

Scope Of Work:

Base Bid: Remove existing oil fired, water boiler and replace with two Propane gas fired, individual modular boilers with each one having an approximate input of 500 MBH and output of 425 MBH. Each modular unit must be able to stand alone, have circulation pump (size as required), and capable of independent operation with cut off valves on intake and outlet of each unit so that it can be isolated for repairs. Remove the old disconnected, domestic hot water heater/storage tank and any associated piping and piers. Also remove the propane gas fired water heater, currently in use. Member boiler to be piped to new Squire indirect domestic hot water heater tank and new circulation pump. Pump to be sized as required for supplying hot water to Squire water heater's heat exchanger, wired to boiler control board. Install a new sediment/air separator, on new primary loop, new backflow preventer, water make up with copper pipe and ball valves and new pressure reducing valve. The existing expansion tanks to be removed and new expansion tank with bladder installed. Pipe running from the system heating to the expansion tank will need to be ¾" or larger copper pipe. Install new ¼ turn ball valves on inlet and outlet domestic hot water piping to new heater. Ashes in chimney to be cleaned out.

DIVISION 23 52 33.13

FINNED WATER-TUBE BOILERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes gas-fired, copper finned-tube hydronic heating boilers
- B. Related Sections (not applicable)
 - 1. Building Services Piping – Division 23 21 00
 - 2. Breeching, Chimneys, and Stacks (Venting) – Division 23 51 00
 - 3. HVAC Instrumentation and Controls – Division 23 09 00
 - 4. Electrical – Division 23 09 33

1.2 REFERENCES

- A. ANSI Z21.13/CSA 4.9
- B. ASME, Section IV
- C. 2006 UMC, Section 1107.6
- D. National Fuel Gas Code
- E. I=B=R
- F. NEC
- G. ASME CSD-1, 2006

1.3 SUBMITTALS

- A. Product data sheet (including dimensions, rated capacities, shipping weights, accessories)
- B. Wiring diagram
- C. Warranty information
- D. Installation and operating instructions

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. ANSI Z21.13/CSA 4.9
- B. Certifications
 - 1. CSA
 - 2. ASME H Stamp and National Board Listed
 - 3. ISO 9001

1.5 HEAT EXCHANGER WARRANTY

- A. Ten-year Heat exchanger warranty against leaks and thermal shock
- B. One year warranty on all parts

- PRODUCTS

1.6 MANUFACTURER

A. Lockinvar Copper Fin II or approved equal

1. Copper finned-tube hydronic boiler(s)

1.7 BOILERS

A. General

1. The boiler(s) shall be fired with natural gas at approximate rated input of 500 MBH each. Output of 425 MBH each
2. The boiler(s) shall be CSA tested and certified with a minimum thermal efficiency of 82 percent at full fire.
3. The boiler(s) shall be ASME inspected and H-stamped and National Board registered for 160 PSIG working pressure, complete with a Manufacturer's Data Report.

B. Heat Exchanger

1. The heat exchanger shall be of a single-bank, horizontal-grid design integral copper fin tubes, each end of which is rolled into an ASME boiler-quality steel tube sheet.
2. The heat exchanger shall be sealed to 160 PSIG rated standard headers.
3. The low water volume heat exchanger shall be explosion-proof on the water side and shall carry a Ten-year warranty against thermal shock caused by boiler operation with large temperature changes, not exceeding 150°F between the water temperature at the boiler inlet and the boiler outlet temperature up to 230°F maximum.
4. The headers shall be secured to the tube sheet by stud bolts with flange nuts to permit inspection and maintenance without removal of external piping connections.
5. The boiler(s) shall be capable of operating at inlet water temperatures as low as 105°F without condensation or have a Low Temperature recirculation valve.

C. Burners

1. The stainless steel alloy burners shall be of the raised port design with primary fixed air ports, capable of quiet extinction without flashback at the orifice at firing rates between 20% and 100%, or Proportional firing of 4:1 Turndown and mounted in a slide out burner drawer for ease of inspection.

D. Pilot Control System

1. The boiler(s) shall be equipped with a 100 percent safety shutdown system. The pilot ignition shall be (a) or (b)
 - a. Standard models (133-1826) shall have an electronic intermittent ignition system with electronic flame supervision having a nominal 0.8 second flame response time.
 - b. Standard models (2100-4001) shall have an electronic ignition system with electronic flame supervision having a nominal 0.8 second flame response time, requiring a manual reset on flame failure.
2. The ignition shall be Spark Ignition or hot surface ignition with full flame rectification to ensure consistent operation.
3. The igniter will be located away from the water inlet to protect the device from condensation during startup.
4. The ignition control module shall include two LED's that indicates flame presence and/or system status.

E. Gas Train

1. The boiler(s) shall have a firing/leak test valve and pressure test port as required by CSD-1.
2. The boiler(s) shall have dual gas valve seats per ANSI Z21.13/CSA 4.9.
3. Gas control trains shall have a redundant safety shut-off feature, main gas regulator, shut-off cock and plugged pressure tapping to meet the requirements of ANSI Z21.13/CSA 4.9.

F. Boiler Control

1. The following safety controls shall be provided:
 - a. High limit control.
 - b. Flow switch, mounted and wired.
 - c. 45 -50 PSIG ASME pressure relief valve, piped by the installer to an approved drain.
 - d. Temperature and pressure gauge.

G. Firing Mode

1. The boiler(s) shall be equipped to (a), (b),
 - a. Provide full modulation of gas input to any load condition as low as 20% of the full rating of the boiler (5:1 ratio) without flashback, burning at orifices or improper combustion.
 - b. Or proportional Firing at 4:1 turndown

H. Boiler Diagnostics

1. Provide ignition module indicating the following flashes by LED signal:

I. Combustion Chamber: The lightweight, high-temperature, multi-piece, interlocking castable combustion chamber liner shall reduce standby radiation losses, reducing jacket losses and increasing unit efficiency.

J. Venting

1. When routed vertically, the boiler's flue material and size shall be in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 latest edition (Category I).

K. Cabinet

1. The corrosion-resistant galvanized steel jackets shall be finished with a baked-on epoxy powder coat which is suitable for outdoor installation, applied prior to assembly for complete coverage, and shall incorporate louvers in the outer panels to divert air past heated surfaces.
2. The boiler(s), if located on a combustible floor, shall require an optional separate combustible floor base.

L. Operating Controls

1. The boiler(s) shall feature an optional staged controller with adjustable outdoor reset, mounted and wired.
2. Water and air temperature sensors for all digital controllers shall be shipped loose for field installation by installing contractor. Boiler Pump - Refer to Equipment Schedule

M. Cold Water Start System

1. The boiler(s) shall be configured with a cold water start automatic proportional bypass system that ensures the boiler will experience inlet temperatures in excess of 105°F within 7 minutes to avoid damaging condensation. The unit will automatically shut down if the inlet temperature is not achieved within the 7-minute time frame.
2. The cold water start system shall be configured with a modulating three-way valve that is controlled by a system-matched PID controller. The PID controller temperature sensor shall be located in the inlet header of the boiler.
3. The control shall have a temperature setting dial located on the face of the board. The temperature range of the dial shall be 105°F to 120°F. The PID Logic shall be capable of limiting system overshoot to a maximum of 10°F on initial start-up or call-for-heat.
4. The cold water start system shall be completely wired and mounted at the factory.
5. The control shall have the following diagnostic LED's:
 - a. Call for heat

- b. Start-up mode
 - c. Inlet temperature error
 - d. Sensor out of range
6. The controller shall have the capability to add optional alarm contacts.

1.8 SOURCE QUALITY CONTROL

- A. The boiler(s) shall be completely assembled, wired, and fire-tested prior to shipment from the factory.
- B. The boiler(s) shall be furnished with the sales order, ASME Manufacturer's Data Report, inspection sheet, wiring diagram, rating plate and Installation and Operating Manual.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Must comply with:
 - 1. Local, state, provincial, and national codes, laws, regulations and ordinances
 - 2. National Fuel Gas Code, NFPA 54/ANSI Z223.1 – latest edition
 - 3. National Electrical Code, ANSI/NFPA 70 – latest edition
 - 4. Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1, when required
 - 5. Canada only: CAN/CSA B149 Installation Code and CSA C22.1 CEC Part I
 - 6. Manufacturer's installation instructions, including required service clearances and venting guidelines
- B. Manufacturer's representative to verify proper and complete installation.

2.2 START-UP

- A. Shall be performed by factory-trained personnel or approved equal personnel.
- B. Test during operation and adjust if necessary:
 - 1. Safeties (2.2 - F)
 - 2. Operating Controls (2.3)
 - 3. Static and full load gas supply pressure
 - 4. Gas manifold and blower air pressure
- C. Submit copy of start-up report to:

**NC NATIONAL GUARD
FACILITY MAINTENANCE DEPARTMENT
4203 REEDY CREEK ROAD
Raleigh, North Carolina 27607-6410**

2.3 TRAINING

- A. Provide factory-authorized service representative to train maintenance personnel on procedures and schedules related to start-up, shut-down, troubleshooting, servicing, and preventive maintenance.
- B. Schedule training at least seven days in advance.

END OF SECTION

BOILER INSPECTION:

It shall be the responsibility of the contractor to complete the installation of the fired and unfired pressure vessels and their safety devices, in accordance with the requirements of the latest Edition of the North Carolina Boiler Inspection Law, Rules, and Regulations. This contractor shall have the equipment, which is installed under this contract, inspected and approved by the State of North Carolina, Department of Boiler Inspections. This contractor shall be responsible for notifying the State Boiler Inspector, in writing, or by phone call, at least two (2) weeks prior to the date of completion, of all equipment requiring inspection.

Furnish and install a suitable metal frame, having a removable glass cover, for posting the certificates of inspection, furnished by the North Carolina Department of Labor, Boiler Bureau. Certificates are to be installed by this contractor before requesting final inspection of the completed job by the Owner.

Final payment will not be made until certificate of inspection has been duly framed and posted. All fees and expenditures, necessary for this requirement, will be paid by the contractor.

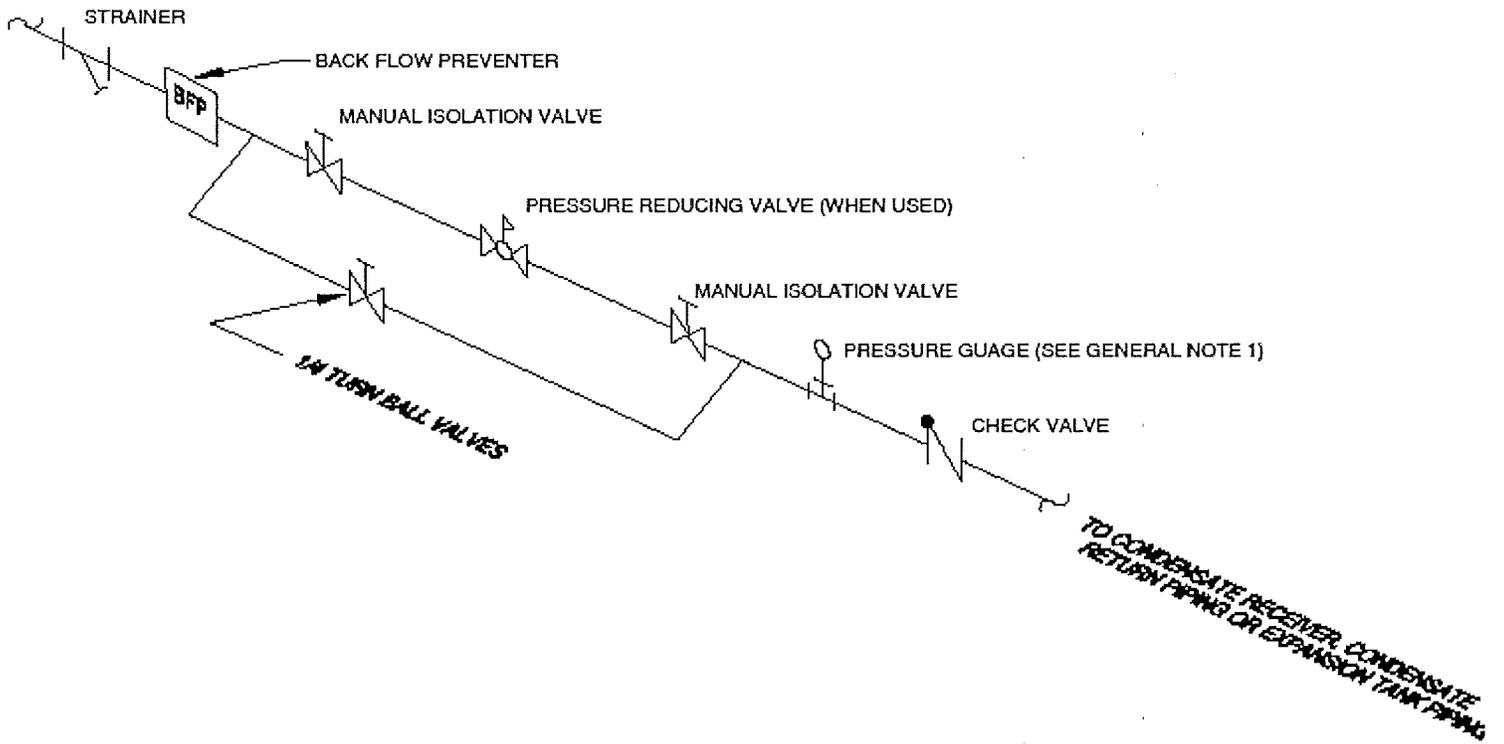
GENERAL NOTES:

1. Replace boiler assembly with two new Propane gas fired boilers.
2. Dispose of the old boiler and accessories in a proper manner & within environmental laws.
3. Electrical connections shall be made by a licensed electrician as required per the latest edition of the N.E.C., NC Office of State Construction Electrical Guidelines Manual and the NC Dept. of Insurance.
4. Conductors to be properly sized for loads required.
5. All Conduits shall be ¾" EMT or larger.
6. Each new boiler shall have rated input of approximately 500 MBH and output of 425 MBH and meets specs for Lockinvar CHL0502-N9.
7. Coordinate gas piping connection with local gas co. Local gas co will run new Propane gas line to point outside boiler room.
8. Main Gas piping from outside to branch at each boiler, shall be 2".
9. POC at JFHQNC-Construction & Facilities Management Office (CFMO) is CW5 Freeman 984-664-6094, Larry Andrews 984-664-6515 or Norman Driver, 984-664-6187.
10. Layout of boiler and piping shall be consistent with general accepted piping principals, with gas exhaust vent piping as short as possible. Piping shall be plumb and level.
11. New copper water make up piping shall be installed per drawings will replace old water makeup.
12. Primary piping system loop will be piped the same size as the existing 4" main piping.
13. Each boiler piping will have a low temperature protection valve (LTV), with bypass and set at 135 degrees F. inlet water temperature, to protect the heat exchanger from condensation. This valve will need to meet or exceeds specs of **Fluid Power Energy # A2010 Low Thermostatic Valve 2" threaded.**
14. Existing expansion tanks to be removed and one new bladder type meeting minimum specs for **Bell & Gossett D80V** or larger.
15. Sediment/air removal separator shall be installed that will be able to remove particles 15 microns and up, such as the **TACO 4900** or **Bell & Gossett SRS 4" Flanged** or equivalent and be 4" to match primary loop piping, with a full size ball valve on the drain of the sediment/air separator. Drain to be piped to floor.
16. Install vent pipes & Barometric dampers, if needed, per manufactures recommendations to ensure proper draft requirements are met.
17. Concrete housekeeping pad/pads for boilers and new domestic hot water heater, to be approximately 4" thick w/fiber mesh reinforcement with the strength to be a minimum of 3,000 PSI in 28 days.
18. Connect all existing piping to boilers as necessary to make system operational.
19. All piping will be insulated per code.
20. Install supply and return temperature sensors in primary loop for boiler operations.
21. Install outdoor temperature sensor to boiler, so boilers will shut down when temperature is above 65 degrees.
22. Install a Stainless Steel indirect domestic hot water heater, **Squire SIT119.**
23. Hook up existing domestic hot water piping to new domestic hot water tank.

SEQUENCE of OPERATION:

1. Install an Outdoor temperature sensor to lead boiler.
2. There will need to be a 2 wire twisted shielded communications cable between the boilers.
3. Boiler will tell all circulator pumps, to go on standby when outside temperature is below 65 degrees. Each zone pump will come on if that zone thermostat calls for heating. Above 65 degrees boiler will tell all circulator pumps not to run.
4. The call for heat is from sensors located in the primary loop.
5. Boiler should then start the boiler unit pump.
6. Boilers should then start the process of firing the burners.
7. Boilers must fire in stages and be wired to use a cascade effect where one boiler will become fully loaded before the second boiler starts heating.
8. After primary loop temperature is satisfied the boilers will shut off.
9. Boiler will alternate running, so as to get even boiler wear. This is an automatic built in feature with Lockinvar boilers.
10. Install emergency shut off switch per code as required. Field locate at each door.
11. Boilers to be of staged or proportional firing or of the modulating type controls.
12. Boiler to have Low water/flow cut off controls.
13. Maximum set point for primary loop temperature is approximately 165 degrees.
14. Offset temperature of primary loop piping no more that 8 degrees above or below 165.
15. Boilers to operate on outdoor air temperature reset.
16. When outdoor air temperature is 60 degrees loop temperature should be about 125.
17. When outdoor air temperature is 25 degrees loop temperature should be maxed at 165 degrees.
18. Boiler # 2 will heat domestic hot water with control sensor installed in the domestic hot water tank.

Work Order 16020304 Elizabethtown Boiler SOW



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