

DATE: 11/1/2024

PROVIDE PROPOSAL FOR TURNKEY INSTALLATION SERVICES FOR OF 2 NEW BOILERS IN EXISTING COVERED AND ENCLOSED EXTERIOR SPACE AT KIVETT HALL. PROJECT INTENT IS TO INSTALL 180F HEATING HOT WATER BOILERS WITH PRIMARY / SECONDARY PUMPING SYSTEM TO SERVE KIVETT AND WIGGINS HALL IN RESPONSE TO RECENT STEAM MAIN FAILURE. BOILERS MUST BE IN STOCK AND READY FOR SHIP FOR CONSTRUCTION TO BEGIN AS SOON AS POSSIBLE.

CONTRACTOR RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE BUILDING CODES, MANUFACTURER INSTALLATION INSTRUCTIONS, AND LOCAL AUTHORITY HAVING JURISDICTION PERMITTING AND INSPECTIONS. INSTALLATION TO SATISFY NC DEPARTMENT OF LABOR AND LOCAL HARNETT COUNTY INSPECTIONS REQUIREMENTS.

DEMOLITION

DEMOLISH STEAM TO HOT WATER SHELL & TUBE HEAT EXCHANGER AND STEAM PIPING TO ISOLATION VALVE UPSTREAM OF PRV IN KIVETT HALL BASEMENT. PREPARE HEATING HOT WATER PIPING FOR CONNECTION TO NEW HEATING HOT WATER PIPING FROM BOILER. CLOSE STEAM ISOLATION VALVE AND INSTALL CAP. DEMOLISH STEAM CONDENSATE FROM HEAT EXCHANGER TO CONDENSATE PUMP.

DEMOLISH STEAM TO HOT WATER SHELL & TUBE HEAT EXCHANGER AND STEAM PIPING TO ISOLATION VALVE UPSTREAM OF PRV IN WIGGINS HALL FIRST FLOOR. PREPARE HEATING HOT WATER PIPING FOR CONNECTION TO NEW HEATING HOT WATER PIPING FROM BOILER.

DEMOLISH 2" STEAM PIPING AND 1" CONDENSATE FROM WIGGINS HALL TO KIVETT HALL. (APPRXIMATELY 130 LF EACH)

EXISTING BUILDING HEATING HOT WATER PUMPS TO REMAIN AS SECONDARY PUMPS ALONG WITH AIR SEPARATORS, EXPANSION TANKS, AND MAKEUP WATER TO REMAIN AT DEMOLISHED HEAT EXCHANGERS.

NEW WORK

PROVIDE TWO 1.5 MILLION BTU/HR (MBH) FIRE TUBE CONDENSING BOILERS WITH INTEGRAL CASCADING BOILER CONTROLS, CONDENSATE NEUTRALIZER, FUEL GAS REGULATOR, AND BACNET COMMUNICATION CARD FOR FUTURE INTEGRATION. INSTALL VIA MANUFACTURER'S INSTRUCTIONS AND APPLICABLE LOCAL CODES. PROVIDE MINIMUM 2" ELEVATED PAD. INSTALL IN EXISTING SPACE WITH MANUFACTURER SERVICE AND COMBUSTIBLE MATERIAL CLEARANCE REQUIREMENTS, ROOM IS APPROXIMATELY 17.5'Lx8.5'Wx10'H. BOILER SHALL BE ASME CERTIFIED, AT LEAST 93% EFFICIENCY, MINIMUM 10:1 TURNDOWN, INCLUDE O2 TRIM, AND MEET SPECIFICATION PROVIDED. (SIMILAR TO CLEAVERBROOKS CFCE, FULTON ENDURA, RAYPAK XVERS KOR, LOCHINVAR CREST, OR RIELLO ARRAY)

PROVIDE INLINE PRIMARY PUMP IN BOILER RETURN FOR EACH BOILER WITH STRAINER AND TRIPLE DUTY VALVE. (QTYx2) (150 GPM @ 30 FT HEAD; 208V/3PH/3HP/1750RPM TEFC MOTOR WITH COMBINATION MOTOR STARTER/DISCONNECT SIMILAR TO TACO 1941 or B&G e-82). PROVIDE TESTING, ADJUSTING, AND BALANCING FOR CIRCUIT SETTER TO BOILER FLOW REQUIREMENTS.

PROVIDE 1-1/2" NATURAL GAS STEEL PIPING FROM 2 PSI METER PROVIDED BY PIEDMONT NATURAL GAS (LOCATED EXTERIOR ADJACENT) TO THE TO BOILER REGULATOR. PROVIDE MINIMUM 10' OF 1-1/2" NATURAL GAS STEEL PIPING FROM REGULATOR TO BOILER CONNECTION. CONFIRM AND SIZE PIPING TO BE IN COMPLIANCE WITH NC FUEL GAS CODE AND MANUFACTURERS INSTALLATION INSTRUCTIONS. PROVIDE ELECTRICAL GROUNDING.

PAINT GAS PIPING YELLOW AND LABEL WITH PSI. PROVIDE TRAP AND ISOLATION VALVES FOR EACH REGULATOR AND EQUIPMENT CONNECTION.

PROVIDE COPPER BOILER TEMPERATURE & PRESSURE RELIEF AND BOILER DRAIN PIPING TO NEAREST EXISTING FLOOR DRAIN. SIZE TO MATCH MANUFACTURER'S CONNECTION SIZE.

PROVIDE PVC BOILER FLUE CONDENSATE DRAIN WITH NEUTRALIZER KIT PIPING TO NEAREST FLOOR DRAIN. FURNISH SPARE BAG OF MEDIA.

PROVIDE 6" HWS & HWR SCHEDULE 40 STEEL PIPING WITH 1-1/2" FIBERGLASS INSULATION WITH ALL SERVICE JACKETING (ASJ) FOR BOILER PRIMARY HEADER FROM BOILER PLANT TO KIVETT BASEMENT. PROVIDE 4" LUGGED BUTTERFLY ISOLATION VALVES FOR EACH BOILER PIPING CONNECTION, 1 FUTURE BOILER, AND 3" EACH SECONDARY BRANCH TAKEOFF. (300 GPM) (est. 90 LF each; 180 LF total)

PROVIDE 3" HWS & HWR SCHEDULE 40 STEEL PIPING WITH 1-1/2" FIBERGLASS INSULATION IN ALL SERVICE JACKETING (ASJ) FROM BOILER PRIMARY HEADER TO KIVETT HOT WATER HEAT EXCHANGER. ROUTE THROUGH BASEMENT CRAWLSPACE. PROVIDE HANGERS AND SUPPORTS. (est. 10 LF each; 20 LF total)

PROVIDE 3" HWS & HWR SCHEDULE 40 STEEL PIPING WITH 1-1/2" FIBERGLASS INSULATION IN ASJ FROM BOILER PRIMARY HEADER TO WIGGINS LIBRARY HOT WATER HEAT EXCHANGER. PROVIDE ALUMINUM SERVICE JACKET WHEN EXTERIOR TO THE BUILDING. ROUTE THROUGH KIVETT HALL BASEMENT CRAWL SPACE THEN FOLLOW EXISTING PATHWAY OF STEAM & CONDENSATE PIPING TO WIGGINS HALL. PROVIDE HANGERS AND SUPPORTS. (est. 130 LF each with 45 LF exterior ; 260 LF total with 90LF in aluminum jacket)

PROVIDE 6" or 8" TYPE B DOUBLE WALL / AL29-4C STAINLESS STEEL VENT THROUGH ROOF DECK WITH SEALED METAL ROOF PENETRATION AND AP FOR EACH BOILER. DO NOT MANIFOLD. MAINTAIN MINIMUM CODE DISTANCES FROM BUILDING OPENINGS (OPERABLE WINDOWS & DOORS), ROOF OVERHANGS, ROOF SURFACE, AND WALKWAYS. TERMINATE FLUE VENT VIA MANUFACTURERS INSTRUCTIONS. (ESTIMATE 18' LENGTH; INSTALL VIA MANUFACTURER SIZING AND MINIMUM LENGTH REQUIREMENTS)

PROVIDE 8" PVC, CPVC, OR STAINLESS STEEL COMBUSTION AIR INTAKE THROUGH SIDE WALL FOR EACH BOILER. DO NOT MANIFOLD. TERMINATE FLUE VENT VIA MANUFACTURERS INSTRUCTIONS WITH BIRD SCREEN. (ESTIMATE 12' LENGTH; INSTALL VIA MANUFACTURER SIZING AND MINIMUM LENGTH REQUIREMENTS)

PROVIDE 3/4" AIR VENT AND DRAIN BALL VALVE WITH HOSE END AND CAP FOR HOT WATER PRIMARY LOOP.

PROVIDE TEMPORARY FILL CONNECTION. EXISTING HOT WATER AIR SEPARATOR, MAKEUP WATER, AND CHEM POTS TO REMAIN IN SECONDARY LOOP.

PROVIDE NEW ELECTRICAL SUB PANEL IN BOILER ROOM TO FEED EQUIPMENT. PANEL TO BE FED FROM MDP IN KIVETT ELECTRICAL ROOM APPROXIMATELY 120 FT. SIZE PANEL, WIRING, AND BREAKERS TO CODE. ROUTE FROM ELECTRICAL ROOM DOWN TO BASEMENT TO JUNCTION BOX AT EXISTING 3" CONDUIT. UTILIZE EXISTING 3" CONDUIT AS RACEWAY FROM BASEMENT TO NEW BOILER LOCATION. VERIFY MDP LOAD DEMAND VIA ELECTRICAL DATA LOGGER.

PROVIDE 120V/1PH/25A CIRCUIT TO EACH BOILER WITH LOCAL DISCONNECT. ELECTRICAL TO CONFORM WITH CURRENT NATIONAL ELECTRICAL CODE REQUIREMENTS.

PROVIDE 208V/3PH/20A CIRCUIT TO EACH 3HP PRIMARY PUMP. PROVIDE COMBINATION STARTER DISCONNECT WITH EACH PUMP.

PROVIDE BOILERS WITH INTEGRAL CASCADING CONTROL TO MAINTAIN 180F. PROVIDE HOT WATER SENSOR IN PRIMARY LOOP FOR STAGING CONTROL. PROVIDE WIRING FOR BOILER TO START/STOP THE PUMP.

PROVIDE 120V SERVICE RECEPTACLE.

PROVIDE NEW 12"x12" FLOOR SINK DRAIN WITH 6" SUMP AND P-TRAP FOR BOILER RELIEF, BOILER DRAIN, AND CONDENSATE DRAIN. PROVIDE 4" WASTE PIPING TO TIE INTO EXISTING SANITARY. (est. 40 LF)

PROVIDE FIRESTOPPING OF ALL PENETRATIONS FROM BOILER MECHANICAL ROOM INTO EXISTING BUILDING. SEAL ALL EXTERIOR PENETRATIONS FOR PIPING.

PROVIDE EMERGENCY POWER OFF SWITCH AT ENTRANCE TO NEW BOILER ROOM. HARDWIRE WITH RELAY TO "FAIL-SAFE" AND SHUT OFF POWER TO BOILER UPON ACTIVATION OR CUT IN WIRE.

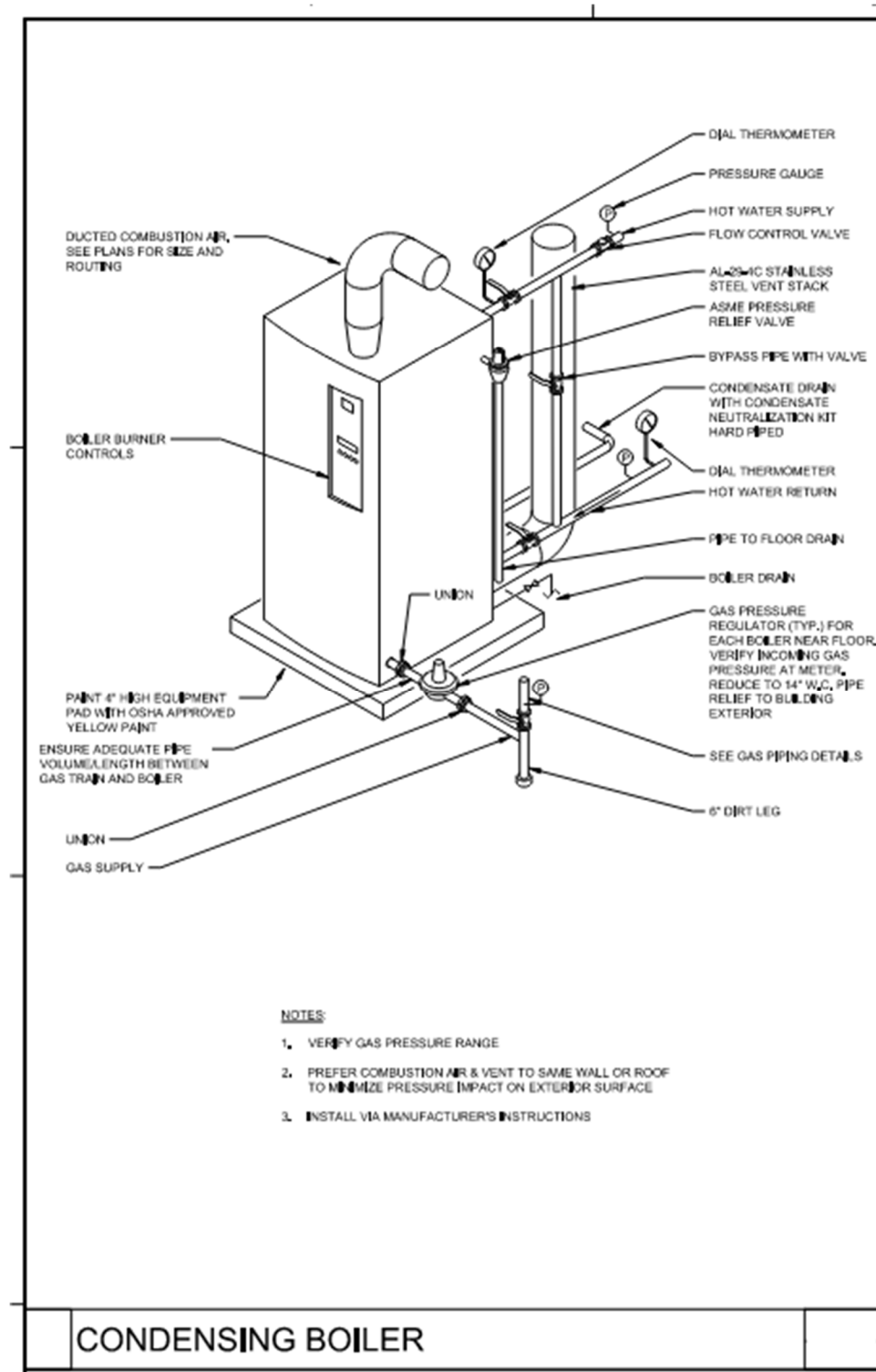
INSTALL TO MEET TYPICAL INSTALLATION DETAILS.

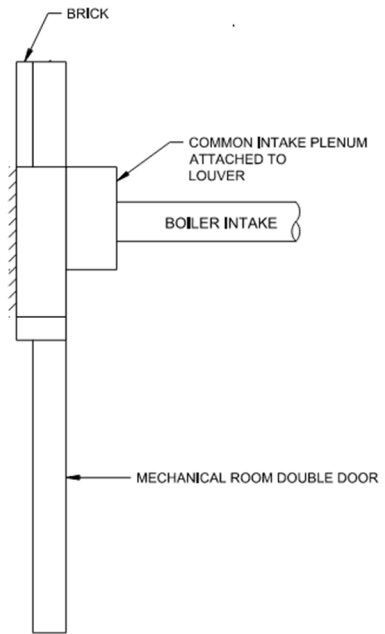
BY OWNER

PROVIDE COMBINATION SMOKE AND CARBON MONOXIDE ALARM. INTEGRATE INTO EXISTING SIMPLEX FIRE ALARM SYSTEM.

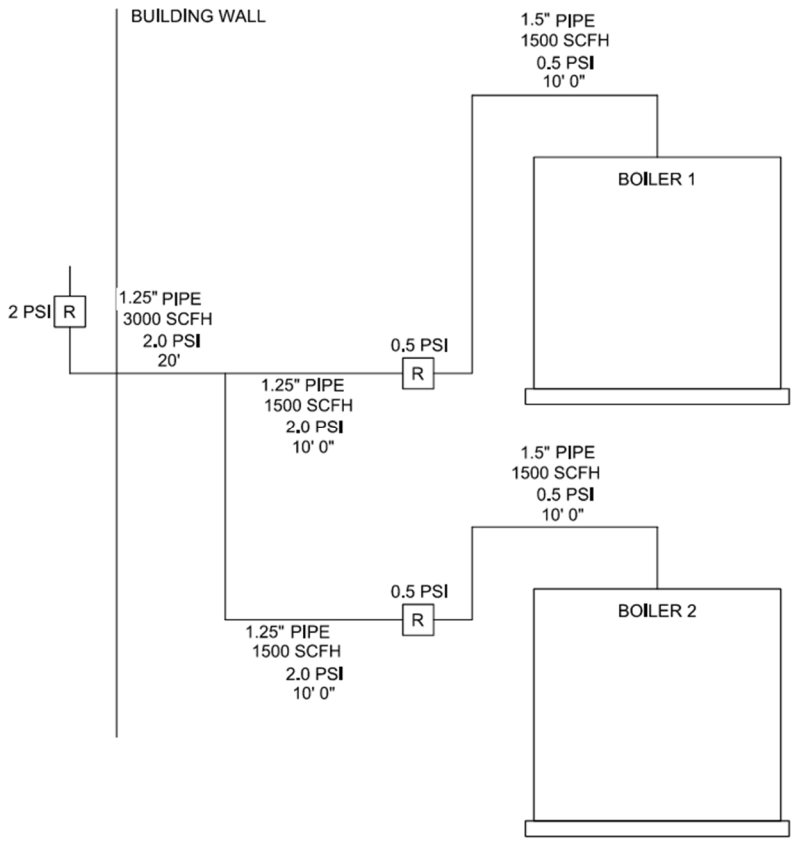
SPRINKLER COVERAGE - EXISTING BUILDING NOT SPRINKLERED.

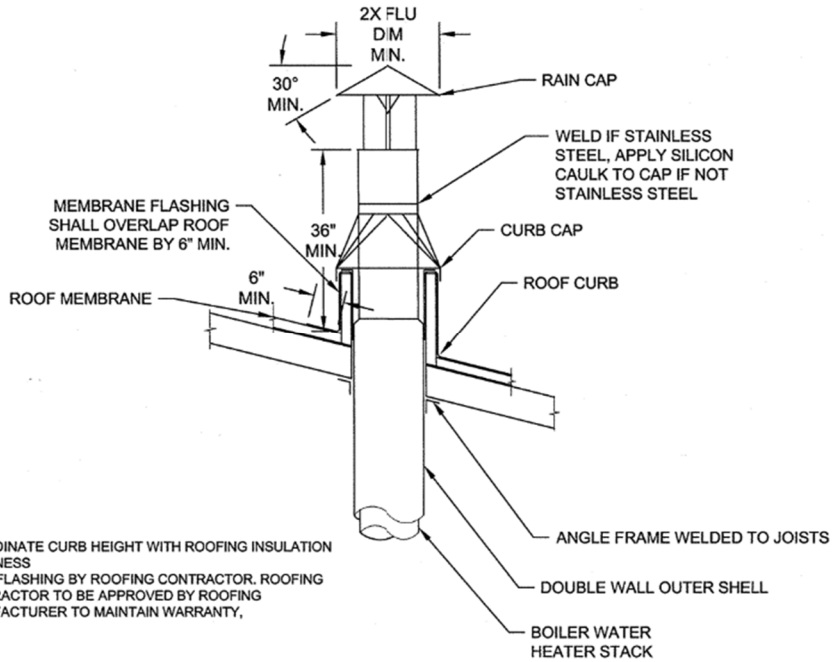
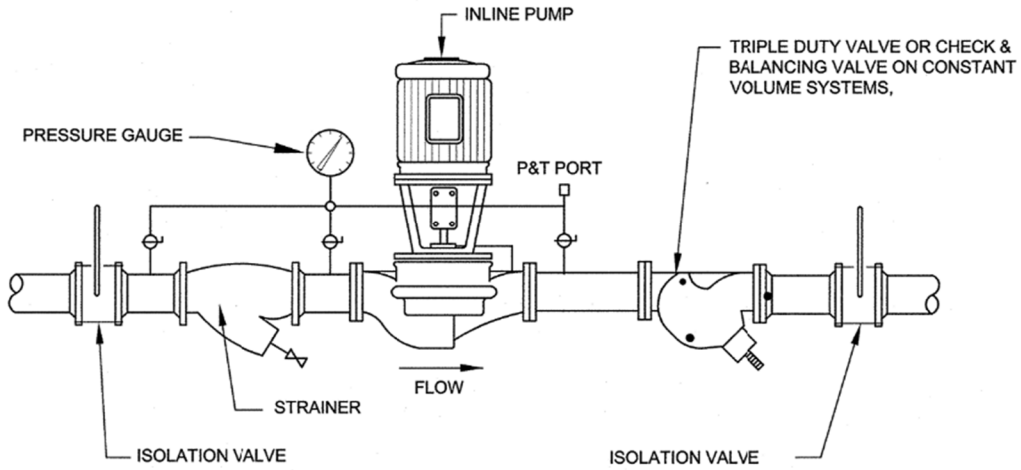
TYPICAL INSTALLATION DETAILS





MAIN BOILER COMBUSTION INTAKE





NOTES:

1. COORDINATE CURB HEIGHT WITH ROOFING INSULATION THICKNESS
2. ROOF FLASHING BY ROOFING CONTRACTOR. ROOFING CONTRACTOR TO BE APPROVED BY ROOFING MANUFACTURER TO MAINTAIN WARRANTY,

SECTION 23 52 16 – CONDENSING BOILERS

PART 1 - GENERAL

1.1. SUMMARY

- A. Section includes gas-fired condensing boilers, trim, and accessories for generating heating hot water.

1.2. SUBMITTALS

- A. Qualification Submittals:

- 1. Vibration Isolation: For boiler, accessories and components, provide dimensions, point load weights, center-of-gravity and anchorage attachment information from the manufacturer to be used by the contractor's vibration isolation delegated design engineer per Section 230548.

- B. Product Submittals: For each type of product indicated.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for boilers.
- 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- 3. Shop Drawings: For boilers, boiler trim, and accessories.
 - a. Include plans, elevations, sections, and mounting details.
 - b. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - c. Include diagrams for power, signal, and control wiring.
- 4. Warranty: Provide sample of manufacturer's warranty.

- C. Construction Submittals:

- 1. Manufacturer Start-Up Certification: Provide manufacturer's complete start-up procedure including verification and results of each step with dated signatures of the manufacturer's technician who performed the work and the installing contractor's supervisor who witnessed the work. The start-up procedure shall include an inspection to verify it meets the manufacturer's installation requirements.
- 2. Commissioning Agent Certification: Provide owner's commissioning agent's certification that boiler is installed and operating as intended.

- D. Close-Out Submittals:

1. Operation and Maintenance Manuals: Provide operation and maintenance information for standard and emergency operation to be included in the Operation and Maintenance Manuals.

1.3. QUALITY ASSURANCE

- A. ASME Compliance: Fabricate and label boilers to comply with 2010 ASME Boiler and Pressure Vessel Code.
- B. Efficiencies shall comply with the State Energy Conservation Code.
- C. Boilers shall comply with UL-795. They shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.
- D. Electrical Components, Devices and Accessories: UL listed and labeled as defined by NFPA 70, the National Electric Code, or equivalent by a qualified testing agency marked for the intended location and application and accepted by the Authority Having Jurisdiction and Engineer.
- E. Mechanical Equipment and Materials: UL listed and labeled as defined by State Building Codes or equivalent by a qualified testing agency marked for the intended location and application and accepted by the Authority Having Jurisdiction and Engineer.
- F. Boilers and their installation shall comply with the State Mechanical, Fuel Gas and Fire Codes.
- G. Boilers with fuel input ratings up to 12,500 MBH shall comply with ASME CSD-1 and with ratings over 12,500 MBH shall comply with NFPA 85.
- H. Testing and listing laboratories of mechanical and electrical equipment shall be accredited by the North Carolina Building Code Council (NCBCC).

1.4. WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's warranty to repair or replace components of the boilers that fail in materials or workmanship within specified warranty period. Warranty period shall start at the date of Owner Acceptance. Warranty repairs and replacements shall include all parts and labor.
 1. Heat Exchanger: 10-years
 2. Control Board: 5 years
 3. All Other Components: Whichever is greater, 1 year from startup or 18 months from shipment after Owner Acceptance.

PART 2 - PRODUCTS

2.1. CONDENSING BOILERS

- A. Manufacturers: Provide full-condensing stainless steel fire-tube boilers that comply with the construction documents and are manufactured by one of the following:
 - 1. Cleaverbrooks (Clearfire CFCE series)
 - 2. Fulton (Endura / Endura Plus series)
 - 3. Lochinvar (Crest series)
 - 4. Raypak (XVERS KOR series)
 - 5. Reillo (Array)
- B. Description: Factory-fabricated, -assembled, and -tested, gas-fired condensing-style water heating boiler with heat exchanger sealed pressure tight, built on a steel base, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.
- C. Heat Exchanger: Fire-tube style heat exchanger designed for condensed flue gas shall be constructed of stainless steel.
- D. Burner: Natural gas, forced-draft burner with 10 to 100 percent minimum firing rate modulation. (10:1)
- E. Blower: Centrifugal fan to operate during each burner firing sequence.
- F. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
 - 1. Provide additional external gas pressure regulator to provide the most reliable and stable boiler operation based on manufacturer recommendations. Coordinate boiler with service gas pressure (2 psi). Gas regulators shall be vented to a safe location exterior to the building. Ventless regulators with vent limiters are not acceptable.
- G. Ignition: Silicon carbide hot-surface ignition that includes flame safety supervision and 100 percent main-valve shutoff.
- H. Casing:
 - 1. Jacket: Sheet metal, with snap-in or interlocking closures.
 - 2. Control Compartment Enclosures: NEMA 250, Type 1A.
 - 3. Finish: Textured epoxy.
 - 4. Insulation: Minimum 1-inch thick, mineral-fiber insulation surrounding the heat exchanger.
 - 5. Combustion-Air Connections: Inlet and vent duct collars.
- I. Combustion Efficiency at AHRI Conditions: 92% (minimum).

2.2. TRIM

- A. Include devices sized to comply with ASME B31.9.
- B. Safety Relief Valve: ASME rated.

- C. Pressure and Temperature Gage: Minimum 3-1/2-inch diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges, so normal operating range is about 50 percent of full range.
- D. Boiler Air Vent: Automatic.
- E. Drain Valve: Minimum 3/4-inch hose-end gate valve.
- F. Circulation Pump: Refer to Section 232123 for pump requirements.

2.3. CONTROLS

- A. Boiler factory-installed operating controls shall include the following features:
 - 1. Control transformer.
 - 2. Set-Point Input (adjustable).
 - 3. Enable / Disable Input.
 - 4. Status and Alarm Outputs.
 - 5. Cascading Controls: Each boiler shall have a built-in cascading sequencer. For installations with multiple boilers, a single boiler shall act and the primary master cascading sequencer. Remaining boilers shall follow the master sequencer to maintain redundancy, lead / lag order, and efficiency optimization. The primary boiler controller shall have the capability to control all operation and energy input of the boiler system in conjunction with input from the BAS.
 - a. When set on Internal Set point Mode, temperature control set points on the boiler shall be fully field adjustable from 90 deg F to 200 deg F in operation.
 - b. When set on internal Outdoor Air Reset Mode, the boiler shall be capable of resetting header temperature based on outside air temperature. Reset ratio shall be fully field-adjustable in operation.
 - c. The boiler shall operate to vary header temperature set point linearly as an externally applied 4mA to 20mA signal (or similar) is supplied by the BAS. Main Header outlet temperature shall not be more than plus/minus 2 deg F from set point at any point of operation. The external signal will allow full remote control of boiler header temperature by the BAS. Control limitations of minimum or maximum boiler water temperatures will be the full responsibility of the boiler manufacturer. Remote monitoring of alarms shall be required.
- B. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.
 - 1. High Cutoff: Automatic reset stops burner if operating conditions rise above maximum boiler design temperature.
 - 2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be automatic-reset type.

3. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.
- C. Building Automation System Interface: Factory install hardware and software to enable building automation system to monitor, control, and display boiler status and alarms. Communication interface with building automation system shall enable building automation system operator to remotely control and monitor the boiler from an operator workstation. Control features available, and monitoring points displayed, locally at boiler control panel shall be available through building automation system.
 1. BACnet per ASHRAE 135 communication interface with the BAS shall enable the BAS operator to remotely control and monitor the boiler from an operator workstation. All control features and monitoring points displayed locally at chiller control panel shall be available through the BAS.

2.4. ELECTRICAL POWER

- A. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

2.5. VENTING

- A. Combustion-Gas Vent: Provide complete system, ASTM A 959, Type 29-4C stainless steel, pipe vent terminal that is listed for use with the boiler for the project's application. Provide connection thimble, indoor plate, vent adapter, condensate trap and neutralization tank, and sealant.
- B. Combustion-Air Intake: Provide complete system, stainless steel, PVC, CPVC, or Polypropylene vent terminal that is listed for use with the boiler for the project's application. Provide with screen, inlet air coupling, and sealant.

2.6. SOURCE QUALITY CONTROL

- A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
- B. Test and inspect factory-assembled boilers, before shipping, according to 2010 ASME Boiler and Pressure Vessel Code.

PART 3 - EXECUTION

3.1. EXAMINATION

- A. Examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting performance of the Work.

1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Examine mechanical spaces for suitable conditions where boilers will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. BOILER INSTALLATION

- A. Equipment Mounting: Install boilers on 4-inch tall light-weight cast-in-place concrete equipment base(s). Install vibration isolation and/or seismic restraint devices per Section 230548.
- B. Install gas-fired boilers according to NFPA 54.
- C. Assemble and install boiler trim.
- D. Install electrical devices furnished with boiler but not specified to be factory mounted.
- E. Install control wiring to field-mounted electrical devices.

3.3. CONNECTIONS

- A. Install piping adjacent to boiler to allow service and maintenance.
- B. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.
- C. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service.
- D. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.
- E. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.
- F. Install piping from safety relief valves to nearest floor drain.
- G. Install flue venting and combustion-air intake.
- H. Ground equipment consistent with the requirements of Division 26.
- I. Connect wiring consistent with the requirements of Division 26.

3.4. FIELD QUALITY CONTROL

- A. Manufacturer Inspection and Start-Up: A Factory-authorized and trained service representative shall test and inspect equipment, components, assemblies and their installations including connections. The representative shall perform the following tests and inspections:
 1. Perform installation and startup checks according to manufacturer's written instructions.

2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
 3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
 - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- B. Boiler will be considered defective if it does not pass tests and inspections.
- C. Provide test and inspection reports within 30 days of completion and manufacturer approval.
- D. Occupancy Adjustments: Upon request within 1 year from the date of owner accepted completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to four (4) owner requested visits to project site for this purpose.

3.5. DEMONSTRATION

- A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 230200 for demonstration and training requirements.

END OF SECTION

SECTION 23 21 23 – HYDRONIC PUMPS

PART 1 - GENERAL

1.1. SUMMARY

- A. Section includes HVAC hydronic system pumps.

1.2. SUBMITTALS

- A. Product Submittals: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
 - 1. Proposed pump data shall include all potential motor sizes, impeller sizes, total head, flow rates and efficiency curves. Pump curves showing only the proposed selection point data is not acceptable.
- B. Close-Out Submittals:
 - 1. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices and Accessories: UL listed and labeled as defined by NFPA 70, the National Electric Code, or equivalent by a qualified testing agency marked for the intended location and application and accepted by the Authority Having Jurisdiction and Engineer.
- B. Mechanical Equipment and Materials: UL listed and labeled as defined by State Building Codes or equivalent by a qualified testing agency marked for the intended location and application and accepted by the Authority Having Jurisdiction and Engineer.
- C. Testing and listing laboratories of mechanical and electrical equipment shall be accredited by the North Carolina Building Code Council (NCBCC).

PART 2 - PRODUCTS

2.1. MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Centrifugal Pumps:
 - a. Armstrong Pumps
 - b. Bell & Gossett
 - c. Grundfos
 - d. Patterson
 - e. TACO

2.2. CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

- A. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.
- B. Pump Construction:
 1. Casing: Radially split, cast iron, with threaded gage-tappings at inlet and outlet, replaceable bronze wear rings and flanged connections.
 2. Impeller: Bronze or stainless steel Type 304; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
 3. Pump Shaft: Stainless steel or carbon steel.
 4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and ethylene propylene terpolymer (EPT) or ethylene propylene rubber (EPR) bellows and gasket. Include water slinger on shaft between motor and seal.
 5. Pump Bearings: Permanently lubricated ball bearings.
- C. Motor: Single speed, TEFC, and rigidly mounted to pump casing.

2.3. PUMP SPECIALTY FITTINGS

- A. Triple-Duty Valve:
 1. Angle or straight pattern.
 2. 175-psig pressure rating, ductile-iron body, pump-discharge fitting.
 3. Drain plug and bronze-fitted shutoff, balancing, and check valve features.
 4. Brass gage ports with integral check valve and orifice for flow measurement.

PART 3 - EXECUTION

3.1. EXAMINATION

- A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PUMP INSTALLATION

- A. Comply with HI 1.4 and HI 2.4.
- B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.
- D. Equipment Mounting:
 - 1. Install in-line pumps with continuous-thread hanger rods and spring hangers with vertical-limit stop of size required to support weight of in-line pumps.

3.3. CONNECTIONS

- A. Where installing piping adjacent to pump, allow space for service and maintenance.
- B. Connect piping to pumps. Install valves that are same size as piping connected to pumps.
- C. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
- D. Install check, shutoff and throttling valves on discharge side of pumps not equipped with a variable speed drive.
- E. Install Y-type strainer and shutoff valve on suction side of in-line pumps.
- F. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.
- G. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping or install single gage with multiple-input selector (trumpet) valve. A single differential pressure gauge is not acceptable.
- H. Ground equipment according to national electrical code.
- I. Connect wiring according to national electrical code.

3.4. STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check piping connections for tightness.
 - 3. Clean strainers on suction piping.
 - 4. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
 - 5. Prime pump by opening suction valves and closing drains and prepare pump for operation.
 - 6. Start motor.
 - 7. Open discharge valve slowly.

3.5. DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION