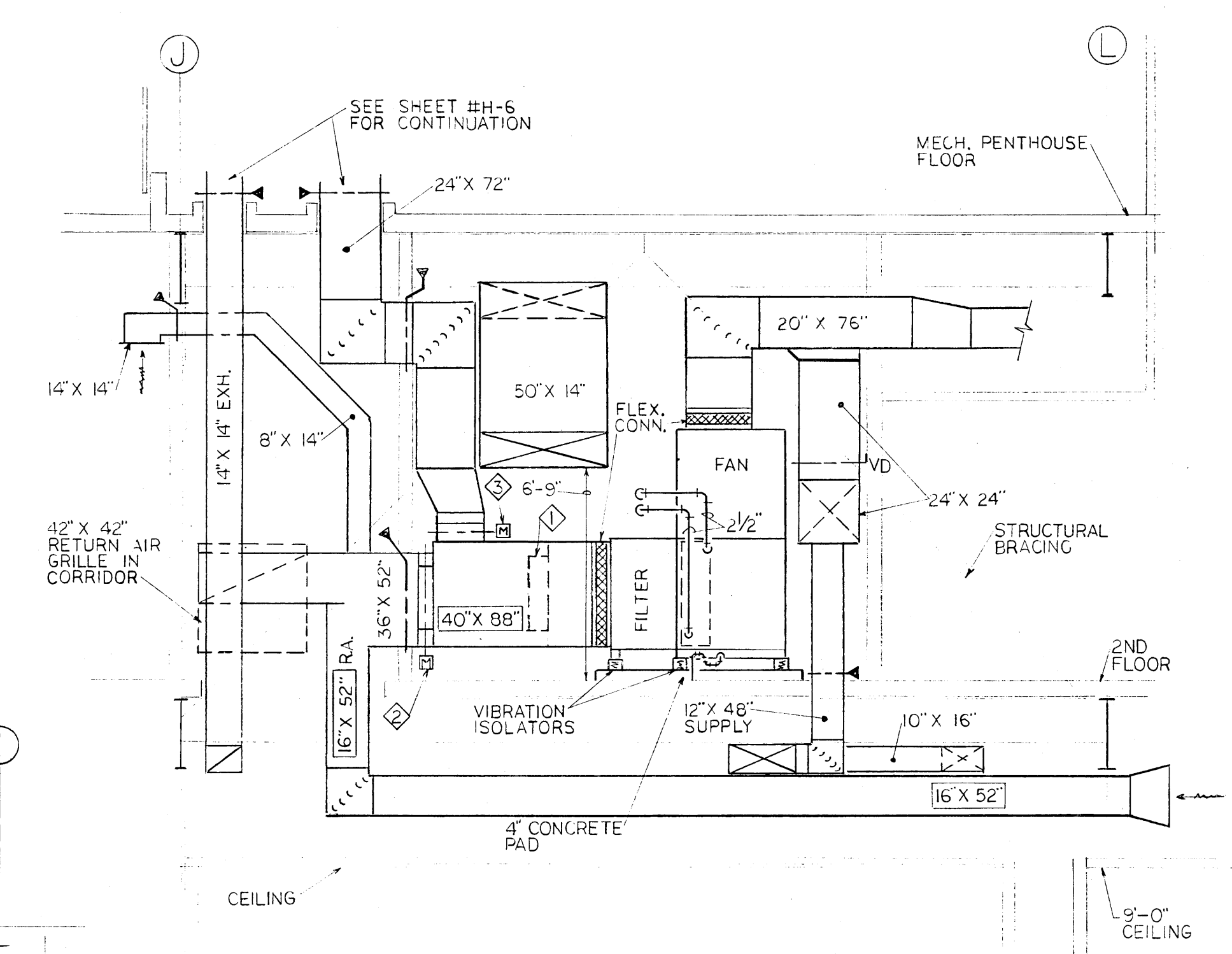
- NOTES:**
- 1) SHADED PIPING, VALVES, AND ACCESSORIES ARE SUPPLIED AND INSTALLED BY CONTRACTOR.
 - 2) DO NOT ANCHOR REFRIGERATION PIPING TO STUD DRYWALL WALLS--SUPPORT AT FLOOR AND CEILING (TRAPEZE HANGERS).
 - 3) USE VIBRATION ISOLATION SUPPORTS SUCH AS "CUSH CLAMPS" OR "VIBRA CUSHION". (DO NOT OVERTIGHTEN CUSH CLAMPS) TAPE AS DIRECTED AND APPROVED BY EQUIPMENT SUPPLIER.



AHU #1 ELEVATION
SCALE: 1/4" = 1'-0"

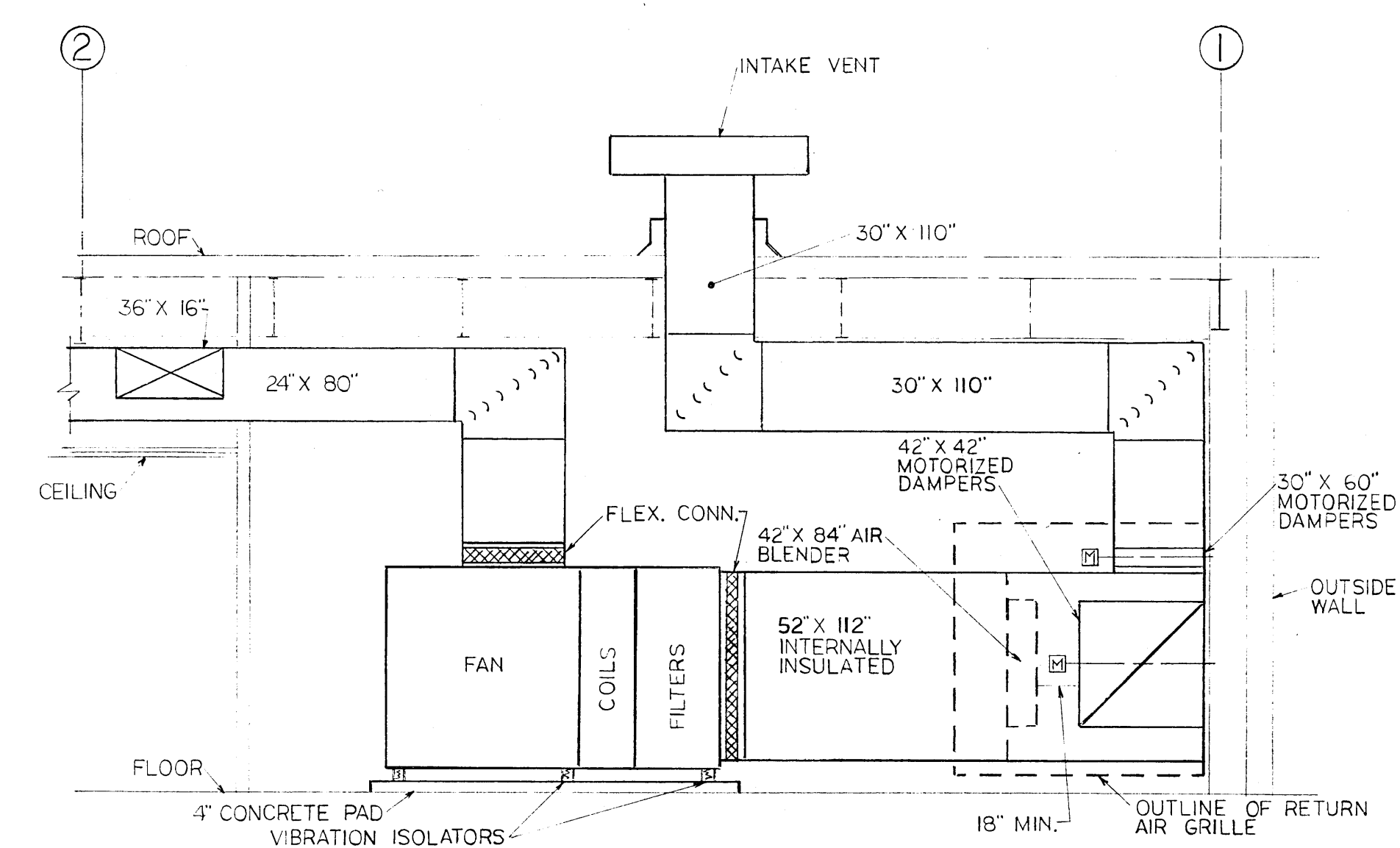


AHU #2 ELEVATION
SCALE: 1/4" = 1'-0"



AHU #5 ELEVATION
SCALE: 1/4" = 1'-0"

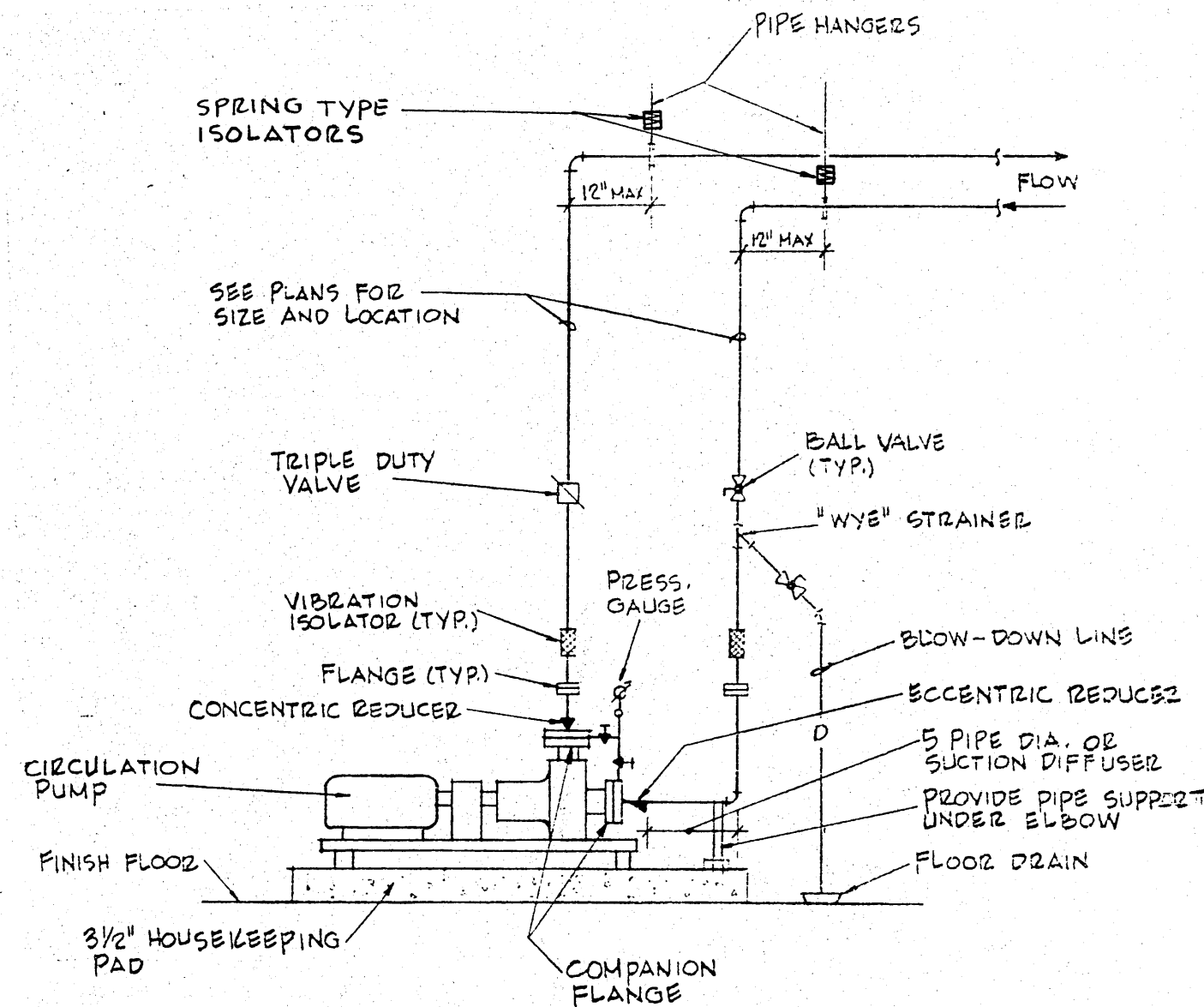
- NOTES:**
1. 30" X 60" AIR BLENDER.
 2. 24" X 36" MOTORIZED DAMPERS.
 3. MOTORIZED DAMPER



AHU #3 ELEVATION
SCALE: 1/4" = 1'-0"

AIR HANDLING UNIT SCHEDULE																															
MARK.	LOCATION	FAN & MOTOR DATA						COOLING COIL DATA										HEATING COIL DATA							FILTER DATA		MANUFACTURER/MODEL	REMARKS			
		CFM	EXT'L SP	TOTAL SP	FAN RPM	FAN DIA.	SOUND DATA	HP-VOLT-PHASE	LEAV'G AIR DB	WB	MBH TOTAL	SENS	GPM	WTR PD	LV'G WTR °F	MIN. F.A. (FT²)	AIR PD (IN)	ROWS/ FINS	ENT AIR °F	LV'G AIR °F	MBH	GPM	WATER PD (FT)	FACE AREA (SQ FT)	AIR PD (IN)	ROWS/FINS			FACE AREA (SQ FT)	TYPE	
AHU-1	MECHANICAL RM.# 113	12,635	1.7"	2.8"	840	22" F.L.		1 1/2 HP-480V-3 ̸	57.6	56.4	424.1	303.4	86.4	10.6	56	25.77	.66	5/8										44.44	4"-35%	DUNHAM BUSH VCS 21	① ③
AHU-2	MECHANICAL RM.# 145	8000	1.8"	2.9"	890	20" F.L.		7 1/2 HP-480V-3 ̸	57.4	56.6	265.4	196.4	50.5	7.1		14.6	.97	5/12										25.00		HCS 14	① ③
AHU-3	MECHANICAL RM.# 131	10,535	1.85"	2.75"	640	27 1/2" F.L.		1 1/2 HP-480V-3 ̸	58.0	56.8	604.8	441.5	117.1	11.2		36.13	.71	5/8										77.80		HCS 36	① ③
AHU-4	MECHANICAL RM.# 149	9935	1.8"	2.9"	920	20" F.L.		10 HP-480V-3 ̸	57.9	56.7	325.3	237.5	62.6	11.5		19.6	.69	5/8										30.50		VCS 17	① ③
AHU-5	MECHANICAL RM.# 236	8500	2.30"	3.15"	960	20" F.L.		10 HP-480V-3 ̸	57.8	56.7	277.8	205.6	53.6	7.1		19.6	.53	4/12										30.50		VCS 17	①
AHU-6	PENTHOUSE MECH.	12,090	1.95"	2.95"	870	22" F.L.		1 1/2 HP-480V-3 ̸	57.7	56.6	399.9	291.9	76.3	8.4		25.77	.61	5/8										44.44		VCS 21	① ③
AHU-7	PENTHOUSE MECH.	12,410	1.85"	2.85"	852	22" F.L.		1 1/2 HP-480V-3 ̸	57.8	56.7	408.1	297.9	78.4	8.8	↓	25.77	.64	5/8										44.44	↓	VCS 21	① ③
AHU-8	UPS ROOM COOLING	785	.15"	—	—	—		225 W-120V-1 ̸	—	—	23.5	16.5	—	—	—	—	—	3/—										2.77	T.A.	↓ CBHPB (H5)	②
AHU-9	RECEIVING	2000	.15"	.15"	1150		84.4 dB	1/3 HP-120V-1 ̸	—	—	—	—	—	—	—	—	—	—/—	-10	89	214.8	23.5	6.9	3.67	—	SEE SPECS.	—	T.A.	WING FAS 22 HORIZ.		
																		/													

- NOTES:
- ① COOLING COIL: ENTERING AIR = 80 DEG. DRY BULB/ 67 DEG. WET BULB; ENTERING WATER TEMPERATURE = 45 DEG.; GLYCOL = 25% (BY WEIGHT)
- ② COOLING COIL: ENTERING AIR = 76 DEG. DRY BULB/ 65 DEG. WET BULB; R-22 REFRIGERANT @ 45 DEG. SUCTION TEMPERATURE.
- ③ PROVIDE "SAME END" CONNECTIONS ON COOLING COIL.



CIRCULATING PUMP PIPING SCHEMATIC
NO SCALE

HVAC SYMBOLS AND ABBREVIATIONS

—S—	HOT WATER SUPPLY	—	FIRE DAMPER
—R—	HOT WATER RETURN	⚠	TOP LETTER INDICATES DIFFUSER, GRILLE, OR REGISTER. BOTTOM NUMBER INDICATES AIR QUANTITY.
—D—	DRAIN LINE	CFM	CUBIC FEET PER MINUTE
—X—	SHUT OFF VALVE	GPM	GALLONS PER MINUTE
—N—	CHECK VALVE	FCU	FAN COIL UNIT
—M—	THREE-WAY MIXING VALVE	AHU	AIR HANDLING UNIT
—B—	BALANCING VALVE	EF	EXHAUST FAN
24"x8"	BOX INDICATES INTERNALLY INSULATED DUCT. SIZE INDICATED IS ACTUAL SHEET METAL.	COND.	CONDENSATE
—X—	FLEX CONNECTION	O.A.	OUTSIDE AIR
①	THERMOSTAT	EXH	EXHAUST
—N—	NEW TO EXISTING	A.F.F.	ABOVE FINISHED FLOOR
φ 2 DIA.	DIAMETER	N.T.S.	NOT TO SCALE
—W—	WATER FLOW	(ORT)	OVERRIDE THERMOSTAT
—A—	AIR FLOW	(TN)	NIGHT THERMOSTAT
—VD—	VOLUME DAMPER	N.A.	NOT APPLICABLE
—M—	MOTORIZED DAMPER		
—BD—	BACKDRAFT DAMPER		

PUMP SCHEDULE							
MARK	DESCRIPTION	GPM	HEAD (FT)	MOTOR DATA			NOTES
				HP	VOLT	PHASE	
HW#1	HW PRIMARY	300	75	10	480	3	BELL & GOSSET 1510-2 1/2 BB
HW#2	HW STANDBY	300		10			1510-2 1/2 BB
CW#3	CW PRIMARY	520		15			1510-4E
CW#4	CW STANDBY	520		15			1510-4E

DUCT HEATING COIL SCHEDULE													
TAG NO.	FACE DIMENSION HGT X LGTH	MAX CFM	MAX AIR PD	AIR TEMP °F		WATER TEMP °F		WATER DATA		MBH MIN.	ROWS FINS/IN	FACE VELOCITY (MAX)	NOTES
				ENT'G	LEAV'G	ENT'G	LEAV'G	GPM	PD				
1	6" x 12"	400	.48"	50	101.0	200	160	1.2	0.6	22.1	3/8	800	
2	6" x 18"	515	.29"		98.6		162	1.5	0.8	27.1	2/8	687	
3	9" x 12"	500	.33"		99.3		162	1.4	0.1	26.7	3/8	667	
4	9" x 15"	800	.54"		97.1		163	2.3	0.2	40.8	3/8	853	
5	9" x 21"	1200	.63"		98.0		163	3.5	0.4	62.4	3/8	914	
6	12" x 24"	1500	.35"		98.3		162	4.3	1.7	78.6	2/8	750	
7	9" x 48"	2400	.40"		97.2		163	6.9	1.7	122.8	2/8	800	
8	15" x 36"	2980	.39"		96.0		164	8.6	0.9	148.8	2/8	795	
9	12" x 48"	3100	.37"		100.0		161	8.9	9.3	168.0	2/8	775	
10	15" x 24"	2150	.55"		99.7		161	6.2	0.5	116.0	3/8	860	
11	15" x 27"	2684	.68"		98.5		162	7.7	0.8	141.2	3/8	954	
12	21" x 48"	6050	.46"		95.8		164	17.4	2.0	300.4	2/8	864	
13	15" x 45"	3440	.33"	50	98.4	200	162	9.9	1.3	180.7	2/8	734	

GRILLE AND DIFFUSER SCHEDULE

TYPE	REMARKS	NECK OR DUCT SIZE	MANUFACTURER/ MODEL	SEE NOTES
A	24" x 24" LAY-IN SUPPLY	6" DIA.	ANEMOSTAT EPLA	
B		8" DIA.	EPLA	
C		10" DIA.	EPLA	
D		12" DIA.	EPLA	
E		15" DIA.	EPL-D	
F		18" DIA.	EPL-D	
G	ONE SLOT BOOT DIFF. SUPPLY	5" DIA. CONN.	SLSD-L-75-1-48-5-D	
H	TWO SLOT BOOT DIFF. SUPPLY	7" DIA. CONN.	SLSD-L-75-11-48-7-D	
I	ROUND ADJUST. PATTERN SUP.	10" DIA. CONN.	C-27	
J	CEILING EXHAUST GRILLE	14" x 14"	S3HD	
K	CEILING EXHAUST GRILLE	10" x 10"	S3HD	
L	CEILING EXHAUST GRILLE	8" x 8"	S3HD	
M	RD. ADJUST. PATTERN SUP.	6" DIA. CONN.	C-27	
N	RD. ADJUST. PATTERN SUP.	8" DIA. CONN.	C-27	
O	TRANSFER GRILLE (CLG)	12" x 12"	GC5	
P	CEILING RETURN GRILLE	24" x 24"	GC5	
Q	1/2" MESH SCR. IN ANGLE FRM.	VARIABLES	CONTRACTOR	
R	SUPPLY REG. DBL. DEFL.	8" x 6"	ANEMOSTAT X2H	
S	SUPPLY REG. DBL. DEFL.	24" x 12"	X2H	
T	WALL TRANSFER GRILLE	16" x 16"	S3HD	
V	FLR. SUPPLY DIFFUSER (SLOT)	2" x 8'-0"	TAL-IN-O	
W	WALL-LINEAR DIFFUSER	4" x 8'-0"	AL-1	①
Z	WALL-LINEAR DIFFUSER	2 1/2" x 8'-0"	AL-15	①

- NOTES:
- 1 WITH TYPE "E" MTG. FRAME.

EQUIPMENT LIST

BOILERS: BURNHAM GAS FIRED/HOT WATER BOILERS
MODEL PF 514; 67.9 BOILER H.P. EACH;
GROSS I.B.R. OUTPUT = 2273 MBH EACH;
NET I.B.R. OUTPUT = 1977 MBH EACH

GAS BURNER - POWER FLAME C3-G-20;
5" GAS PRESSURE REQUIRED

1-1/2 HP MOTOR: 2" GAS TRAIN
480 VOLT - 3 PHASE

CONDENSING UNIT: DUNHAM-BUSH MODEL SPR 240 SD
214.5 TONS, 253.2 KW, 95 deg. AMB.
480V - 3 PHASE

CHILLER BARREL: TO MATCH CONDENSING UNIT CAPACITY
45 deg. LWT (25% GLYCOL), 520 GPM, 16.8 FT. WPD
MOUNTED ON FRAME WITH CONTROL PANEL
AND REFRIGERANT VALVES PREPARED.



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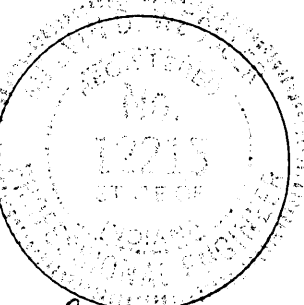
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