

## **SECTION 22 45 80 - DOMESTIC WATER HEATERS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

- A. Provide labor, materials, equipment and services to perform operations required for the complete installation and related Work as required in Contract Documents.

#### **1.2 SUBMITTALS**

- A. Submit shop drawings for all items specified under "Part 2 - Products" of this Section.
- B. Submit the following information relating to water heating equipment:
  - 1. Instruction and maintenance manuals for all water heaters.
  - 2. Warrantees for all water heating equipment.
  - 3. Tank and lining instruction manuals, guarantee and warranty.
  - 4. Wiring diagrams for water heating equipment and all related controls (aquastats, flow switches, pumps, etc.).
  - 5. Maintenance instructions for all related pumps serving water heating systems.
  - 6. All storage tanks, heaters, expansion tanks and related devices shall be ASME rated.

### **PART 2 - PRODUCTS**

#### **2.1 GAS FIRED WATER HEATERS (HWH-1)**

- A. The water heater shall have a modulating input rating of 399,999 Btu/Hr, a recovery capacity of 110 gallons per hour at a 100°F rise and shall be operated on Natural Gas. The water heater shall be capable of full modulation firing down to 20% of rated input with a turn down ratio of 5:1. Make: Lochinvar Model SWA400N or equal.
  - 1. The water heater shall consist of a direct fired stainless steel heat exchanger mounted on top of a glass lined storage tank in a fashion that will reduce the amount of scale build-up that is known to reduce efficiency. The water heater shall have no visible pipes that connect the heat exchanger to the storage tank. Heat exchangers with input in excess of 200,000 Btu/Hr shall bear the ASME "HLW" stamp and shall be National Board listed. There shall be no banding material, bolts, gaskets or "O" rings

in the header configuration. The stainless steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in trap shall allow condensation to drain from the heat exchanger assembly. The water heater shall carry a three (3) year warranty against leaks (one (1) year parts).

2. Specified water heater shall bear the ASME "HLW" stamp and shall be National Board listed. The tank shall have a working pressure of 150 psi. The tank shall be glass lined and fired to 1600°F to ensure a molecular fusing of glass and steel. The tank shall be completely encased in high density insulation of sufficient thickness to meet the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. The tank shall be fitted with a brass drain valve.
3. The water heater shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.10.3 test standard for the US and Canada . The water heater shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 standard. The water heater shall operate at a minimum of 96% thermal efficiency. The water heater shall be certified for indoor installation. The water heater's efficiency shall be verified through third party testing by AHRI and listed in the AHRI Certification Directory.
4. The water heater shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The water heater shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating water heater firing rates for maximum efficiency. The water heater shall operate in a safe condition at a de-rated output with gas supply pressures as low as 4 inches of water column.
5. The water heater shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for water heater set-up, water heater status, and water heater diagnostics. All electronic circuitry shall be easily accessed and serviceable from the front of the jacket. The water heater shall be equipped with; an all-bronze circulating pump; high limit temperature control; ASME certified temperature and pressure relief valve; inlet & outlet water temperature sensors; flue temperature sensor; runtime contacts; alarm contacts; low water flow protection, contacts for louvers, security protection, adjustable pump delay, enable/disable contacts and built-in freeze protection. The manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

6. The water heater shall feature a SMART Control with an LCD display with soft key pad, pump delay with freeze protection and pump exercise. The water heater shall be equipped with an eight foot power cord. Supply voltage shall be 120 volt / 60 hertz / single phase.
7. The water heater shall be installed and vented per the following:

**(a) Direct Vent Sidewall** system with a horizontal sidewall termination of both the vent and combustion air. The flue shall be PVC, CPVC, Polypropylene or Stainless Steel sealed vent material terminating at the sidewall with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the water heater from the outside. The air inlet pipe may be PVC, CPVC, Polypropylene, ABS, Galvanized, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on the same sidewall with the manufacturer's specified air inlet cap. The water heater's total combined air intake length shall not exceed 100 equivalent feet. The water heater's total combined exhaust venting length shall not exceed 100 equivalent feet. **Foam Core pipe is not an approved material for exhaust piping.**

**(b) Direct Vent Vertical** system with a vertical roof top termination of both the vent and combustion air. The flue shall be PVC, CPVC, Polypropylene or Stainless Steel sealed vent material terminating at the roof top with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the water heater from the outside. The air inlet pipe may be PVC, CPVC, Polypropylene, ABS, Galvanized, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on the roof top with the manufacturer's specified air inlet cap. The water heater total combined air intake length shall not exceed 100 equivalent feet. The water heater total combined exhaust venting length shall not exceed 100 equivalent feet. **Foam Core pipe is not an approved material for exhaust piping.**

**(c) Sidewall Vent with Room Air** system with a horizontal sidewall termination of the vent with the combustion air drawn from the interior of the building. The flue shall be PVC, CPVC, Polypropylene or Stainless Steel sealed vent material terminating at the sidewall with the manufacturers specified vent termination. . The water heater total combined exhaust venting length shall not exceed 100 equivalent feet. **Foam Core pipe is not an approved material for exhaust piping.**

**(d) Vertical Vent with Room Air** system with a vertical rooftop termination of the vent with the combustion air drawn from the interior of the building. The flue shall be PVC, CPVC, Polypropylene or Stainless Steel sealed vent material terminating at the rooftop with the manufacturers specified vent termination. The **WATER HEATER's** total combined exhaust venting length shall not exceed 100 equivalent feet. **Foam Core pipe is not an approved material for exhaust piping.**

**(e) Vertical Vent with Sidewall Air** system with a vertical rooftop termination of the vent with the combustion air being drawn horizontally from a sidewall. The flue shall be PVC, CPVC, Polypropylene, or Stainless Steel sealed vent material terminating at the roof top with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the water heater from the outside. The air inlet may be PVC, CPVC, Polypropylene, ABS, Galvanized, Dryer Vent, or Stainless Steel sealed pipe. The air inlet must terminate on a sidewall using the manufacturers specified air inlet cap. The water heater total combined air intake length shall not exceed 100 equivalent feet. The water heater total combined exhaust venting length shall not exceed 100 equivalent feet. **Foam Core pipe is not an approved material for exhaust piping.**

## **2.2 WATER HEATER AND STORAGE TANK PROTECTIVE VALVES**

- A. Temperature and Pressure Relief:
  - 1. Provide storage tank with T&P with sufficient capacity for heaters served at pressure rating of tank. Watts Model 40-140-240 series.

## **2.3 DOMESTIC WATER HEATING SYSTEM EXPANSION TANK (DET-1)**

- A. Make: Watts model DET-12-M1 (4.5 gallon, non-ASME)

## **2.4 DOMESTIC HOT WATER SYSTEM ACCESSORIES**

- A. 1 ½" bronze flange sets on pumps, heater and tank.
- B. Johnson Control Model A19ABC-39 aquastat controller for control of each pump (total of 3 aquastats) and tank.
- C. Thermometers – Trerice Model FX91403½ (solar powered).
- D. Flow Switches – Johnson Model F61KB-11.
- E. Provide all control wiring and 120 volt circuits for heater and system control and operation. Provide all control wiring for aquastats, flow switches and domestic hot water system control devices.

### **2.12 CHECK VALVE**

- A. Furnish 5 psi spring loaded check valve or pressure reducing valve. Make: Watts

### **2.13 MANUFACTURERS**

- A. Acceptable water heating plant equipment manufacturers:
  - 1. A.O. Smith, Lochinvar.

## **PART 3 - EXECUTION**

### **3.1 WATER HEATERS**

- A. Division 22 (Plumbing) Contractor Shall:
1. Provide all connections, accessories, controls, wiring and devices required for proper system operation.
  2. Provide one-day system start-up and instruction to Owner's personnel on system operation and maintenance.
  3. Provide installation manuals and warranties in O&M Manuals.
  4. Provide start-up services of factory trained technician to inspect installation based on factory recommendations. Inspect installation for correct piping configuration, venting and fuel supply as well as proper balancing of multiple heater installations. Technician to verify combustion efficiency, proper temperature differential across heater(s), proper operation of equipment, safety controls, and venting based on factory start-up procedure. Submit start-up report in writing to project plumbing engineer.

### **3.2 TEMPERATURE AND PRESSURE RELIEF VALVES**

- A. Pipe all devices full size to nearest floor drain.

### **3.3 SYSTEM START UP**

- A. Provide start up services of factory trained technician to inspect installation based on factory recommendations. Inspect installation for correct piping configuration, venting and fuel supply.
- B. Start up technician to adjust controls and safety devices for proper operation of system, and balance water flow through heater(s) for proper temperature differential based on manufacturer's recommendations. Verify proper pump size and pump operation for heater(s) and circulation pump(s).
- C. Start up report, in writing, shall be submitted to the engineer with the minimum following information:
1. Temperature differential across heater(s)
  2. Stack temperature
  3. Combustion efficiency
  4. Gas pressure at control string inlet
  5. Gas pressure at burner
  6. Draft reading
  7. Temperature setting – storage tank
  8. Temperature setting – high limit
  9. Temperature setting – return line aquastat
  10. Mixed outlet temperature, if applicable

11. Supply voltage
  12. Water hardness
  13. Static pressure
  14. Proper air charge at thermal expansion tank, if applicable
  15. Relief valve settings and type at heater(s) and tank(s)
- D. Advise, in writing, any deficiencies in the installation, and/or operation of the system.

**END OF SECTION**