



Addendum 2

April 5, 2022

PKMR – 21.659B

PROJECT: Boiler Replacements
Kansas City, Kansas School District USD 500
Argentine, Central, & Rosedale Middle Schools
Washington & Wyandotte High Schools
Kansas City, Kansas

Notice to Contractor:

The following described changes, corrections, clarifications, deletions, additions and approvals for the Contract Documents, which comprise of Addendum No. 2, are hereby made a part of the Contract Documents dated February 14, 2022, and shall govern in the performance of the Work. The contractor shall acknowledge receipt of this Addendum.

GENERAL

1. Refer to prebid attendance sheet attached.
2. C&C Group is the building controls vendor for the school district.
3. Any supply chain, lead time constraints outside the control of the contractor shall be addressed via negotiation as the issues arise. It is the owners intent to complete this project within the stated dates, however, should that not be possible due to events outside the contractors control a negotiated and mutually aggregable resolution and extension of the project as required will occur.
4. Refer to attached Division 22 specifications for plumbing related work.
5. Clarification: Contractor is responsible to drain and fill hot water system with 40% glycol mixture. Contractor shall coordinate method of saving, replacing, supplementing or new at their option.

MECHANICAL

Specifications:

1. SECTION 230515 – VARIABLE FREQUENCY CONTROLLERS: Add Danfoss as an approved manufacturer.
2. SECTION 235113 – CHIMNEY AUTOMATION SYSTEM: Add US Draft Company as an approved manufacturer.

Drawings:

1. Refer to attached drawing set with school names as well as additional items as listed below.

Sheet M1.1:

1. Add ultrasonic flowmeter to main hot water return piping and connect flow meter to boiler control system.
2. Note added clarifying existing pump HP and voltage

Sheet M1.2:

1. Add ultrasonic flowmeter to main hot water return piping and connect flow meter to boiler control system.
2. Note added clarifying existing pump HP and voltage

Sheet M1.3:

1. Add ultrasonic flowmeter to main hot water return piping and connect flow meter to boiler control system.
2. Note added clarifying existing pump HP and voltage

Sheet M1.4:

1. Add ultrasonic flowmeter to main hot water return piping and connect flow meter to boiler control system.
2. Note added clarifying existing pump HP and voltage

Sheet M1.5:

1. Add ultrasonic flowmeter to main hot water return piping and connect flow meter to boiler control system.
2. Note added clarifying existing pump HP and voltage
3. Revised flue duct routing and connections to be removed/added.

Sheet M2.1:

1. Hot Boiler Detail: Clarification – All valves, flex connections, control valves strainers at boilers are to be new.
2. Gas Connection: Gas regulators shall be vented to outside or listed ventless regulators shall be installed.

END OF ADDENDUM



03/31/22

IFB -22-010 Boiler Replacement – SIGN-IN-SHEET

NAME	SIGNATURE	COMPANY NAME	EMAIL
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**DIVISION 22
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SECTION 220010 – PLUMBING PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Plumbing Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Plumbing systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
- C. Refer to Architectural, Structural and Electrical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping and ductwork in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, piping and other plumbing work are indicated diagrammatically by the plumbing drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
- B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
- D. Do not scale mechanical, plumbing and electrical drawings for dimensions. Contractor shall accurately layout work from the dimensions indicated on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of plumbing systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.
- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in plumbing or electrical service requirements necessary

to accommodate such substitution.

- H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.13. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.14. EXTENT OF CONTRACT WORK

- A. Provide plumbing systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of plumbing systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.
- B. Contractor shall become familiar with equipment provided by other contractors that require plumbing connections and controls.
- C. Electrical work required to install and control plumbing equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal.
- D. All automatic temperature control devices shall be mounted as indicated in automatic temperature control section of specifications.
- E. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be paid for by Plumbing Contractor at no cost to Owner or Architect-Engineer.
- F. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of plumbing and electrical equipment are made to attain intended control sequences and system operation.
- G. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.
- H. Contractor shall obtain complete electrical data on plumbing shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of plumbing equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.15. WORK NOT INCLUDED IN CONTRACT

- A. Consult Division 21, 23, and 26 of specifications for work to be provided by Electrical Contractor in conjunction with installation of plumbing equipment.

1.16. CODES, RULES AND REGULATIONS

- A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.
- B. Conform to latest editions and supplements of following codes, standards or recommended practices.
- C. BUILDING CODES:
 - 1. International Codes (Latest adopted version of applicable codes)
- D. SAFETY CODES:

1. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
2. Occupational Safety and Health Standard (OSHA) - Department of Labor.

E. NATIONAL FIRE CODES:

1. NFPA No. 54 Gas Appliance & Gas Piping Installation
2. NFPA No. 70 National Electrical Code
3. NFPA No. 89M Clearances, Heat Producing Appliances
4. NFPA No. 204 Smoke & Heating Vent Guide

F. UNDERWRITERS LABORATORIES INC:

1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

G. MISCELLANEOUS CODES:

1. ANSI A117.1 - Handicapped Accessibility
2. Applicable State Boiler Codes
3. Americans with Disabilities Act (ADA)

H. ENERGY EFFICIENCY REQUIREMENTS:

1. All plumbing systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.17. STANDARDS

- A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.18. PERMITS/FEEES

- A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.
- B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SUBMITTALS

- A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
- B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.
 1. Submittals shall be furnished in an Adobe PDF format.
 2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.
 - a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.
 3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
 4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
 5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall

- bear the equipment manufacturer's name and address.
6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
 7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.
- C. Contractor review:
1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.
 2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
 3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- D. Review Schedule:
1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
 2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
 3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
 4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the Contractor's responsibility.
- E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
- F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
- G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
- H. Coordination
1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.2. SHOP DRAWINGS

- A. Shop drawings shall meet all of the above requirements for submittals.
- B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
- C. No work shall be fabricated until Architect-Engineer's review has been obtained.
- D. Plumbing shop drawings for pipe fabrication shall be a minimum of 1/4" scale. Provide drawings where the complexity of the system or confines of the space require coordination with construction and other trades. Plumbing shop drawings shall not be a reproduction of the contract document and shall show details of the following: Plans, elevations above finished floor, sections, components, insulation and attachments to other work. Plumbing layout indicating sizes on plans, fittings, insulation, clearances, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration

isolation, seismic restraints, and attachment.

3.3. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
- B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:
 - 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
 - 2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
 - 3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
 - 4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of plumbing system.
- D. Provide brochures bound in three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - 1. Project name and address.
 - 2. Section of work covered by brochure, i.e., "Plumbing", etc.

3.4. RECORD DOCUMENTS

- A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
- C. Provide one copy of on high quality heavy weight presentation type paper. Media which fade shall not be used.
- D. Provide one electronic scanned version of record documents in Adobe PDF format – PDFs may be submitted on electronic media (DVD, USB) or via an FTP or other file sharing site. Provide electronic copies in conjunction with hard copy documents.

3.5. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all ductwork and equipment at the completion of the project.
- C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.6. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.7. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
- C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused

by installation of plumbing work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.8. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
- B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
- C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Plumbing contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
- F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.9. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

- A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.
- B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructors name, names of Owner's personnel attending and total hours of instruction given each individual.
- C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.10. FINAL CONSTRUCTION REVIEW

- A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 220010

SECTION 220011 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Provide documentation of all completed tests described herein and their results.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

- A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
- B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
- C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
- D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
- E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
- F. For test pressure schedules see Section 221100 of this specification.

3.2. TEST METHODS AND PRESSURES

- A. Test methods and pressures shall be as follows:
 - 1. Hydrostatic Test (Closed Systems):
 - a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.
 - 2. Hydrostatic Test (Open System):
 - a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.
 - 3. Pneumatic Test:
 - a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
 - b. Allow at least 1 hour after test pressure has been applied before making initial test.
 - c. Curing test, completely isolate entire system from compressor or other sources of air pressure.
 - 4. Pressure Relief and Safety Valve:
 - a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
 - b. Tag items that pass test with date of test, observed relief pressure setting and inspector's signature.
 - c. Items installed in systems without test tag attached will be rejected.

3.3. STERILIZATION OF DOMESTIC WATER SYSTEMS

- A. After final pressure testing of distribution system thoroughly flush entire system with water until free of dirt and construction debris. Fill system with solution of liquid chlorine or hypochlorite of not less than 50 PPM. Retain treated water in system until test indicates non-spore-forming bacteria have been destroyed or for 24 hours whichever is greater.

- B. All points in systems shall have at least 10 PPM of solution at end of retention period. Open and close each valve at least six times in system during sterilization process to sterilize valve parts.
- C. When time and concentration conditions have been met, drain system and flush with fresh domestic water until residual cleaning solution is less than 1.0 PPM. Open and close each valve in system six times during flushing operation.
- D. Test samples taken from several points in system shall indicate absence of pollution for two full days. Repeat sterilization as required. Acceptance of system will not be given until satisfactory bacteriological results are obtained.

3.4. CLEANING OF SYSTEMS AND EQUIPMENT

- A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

3.5. MAINTENANCE OF SYSTEMS

- A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
- B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
- C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.6. PAINTING OF MATERIALS AND EQUIPMENT

- A. Paint all exterior piping with (2) two coats of an enamel rust inhibiting exterior paint in a color selected by architect.
- B. Touch-up painting and refinishing of factory applied finishes shall be by Plumbing Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- C. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- D. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- E. Where extensive refinishing is required equipment shall be completely repainted.

3.7. PIPING IDENTIFICATION

- A. Provide pipe markers at 10'-0" maximum spacing to identify piping in mechanical rooms and 20'-0" maximum spacing in all other areas with Seaton Setmark pipe markers with letters and flow direction arrows.
- B. Colors and wording shall be of standard pipe markers as available from Seaton or equal. Submit for approval list of colors and wording prior to purchase of pipe markers.
- C. Pipe marker nomenclature/colors shall meet applicable ANSI Standard and OSHA requirements.

3.8. EQUIPMENT LABELS:

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware. Black letters on white background.
- B. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- C. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- D. Fasteners: Stainless-steel rivets or self-tapping screws.
- E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- F. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

3.9. EQUIPMENT ANCHORS

- A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
- B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
- C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

END OF SECTION 220011

SECTION 220013 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
1. Coordination Drawings.
 2. Administrative and supervisory personnel.
 3. Project meetings.
 4. Requests for Interpretation (RFIs).
- B. Each related sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3. COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Delivery and processing of submittals.
 2. Progress meetings.
 3. Preinstallation conferences.
 4. Project closeout activities.
 5. Startup and adjustment of systems.

1.4. SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.

3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
- F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
- H. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- I. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.
- J. Adjust location of piping, ductwork, conduit, wiring, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

- a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

1.6. DRAWINGS AND FILES.

- A. The Drawings show only the general run of MEP systems, equipment, fixtures, piping and ductwork and other components as well as approximate location of items such as outlets, switches, diffusers, lights, and equipment connections, etc. Coordinate all exact locations of items with other trades, architectural elevations, equipment requirements, owner requirements, ceilings, access, serviceability, etc. All such modifications and coordination shall be made without additional cost to the Owner. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made
- B. Wherever the work is of sufficient complexity, additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field. Attend meetings with other trades to review all documents.
- C. When directed by the General Contractor for areas of necessary coordination provide 3D building modelling coordination files and documents with other trades. Transmit information electronically and attend meetings as directed by the G/C as well as take part in coordination activities and documentation. Contractor shall be required to generate their own electronic files for this process.

1.7. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Manufacturer's written recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
 - b. Review present and future needs of each contractor present, including the following:
 - i. Interface requirements.

- ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication.
 - vi. Access.
 - vii. Quality and work standards.
 - viii. Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8. REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

3.1. EQUIPMENT FURNISHED BY OTHERS

- A. Description:
1. Items furnished by other trades (electrical contractor, etc.) such as disconnect switches, etc.
 2. Kitchen Equipment (may be furnished by owner, owner's vendor, or separate sub-contractor)
 3. Equipment furnished by general contractor
 4. Equipment furnished by owner
- B. General
1. Fully review manufacturer's installation instructions for equipment. Installation of all related plumbing items shall be per same.
 - a. Plumbing contractor shall obtain same from others if not readily available.

END OF SECTION 220013

SECTION 220505 – PLUMBING DEMOLITION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

- A. This Section requires the selective removal and subsequent offsite disposal of the following:
 - 1. Plumbing and electrical equipment, devices, piping, conduits, ductwork, insulation, lighting, etc in existing building indicated on drawings and as required to accommodate new construction.
 - 2. Removal of MEP items in interior partitions as indicated on drawings.
 - 3. Removal and protection of existing fixtures, materials, and equipment items indicated to be removed, salvaged, relocated, reinstalled, etc.

1.3. SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Schedule indicating proposed sequence of operations for selective demolition work to Architect for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
 - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
 - 2. Coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of completed remodeled areas.
- C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Architect prior to start of work.

1.4. JOB CONDITIONS

- A. Occupancy:
 - 1. Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in such a manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities that will affect Owner's normal operations.
- B. Condition of Structures:
 - 1. Owner assumes no responsibility for actual condition of items or structures to be demolished. Conditions existing at time of Contractor's inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
 - 2. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed. Storage or sale of removed items on site will not be permitted.
 - 3. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.
 - 4. Provide protective measures as necessary and required to provide free and safe passage of Owner's personnel and general public to any occupied portions of building.
 - 5. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
 - 6. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.
 - 7. Construct temporary insulated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks.
 - 8. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 - 9. Remove protections at completion of work.
- C. Damages:

1. Promptly repair damages caused to adjacent facilities by demolition work.
- D. Traffic:
1. Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- E. Flame Cutting:
1. Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.
- F. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- G. Maintain fire protection services during selective demolition operations.
- H. Environmental Controls:
1. Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing and/or approved regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1. PREPARATION

- A. General:
1. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.
 2. Cease operations and notify Architect immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
- B. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to any occupied portions of the building.
- C. Where selective demolition occurs immediately adjacent to any occupied portions of the building, construct dust-proof partitions of minimum 4-inch studs, 5/8-inch drywall (joints taped) on occupied side, 1/2-inch fire-retardant plywood on demolition side. Fill partition cavity with sound-deadening insulation as required by Architect.
1. Provide weatherproof closures for exterior openings resulting from demolition work.
- D. Locate, identify, stub off, and disconnect utility services that are not indicated to remain. Provide bypass connections as necessary to maintain continuity of service to any occupied areas of building. Provide minimum of 72 hours advance notice to Architect if shutdown of service is necessary during changeover.

3.2. DEMOLITION

- A. General:
1. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
- C. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.
- D. Provide services for effective air and water pollution controls as required.
- E. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel, or sand, free of trash and debris, stones over 6 inches in diameter, roots, or other organic matter.
- F. If unanticipated plumbing, electrical, or structural elements that conflict with intended function or design are

encountered, investigate and measure both nature and extent of the conflict. Submit report to architect in written accurate detail. Pending receipt of directive from Architect, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.3. SALVAGED MATERIALS

- A. Salvaged Items: Where indicated on Drawings as "Salvage - Deliver to Owner," carefully remove indicated items, clean, store, and turn over to Owner and obtain a receipt.

3.4. DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove debris, rubbish, and other materials resulting from demolition operations from building site. Transport and legally dispose off site.
- B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.
- C. Burning of removed materials is not permitted on Project site.

3.5. CLEANUP AND REPAIR

- A. General:
 - 1. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 220505

SECTION 220523 – VALVES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. EQUIVALENTS

- A. Equivalent valves shall be used only from the following specified valve manufacturers and listed on current comparison charts by Apollo, Hammond, Hays, Milwaukee, Muessco, Nibco, Rockwell-Nordstrom, Stockham, and Watts.

1.3. SUBMITTALS

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

1.4. QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service and NSF 372 for lead content.

PART 2 - PRODUCTS

2.1. GENERAL REQUIREMENTS FOR VALVES

- A. Plumbing valve applications specified in this Section are limited to NPS 12 (DN 300).
- B. Refer to valve schedule articles for applications of valves.
- C. Caution: Revise pressure ratings and insert temperature ratings in valve articles if valves with higher ratings are required.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. Valve Actuator Types:
 1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 2. Handwheel: For valves other than quarter-turn types.
 3. Handlever: For quarter-turn valves NPS 6 and smaller[except plug valves.
 4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.
- G. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 1. Gate Valves: With rising stem.
 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 3. Butterfly Valves: With extended neck.
- H. Valve-End Connections:
 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 2. Solder Joint: With sockets according to ASME B16.18.
 3. Threaded: With threads according to ASME B1.20.1.
 4. Grooved: With grooved ends to copper-tube dimensions or similar to AWWA C606.

2.2. VALVES

A. BALL VALVES

1. Ball valves shall be scheduled as type "BLV" valves. Valve specifications by type number shall be as follows:
2. Provide ball handle with extension or offset as required to clear piping insulation.
 - a. BLV-1: 2-1/2" valves and smaller, Hammond #8501 (screwed) or 8511 (solder) series bronze two piece large port ball valve 600 PSI-WOG/150 PSI-WSP reinforced TFE seats, chrome plate brass ball (tunnel or drilled design), silicon bronze stem vinyl-covered steel lever handle. Stainless steel ball and stem shall be provided for steam applications.

B. PLUG VALVES

1. Plug valves shall be scheduled as type "PLV" valves. Valve specifications by type number shall be as follows:
 - a. PLV-1: 1" valves and smaller Hays 7400 series iron body gas cock, 175 PSI-WOG bronze plug washer and nut, screwed ends.
 - b. PLV-2: 1-1/4" through 4" valves, Rockwell-Nordstrom Fig. 142, semi-steel lubricated plug valve, 175 PSI-WOG coated plug, two bolt cover, and short pattern screwed ends. Provide complete with standard pattern cast handle.

C. CHECK VALVES

1. Check valves shall be scheduled as type "SCV" valves. Valve specifications by type number shall be as follows:
 - a. SCV-1: 2" valves and smaller Hammond #IB940 (screwed) or IB912 (solder) bronze check valve, 200 PSI-WOG/125 PSI-WSP, Teflon or bronze disc and seat ring.
 - b. SCV-2: 2-1/2" and larger Hammond #IR1124 HI flanged, ASTM 126 iron body, bronze trimmed, 200PSI-WOG/125 PSI-WSP.

D. BUTTERFLY VALVES

1. Butterfly valves shall be scheduled as Type "BFV" valves. Valve specifications by type number shall be as follows:
 - a. BFV-1: Size 3" and larger Hammond #6211-01 (lever) or 6211-03 (gear) ASTM A 126 cast iron drilled and tapped full lug body, 200 PSI-WOG 12" and smaller, 150 PSI-WOG 14" and larger, extended neck, bronze disc, stainless steel stem, field-replaceable EPDM or (buna for oil or lubricated service) sleeve and stem seals.
2. UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.

2.3. VALVE SCHEDULE

SYSTEM	SIZE	STOP	CHECK	BALANCE
Domestic Water	1/2"-2-1/2"	BLV-1	SCV-1	BAV-1
Domestic Water	3" and up	BFV-1 or 2	SCV-2	BAV-1
Natural Gas	1/2" - 1"	PLV-1	--	--
Natural Gas	1-1/4"-4"	PLV-2	--	--

PART 3 – EXECUTION

3.1. VALVE INSTALLATION

- A. Install valves with unions, grooved joint couplings, or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2. INSTALLATION

- A. Install necessary valves within piping systems to provide required flow control, to allow isolation for inspection, maintenance and repair of each piece of equipment or fixture, and on each main and branch service loop.
- B. Each valve shall be installed so that it is easily accessible for operation, visual inspection, and maintenance and wherever possible, gate, check and ball valves shall be installed on a horizontal run with the handle upright and within 15 degrees of vertical. Butterfly valves shall be installed with the stem in the horizontal position and the handle at 90 degrees from vertical.
- C. Valves installed in piping systems shall be compatible with system maximum test pressure, pipe materials, pipe joining method, and fluid or gas conveyed in system.
- D. Valves 2-1/2" and smaller shall have soldered, grooved, or screwed end connections as required by piping materials unless otherwise specified or shown on drawings. Install union connection in the line within two feet of each screw end valve unless valve can be otherwise easily removed from line. Valves 3" and over shall

have flange or grooved end connections.

- E. Non-rising stem valves shall not be installed at any point in the piping systems. With permission of Architect-Engineer non-rising stem valve may be installed at particular points where space is restricted.
- F. Provide butterfly valves 6" and smaller with 10 position lever handle for on-off application and infinite position handle for throttling applications. Provide butterfly valves 8" and up with fully enclosed all weather gear operators.
- G. Install globe valves with pressure on top of disc except that must be completely drained for inspection, maintenance or to prevent freezing shall be installed with stem in horizontal position to insure complete drainage of pipelines.
- H. Gate valves shall not be installed in pipelines where intended for throttling service or where piping is subject to vibration as part of normal operating conditions.
- I. Valves shall be designed for repacking under pressure when fully opened and backseated.
- J. Balancing valves installed by means of sweating or soldering shall have their interiors removed before installation and reinstalled upon dissipation of the heat associated with installation. Using a wet rag in lieu of removing the valve interior as a means of heat dissipation during installation is not acceptable.

3.3. ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

SECTION 220700 – PLUMBING INSULATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Sealants.
6. Factory-applied jackets.
7. Field-applied jackets.
8. Tapes.

B. SUBMITTALS

1. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
2. Shop Drawings:
 - a. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - b. Detail attachment and covering of heat tracing inside insulation.
 - c. Detail insulation application at pipe expansion joints for each type of insulation.
 - d. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - e. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - f. Detail application of field-applied jackets.
 - g. Detail application at linkages of control devices.
 - h. Detail field application for each equipment type.
3. Qualification Data: For qualified Installer.
4. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. QUALITY ASSURANCE

1. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
2. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - a. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - b. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
3. Products shall not contain formaldehyde, asbestos, lead, mercury, mercury compounds, or polybrominated diphenyl ether fire retardants.

1.3. DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard

designation, type and grade, and maximum use temperature.

1.4. COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.5. SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.1. INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2. PIPING AND EQUIPMENT INSULATION

- A. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Knauf Insulation; Earthwool 1000(Pipe Insulation).
 - b. Johns Manville; Micro-Lok.
 - c. Manson Insulation Inc.; Alley-K.
 - d. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F and Type IV, 1000 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I and IV, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.3. INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.4. ADHESIVES

- A. Military Specification referenced in this article is the only standard available when this Section was updated. MIL-A-3316C was last updated in October 1987.
- B. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
 - 1. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated

according to 40 CFR 59, Subpart D (EPA Method 24).

2.5. MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 200 deg F.
 - 3. Solids Content: 63 percent by volume and 73 percent by weight.
 - 4. Color: White.

2.6. SEALANTS

- A. Joint Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Permanently flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 4. Color: White or gray.
 - 5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. FSK and Metal Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.
 - 5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.
 - 5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7. FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 - 3. ASJ+ SSL+: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing, interleaving with an outer polymer film leaving no paper exposed, and pressure-sensitive, acrylic-based adhesive covered by removable protective strip; complying with ASTM C 1136, Type I, II, III, IV, VII, VIII, and X
 - 4. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 - 5. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

2.8. FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for equipment and pipe.

2.9. FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Although other thicknesses for PVC jackets are available, a flame-spread index of 25 and a smoke-developed index of 50 apply only to thicknesses of 30 mils (0.8 mm) and less.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
 - 5. Factory-fabricated tank heads and tank side panels.

2.10. TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
 - 1. Width: 2 inches.
 - 2. Thickness: 6 mils.
 - 3. Adhesion: 64 ounces force/inch in width.
 - 4. Elongation: 500 percent.
 - 5. Tensile Strength: 18 lbf/inch in width.
- D. PVDC Tape: White vapor-retarder PVDC tape with acrylic adhesive.
 - 1. Width: 3 inches.
 - 2. Film Thickness: 6 mils.
 - 3. Adhesive Thickness: 1.5 mils.
 - 4. Elongation at Break: 145 percent.
 - 5. Tensile Strength: 55 lbf/inch in width.

2.11. SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.12. INSULATION SCHEDULE

- A. See plans for piping and insulation schedule. Other insulation requirements are scheduled below:

INSULATION SERVICE	SIZE	TYPE	THICKNESS	JACKET
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Hot/Cold Piping		All Sizes	MF	1"	ASJ-SSL
MF - Mineral-Fiber	CG - Cellular Glass	FE - Flexible Elastomeric			

2.13. LAVATORIES AND SINK INSULATION

- A. Insulate all exposed hot, cold and waste piping associated with lavatories and sinks with Truebro "Handi Lav-Guard" insulation kit model no. 102. Equivalent by Brocar Products Inc. or Proto P-trap and valve covers.

PART 3 – EXECUTION

3.1. EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3. GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. All portions of piping shall be insulated, including inside walls, chases and other concealed spaced.
- C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- F. Install multiple layers of insulation with longitudinal and end seams staggered.
- G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- H. Keep insulation materials dry during application and finishing.
- I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- J. Install insulation with least number of joints practical.
- K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- M. Install insulation with factory-applied jackets as follows:
 1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- Q. For above ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.
- R. Undamaged insulation systems on cold surface piping and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.

3.4. PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Penetration Firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Penetration Firestopping."

3.5. GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter,

- whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6. MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire, bands or SSL (self sealing lap) closure system and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant. If the ASJ jacket is equipped with SSL closure system, use it to seal the longitudinal seam.
 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7. FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.
- E. Where PVDC jackets are indicated, install as follows:
1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
 2. Wrap factory-presize jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
 3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
 4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
 5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.8. FINISHES

- A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.9. FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
 - 2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.
- E. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Plumbing Contractors expense at no cost to owner.

END OF SECTION 220700

SECTION 221000 – PLUMBING PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product to be used.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

- A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. See piping material schedule at end of this Section for materials to be used for each piping system.

1. Carbon Steel Pipe (1/8" thru 2"):

a. Pipe:

- i. Provide seamless carbon steel conforming to ASTM specification A-106.
- ii. Pipe joints shall be threaded conforming to ANSI Standard B2.1.

b. Carbon Steel Welding Fittings:

- i. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.

c. Branch Connection Welding Fittings:

- i. Provide carbon steel weldolet fittings conforming to ANSI Standards B16.9, B16.11, B31.1.0 and ASTM specification A105, Grade 11.

d. Malleable Iron Screwed Fittings:

- i. Provide screwed malleable iron fittings conforming to ANSI Standard B16.3, and ASTM Specification A-47 grade 32510.

e. Cast Iron Screwed Fittings:

- i. Provide screwed cast iron fittings conforming to ANSI Standard B16.4, B2.1, and ASTM Specification A-126, Class A.

2. Carbon Steel Pipe (2-1/2" and above):

a. Pipe:

- i. Provide electric resistance welded carbon steel pipe conforming to ASTM Specification A-53.
- ii. Pipe ends shall be beveled for welding.

b. Carbon Steel Welding Fittings:

- i. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.

c. Branch Connection, Welding to Screwed Fitting:

- i. Provide carbon steel threadolet fitting conforming to ANSI Standards B16.9, B16.11, B31.1, and ASTM Specification A105, Grade 11.

d. Malleable Iron Screwed Fittings:

- i. Provide screwed malleable iron fittings conforming to ANSI Standard B16.3, and ASTM Specification A-47 grade 32510.

e. Cast Iron Screwed Fittings:

- i. Provide screwed cast iron fittings conforming to ANSI Standard B16.4, B2.1, and ASTM Specification A-126, Class A.

3. Copper Tube:
 - a. Tube/Pipe:
 - i. Provide hard temper copper water tube conforming to requirements of current ASTM Specification B-88. Tubing shall be Type K, L, or M as listed in schedule. Tubing joints shall be soldered, brazed or Viega Pro-Press style fittings. See schedule for joining method to be used.
 - ii. Pipe by Anaconda, Cerro, Chase, Mueller or Revere Copper.
 - b. Wrought Copper Fittings:
 - i. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
 - ii. Fittings by Anaconda, Chase, Viega or Nibco.
 - c. Grooved Joint Fittings: ASME B16.22 wrought copper or cast bronze to ASME B16.18. Manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.) Victaulic Copper Connection.
 - d. Provide Victaulic Installation-Ready Style 607H couplings with grade 'EHP' gasket. Copper-tube dimensions with offsetting, angle-pattern bolt pads.

PART 3 EXECUTION

3.1. PIPING INSTALLATION

- A. Piping systems materials and installation shall conform to the following standards and codes.
 1. System: Natural Gas Piping
 - a. Code: ANSI Standard B31.12 "Fuel Gas Piping"
- B. Natural Gas piping and other fuel piping systems shall be installed per code. All fittings in chases, solid walls, floors, etc. shall be welded, fused or otherwise listed for installation in concealed locations. Other acceptable methods shall include providing ventilated casings for installation in these situations. Unions, elbows, bushings, etc shall not be installed in concealed locations and shall only be installed in accessible locations.
- C. No piping containing water shall be located in areas subject to freezing temperatures, including: unheated attics, unheated plenums, chases wall spaces or cavities within exterior walls, under slabs, or in concrete.
- D. Pipe sizes indicated on plans and as specified refer to nominal size in inches, unless otherwise indicated. Pipes are sized to nearest $\frac{1}{2}$ ". In no case shall piping smaller than size specified be used.
- E. Install drainage piping pitched down at a minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent) for piping 4 inch and larger. Install vent piping pitched to drain back by gravity to the sanitary drainage piping system.
- F. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings.
- G. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.
- H. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.
- I. Install piping so that systems can be completely drained. Provide piping systems with valve drain connections at all low pipe and ahead of all sectionalizing valves whether shown on plans or not. Drain lines shall be $\frac{3}{4}$ ".
- J. Drain valves on closed piping systems such as chilled water system shall have lock shields and plugged or capped outlets to protect system from inadvertent drainage.
- K. Pitch all piping and where possible make connections from horizontal piping so that air can be properly vented from system. Provide air vents as specified at all system high points and at drop in piping in direction of flow. Use eccentric reducers where necessary to avoid air pockets in horizontal piping.
- L. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.
- M. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.

- N. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.
- O. Brazed socket type joints shall be made with suitable brazing alloys. Minimum socket depth shall be sufficient for intended service. Brazing alloy shall be end fed into socket, and shall fill completely annular clearance between socket and pipe or tube. Brazed joints depending solely upon a fillet rather than a socket type joint will not be acceptable.
- P. Soft soldered socket type joints shall be made with sill-floss or 95-5 tin-antimony solder as required by temperature and pressure rating of piping system. Soldered socket-type joints shall be limited to systems containing non-flammable and non-toxic fluids. Soldered socket-type joints shall not be used on piping systems subject to shock vibration. Soldered joints depending solely upon a fillet rather than a socket-type joint will not be acceptable.
- Q. Make changes in piping size and direction with approved factory made fittings. Provide fittings suitable for at least 125 PSI working pressure or of pressure rating required for maximum working pressure of system whichever is greater.

3.2. PIPING SUPPORTS, ANCHORS, SLEEVES AND SEALS

- A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Sleeves are not required for supply and waste piping through wall supporting plumbing fixtures or for cast iron soil pipe passing through concrete slab or grade except where penetrating a membrane waterproof floor.
- B. Plumbing Contractor shall supervise installation of sleeves to insure proper location and installation.
- C. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.
- D. Sleeves passing through above grade floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchens shall be cast iron with integral flanges and shall extend 1 inch above finished floor. Size sleeves for and seal space between pipe sleeve with Thunderline Link-Seal.
- E. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core drill.
- F. Pipe insulation shall run continuous through pipe sleeves with ¼" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves with Thunderline High Temperature Link Seal.
- G. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.
- H. All below grade and exterior wall penetrations shall be installed in a pipe sleeve and sealed between the pipe and pipe sleeve with Thunderline High Temperature Link Seal.
- I. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around cables with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
 - 1. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.3. PIPE HANGERS AND SUPPORTS

- A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.
- B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.
- C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments so that rod is vertical in hot position.
- D. Hangers shall not become disengaged by movements of supported pipe.
- E. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.
- F. Unless indicated otherwise on drawings support horizontal steel piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4"	3/8"	8 Ft.
1-1/2" to 2"	3/8"	10 Ft.
2-1/2" to 3-1/2"	1/2"	12 Ft.
4" and 5"	5/8"	15 Ft.

G. Unless indicated otherwise on drawings support horizontal copper tubing as follows:

NOM. TUBING SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1"	3/8"	6 Ft.
1-1/4" to 1-1/2"	3/8"	8 Ft.
2"	3/8"	9 Ft.
2-1/2"	1/2"	9 Ft.
3" and 4"	1/2"	10 Ft.

- H. Support horizontal cast iron soil pipe with two hangers for each section located close to each hub.
- I. Support vertical cast iron soil pipe at every floor, steel and copper tubing at every other floor except where indicated otherwise on drawings.
- J. Provide continuous threaded hanger rods wherever possible. No chain, wire, or perforated straps shall be used.
- K. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Architect-Engineer for review prior to fabrication.
- L. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	1/2" thru 4"	CT-121
Steel	3/4" thru 20"	261

- M. Provide Grinnell Fig. 194, 195 or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.
- N. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation.
- O. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide calcium silicate blocking insulation at each pipe hanger in thickness of other adjacent insulation. Insulation vapor barrier jacket shall overlap to maintain vapor barrier continuous.

3.4. INSULATION MATERIALS AND APPLICATIONS METHODS (HANGERS, SUPPORTS, ANCHORS, GUIDES, EXPANSION JOINTS, ETC.)

- A. Insulation materials and application methods for piping hangers supports, anchors, guides expansion joints, etc., shall be as follows:
 - 1. Insulate hangers and supports from direct contact with cold or hot surfaces (-120°F to 450°F) with rigid calcium silicate insulation at suspension points to prevent crushing of insulation.
 - 2. The length or thickness of the insulation support same as the pipe insulation thickness. Provide ASJ type discs or otherwise reestablish vapor barrier.
- B. Structural attachments for pipe hangers shall be as follows:
- C. Concrete Structure: Provide Grinnell Fig. No. 285 cast in concrete insert for loads up to 400 lbs. and Grinnell Fig. 281 wedge cast in type concrete insert for loads up to 1200 lbs.
- D. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIALS	PIPE SIZE	HANGER FIG. NO.
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Copper	½" thru 4"	CT-65
Steel	3/8" thru 4"	65
Steel	5" thru 30"	260

- E. Provide Fee and Mason Fig. 600 channel trapeze pipe hangers for horizontal multiple pipe runs with pipe clamps or pipe rollers as follows:

PIPE MATERIALS	PIPE SIZE	CLAMP NO.	ROLLER NO.
Copper	3/8" thru 4"	8600 CP*	8010 CP*
Steel	3/8" thru 6"	8500	8010

*Copper Plated

- F. Pipe supports for horizontal piping mounted on pipe racks or stanchions shall be Advanced Thermal Systems low friction graphite slide supports or equivalent by Elcen or Grinnell. Where racks and supports are not detailed on drawings submit detailed support drawings to Architect-Engineer for review prior to fabrication.
- G. Provide Fee and Mason Fig. 404 vibration control hangers at locations where piping vibrations would be transmitted to building structure by conventional hangers. Apply hangers within their load supporting range.
- H. Provide Elcen Fig. 50 pipe saddle with adjuster to support piping from floor. Provide complete with pedestal type floor stand.
- I. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Architect-Engineer prior to installations.
- J. Equivalent hangers and supports by Auto-Grip, Basic Engineer, Bee Line, Elcen, Fee & Mason, Fluorocarbon Company, Unistrut or Super Strut Inc.
- K. Provide premanufactured pipe support for piping located on flat roofs, unless otherwise indicated on drawings. Support will be of modular designs with roller bearings and guide saddles for straight piping runs longer than 50' and Unistrut type clamp/support type for other shorter runs. Maximum pipe support spacing shall be 10' for steel piping. Copper piping and refrigerant piping shall be supported at shorter distances. Piping near equipment connections shall be supported within 3' of units. System supports shall be compatible with roofing materials and shall be provided with plates, pads, etc to spread weight and wear on roof surface. Provide pipe supports from Miro Industries, B-Line, or approved equivalent.

END OF SECTION 221000

SECTION 221119 – DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 1. Unions
 2. Strainers
 3. Gas Pressure Regulators
 4. Domestic Hot Water Expansion Tanks
 5. Thermometers and Gauges.

1.3. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.4. QUALITY ASSURANCE

- A. NSF Compliance:
 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
 2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1. INSULATING UNIONS AND FLANGES

- A. Provide insulating unions and flanges conforming to following specifications and plainly and permanently marked with manufacturers name and pressure class rating. Unions and flanges shall be as follows:
 1. Steel pipe to steel pipe screwed end:
 - a. Provide Stockham malleable iron No. 693-1/2 insulating union with high dielectric strength insulating sleeve and gasket.
 2. Steel pipe to steel pipe flanged end:
 - a. Provide two weld neck flanges of proper pressure rating insulated on both sides with Central or Klingerit Flange Insulation Kit.
 3. Iron or steel pipe to copper pipe:
 - a. Provide Epco Dielectric union or flange with screwed or solder joint as required. Union shall have 250 PSI rating and flange 175 PSI rating at 190 degrees F.
 - b. Dielectric Waterway Fitting: Copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service, with threaded or grooved ends. Victaulic Style 647 or equal.

2.2. UNIONS

- A. Provide unions or flanged joint in each line preceding connections to equipment or valves requiring maintenance.
 1. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.
- B. Provide Stockham brass seat unions of material and pressure rating required by piping system.
- C. Where piping systems of dissimilar materials are jointed together provide proper insulating union as specified under this specification.
- D. Equivalent unions by Fairbanks or Grinnell.

2.3. STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers:
1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
 2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
 3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 4. Screen: Stainless steel with round perforations, unless otherwise indicated.
 5. If retaining more than one screen size, indicate screen size on Drawings.
 6. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.062 inch
 - b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
 - c. Strainers NPS 5 and Larger: 0.125 inch.
 7. Drain: Factory-installed, hose-end drain valve.
- B. Install strainers upstream from automatic control valves, water service backflow preventers and RPZ backflow preventers 1" and larger. Where strainers are an integral part of these items or incorporated in accessory equipment directly upstream, individual line strainers will not be required. Strainers shall be same size as piping. Provide strainers with proper isolation and blow down valves to allow basket removal for cleaning.
- C. Install strainer so that basket contains debris by gravity at no flow conditions to allow removal of large debris not able to be passed by blow down.

2.4. GAS PRESSURE REGULATORS

- A. Provide gas pressure regulators with internal relief and low pressure cut-off as manufactured by Fisher Controls or Equimeter. Units shall be of size capable of capacities and pressures as shown on plans or as required for proper service. Prior to order verify capacities and pressures with each piece of equipment served.

2.5. DOMESTIC HOT WATER EXPANSION TANKS

- A. The expansion tank shall be welded steel, diaphragm type tank, and pre-charged to the minimum operating pressure. Tanks shall be suitable for domestic water service.
- B. Provide expansion tanks as shown on plans by Amtrol, Bell and Gossett, Watts.

2.6. THERMOMETERS AND GAUGES

A. GENERAL

1. Provide thermometers and wells and pressure test plugs as hereinafter specified and shown on the plans so that proper testing and balancing and trouble shooting can be accomplished.

B. THERMOMETERS

1. Thermometers shall be red reading mercury type having scale length of not less than 9", and scale divisions of 2 degrees F, or less similar and approved equal to Moeller Instrument Company, Inc., Style AJ. Range shall be as specified or as required for the duty. Thermometers and wells must be of at least the quality and design specified. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Moeller, Trerice or Weksler.
2. Install thermometers at eye level (5'-0") at easily readable locations.

C. GAUGES

1. Gauges shall be bourdon tube with minimum 4-1/2" dial and die cast aluminum case with black enamel finish. The movement shall be all stainless steel with Grade A phosphor bronze bourdon tube brazed at socket and tip. The accuracy of the gauge shall be within 1/2 percent of the scale range. The pointer shall be the micrometer adjustment type recalibrated from the front. Pressure, compound, and differential pressure gauges shall have suitable scale ranges, shall be submitted and are subject to the review of the Engineer. Graduations shall be one pound or less on all gauges where this is standard for the required range.
2. Gauges shall have 1/4" IPS connections and shall be Moeller "Vantage" gauges with Case Style No. 2, or approved equal. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Ashcroft, Marsh, Trerice, Moeller, Weksler, Taylor, Weiss, or Midwest.
3. Install a Sisco 1/4" or 1/2" NPT fitting (Test Plug) of solid brass at desired indicated locations. Test plug shall be capable of receiving either a pressure or temperature probe 1/8" o.d. Dual seal core shall be

- neoprene for temperature to 200°F and shall be rated zero leakage from vacuum to 1000 psig.
- 4. Install gauges vertically.

D. INSTALLATION

1. Thermometers shall be installed as hereinafter specified. Where thermometer is scheduled, a thermometer well shall be provided.
2. All thermometer wells shall be constructed of brass or stainless steel and where installed in insulated piping shall have at least 2-1/2" lagging extension. Gauges shall be installed as hereinafter specified.
3. Gauge cocks shall be polished brass A10 1/4" tee handle type with threaded ends. 125 psi rated.
4. Provide gauge cock with 1/4" pipe nipple for connection to gauge cock.
5. Pressure temperature ratings of each well shall be suitable for the system in which it is installed in accordance with specifications and as indicated on the drawings. All wells shall be filled with Silicon and be complete with caps and chains.
6. Thermometers shall have the temperature ranges as required for the intended application and shall be installed as scheduled.

E. THERMOMETER & TEST GAUGE COCK INSTALLATION SCHEDULE

SERVICE	Thermometer & Well	Press Gauge & Gauge Cock
Hot water entering and leaving heaters	X	
Hot water entering and leaving storage tanks	X	
Water Service ahead of PRV		X
Water Service after PRV	X	X
Fire Water Service		X

PART 3 EXECUTION

3.1. INSTALLATION

- A. Refer to other Division 22 Sections for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to plumbing equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet. Install at approximately 6' AFF for service and maintenance.
 1. Install thermometers and water regulators if specified.
 2. Install cabinet-type units recessed in or surface mounted on wall as specified.
- F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.
- G. Install water hammer arresters in water piping according to PDI-WH 201.
- H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- I. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- J. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2. FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 - 1. Test each backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3. ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.
- D. Prior to occupancy the contractor shall balance all components of the recirculation system to insure hot water is delivered throughout the building. This shall be done at times of low usage of the domestic system to insure systems functions during times of low/no use. Mark all valves, record settings of balance and provide documentation to owner at turnover.

END OF SECTION 221119

SECTION 223400 – GAS WATER HEATERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220010.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. ELECTRICAL WORK REQUIRED

- A. Contractor shall provide electrical connections for any equipment that requires electrical connections for power or control. Electrical requirements and work shall be coordinated with Electrical Contractor.

1.3. SUBMITTALS

- A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
- B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.
- C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.
- D. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.
- E. Warranties: Special warranties specified in this Section.

1.4. QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
- D. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:
 - 1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
 - 2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

1.5. WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
- C. Warranty Period: From date of Substantial Completion:
 - 1. Storage Tanks: 5 years.
 - 2. Burner Assemblies: 3 years.

PART 2 - PRODUCTS

- A. COMMERCIAL, GAS-FIRED, HIGH-EFFICIENCY, STORAGE, DOMESTIC-WATER HEATERS:
 - 1. Provide water heaters as scheduled by State, Rheem, A.O. Smith, Bosch, Lochinvar, HTP. Refer to schedule for capacities and characteristics.
 - 2. Standard: ANSI Z21.10.3/CSA 4.3.
 - 3. Description: Manufacturer's proprietary design to provide at least 96 percent thermal efficiency at optimum operating conditions.
 - 4. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.
 - a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
 - b. Lining: Glass lining complying with NSF 61 barrier materials for potable-water tank linings.
 - 5. Factory-Installed Storage-Tank Appurtenances:

- a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Hydrojet diptube required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: Low restriction brass ball-type complying with ASSE 1005.
6. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
 7. Jacket: Steel with painted finish.
 8. Burner: For use with gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.
 9. Temperature Control: Adjustable thermostat.
 10. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
 11. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4-M. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting at 150 psig. Select one relief valve with sensing element that extends into storage tank.

PART 3 - EXECUTION

3.1. WATER HEATER INSTALLATION

- A. Install commercial water heaters on concrete bases.
 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
- B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
- C. Anchor water heaters to substrate.
- D. Install and connect gas water heaters according to NFPA 54.
 1. Install appliance, gas pressure regulators on gas-burner inlets of water heaters without pressure regulators.
 2. Install vent piping from gas-train pressure regulators and valves to outside of building where required. Terminate vent piping with brass-screened vent cap fitting. Do not combine vents except with approval of authorities having jurisdiction.
- E. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- F. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
- G. Install vacuum relief valves in cold-water-inlet piping.
- H. Install vacuum relief valves in water heater storage tanks that have copper lining.
- I. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Plumbing Specialties" for drain valves.
- J. Install thermometers on water heater inlet and outlet piping. Refer to Division 22 Section "Meters and Gages" for thermometers.
- K. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, and thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 22 Section "Valves" for general-duty valves and Division 22 Section "Meters and Gages" for thermometers.
- L. Arrange for insulation on equipment and piping not furnished with factory-applied insulation.
- M. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- N. Fill water heaters with water.
- O. Charge compression tanks with air.
- P. Install gas-fired, domestic-water heaters according to NFPA 54.
 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.

3.2. CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general

- arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to machine to allow service and maintenance.
- C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
- D. Make connections with dielectric fittings where piping is made of dissimilar metal.
- E. Gas, Water Heater Vent Connections: Connect to vent system. Include draft hoods and diverters where required. Use vents same size as or larger than water heater outlets, but not smaller than indicated unless smaller vent size has been calculated according to NFPA 54. Comply with gas utility requirements for sizing. Gas vents are specified in Section "Breechings, Chimneys, and Stacks."
- F. Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit service.
- G. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- H. Emergency Power Off - For all water heaters/boilers over 399MBH Input, provide an emergency power off toggle switch at the boiler room entrance to shutdown boilers, in the event of an emergency, when the switch is thrown. Switch shall be red and shall be labeled with a red and white phenolic plastic sign with white letters on red background, reading "Emergency Boiler Shutdown".

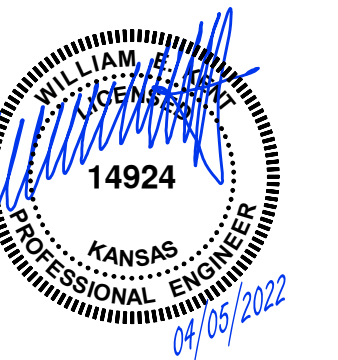
3.3. FIELD QUALITY CONTROL

- A. Engage a factory-authorized service representative to perform startup service.
- B. In addition to manufacturer's written installation and startup checks, perform the following:
 - 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
 - 2. Verify that piping system tests are complete.
 - 3. Check for piping connection leaks.
 - 4. Check for clear relief valve inlets, outlets, and drain piping.
 - 5. Check operation of circulators.
 - 6. Test operation of safety controls, relief valves, and devices.
 - 7. Energize electric circuits.
 - 8. Adjust operating controls.
 - 9. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.
 - 10. Balance water flow through manifolds of multiple-unit installations.

3.4. DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.
 - 1. Train Owner's maintenance personnel on procedures for starting and stopping troubleshooting, servicing, and maintaining equipment.
 - 2. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
 - 3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 223400



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KANSAS CITY, KANSAS

GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL HYDRONIC SYSTEMS AND PLUMBING SYSTEMS TO REMAIN UNLESS OTHERWISE NOTED.

DEMOLITION PLAN KEYED NOTES

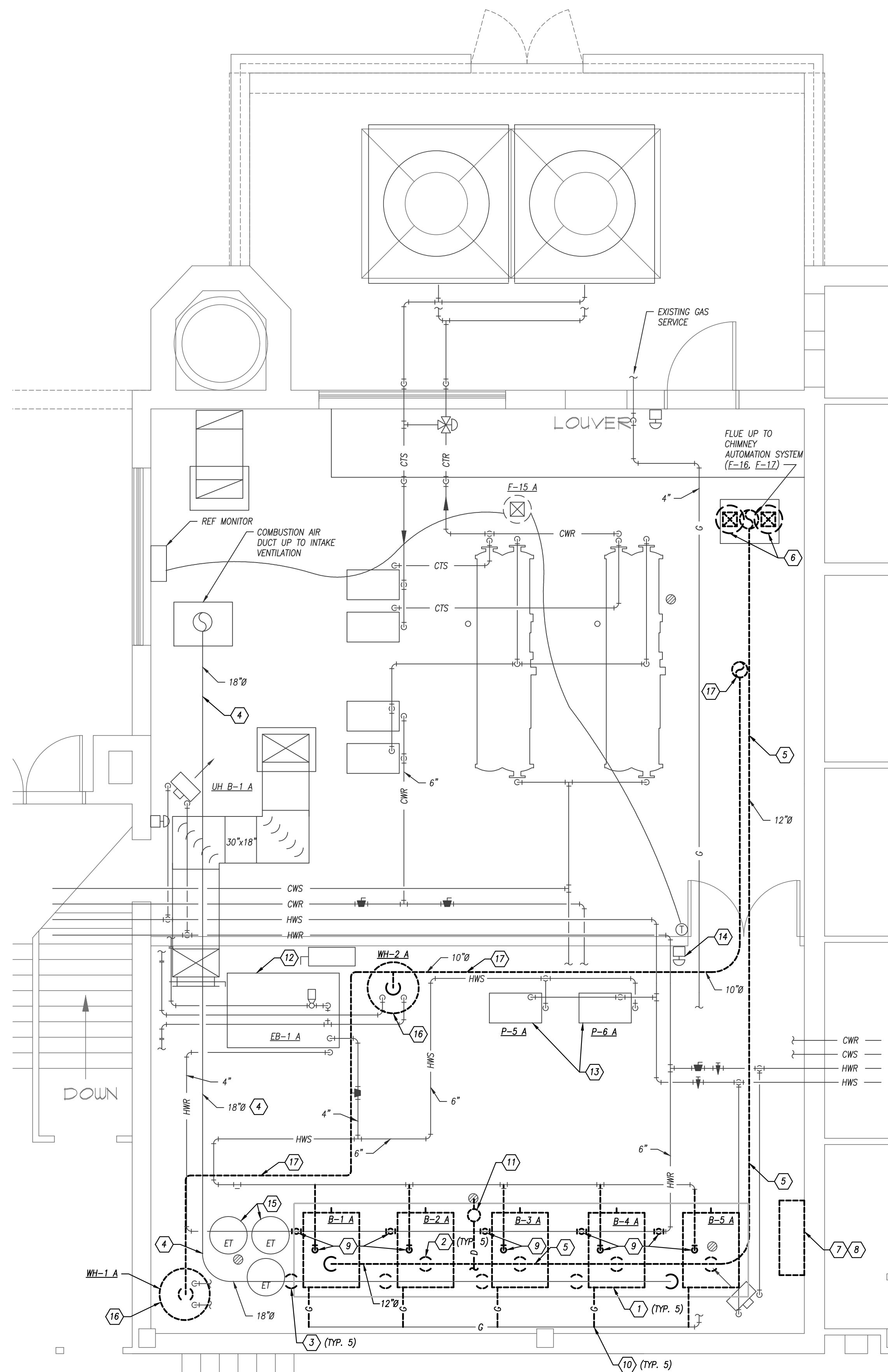
- 1) REMOVE BOILER.
- 2) REMOVE 4" BOILER FLUE, MUFFLER, AND FLUE SUPPORTS.
- 3) REMOVE 4" COMBUSTION AIR DUCT BACK TO MAIN COMBUSTION AIR DUCT.
- 4) 18" COMBUSTION AIR DUCT MAIN TO REMAIN.
- 5) REMOVE 12" BOILER FLUE.
- 6) REMOVE FLUE EXHAUST FANS.
- 7) REMOVE BOILER CONTROLS.
- 8) REMOVE FLUE EXHAUST FAN CONTROLS.
- 9) REMOVE HOT WATER SUPPLY AND RETURN BRANCH PIPING BACK TO MAIN. REMOVE 2-WAY CONTROL VALVE AND SHUTOFF VALVE.
- 10) REMOVE 1-1/4" NATURAL GAS VALVE TRAIN BACK TO MAIN. NATURAL GAS MAIN TO REMAIN.
- 11) REMOVE FLUE CONDENSATE DRAIN PIPING.
- 12) ELECTRIC BOILER TO REMAIN.
- 13) HOT WATER PUMPS TO REMAIN. REPLACE VFD'S.
- 14) BOILER SHUTDOWN SWITCH TO REMAIN.
- 15) HYDRONIC PIPING AND SYSTEM ACCESSORIES (I.E. AIR SEPARATORS, EXPANSION TANKS, VALVES, STRAINERS, ETC.) TO REMAIN.
- 16) REMOVE DOMESTIC WATER HEATERS, FLUE VENT, VALVES, AND NG REGULATOR. PIPING DOWN TO WH AND PAD TO REMAIN FOR REUSE.
- 17) REMOVE FLUE FROM WATER HEATERS AND ROOF CAP.

GENERAL HVAC NOTES

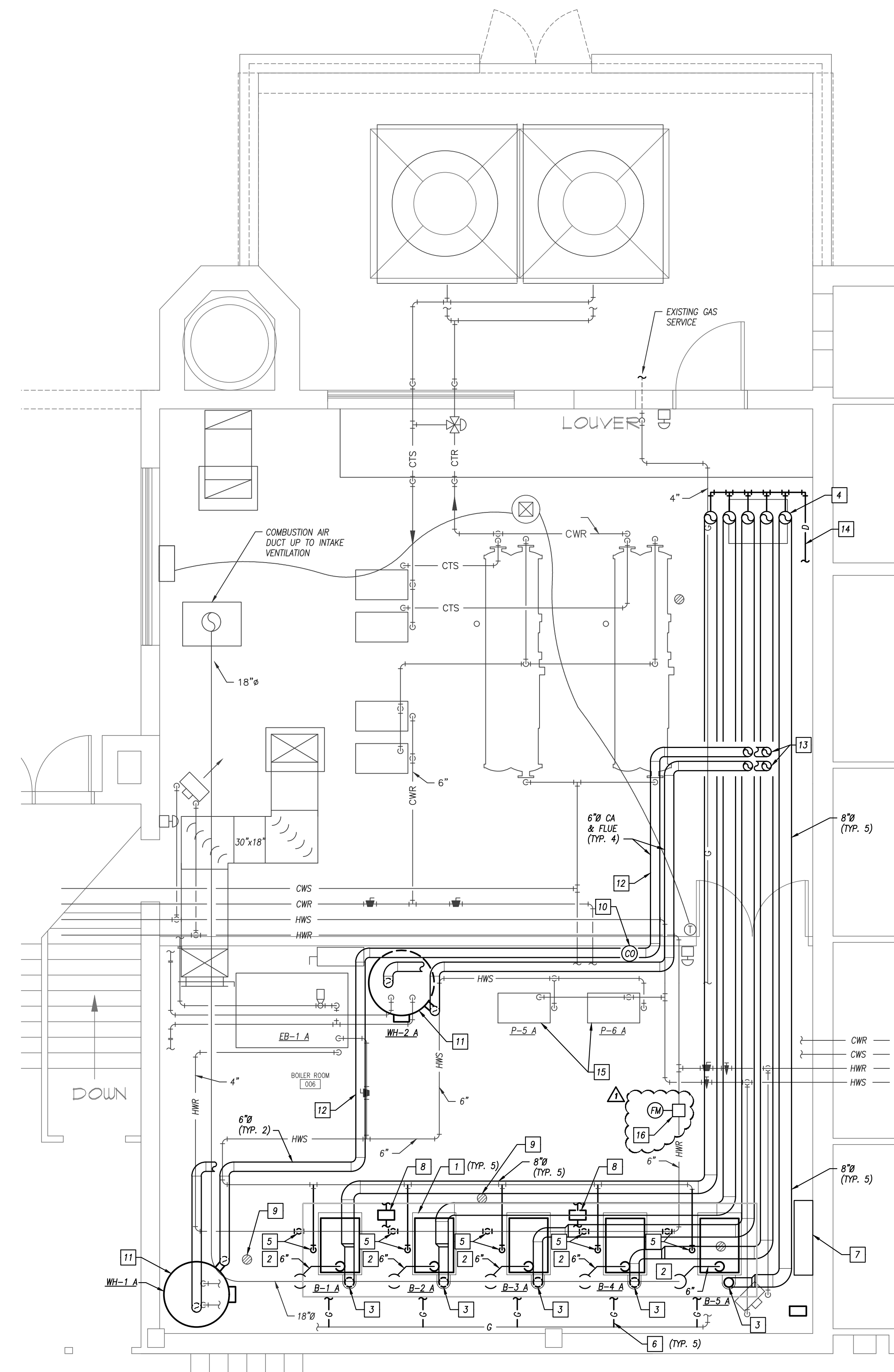
1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL BOILER FLUE SHALL BE STAINLESS STEEL AND COMPLIANT WITH UL-173B.
3. FILL AND PURGE SYSTEM AFTER INSTALLATION IS COMPLETE. ADD ETHYLENE GLYCOL TO ACHIEVE 40% CONCENTRATION.
4. PROVIDE NEW OUTSIDE AIR TEMPERATURE SENSOR AND CONNECT TO BOILER CONTROLS.

HVAC PLAN KEYED NOTES

- 1) INSTALL BOILER ON EQUIPMENT PAD. EXTEND PAD IF REQUIRED. PROVIDE EQUIPMENT NEOPRENE PAD ON TOP OF EXISTING CONCRETE PAD TO ACHIEVE A BOILER HEIGHT OF 6" ABOVE FINISHED FLOOR.
- 2) CONNECT 6" COMBUSTION AIR INTAKE TO EXISTING COMBUSTION AIR MAIN WITH NEW 45 DEG TAKEOFF.
- 3) INSTALL NEW BOILER FLUE FOR EACH BOILER.
- 4) BOILER FLUE UP TO ROOF ABOVE. REFER TO DETAIL ON SHEET M201 FOR ROOF TERMINATION.
- 5) CONNECT NEW 2" HWS & HWR BRANCH PIPING TO BOILER FROM EXISTING MAINS. PROVIDE NEW SHUTOFF VALVES ON SUPPLY AND RETURN AND CONTROL VALVE ON RETURN.
- 6) CONNECT NEW NATURAL GAS PIPING TO BOILER FROM EXISTING MAIN. PROVIDE NEW NG REGULATOR AND REGULATOR RELIEF TUBING.
- 7) INSTALL BOILER CONTROLS ON WALL.
- 8) INSTALL CONDENSATE NEUTRALIZATION KIT AND CONDENSATE DRAIN TRAP. ROUTE DRAIN PIPING FROM DRAIN TRAP OUTLET TO NEAREST FLOOR DRAIN. COORDINATE EXACT LOCATION SO AS TO MEET PROPER SLOPE INTO UNIT FROM BOILER CONDENSATE DISCHARGE. ROUTE NEUTRALIZATION TANK DISCHARGE TO FLOOR DRAIN NEARBY.
- 9) CLEAN DEBRIS FROM EXISTING FLOOR DRAINS. REPLACE FLOOR DRAIN GRATE.
- 10) PROVIDE CO SENSOR IN SPACE MOUNTED 60 IN. AFF. WIRE TO EXISTING AOC CONTROLS SYSTEM FOR HIGH LEVEL ALARM AND NOTIFICATION TO BMS.
- 11) INSTALL WATER HEATER ON EXISTING EQUIPMENT PAD. EXTEND PAD IF REQUIRED. EXTEND DOMESTIC WATER PIPING AS REQUIRED. PROVIDE NEW SHUTOFF VALVES, NO PRESSURE REGULATOR, RELIEF AND RELIEF VALVE. ROUTE RELIEF VALVE DISCHARGE TO NEAREST FLOOR DRAIN.
- 12) PROVIDE 6" PVC COMBUSTION AIR INTAKE AND FLUE PIPING FOR DOMESTIC WATER HEATERS.
- 13) COMBUSTION AIR AND FLUE FROM WATER HEATER UP THROUGH ROOF AT LOCATION OF EXISTING WATER HEATER FLUE PENETRATION.
- 14) PROVIDE BULLHEAD TEE WITH DRAIN CONNECTION AT BASE OF BOILER STACK. ROUTE DRAIN PIPING TO NEAREST FLOOR DRAIN.
- 15) HOT WATER PUMPS TO REMAIN. REPLACE VFD'S. PUMP P-5A AND P-6A TO HP 480V/3PH EACH.
- 16) PROVIDE ULTRASONIC FLOW METER. CONNECT TO BOILER CONTROL SYSTEM.



BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"



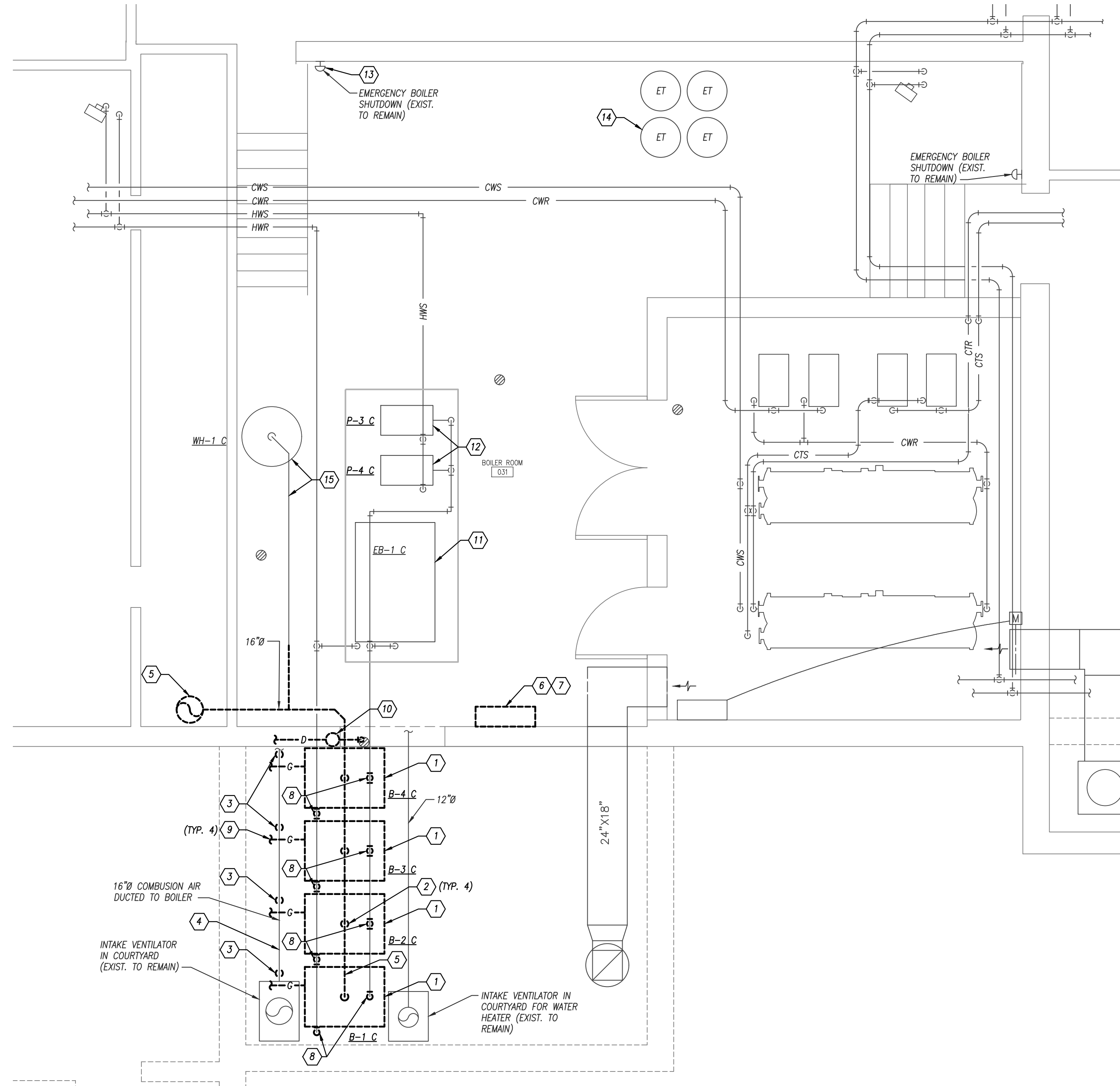
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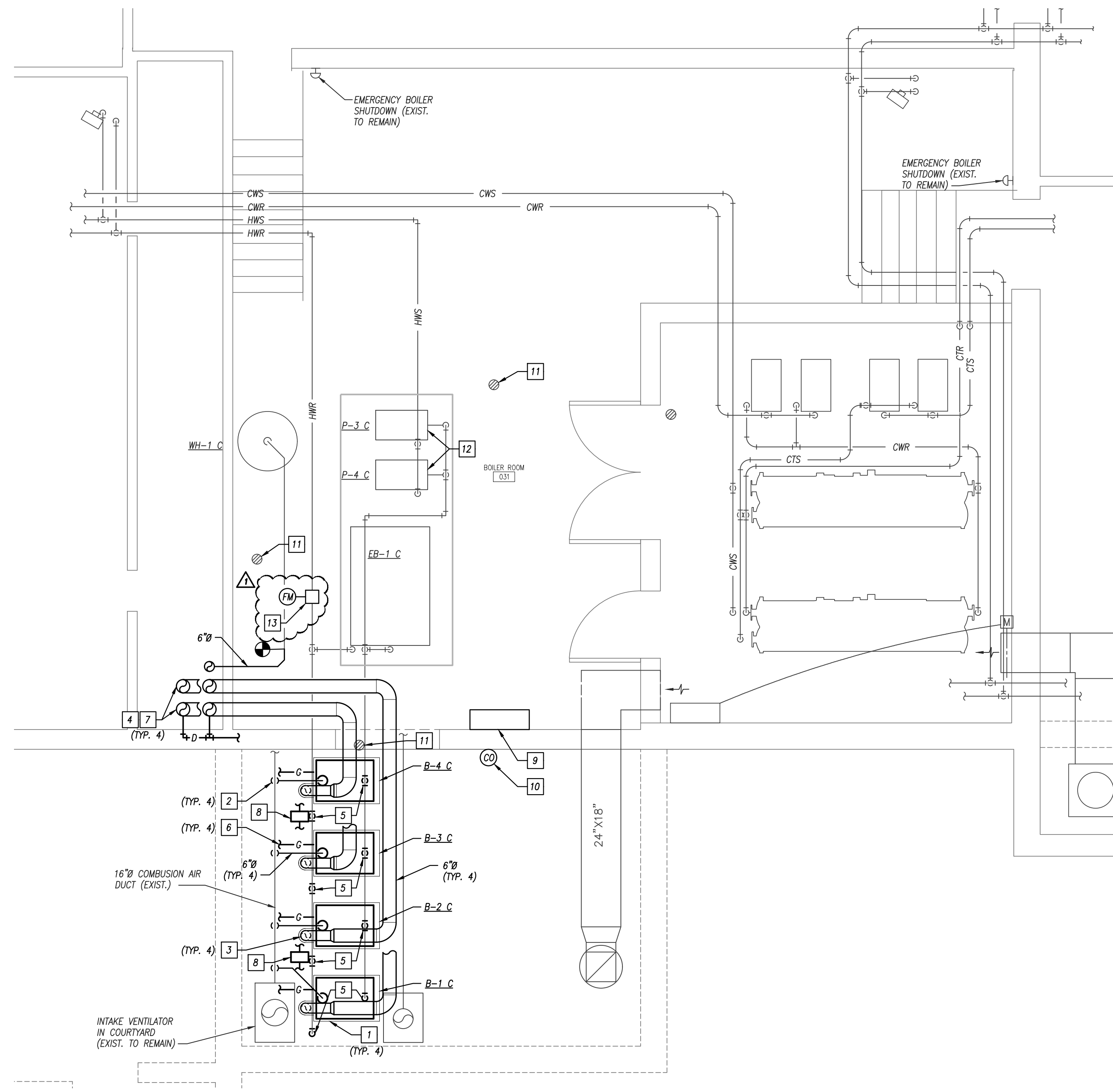
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MECHANICAL - BOILER PLANS

DATE: 2/14/22 PKMR PROJECT: 21.659b
SHEET NUMBER:

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BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"

GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL HYDRONIC SYSTEMS AND PLUMBING SYSTEMS TO REMAIN UNLESS OTHERWISE NOTED.

DEMOLITION PLAN KEYED NOTES

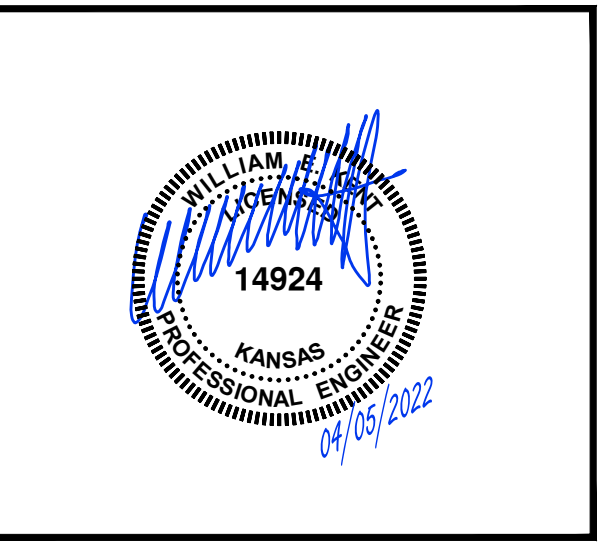
1. REMOVE BOILER.
2. REMOVE 4" BOILER FLUE DN TO BOILER, MUFFLER, AND FLUE SUPPORTS.
3. REMOVE 4" COMBUSTION AIR DUCT BACK TO MAIN COMBUSTION AIR DUCT.
4. 18" COMBUSTION AIR DUCT MAIN TO REMAIN.
5. REMOVE 16" BOILER FLUE IN MECHANICAL ROOM AND IN CHASE UP TO ROOF. REMOVE ROOF-MOUNTED FLUE EXHAUST FANS.
6. REMOVE BOILER CONTROLS.
7. REMOVE FLUE EXHAUST FAN CONTROLS.
8. REMOVE HOT WATER SUPPLY AND RETURN BRANCH PIPING BACK TO MAIN.
9. REMOVE 2-WAY CONTROL VALVE AND SHUTOFF VALVE.
10. REMOVE 1-1/4" NATURAL GAS VALVE TRAIN BACK TO MAIN. NATURAL GAS MAIN TO REMAIN.
11. REMOVE FLUE CONDENSATE DRAIN PIPING.
12. REMOVE HOT WATER PUMPS TO REMAIN. REPLACE VFD'S.
13. REMOVE BOILER SHUTDOWN SWITCH TO REMAIN.
14. HYDRONIC PIPING AND SYSTEM ACCESSORIES (I.E. AIR SEPARATORS, EXPANSION TANKS, VALVES, STRAINERS, ETC.) TO REMAIN.
15. WATER HEATER, DRYHT HOOD, AND PORTION OF VENTING TO REMAIN. REMOVE FLUE CONNECTION TO EXHAUST SYSTEM.

GENERAL HVAC NOTES

1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL BOILER FLUE SHALL BE STAINLESS STEEL AND COMPLIANT WITH UL-173B.
3. FILL AND PURGE SYSTEM AFTER INSTALLATION IS COMPLETE. ADD ETHYLENE GLYCOL TO ACHIEVE 40% CONCENTRATION.
4. PROVIDE NEW OUTSIDE AIR TEMPERATURE SENSOR AND CONNECT TO BOILER CONTROLS.

HVAC PLAN KEYED NOTES

1. INSTALL BOILER ON EQUIPMENT PAD. EXTEND PAD IF REQUIRED.
2. CONNECT 6" COMBUSTION AIR INTAKE TO EXISTING COMBUSTION AIR MAIN WITH NEW 45 DEG TAKEOFF.
3. INSTALL NEW 6" BOILER FLUE FOR EACH BOILER.
4. BOILER FLUE(S) UP TO ROOF ABOVE. REFER TO DETAIL ON SHEET M201 FOR FLUE TERMINATION.
5. CONNECT NEW 2" HWS & HWR BRANCH PIPING TO BOILER FROM EXISTING MAINS. PROVIDE NEW SHUTOFF VALVES ON SUPPLY AND RETURN AND CONTROL VALVE ON RETURN.
6. CONNECT NEW NATURAL GAS PIPING TO BOILER FROM EXISTING MAIN. PROVIDE NEW NG REGULATOR AND REGULATOR RELIEF TUBING.
7. PROVIDE BULLHEAD TEE WITH DRAIN CONNECTION AT BASE OF BOILER STACK. ROUTE DRAIN PIPING TO NEAREST FLOOR DRAIN.
8. INSTALL CONDENSATE NEUTRALIZATION KIT AND CONDENSATE FLUE TRAP. ROUTE DRAIN PIPING FROM DRAIN TRAP OUTLET TO NEAREST FLOOR DRAIN.
9. INSTALL BOILER CONTROLS.
10. PROVIDE CO SENSOR IN SPACE MOUNTED 60 IN. AFF. WIRE TO EXISTING AOC CONTROLS SYSTEM FOR HIGH LEVEL ALARM AND NOTIFICATION TO BMS.
11. CLEAN DEBRIS FROM EXISTING FLOOR DRAINS. REPLACE FLOOR DRAIN GRATE.
12. HOT WATER PUMPS TO REMAIN. REPLACE VFD'S. PUMP P-5C AND P-6C. TO HP 480V/3PH EACH.
13. PROVIDE ULTRASONIC FLOW METER. CONNECT TO BOILER CONTROL SYSTEM.



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BOILER REPLACEMENTS
KANSAS CITY, KANSAS SCHOOL DISTRICT U.S.D. 500
ARGENTINE, CENTRAL & ROSEDALE MIDDLE SCHOOLS
WASHINGTON & WYANDOTTE HIGH SCHOOLS
KANSAS CITY, KANSAS

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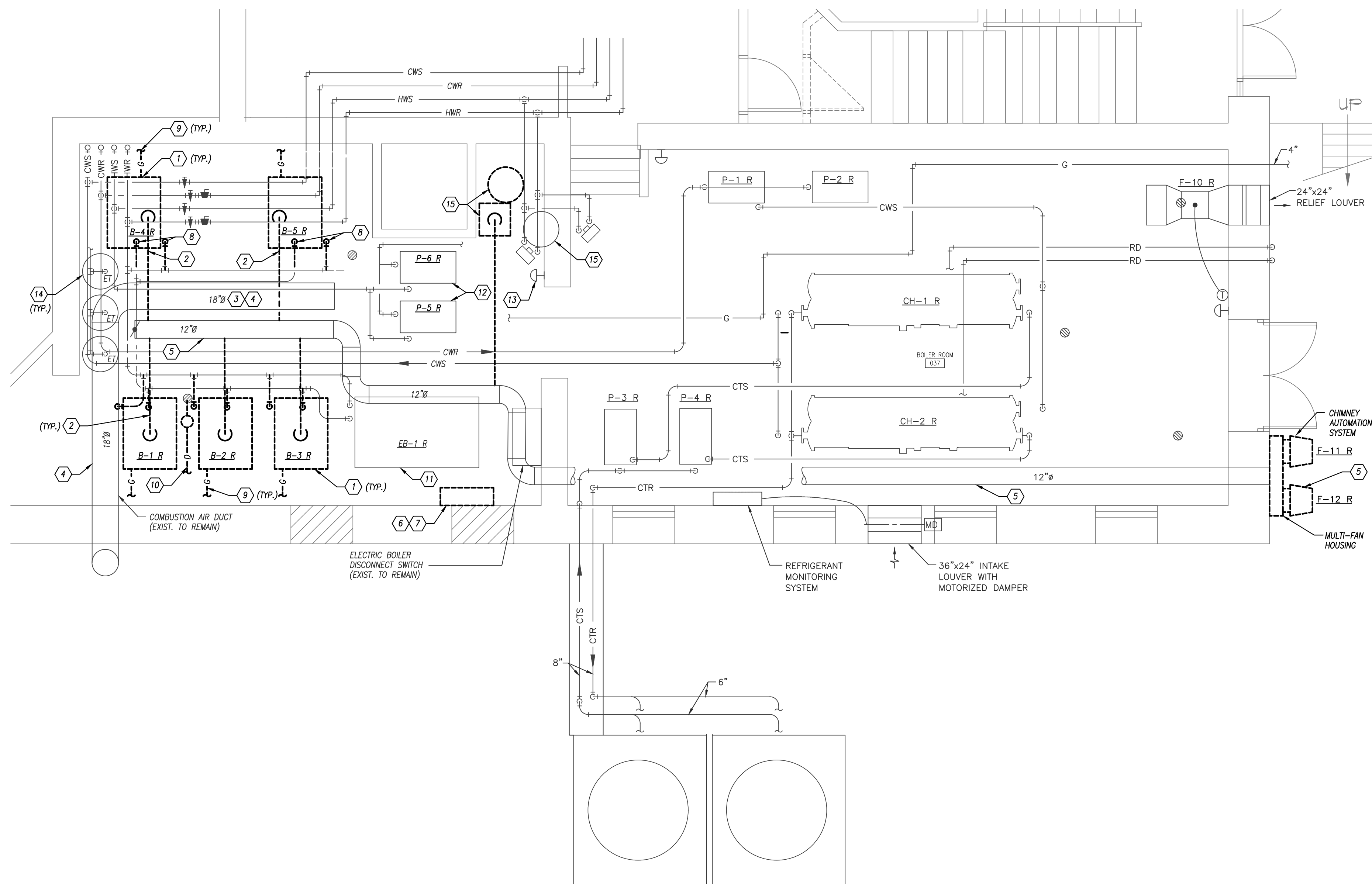
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MECHANICAL - BOILER ROOMS

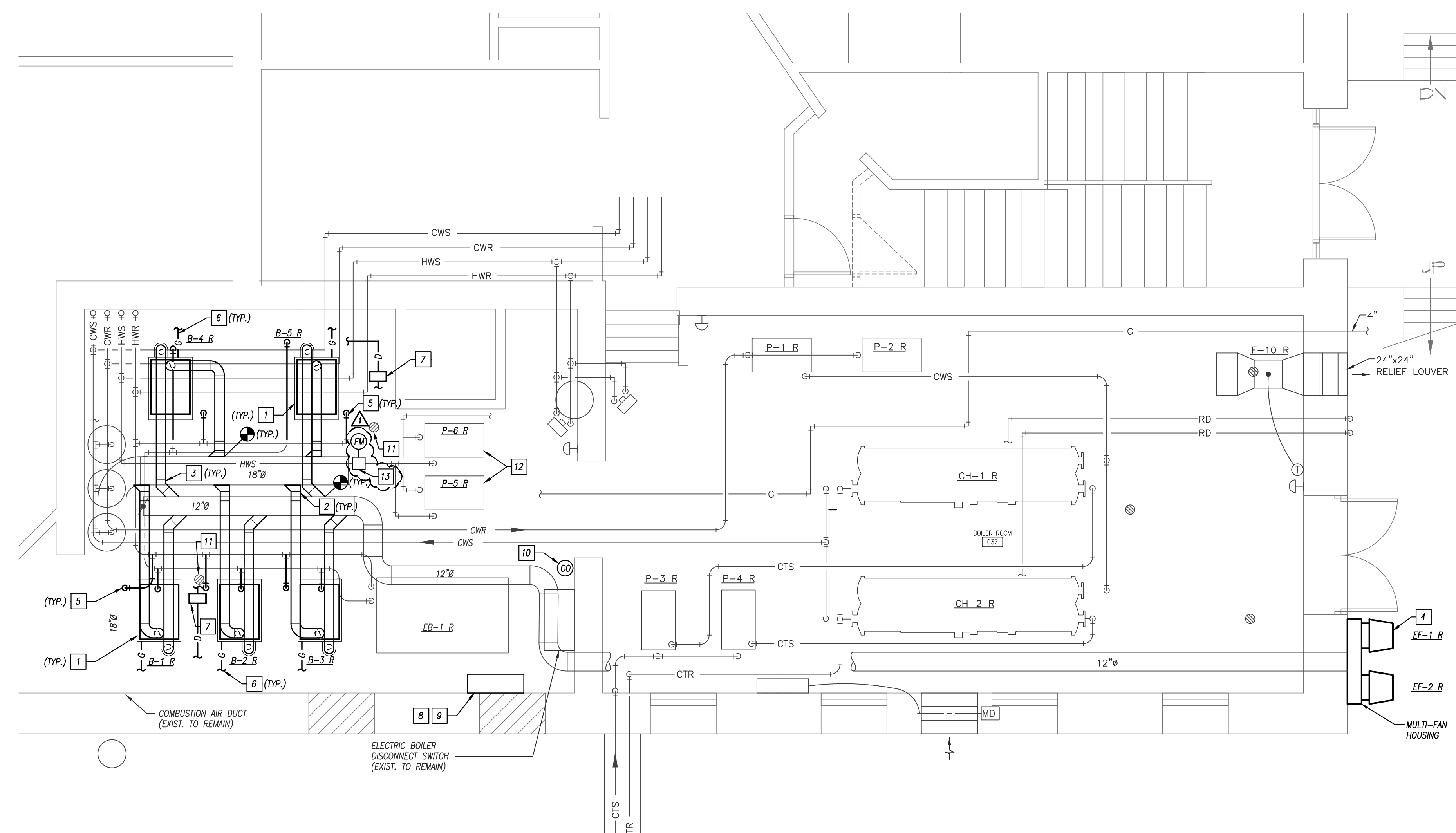
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BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"

GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL HYDRONIC SYSTEMS AND PLUMBING SYSTEMS TO REMAIN UNLESS OTHERWISE NOTED.

DEMOLITION PLAN KEYED NOTES

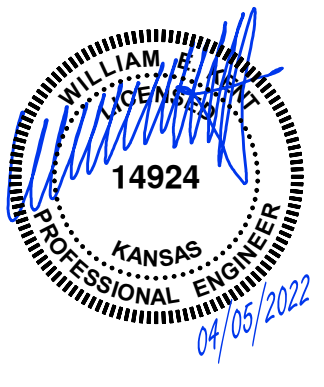
1. REMOVE BOILER. EQUIPMENT PAD TO REMAIN.
2. REMOVE 4" BOILER FLUE ON TO BOILER, MUFFLER, AND FLUE SUPPORTS.
3. REMOVE 4" COMBUSTION AIR DUCT BACK TO MAIN COMBUSTION AIR DUCT.
4. 18" COMBUSTION AIR DUCT MAIN TO REMAIN.
5. 12" BOILER FLUE MAIN TO REMAIN FOR REUSE. REMOVE WALL-MOUNTED FLUE EXHAUST FANS FOR REPLACEMENT.
6. REMOVE BOILER CONTROLS.
7. REMOVE FLUE EXHAUST FAN CONTROLS.
8. REMOVE HOT WATER SUPPLY AND RETURN BRANCH PIPING BACK TO MAIN. REMOVE 2-WAY CONTROL VALVE AND SHUTOFF VALVE.
9. REMOVE 1-1/4" NATURAL GAS VALVE TRAIN BACK TO MAIN. NATURAL GAS MAIN TO REMAIN.
10. REMOVE FLUE CONDENSATE DRAIN PIPING.
11. ELECTRIC BOILER TO REMAIN.
12. HOT WATER PUMPS TO REMAIN. REPLACE VFD'S.
13. BOILER SHUTDOWN SWITCH TO REMAIN.
14. HYDRONIC PIPING AND SYSTEM ACCESSORIES (I.E. AIR SEPARATORS, EXPANSION TANKS, VALVES, STRAINERS, ETC.) TO REMAIN.
15. REMOVE ABANDONED DOMESTIC WATER HEATER, DHW STORAGE TANK, AND FLUE. EXISTING OPERABLE ELECTRIC WATER HEATER TO REMAIN.

GENERAL HVAC NOTES

1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL BOILER FLUE SHALL BE STAINLESS STEEL AND COMPLIANT WITH UL-173B.
3. FILL AND PURGE SYSTEM AFTER INSTALLATION IS COMPLETE. ADD ETHYLENE GLYCOL TO ACHIEVE 40% CONCENTRATION.
4. PROVIDE NEW OUTSIDE AIR TEMPERATURE SENSOR AND CONNECT TO BOILER CONTROLS.

HVAC PLAN KEYED NOTES

1. INSTALL BOILER ON EQUIPMENT PAD. EXTEND PAD IF REQUIRED.
2. CONNECT 6" COMBUSTION AIR INTAKE TO EXISTING COMBUSTION AIR MAIN WITH NEW 45 DEG TAKEOFF.
3. INSTALL NEW 6" BOILER FLUE FOR EACH BOILER.
4. INSTALL NEW BOILER FLUE EXHAUST FANS IN PLACE OF EXISTING FANS. RECONNECT TO EXISTING FLUE DUCT.
5. CONNECT NEW 2" HWS & HWR BRANCH PIPING TO BOILER FROM EXISTING MAINS. PROVIDE NEW SHUTOFF VALVES ON SUPPLY AND RETURN AND CONTROL VALVE ON RETURN.
6. CONNECT NEW NATURAL GAS PIPING TO BOILER FROM EXISTING MAIN. PROVIDE NEW SHUTOFF VALVE, NG REGULATOR, AND REGULATOR RELIEF TUBING.
7. INSTALL CONDENSATE NEUTRALIZATION KIT AND MULTIPLE BOILER CONDENSATE DRAIN TRAP. ROUTE DRAIN PIPING FROM DRAIN TRAP OUTLET TO NEAREST FLOOR DRAIN.
8. INSTALL BOILER CONTROLS ON WALL.
9. INSTALL FLUE EXHAUST FAN CONTROLS. PROVIDE DUPLICATE CONTROLLERS, SENSORS, TRANSDUCERS, ETC. FOR REDUNDANT SYSTEM OPERATION.
10. PROVIDE CO SENSOR IN SPACE MOUNTED 80 IN. AFF. WIRE TO EXISTING 400. CONTROL SYSTEM FOR HIGH LEVEL ALARM AND NOTIFICATION TO BMS.
11. CLEAN DEBRIS FROM EXISTING FLOOR DRAINS. REPLACE FLOOR DRAIN GRATE.
12. HOT WATER PUMPS TO REMAIN. REPLACE VFD'S. PUMP P-5A AND P-6A 15 HP 480V/3PH EACH.
13. PROVIDE ULTRASONIC FLOW METER. CONNECT TO BOILER CONTROL SYSTEM.



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KANSAS CITY, KANSAS
BOILER REPLACEMENTS
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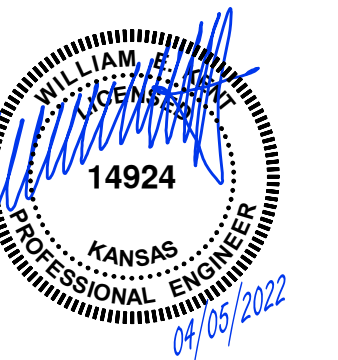
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MECHANICAL BOILER PLANS

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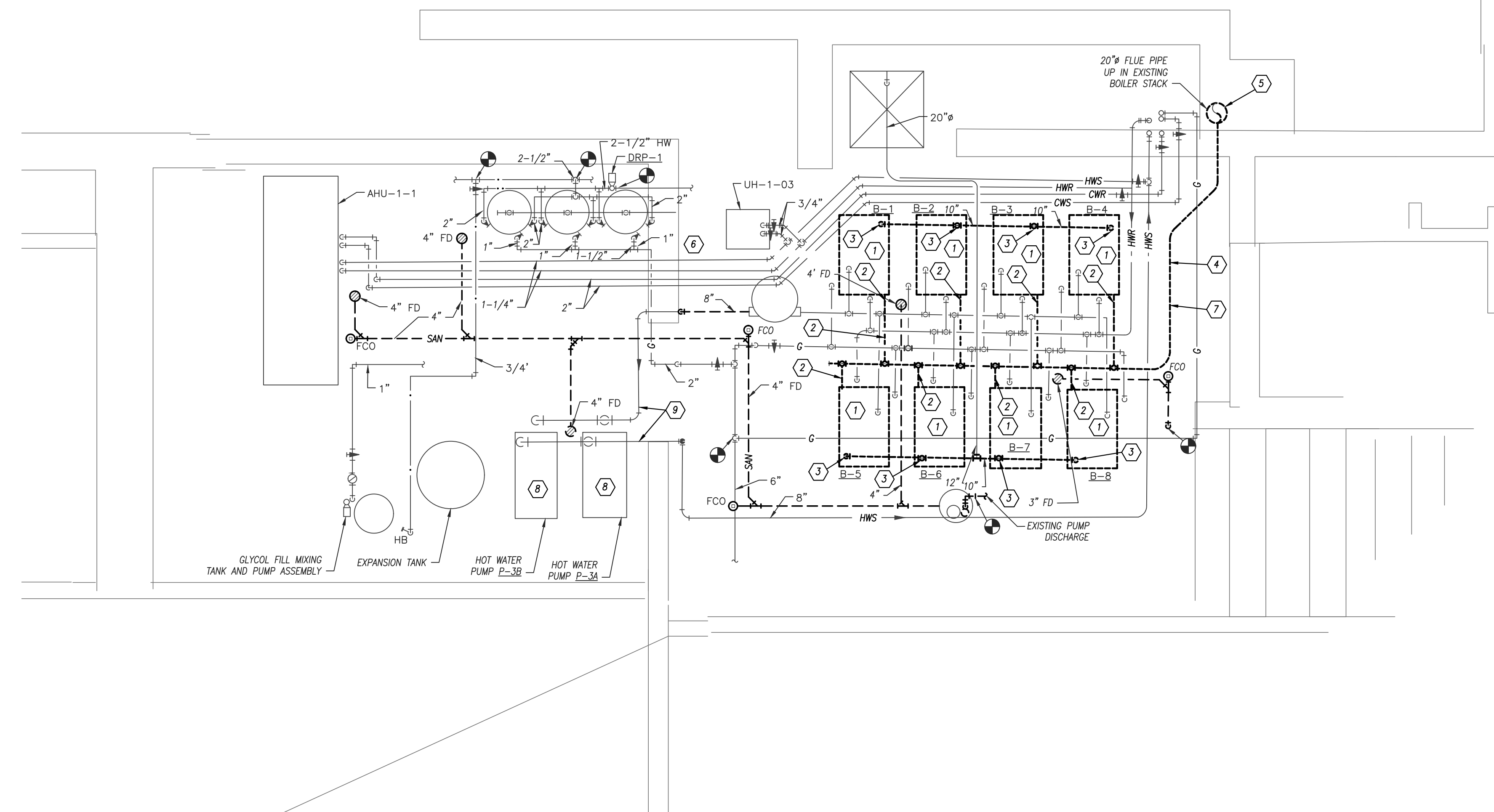
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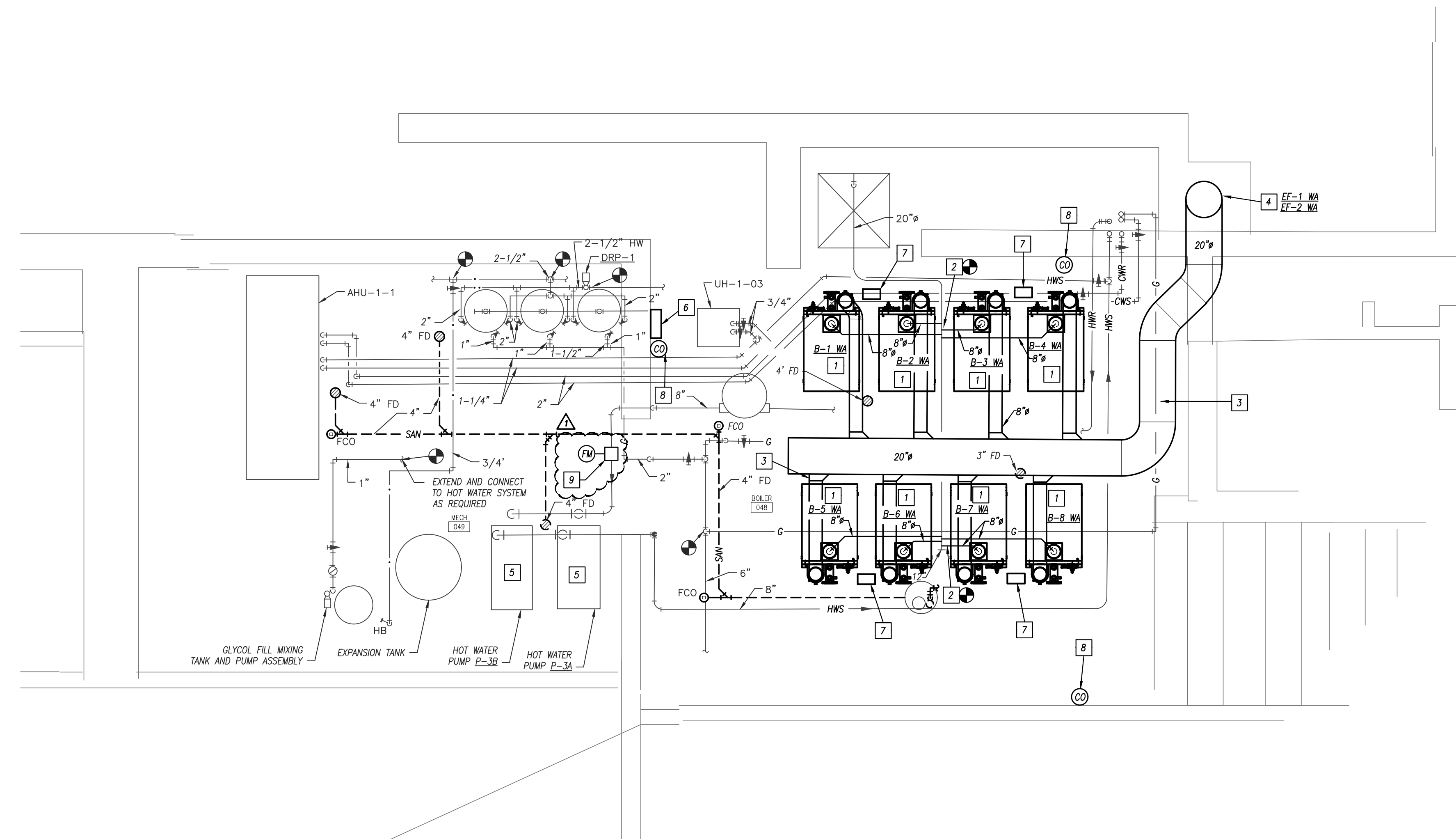


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KANSAS CITY, KANSAS BOILER REPLACEMENTS
ARGENTINE, CENTRAL & ROSEDALE MIDDLE SCHOOLS
WASHINGTON & WYANDOTTE HIGH SCHOOLS
KANSAS CITY, KANSAS



BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"

GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL HYDRONIC SYSTEMS AND PLUMBING SYSTEMS TO REMAIN UNLESS OTHERWISE NOTED.

DEMOLITION PLAN KEYED NOTES

- 1 REMOVE BOILER AND ASSOCIATED BOILER CONTROLS. REMOVE 1-1/4" NATURAL GAS VALVE TRAIN BACK TO MAIN. NATURAL GAS MAIN TO REMAIN. BOILER SHUTDOWN SWITCH TO REMAIN. REMOVE HOT WATER SUPPLY AND RETURN BRANCH PIPING BACK TO MAIN. REMOVE 2-WAY CONTROL VALVE AND SHUTOFF VALVE.
- 2 REMOVE 8" BOILER FLUE, MUFFLER, AND FLUE SUPPORTS.
- 3 REMOVE 6" COMBUSTION AIR DUCT BACK TO MAIN COMBUSTION AIR DUCT.
- 4 20" EXHAUST AIR DUCT MAIN TO BE REMOVED. ASSOCIATED ACCESSORIES TO BE REMOVED.
- 5 REMOVE FLUE DUCT UP TO ROOF AND ASSOCIATED EXHAUST FAN(S) AND CONTROLS. PATCH AND REPAIR TERMINATION LOCATION THROUGH ROOF.
- 6 REMOVE FLUE EXHAUST FAN CONTROLS.
- 7 REMOVE FLUE CONDENSATE DRAIN PIPING.
- 8 HOT WATER PUMPS TO REMAIN. REPLACE VFD'S.
- 9 HYDRONIC PIPING AND SYSTEM ACCESSORIES (I.E. AIR SEPARATORS, EXPANSION TANKS, VALVES, STRAINERS, ETC.) TO REMAIN

GENERAL HVAC NOTES

1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL BOILER EXHAUST DUCTS TO BE ROUTED IN MATERIAL COMPLIANT WITH UL-173B.
3. FILL AND PURGE HEATING HOT WATER SYSTEM AND ADD ETHYLENE GLYCOL TO ACHIEVE 40% CONCENTRATION.
4. DUCT SIZES SHOWN ON PLANS ARE INSIDE FREE AREA.
5. PROVIDE NEW OUTSIDE AIR TEMPERATURE SENSOR FOR BOILER COMBUSTION AIR TEMPERATURE CONTROL.

HVAC PLAN KEYED NOTES

- 1 INSTALL BOILER ON EQUIPMENT PAD. EXTEND PAD IF REQUIRED. PROVIDE EQUIPMENT INSURENCE PAD ON TOP OF EXISTING CONCRETE PAD TO ACHIEVE A BOILER HEIGHT OF 6" ABOVE FINISHED FLOOR. INSTALL BOILER WITH ALL MANUFACTURER'S REQUIRED CLEARANCES MAINTAINED. CONNECT NEW 4" HWS & HWR BRANCH PIPING TO BOILER FROM EXISTING MAINS. PROVIDE NEW FLEXIBLE CONNECTIONS AND SHUTOFF VALVES ON SUPPLY AND RETURN AND SOLVED CONTROL VALVE ON RETURN. REPLACE STRAINER ASSOCIATED TO BOILER. CONNECT NEW NATURAL GAS PIPING TO BOILER FROM EXISTING MAIN. PROVIDE NEW NG REGULATOR AND REGULATOR RELIEF TUBING. ROUTE BOILER RELIEF DRAIN TO ADJACENT FLOOR DRAIN.
- 2 CONNECT 8" COMBUSTION AIR INTAKE TO EXISTING COMBUSTION AIR MAIN WITH NEW 45 DEG TAKEOFF.
- 3 INSTALL NEW 8" BOILER FLUE FOR EACH BOILER. EACH INDIVIDUAL BOILER FLUE SHALL BE ROUTED TO NEW MAIN 20" DUCT. ROUTE FLUES AS SHOWN IN COORDINATION WITH EXISTING PIPING AND EQUIPMENT TO REMAIN WITHIN BOILER ROOM. MODIFY ROUTING AS NEEDED. NEW 20" MAIN SHALL BE ROUTED UP THROUGH SHUTT FOR CONNECTION TO NEW ENERGY FAN.
- 4 BOILER FLUE UP TO ROOF ABOVE FOR CONNECTION TO NEW ENERGY FAN SYSTEM (EF-1 MA & EF-2 MA). REFER TO DETAIL AND SCHEDULE ON SHEET M001. PROVIDE DRAIN CONNECTION AT BULL HEAD TEE AT BASE OF BOILER STACK. ROUTE DRAIN TO NEARBY FLOOR DRAIN AND TERMINATE.
- 5 HOT WATER PUMPS TO REMAIN. REPLACE VFD'S. PUMP P-SA AND P-BA. 20 HP 480V/3PH EACH.
- 6 PROVIDE NEW ENERGY CONTROLLER AND BOILER MANAGEMENT SYSTEM CONTROLLER.
- 7 PROVIDE NEW CONDENSATE NEUTRALIZATION TANK. TANK TO SERVE THE TWO BOILERS ADJACENT TO ITS LOCATION. COORDINATE EXACT LOCATION SO AS TO MEET PROPER SLOPE INTO UNIT FROM BOILER CONDENSATE DISCHARGE. ROUTE NEUTRALIZATION TANK DISCHARGE TO FLOOR SINK NEARBY AND TERMINATE.
- 8 PROVIDE CO SENSORS WITHIN SPACE. WIRE TO EXISTING BOC CONTROLS SYSTEM FOR HIGH LEVEL ALARM AND NOTIFICATION TO BMS.
- 9 PROVIDE ULTRASONIC FLOW METER. CONNECT TO BOILER CONTROL SYSTEM.

ISSUED FOR:	DESCRIPTION	DATE
1	ADDENDUM #2	4/8/2022
2		
3		

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SHEET TITLE:
MECHANICAL - BOILER ROOMS

DATE: 2/14/22 PKMR PROJECT: 21.659b
SHEET NUMBER:



M1.4



pkmr
ENGINEERS

PEARSON KENT MCKINLEY RAAF ENGINEERS LLC
13300 W 98TH STREET, LENEXA, KS 66215
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KANSAS CITY, KANSAS SCHOOL DIRSTICT U.S.D. 500
ARGENTINE, CENTRAL & ROSEDALE MIDDLE SCHOOLS
WASHINGTON & WYANDOTTE HIGH SCHOOLS
KANSAS CITY, KANSAS

GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL HYDRONIC SYSTEMS AND PLUMBING SYSTEMS TO REMAIN UNLESS OTHERWISE NOTED.

DEMOLITION PLAN KEYED NOTES

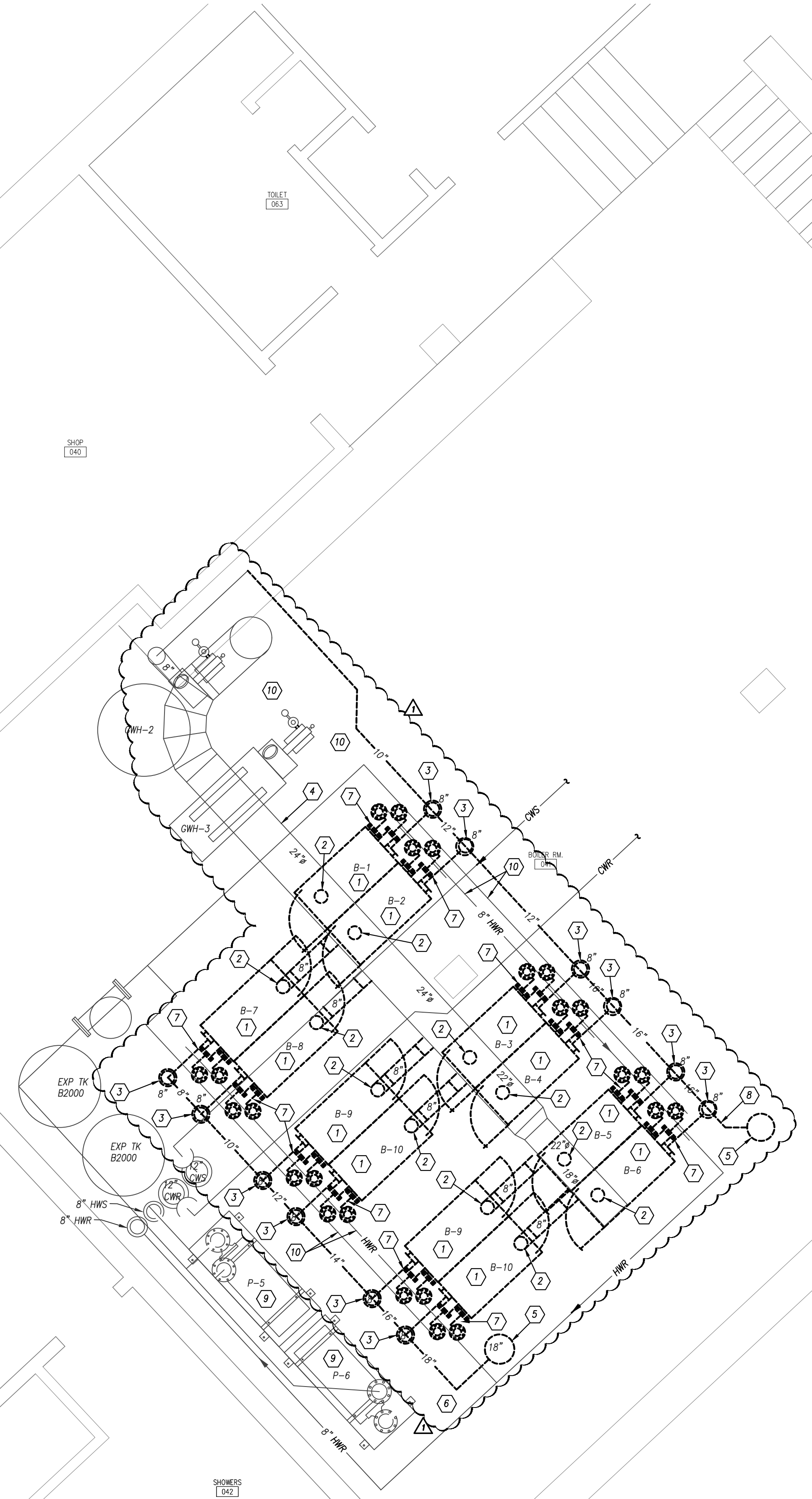
- 1 REMOVE BOILER AND ASSOCIATED BOILER CONTROLS. REMOVE 1-1/4" NATURAL GAS VALVE TRAIN BACK TO MAIN. NATURAL GAS MAIN TO REMAIN. BOILER SHUTDOWN SWITCH TO REMAIN.
- 2 REMOVE 6" BOILER COMBUSTION AIR AND SUPPORTS.
- 3 REMOVE 8" BOILER EXHAUST AIR DUCT, MUFFLER, SUPPORTS, AND MAIN EXHAUST AIR DUCT.
- 4 24" COMBUSTION AIR DUCT MAIN TO REMAIN AND ALL ASSOCIATED ACCESSORIES.
- 5 REMOVE FLUE DUCT UP TO ROOF AND ASSOCIATED EXHAUST FAN(S) AND CONTROLS. PATCH AND REPAIR TERMINATION LOCATION THROUGH ROOF.
- 6 REMOVE FLUE EXHAUST FAN CONTROLS.
- 7 REMOVE HOT WATER SUPPLY AND RETURN BRANCH PIPING BACK TO MAIN. REMOVE 2-WAY CONTROL VALVE AND SHUTOFF VALVE.
- 8 REMOVE FLUE CONDENSATE DRAIN PIPING.
- 9 HOT WATER PUMPS TO REMAIN. REPLACE VFD'S.
- 10 HYDRONIC PIPING AND SYSTEM ACCESSORIES (I.E. AIR SEPARATORS, EXPANSION TANKS, VALVES, STRAINERS, ETC.) TO REMAIN.

GENERAL HVAC NOTES

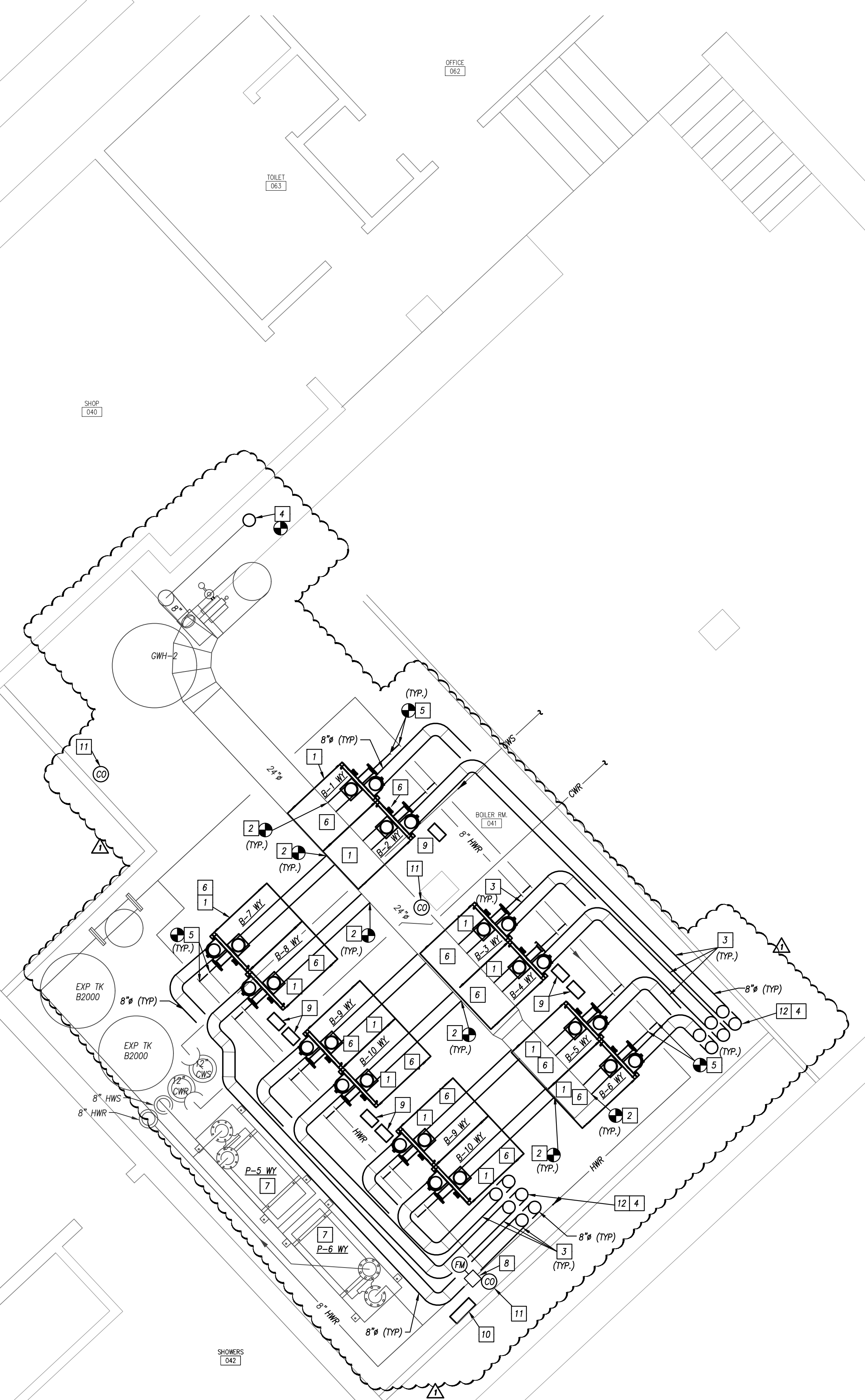
1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
2. ALL BOILER EXHAUST DUCTS TO BE ROUTED IN MATERIAL COMPLIANT WITH UL-173B.
3. FILL AND PURGE HEATING HOT WATER SYSTEM AND ADD ETHYLENE GLYCOL TO ACHIEVE 40% CONCENTRATION.
4. DUCT SIZES SHOWN ON PLANS ARE INSIDE FREE AREA.
5. PROVIDE NEW OUTSIDE AIR TEMPERATURE SENSOR FOR BOILER COMBUSTION AIR TEMPERATURE CONTROL.

HVAC PLAN KEYED NOTES

- 1 INSTALL BOILER ON EQUIPMENT PAD. EXTEND PAD IF REQUIRED. PROVIDE EQUIPMENT NEOPRENE PAD ON TOP OF EXISTING CONCRETE PAD TO ACHIEVE A BOILER HEIGHT OF 6" ABOVE FINISHED FLOOR. ROUTE BOILER RELIEF DRAIN TO ADJACENT FLOOR DRAIN.
- 2 CONNECT 8" COMBUSTION AIR INTAKE TO EXISTING COMBUSTION AIR MAIN WITH NEW 45 DEG TAKEOFF (TYPICAL FOR ALL BOILERS).
- 3 INSTALL NEW BOILER FLUE FOR EACH BOILER. EACH INDIVIDUAL BOILER FLUE SHALL BE INDIVIDUALLY VENTED. ROUTE FLUES AS SHOWN IN COORDINATION WITH EXISTING PIPING AND EQUIPMENT TO REMAIN WITHIN BOILER ROOM. VERIFY ROUTING AS NEEDED.
- 4 BOILER FLUE UP TO ROOF ABOVE. TERMINATE EACH FLUE WITH WEATHER CAP. REFER TO DETAIL ON SHEET M201. COORDINATE PENETRATION LOCATION WITH ROOF STRUCTURE ON FLOOR ABOVE. UTILIZE BEAM SPACES FOR DUCT TERMINATIONS.
- 5 CONNECT NEW 4" HWS & HWR BRANCH PIPING TO BOILER FROM EXISTING MAINS. PROVIDE NEW SHUTOFF VALVES ON SUPPLY AND RETURN AND SOLENOID CONTROL VALVE ON RETURN. REPLACE EXISTING STRAINER. REPLACE FLEXIBLE CONNECTIONS TYPICAL FOR ALL BOILERS.
- 6 CONNECT NEW NATURAL GAS PIPING TO BOILER FROM EXISTING MAIN. PROVIDE NEW NG REGULATOR AND REGULATOR RELIEF TUBING.
- 7 HOT WATER PUMPS TO REMAIN. REPLACE VFD'S. PUMP P-3A AND P-4A 40 HP 480V/3PH EACH.
- 8 PROVIDE ULTRASONIC FLOW METER. CONNECT TO BOILER CONTROL SYSTEM.
- 9 PROVIDE NEW CONDENSATE NEUTRALIZATION TANK TANK TO SERVE THE TWO BOILERS ADJACENT TO ITS LOCATION. COORDINATE EXACT LOCATION SO AS TO MEET PROPER SLOPE INTO UNIT FROM BOILER CONDENSATE DISCHARGE. PROVIDE CONDENSATE DRAIN TRAP FOR EACH BOILER. ROUTE NEUTRALIZATION TANK DISCHARGE TO FLOOR DRAIN NEARBY AND TERMINATE. CLEAN DEBRIS FROM EXISTING FLOOR DRAIN AND REPLACE GRATE.
- 10 PROVIDE NEW BOILER MANAGEMENT SYSTEM CONTROLLER.
- 11 PROVIDE CO SENSORS WITHIN SPACE. WIRE TO EXISTING DDC CONTROLS SYSTEM FOR HIGH LEVEL ALARM AND NOTIFICATION TO BMS.
- 12 PROVIDE DRAIN CONNECTION AT BULL HEAD TEE AT BASE OF BOILER STACK. ROUTE DRAIN TO NEARBY FLOOR DRAIN AND TERMINATE.



BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"



ISSUED FOR:	DESCRIPTION	DATE
1	ADDENDUM #2	4/8/2022
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3		

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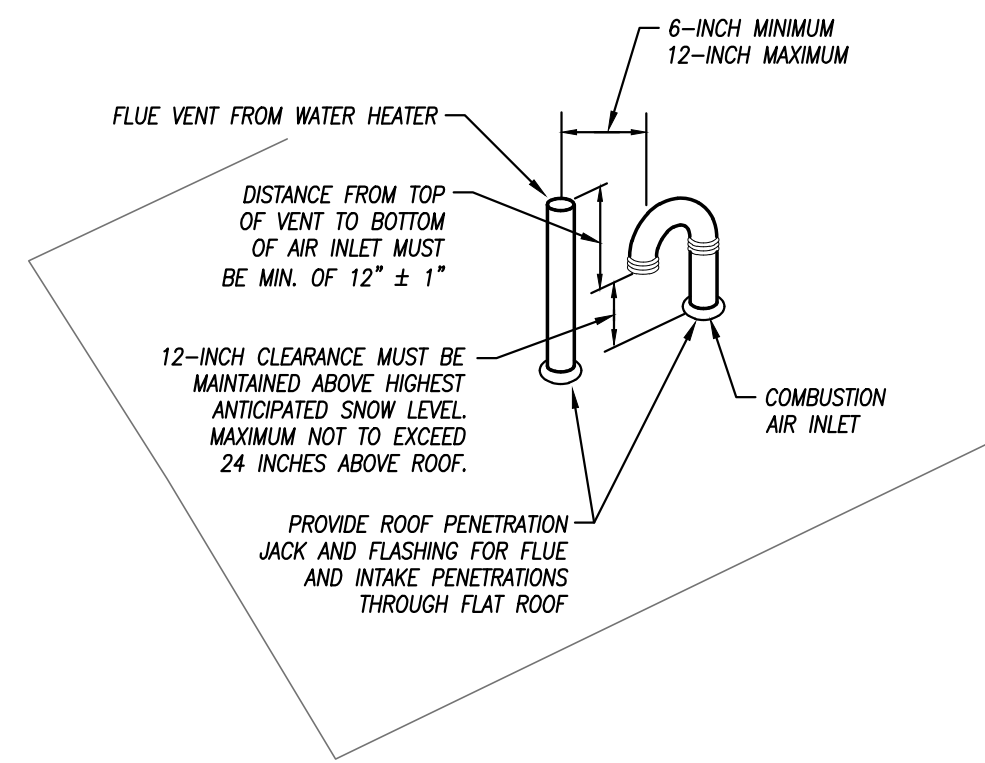
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MECHANICAL-BOILER ROOMS

DATE: 2/14/22 PKMR PROJECT: 21.659b
SHEET NUMBER:

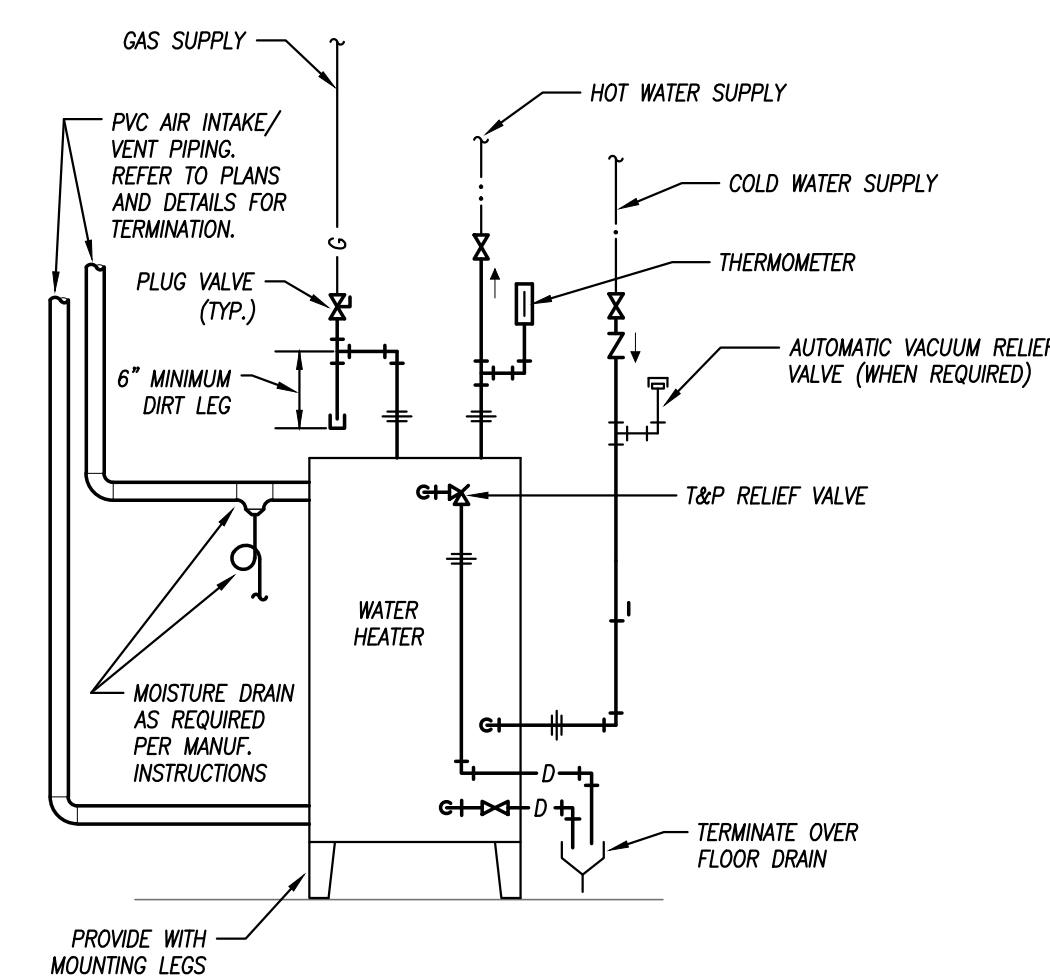
M1.5

GAS WATER HEATER SCHEDULE (ARGENTINE MIDDLE SCHOOL)										
PLAN MARK	MANUFACTURER	MODEL NUMBER	GALLONS	STYLE	GAS INPUT (MBH)	THERMAL EFFICIENCY	RECOVERY @ 90°F RISE	FLUE SIZE (IN/OUT)	VOLTAGE/ PHASE	REMARKS
WH-1 A	STATE	SUFL-220-400A	220	STORAGE TANK	399.9	93%	500	4" / 4"	120V / 1PH	1,2
WH-2 A	STATE	SUFL-220-400A	220	STORAGE TANK	399.9	93%	500.0	4" / 4"	120V / 1PH	1,2

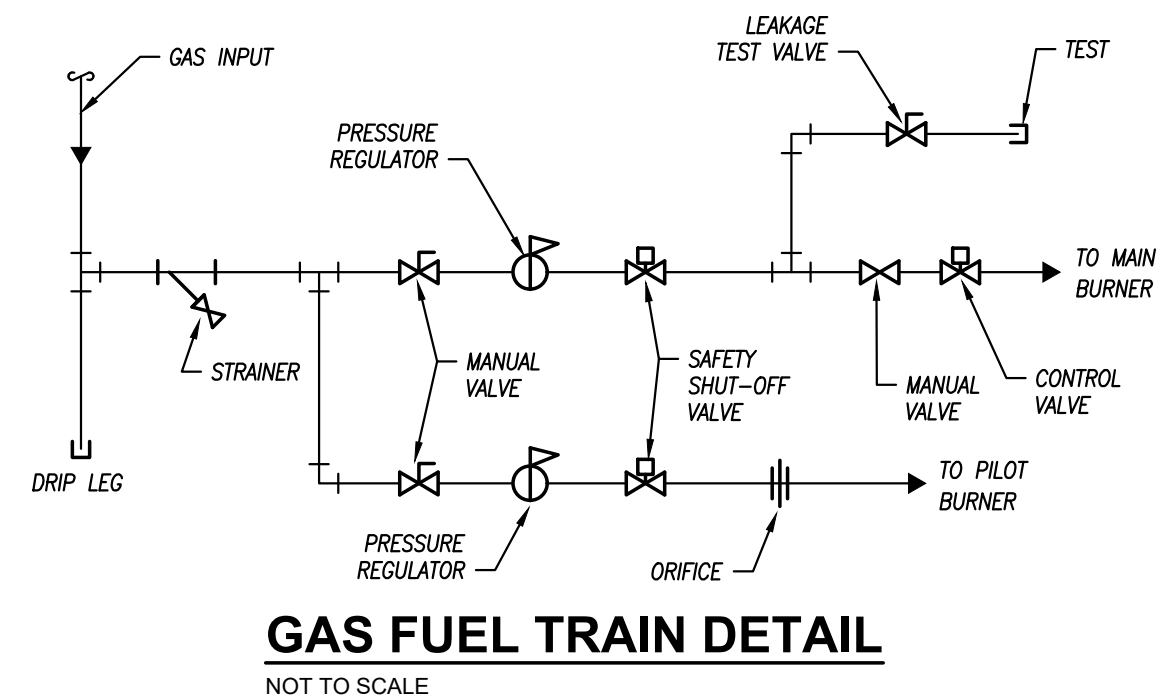
REMARKS:
 1. DIRECT-VENT STYLE WATER HEATER.
 2. PROVIDE WITH CONDENSATE NEUTRALIZATION KIT.



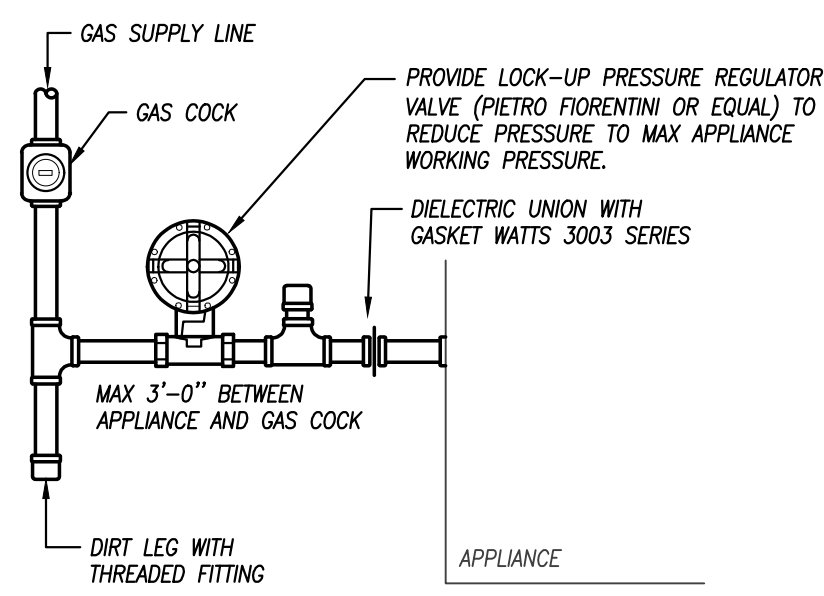
VENT AND INTAKE TERMINATION DETAIL
NOT TO SCALE



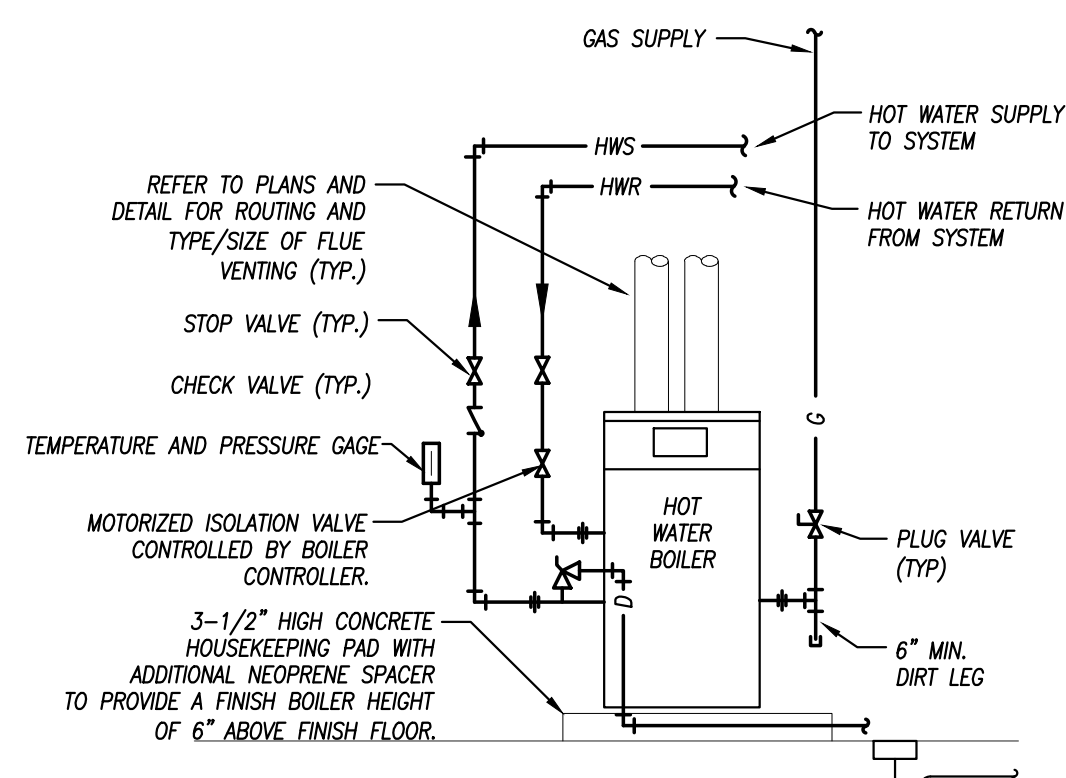
CONDENSING GAS WATER HEATER DETAIL
NOT TO SCALE



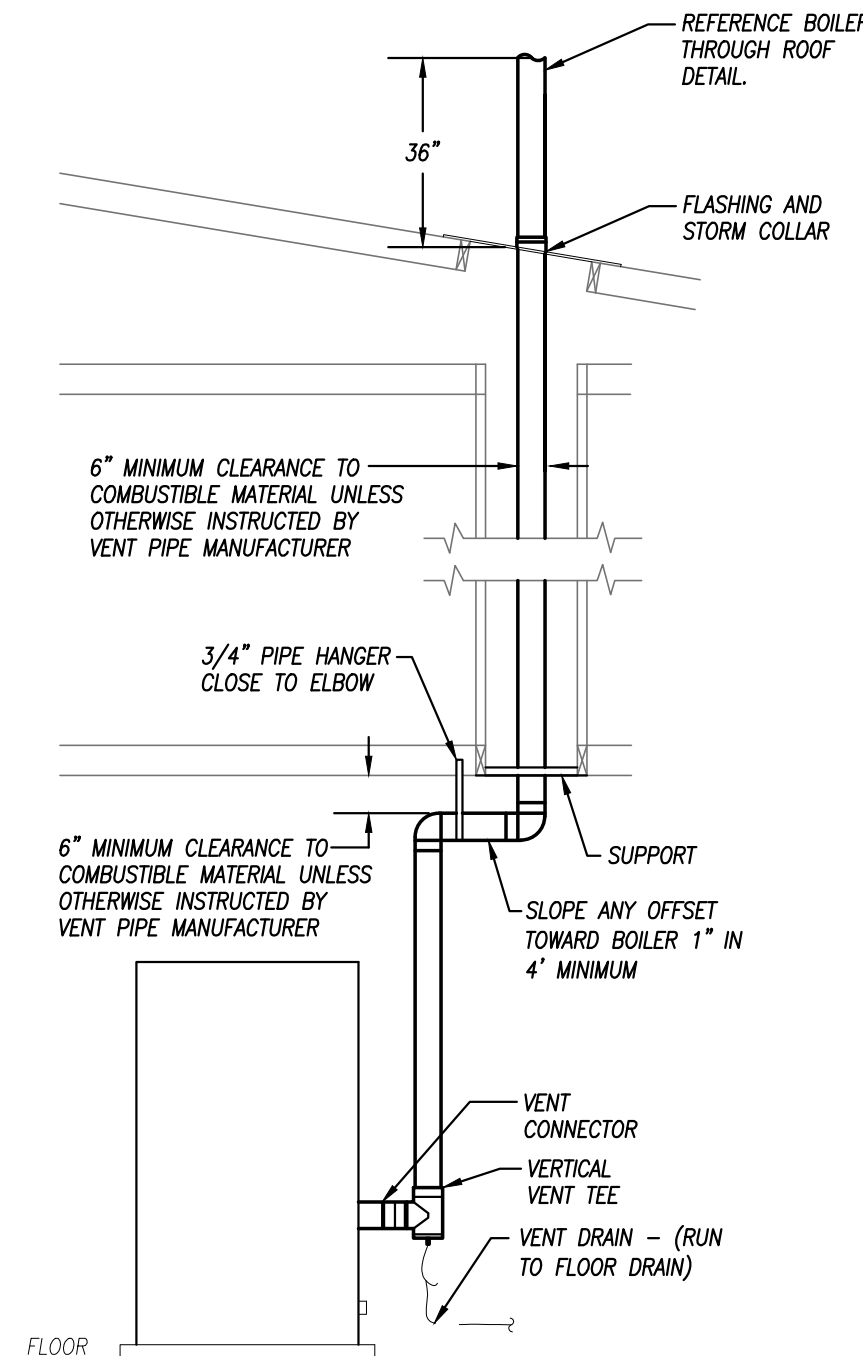
GAS FUEL TRAIN DETAIL
NOT TO SCALE



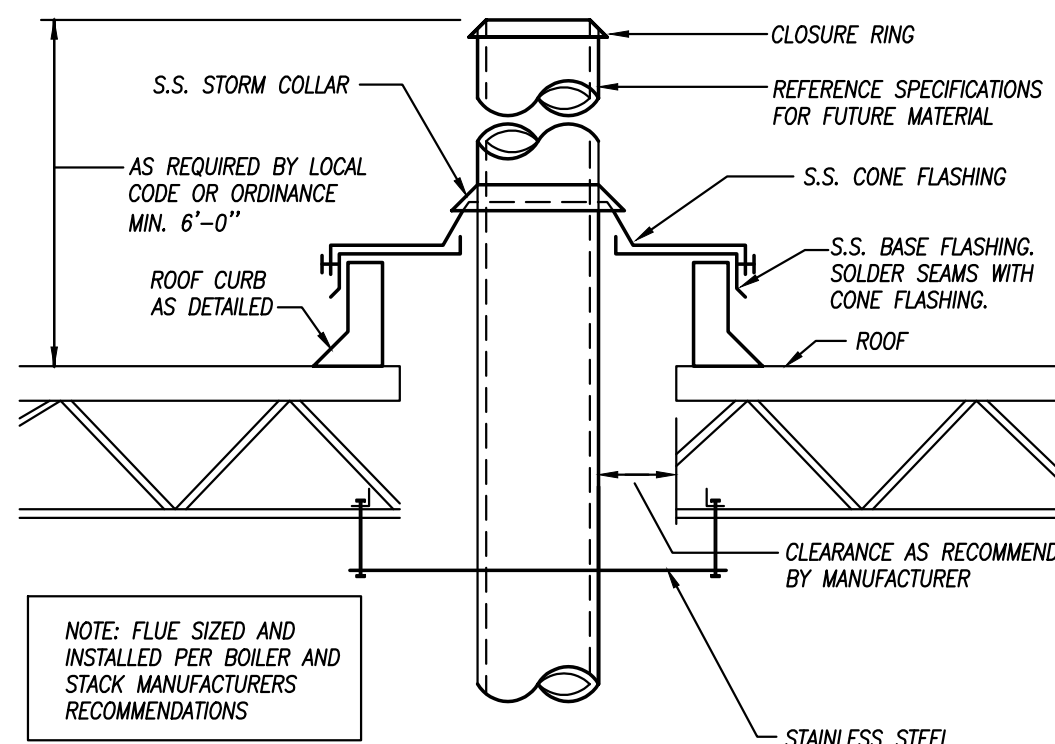
TYPICAL GAS CONNECTION
NOT TO SCALE



HOT WATER BOILER DETAIL
NOT TO SCALE



BOILER VENTING DETAIL
NOT TO SCALE



POWER EXHAUSTED BOILER FLUE THRU ROOF
NOT TO SCALE

HIGH-EFFICIENCY BOILER SCHEDULE (ARGENTINE MIDDLE SCHOOL)											
PLAN MARK	MANUFACTURER	CATALOG NUMBER	INPUT (MBH)	OUTPUT (MBH)	FLOW @ 40°F TEMP. RISE (GPM)	FIRING	VENT SIZE	COMB AIR SIZE (IN.)	ELECTRICAL (VOLT / PH)	MCA	REMARKS
B-1 A	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-2 A	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-3 A	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-4 A	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-5 A	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2

REMARKS:
 1. CONDENSING-TYPE BOILER. BOILER TO BE PROVIDED WITH CONDENSATE DRAIN KIT.
 2. BOILER TO BE ABLE TO FIT THROUGH A 36" DOOR.
 3. BOILER TO BE INSTALLED WITH MODSVC BOILER MANAGEMENT SYSTEM AND BACNET CONTROLS TIED INTO EXISTING BMS.

HIGH-EFFICIENCY BOILER SCHEDULE (CENTRAL MIDDLE SCHOOL)											
PLAN MARK	MANUFACTURER	CATALOG NUMBER	INPUT (MBH)	OUTPUT (MBH)	FLOW @ 40°F TEMP. RISE (GPM)	FIRING	VENT SIZE	COMB AIR SIZE (IN.)	ELECTRICAL (VOLT / PH)	MCA	REMARKS
B-1 C	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-2 C	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-3 C	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-4 C	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2

REMARKS:
 1. CONDENSING-TYPE BOILER. BOILER TO BE PROVIDED WITH CONDENSATE DRAIN KIT.
 2. BOILER TO BE ABLE TO FIT THROUGH A 36" DOOR.
 3. BOILER TO BE INSTALLED WITH MODSVC BOILER MANAGEMENT SYSTEM AND BACNET CONTROLS TIED INTO EXISTING BMS.

HIGH-EFFICIENCY BOILER SCHEDULE (ROSEDALE MIDDLE SCHOOL)											
PLAN MARK	MANUFACTURER	CATALOG NUMBER	INPUT (MBH)	OUTPUT (MBH)	FLOW @ 40°F TEMP. RISE (GPM)	FIRING	VENT SIZE	COMB AIR SIZE (IN.)	ELECTRICAL (VOLT / PH)	MCA	REMARKS
B-1 R	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-2 R	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-3 R	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-4 R	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2
B-5 R	FULTON	EDR-1000	1,000	953	48.0	MODULATING	6"	6"	120V / 1PH	12.5	1, 2

REMARKS:
 1. CONDENSING-TYPE BOILER. BOILER TO BE PROVIDED WITH CONDENSATE DRAIN KIT.
 2. BOILER TO BE ABLE TO FIT THROUGH A 36" DOOR.
 3. BOILER TO BE INSTALLED WITH MODSVC BOILER MANAGEMENT SYSTEM AND BACNET CONTROLS TIED INTO EXISTING BMS.

HIGH-EFFICIENCY BOILER SCHEDULE (WASHINGTON HIGH SCHOOL)											
PLAN MARK	MANUFACTURER	CATALOG NUMBER	INPUT (MBH)	OUTPUT (MBH)	FLOW @ 40°F TEMP. RISE (GPM)	FIRING	VENT SIZE	COMB AIR SIZE (IN.)	ELECTRICAL (VOLT / PH)	MCA	REMARKS
B-1 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-2 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-3 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-4 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-5 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-6 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-7 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-8 WA	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2

REMARKS:
 1. CONDENSING-TYPE BOILER. BOILER TO BE PROVIDED WITH CONDENSATE DRAIN KIT.
 2. BOILER TO BE ABLE TO FIT THROUGH A 36" DOOR.
 3. BOILER TO BE INSTALLED WITH MODSVC BOILER MANAGEMENT SYSTEM AND BACNET CONTROLS TIED INTO EXISTING BMS.

HIGH-EFFICIENCY BOILER SCHEDULE (WYANDOTTE HIGH SCHOOL)											
PLAN MARK	MANUFACTURER	CATALOG NUMBER	INPUT (MBH)	OUTPUT (MBH)	FLOW @ 40°F TEMP. RISE (GPM)	FIRING	VENT SIZE	COMB AIR SIZE (IN.)	ELECTRICAL (VOLT / PH)	MCA	REMARKS
B-1 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-2 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-3 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-4 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-5 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-6 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-7 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-8 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-9 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-10 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-11 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2
B-12 WY	FULTON	EDR-2000	2,000	1,874	94.0	MODULATING	8"	8"	120V / 1PH	25	1, 2

REMARKS:
 1. CONDENSING-TYPE BOILER. BOILER TO BE PROVIDED WITH CONDENSATE DRAIN KIT.
 2. BOILER TO BE ABLE TO FIT THROUGH A 36" DOOR.
 3. BOILER TO BE INSTALLED WITH MODSVC BOILER MANAGEMENT SYSTEM AND BACNET CONTROLS TIED INTO EXISTING BMS.

HVAC PIPING MATERIAL SCHEDULE

SYSTEM	SIZE	TYPE/SCHED	MATERIAL	ACCEPTABLE FITTINGS	FIELD TEST PRESSURE/TIME	ALLOWABLE IN PLENUMS	INSULATION TYPE	INSULATION THICKNESS
CONDENSATE DRAIN INTERIOR	3/4" - 2"	SCH 40	CPVC	SOLVENT JOINED	10 FT - 1/2HR	YES	FIBERGLASS W/ ASI	1/2" (PLENUM ONLY)
CONDENSATE DRAIN INTERIOR	1/2" - 2"	L	COPPER	SOLDER, PRO-PRESS	10 FT - 1/2HR	YES	FIBERGLASS W/ ASI	1/2" (PLENUM ONLY)
HEATING HOT WATER	1/2" - 1-1/2"	L	COPPER	SOLDER, PRO-PRESS	100 PSI - 1/2HR	YES	FIBERGLASS W/ ASI	1-1/2"
HEATING HOT WATER	2"	L	COPPER	SOLDER, PRO-PRESS	100 PSI - 1/2HR	YES	FIBERGLASS W/ ASI	2"
HEATING HOT WATER	1/2" - 1-1/2"	SCH 40	STEEL - SEAMLESS	THREADED IRON	100 PSI - 1/2HR	YES	FIBERGLASS W/ ASI	1-1/2"
HEATING HOT WATER	2"	SCH 40	STEEL - SEAMLESS	THREADED IRON	100 PSI - 1/2HR	YES	FIBERGLASS W/ ASI	2"
HEATING HOT WATER	1/2" - 1-1/4"	L	COPPER	CONTINUOUS TUBING, BRAZED	100 PSI - 1/2HR	YES	ELASTOMERIC	1-1/2"
HEATING HOT WATER	2 1/2" - 8"	SCH 40	STEEL - SEEMED	WELDED / FLANGED	100 PSI - 1/2HR	YES	FIBERGLASS W/ ASI	2"
HEATING HOT WATER	2 1/2" - 8"	SCH 40	STEEL - SEEMED	VICTALIC	100 PSI - 1/2HR	YES	FIBERGLASS W/ ASI	2"
BOILER RELIEF	1/2" - 2-1/2"	SCH 40	STEEL - SEAMLESS	THREADED IRON	130 PSI - 1/2HR	YES	-	-
BOILER RELIEF	2 1/2" - 8"	SCH 40	STEEL - SEEMED	WELDED / FLANGED	130 PSI - 1/2HR	YES	-	-

NOTES:
 1. ALL PIPING AND MATERIALS IN PLENUMS MUST MEET ASTM E84 FLAME/SMOKE RATING OF 25/50.
 2. ALL INSULATION THICKNESSES SHALL MEET ASHRAE 90.1 - 2007 REQUIREMENTS AT A MINIMUM.
 3. REFER TO SPECIFICATIONS FOR MORE DETAILED INFORMATION.

EXHAUST FAN SCHEDULE (ROSEDALE MIDDLE SCHOOL)

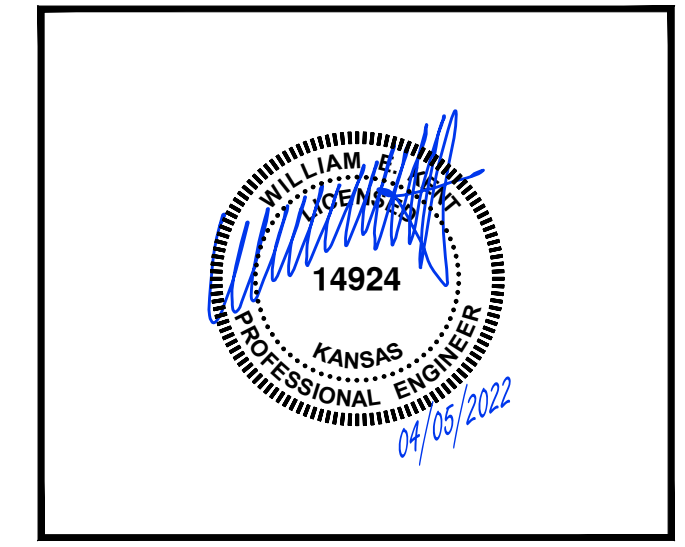
PLAN MARK	MANUFACTURER	MODEL NUMBER	TYPE	SERVICE	FAN DATA						ELECTRICAL	CONTROL	REMARKS
					CFM	E.S.P. (IN)	HP	DRIVE	SONES	RPM			
EF-1 R	ENEREX	RSV-315	BOILER EXHAUST SYSTEM	BOILER FLUES	1,400	1.00	1/2	DIRECT	48	1,600	120V / 1PH	BMS	1,2
EF-2 R	ENEREX	RSV-315	BOILER EXHAUST SYSTEM	BOILER FLUES	1,400	1.00	1/2	DIRECT	48	1,600	120V / 1PH	BMS	1,2

REMARKS:
 1. UNIT SHALL BE PROVIDED WITH FULL SYSTEM REDUNDANCY INCLUDING DUPLICATE CONTROLLER, SENSORS, AND TRANSDUCERS.
 2. UNIT TO BE CONTROLLED VIA THE BOILER MANAGEMENT SYSTEM.

EXHAUST FAN SCHEDULE (WASHINGTON HIGH SCHOOL)

PLAN MARK	MANUFACTURER	MODEL NUMBER	TYPE	SERVICE	FAN DATA						ELECTRICAL	CONTROL	REMARKS
					CFM	E.S.P. (IN)	HP	DRIVE	SONES	RPM			
EF-1 WA	ENEREX	RSV-450-2	BOILER EXHAUST SYSTEM	BOILER FLUES	3,900	1.00	2	DIRECT	56	1,720	208V / 3PH	BMS	1,2
EF-1 WA	ENEREX	RSV-450-2	BOILER EXHAUST SYSTEM	BOILER FLUES	3,900	1.00	2	DIRECT	56	1,720	208V / 3PH	BMS	1,2

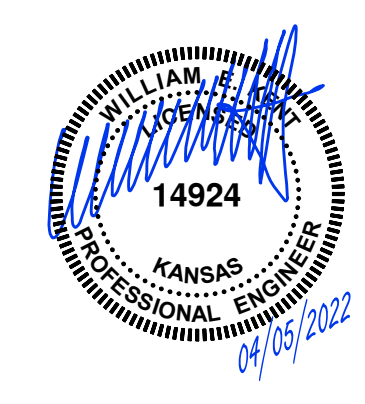
REMARKS:
 1. UNIT SHALL BE PROVIDED WITH FULL SYSTEM REDUNDANCY INCLUDING DUPLICATE CONTROLLER, SENSORS, AND TRANSDUCERS.
 2. UNIT TO BE CONTROLLED VIA THE BOILER MANAGEMENT SYSTEM.



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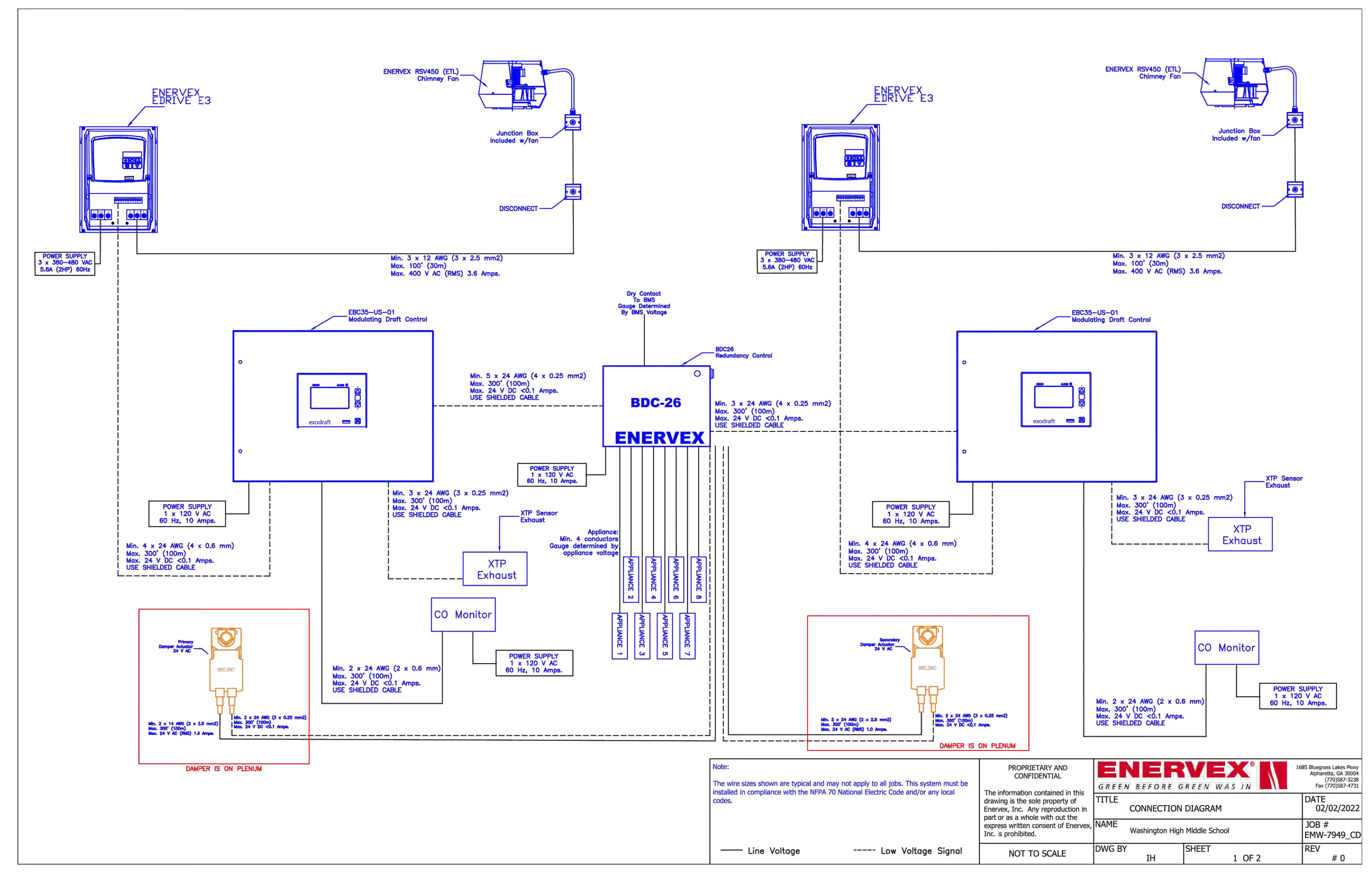
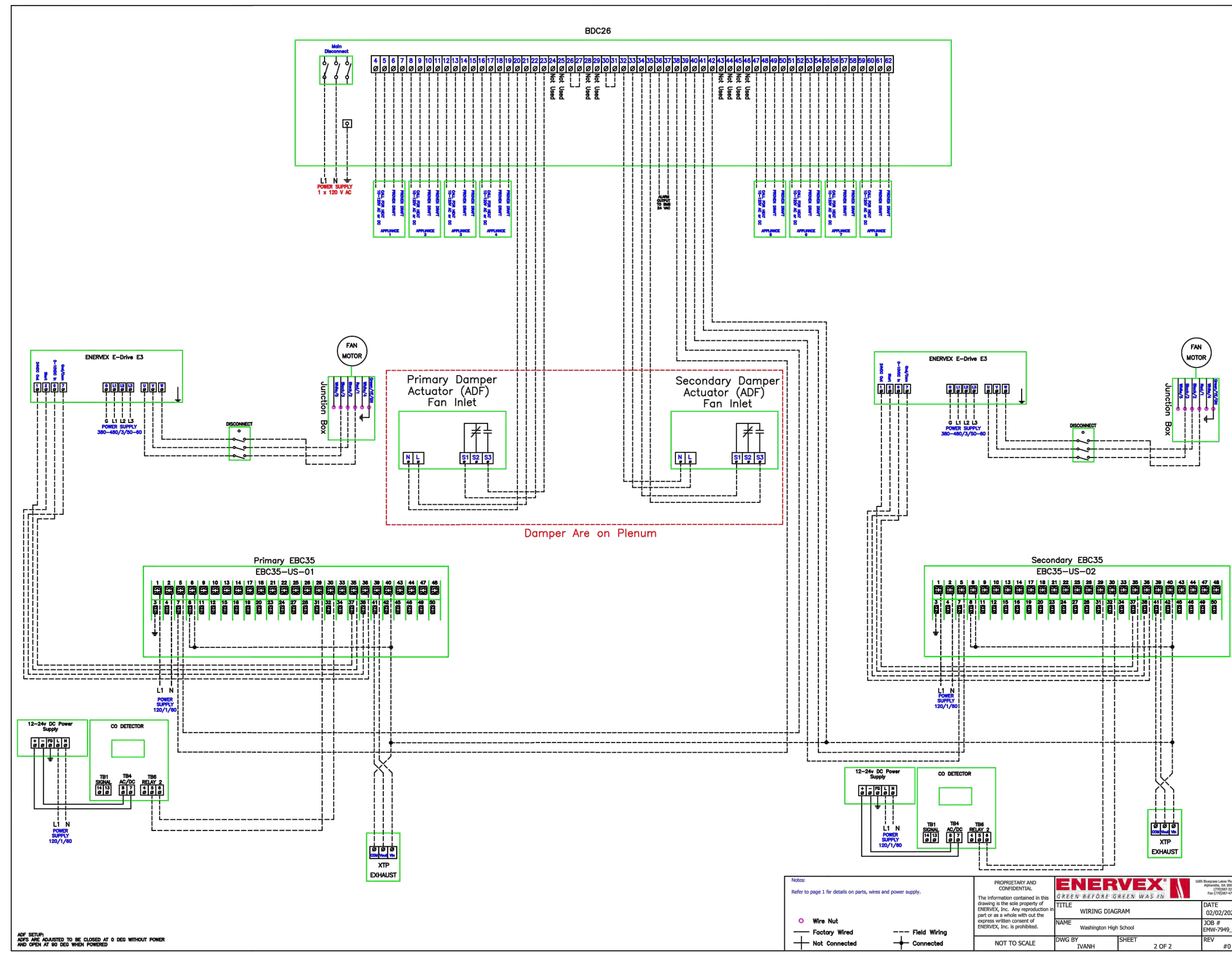
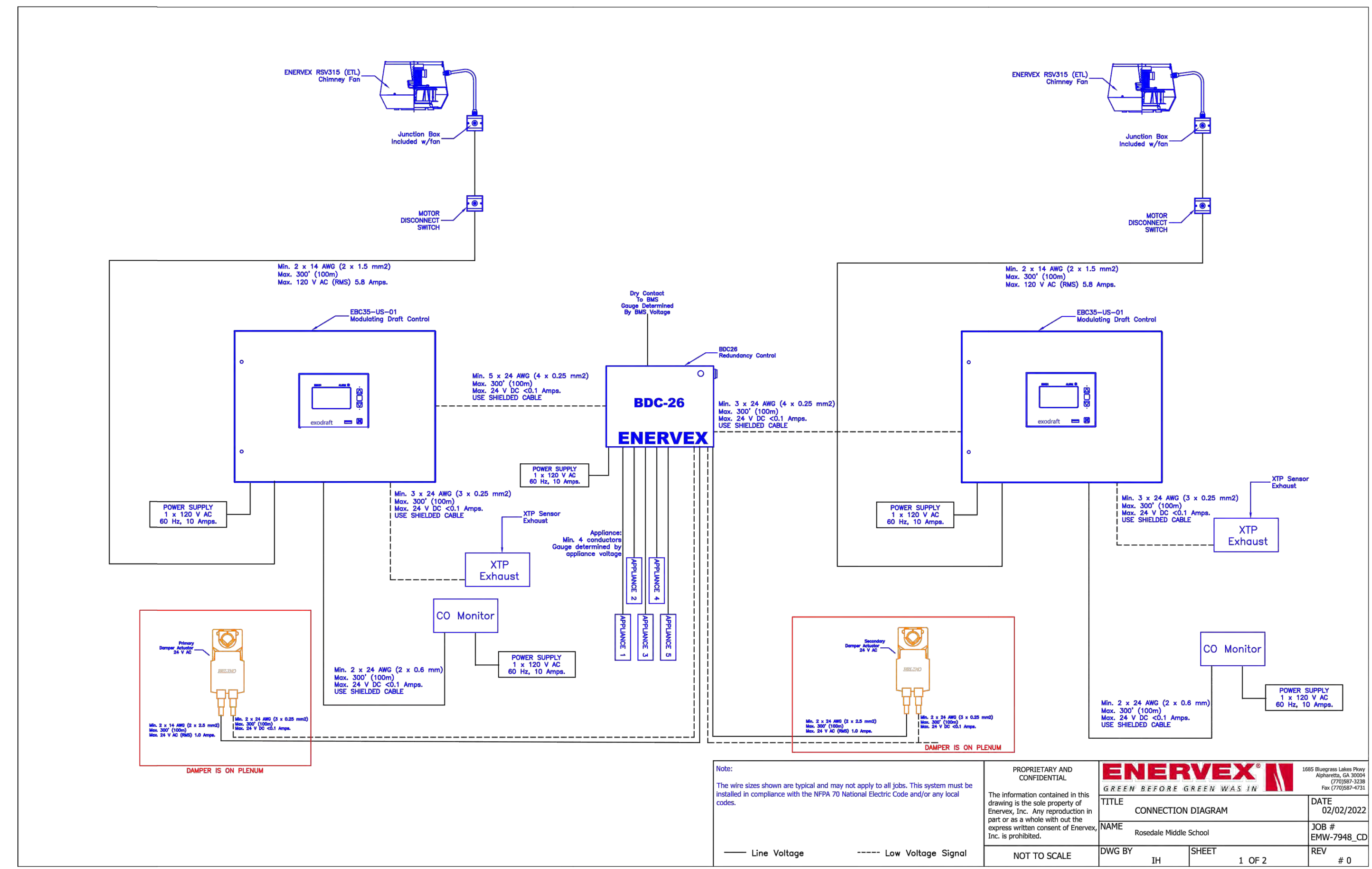
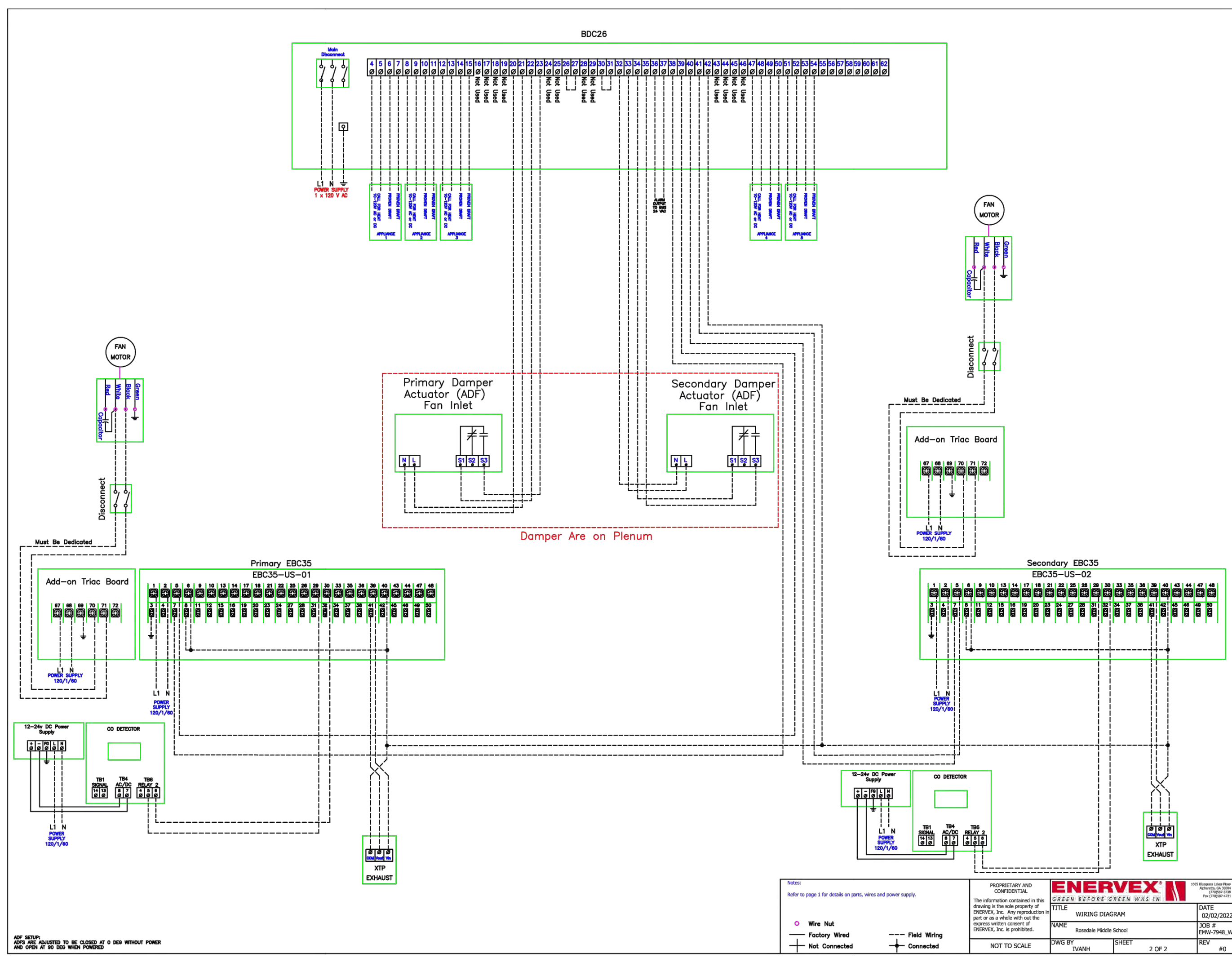
KANSAS CITY, KANSAS
BOILER REPLACEMENTS
ARGENTINE, CENTRAL & ROSEDALE MIDDLE SCHOOLS
WASHINGTON & WYANDOTTE HIGH SCHOOLS

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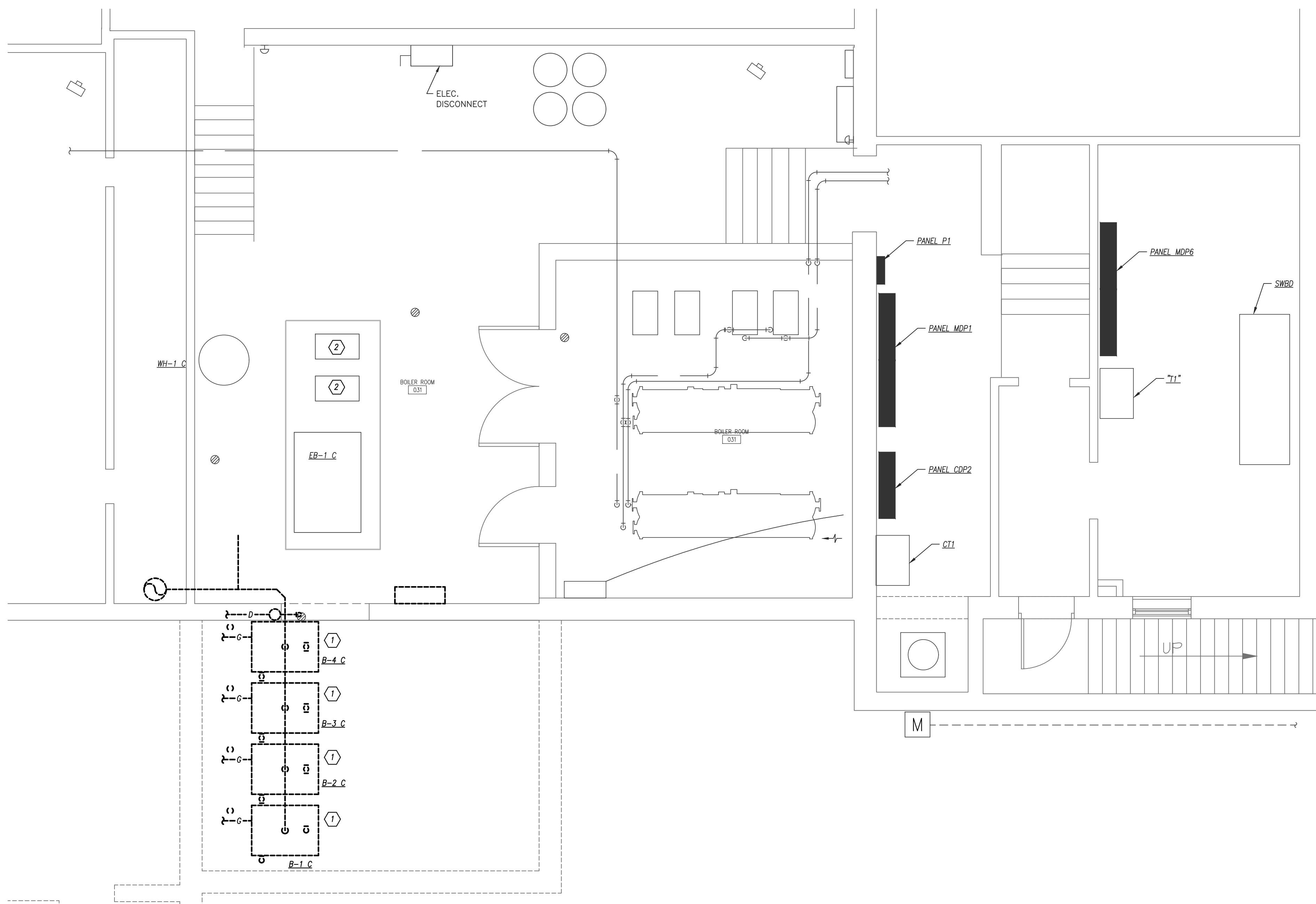
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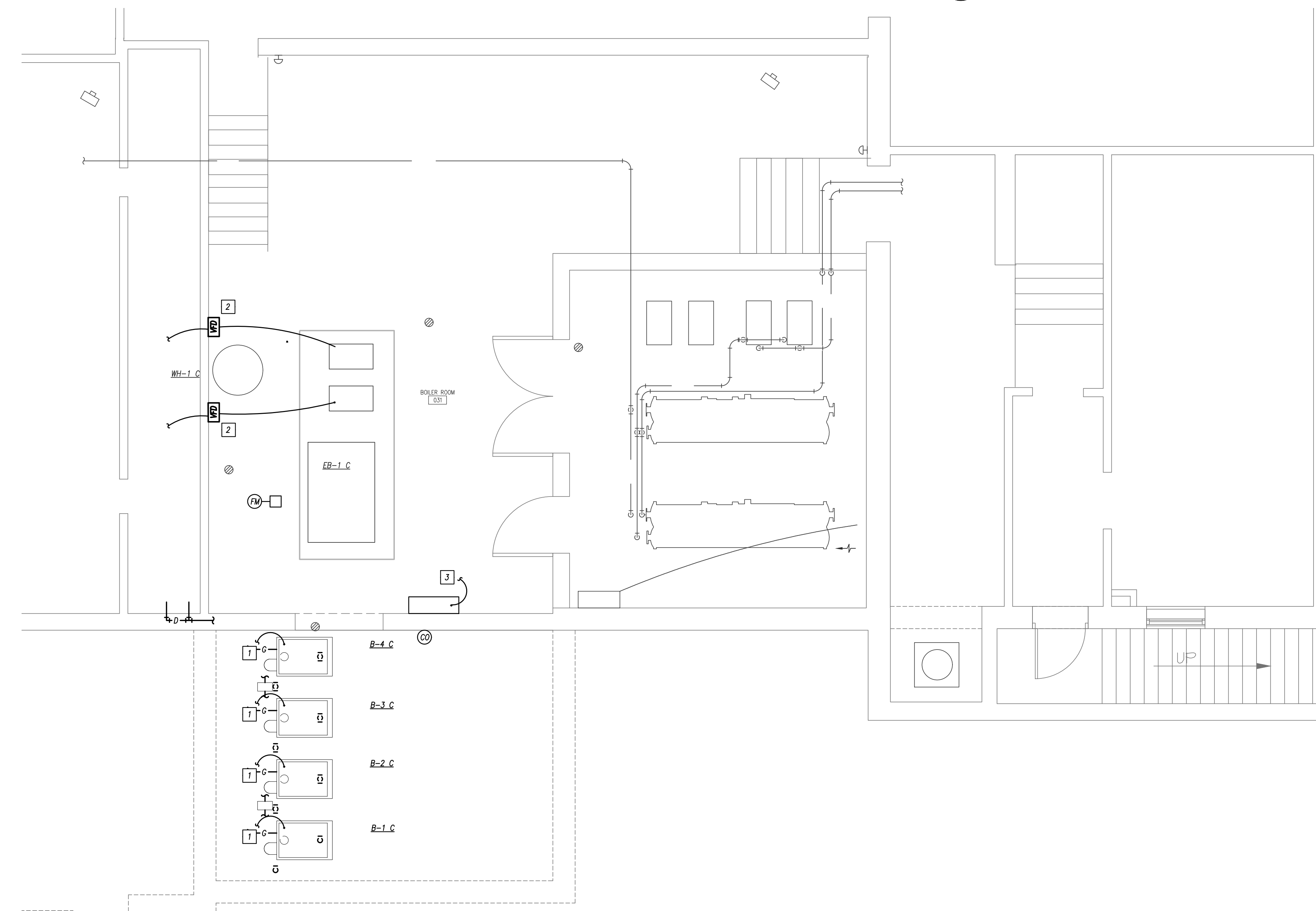
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DATE: 2/14/22
PKMR PROJECT: 21.659b

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M2.2



BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"

GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.

DEMOLITION PLAN KEYED NOTES

- ① DISCONNECT EXISTING ELECTRICAL FROM BOILER TO BE REPLACED AND PREPARE FOR RECONNECTION.
- ② DISCONNECT EXISTING VFD FROM PUMP AND PREPARE FOR REPLACEMENT.

GENERAL POWER NOTES

- 1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
- 2. COORDINATE EXACT NEMA CONFIGURATIONS OF RECEPTACLES SERVING EQUIPMENT WITH EXACT EQUIPMENT BEING FURNISHED.
- 3. REFER TO THE SPECIFICATIONS FOR ADDITIONAL LOCATIONS/REQUIREMENTS FOR RECEPTACLES, INCLUDING OTC, WEATHER-RESISTANT, HOSPITAL-GRADE, AND TAMPER-RESISTANT RECEPTACLES.
- 4. EXACT MECHANICAL EQUIPMENT LOCATIONS MAY NOT BE SHOWN FOR CLARITY. COORDINATE EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT, DUCT DETECTORS, ETC. WITH MECHANICAL DRAWINGS AND CONTRACTOR.
- 5. COORDINATE EXACT LOCATIONS OF SMOKE DETECTORS WITH CEILING FANS, HVAC DIFFUSERS, SPRINKLER HEADS, ETC. PER NFPA REQUIREMENTS.

POWER PLAN KEYED NOTES

- 1 RECONNECT TO EXISTING ELECTRICAL CIRCUIT FROM PREVIOUS BOILER.
- 2 REPLACE EXISTING VFD AND RECONNECT TO EXISTING PUMP AND CIRCUIT.
- 3 PROVIDE POWER AND INTERCONNECTING WIRING TO BOILER CONTROL SYSTEM.



pkmr
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ARGENTINE, CENTRAL & ROSEDALE MIDDLE SCHOOLS
WASHINGTON & WYANDOTTE HIGH SCHOOLS
KANSAS CITY, KANSAS

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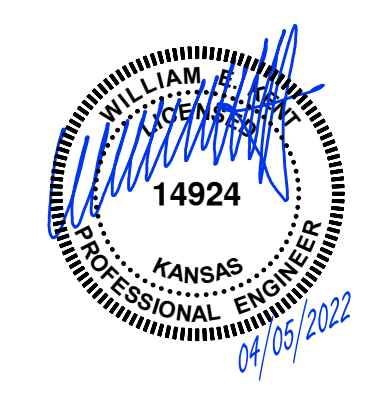
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**ELECTRICAL -
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GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.

DEMOLITION PLAN KEYED NOTES

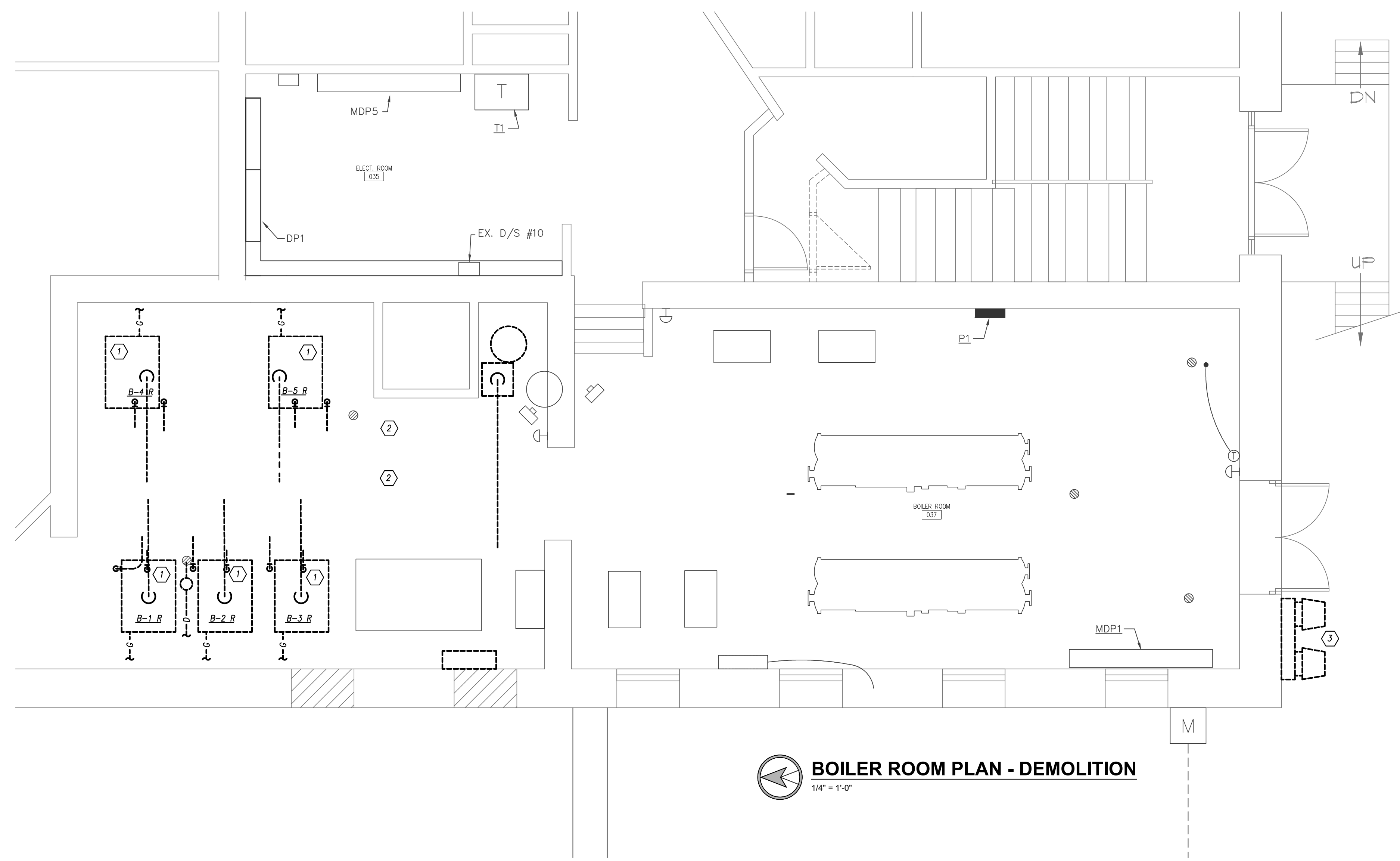
- ① DISCONNECT EXISTING ELECTRICAL FROM BOILER TO BE REPLACED AND PREPARE FOR RECONNECTION.
- ② DISCONNECT EXISTING VFD FROM PUMP AND PREPARE FOR REPLACEMENT.
- ③ DISCONNECT EXISTING ELECTRICAL FROM FLUE EXHAUST SYSTEM TO BE REPLACED ALONG WITH MISCELLANEOUS CONTROLS.

GENERAL POWER NOTES

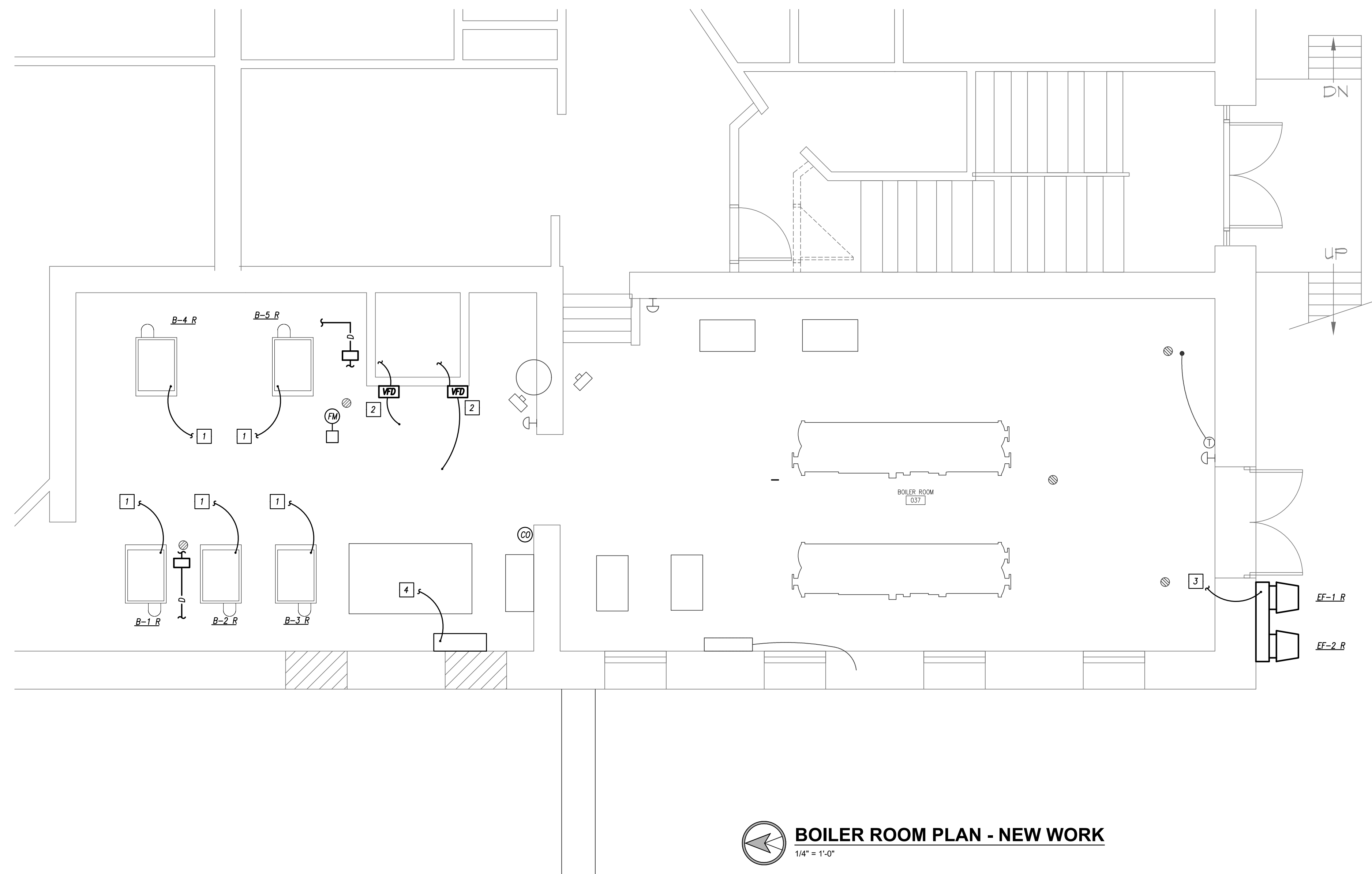
- 1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
- 2. COORDINATE EXACT NEMA CONFIGURATIONS OF RECEPTACLES SERVING EQUIPMENT WITH EXACT EQUIPMENT BEING FURNISHED.
- 3. REFER TO THE SPECIFICATIONS FOR ADDITIONAL LOCATIONS/REQUIREMENTS FOR RECEPTACLES, INCLUDING GFCI WEATHER-RESISTANT, HOSPITAL-GRADE, AND TAMPER-RESISTANT RECEPTACLES.
- 4. EXACT MECHANICAL EQUIPMENT LOCATIONS MAY NOT BE SHOWN FOR CLARITY. COORDINATE EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT, DUCT DETECTORS, ETC. WITH MECHANICAL DRAWINGS AND CONTRACTOR.
- 5. COORDINATE EXACT LOCATIONS OF SMOKE DETECTORS WITH CEILING FANS, HVAC DIFFUSERS, SPRINKLER HEADS, ETC. PER NFPA REQUIREMENTS.

POWER PLAN KEYED NOTES

- 1 RECONNECT TO EXISTING ELECTRICAL CIRCUIT FROM PREVIOUS BOILER.
- 2 REPLACE EXISTING VFD AND RECONNECT TO EXISTING PUMP AND CIRCUIT.
- 3 REUSE EXISTING CIRCUIT FROM PREVIOUS EXHAUST SYSTEM. PROVIDE ALL NEW CONNECTIONS. COORDINATE LOCATIONS OF CONTROL PANEL, MOTOR CONTROLLERS AND OTHER LINE VOLTAGE REQUIREMENTS WITH EQUIPMENT AND INSTALLATION LOCATIONS IN BOILER ROOM.
- 4 PROVIDE POWER TO BOILER CONTROL SYSTEM AND RELATED INTERLOCKS. COORDINATE WITH M/C.



BOILER ROOM PLAN - DEMOLITION
 1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
 1/4" = 1'-0"

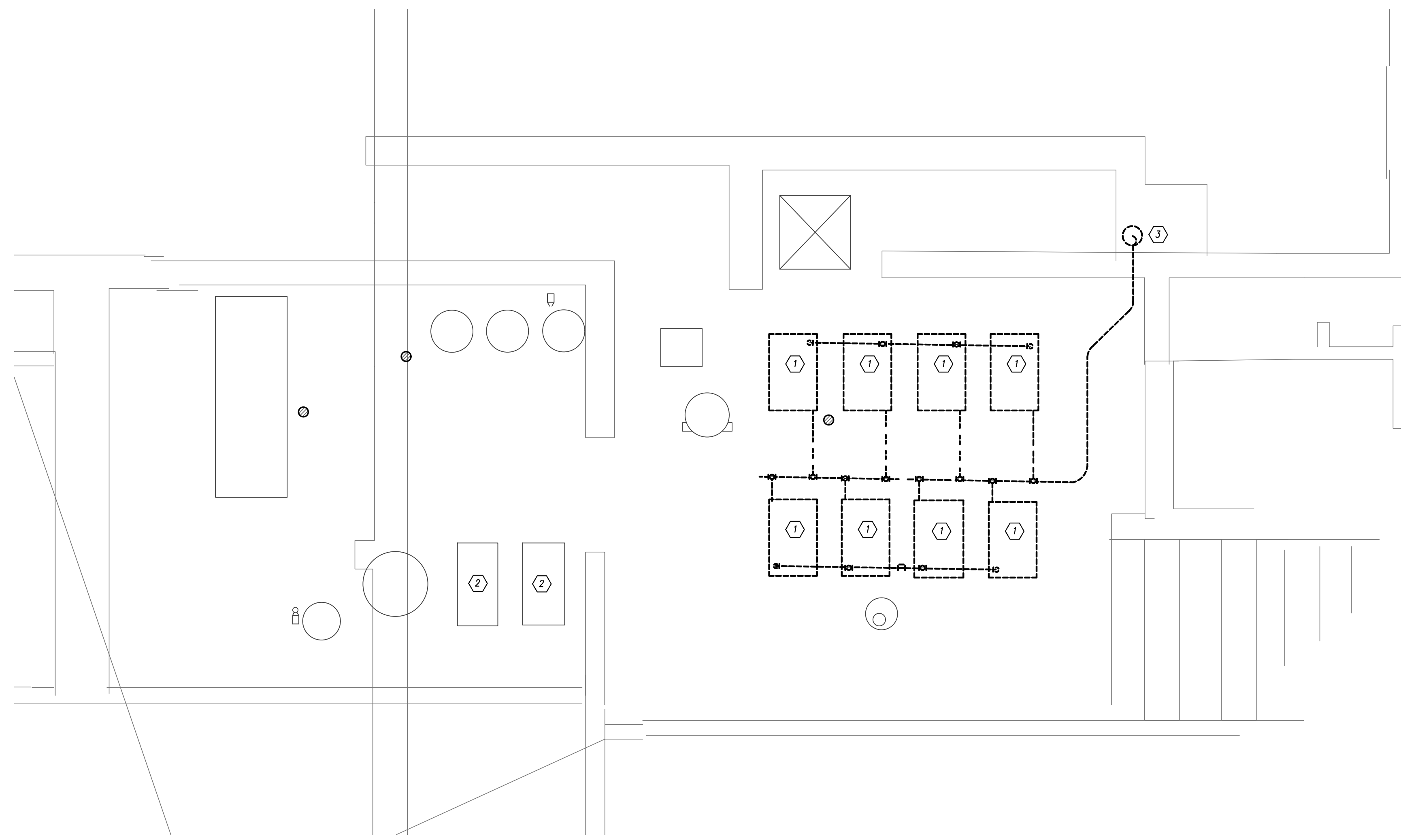


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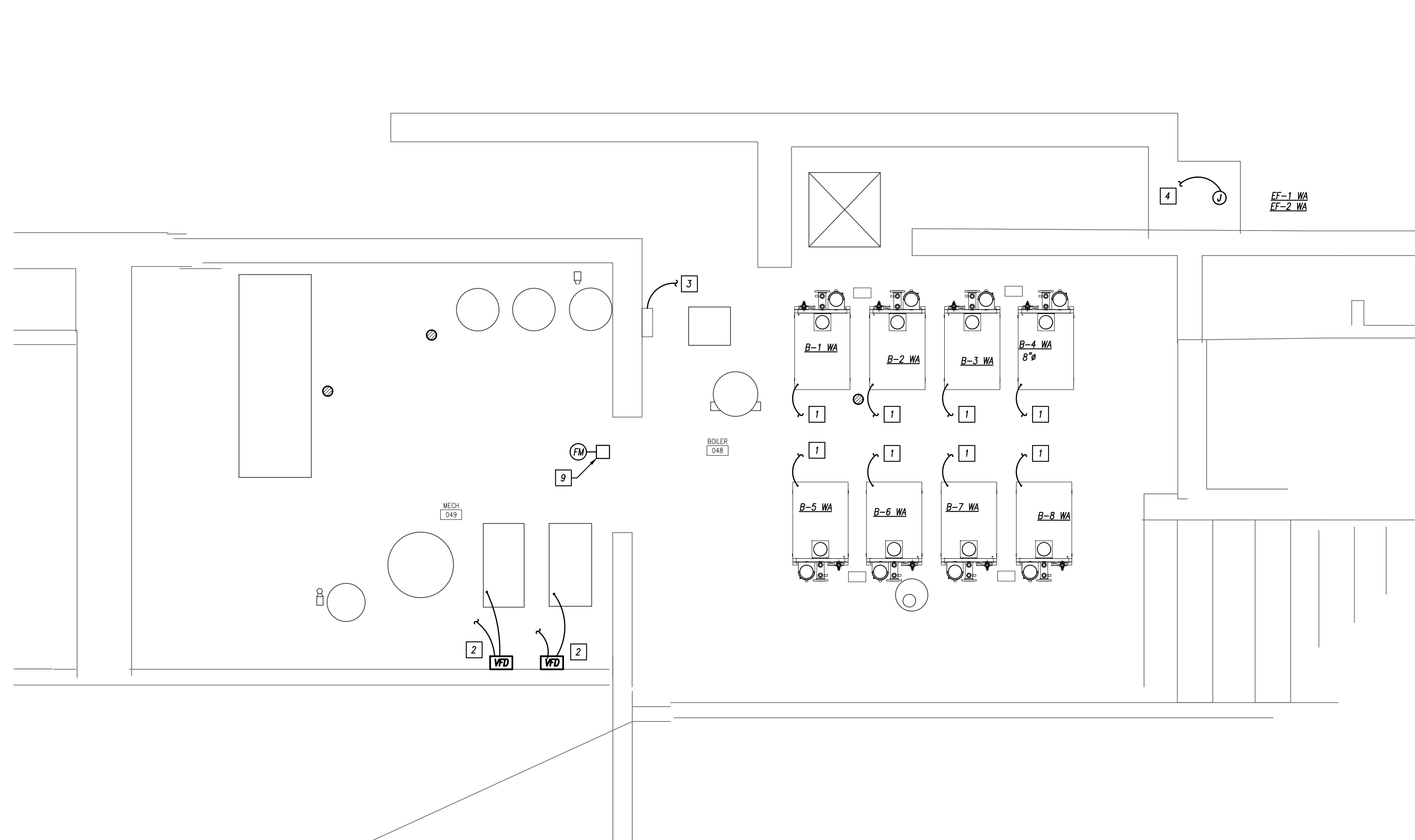
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ELECTRICAL BOILER PLANS

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 SHEET NUMBER: **E1.3**



BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"



BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"

GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.

DEMOLITION PLAN KEYED NOTES

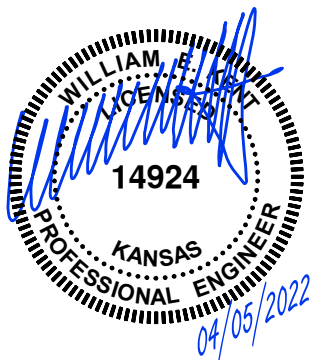
- ① DISCONNECT EXISTING ELECTRICAL FROM BOILER TO BE REPLACED AND PREPARE FOR RECONNECTION.
- ② DISCONNECT EXISTING VFD FROM PUMP AND PREPARE FOR REPLACEMENT.
- ③ DISCONNECT EXISTING ELECTRICAL FOR COMBUSTION EXHAUST FANS. PREPARE FOR RECONNECTION TO NEW.

GENERAL POWER NOTES

- 1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
- 2. COORDINATE EXACT NEMA CONFIGURATIONS OF RECEPTACLES SERVING EQUIPMENT WITH EXACT EQUIPMENT BEING FURNISHED.
- 3. REFER TO THE SPECIFICATIONS FOR ADDITIONAL LOCATIONS/REQUIREMENTS FOR RECEPTACLES, INCLUDING OPEN WEATHER-RESISTANT, HOSPITAL-GRADE, AND TAMPER-RESISTANT RECEPTACLES.
- 4. EXACT MECHANICAL EQUIPMENT LOCATIONS MAY NOT BE SHOWN FOR CLARITY. COORDINATE EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT, DUCT DETECTORS, ETC. WITH MECHANICAL DRAWINGS AND CONTRACTOR.
- 5. COORDINATE EXACT LOCATIONS OF SMOKE DETECTORS WITH CEILING FANS, HVAC DIFFUSERS, SPRINKLER HEADS, ETC. PER NFPA REQUIREMENTS.

POWER PLAN KEYED NOTES

- 1 RECONNECT TO EXISTING ELECTRICAL CIRCUIT FROM PREVIOUS BOILER.
- 2 REPLACE EXISTING VFD AND RECONNECT TO EXISTING PUMP AND CIRCUIT.
- 3 RECONNECT TO PREVIOUS POWER AND CIRCUITING FOR COMBUSTION FAN SYSTEM CONTROLS. COORDINATE ALL WORK WITH M/C FOR PROPER INSTALLATION AND INTERCONNECTIONS.
- 4 RECONNECT TO PREVIOUS POWER FOR COMBUSTION FANS AT ROOF. PROVIDE ALL INTERCONNECTING CIRCUITING AND CONTROLS.



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KANSAS CITY, KANSAS

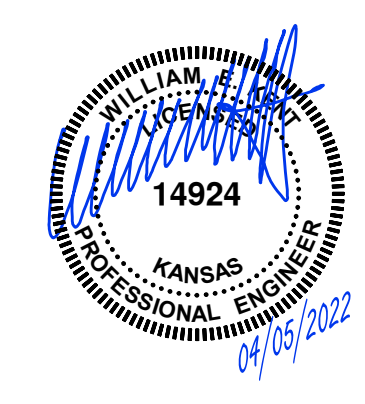
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SHEET TITLE:
ELECTRICAL - BOILER ROOMS

DATE: 2/14/22 PKMR PROJECT: 21.659b
SHEET NUMBER: **E1.4**





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GENERAL DEMOLITION NOTES

1. REFER TO GENERAL DEMOLITION NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.

DEMOLITION PLAN KEYED NOTES

- 1 DISCONNECT EXISTING ELECTRICAL FROM BOILER TO BE REPLACED AND PREPARE FOR RECONNECTION.
- 2 DISCONNECT EXISTING VFD FROM PUMP AND PREPARE FOR REPLACEMENT.
- 3 REMOVE POWER AND RELATED CIRCUITING FROM COMBUSTION AIR FAN SYSTEM.

GENERAL POWER NOTES

- 1. REFER TO GENERAL NOTES ON MEP COVER SHEET FOR ADDITIONAL REQUIREMENTS OF WORK.
- 2. COORDINATE EXACT NEMA CONFIGURATIONS OF RECEPTACLES SERVING EQUIPMENT WITH EXACT EQUIPMENT BEING FURNISHED.
- 3. REFER TO THE SPECIFICATIONS FOR ADDITIONAL LOCATIONS/REQUIREMENTS FOR RECEPTACLES, INCLUDING OTC WEATHER-RESISTANT, HOSPITAL-GRADE, AND TAMPER-RESISTANT RECEPTACLES.
- 4. EXACT MECHANICAL EQUIPMENT LOCATIONS MAY NOT BE SHOWN FOR CLARITY. COORDINATE EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT, DUCT DETECTORS, ETC. WITH MECHANICAL DRAWINGS AND CONTRACTOR.
- 5. COORDINATE EXACT LOCATIONS OF SMOKE DETECTORS WITH CEILING FANS, HVAC DIFFUSERS, SPRINKLER HEADS, ETC. PER NFPA REQUIREMENTS.

POWER PLAN KEYED NOTES

- 1 RECONNECT TO EXISTING ELECTRICAL CIRCUIT FROM PREVIOUS BOILER.
- 2 REPLACE EXISTING VFD AND RECONNECT TO EXISTING PUMP AND CIRCUIT.
- 3 PROVIDE POWER AND INTERCONNECTING WIRING TO BOILER CONTROL SYSTEM.

BOILER ROOM PLAN - DEMOLITION
1/4" = 1'-0"

BOILER ROOM PLAN - NEW WORK
1/4" = 1'-0"



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