

TROUBLE SHOOTING TOOL KIT

- ☑ Hand tools including screwdriver with interchangeable bit set, pocket screwdriver, special tools or wrenches for manifolds and tube fittings, adjustable wrench, ratchet and sockets, needle nose pliers, 'channel lock' pliers, etc.
- ☑ Pressure gauge (0–100#) with 1/2", 3/4" bushings and couplings and female hose thread adapter. Two or three double ended (washing machine) hoses.
- ☑ Utility/charging pump for filling, purging, and flushing systems. Essential for use with anti freeze and chemical additives.
- ☑ Thermometers: pocket, gauge, and infrared; and thermocouples for use with multimeters to check water, pipe and surface temperatures.
- ☑ Manometer: U-tube, inclined or magnehelic gauge to measure and monitor fuel gas pressure.
- ☑ Multimeter/tester: AC/DC volts, resistance, amperage/current with test leads and alligator clips and jumper wires.
- ☑ Combustion test kit or flue gas analyzer with draft gauge, flue gas thermometer, smoke tester and CO2 or O2 tester.
- ☑ Antifreeze test strips or spectrometer.
- ☑ Ultrasonic flow detector.
- ☑ Spare parts assortment appropriate for system. i.e. relays, transformers, circulators, zone valves, sensors, copper and tube/hose fittings and adapters,. etc.
- ☑ Manufacturers equipment manuals.
- ☑ Patience.

I. SYSTEM DESIGN

- Heat loss analysis for the building done.
- Building construction complete as shown in the same plans used to design the system.
- Acceptable procedure or design process used for the radiant panel system design.
- Installed system meets the design criteria and/or other accepted standards.
- Met customer expectations and level of understanding of how the system will operate, particularly with respect to the differences between radiant heating versus other forms of heating systems.

II. INSTALLATION

A) Loop Installation

- Loop Spacing (on center distance between each pipe) as specified by the system design.
- Installed length of loops as specified by the system design +/-3%.
- Installation methods comply with the manufacturer's recommendations.
- Installed loops subjected to an acceptable pressure test following completion of the tube installation.
- All circuits and manifolds accurately labeled for length, location and zone.
- Proper manifold location and height for accessibility and ease of service.

B) Mechanical and Piping

- Boiler or heat source capacity or output as specified in system design.
- Boiler installation, piping, venting, safety equipment, combustion air supply, condensate drainage in compliance with the system design, manufacturer's guidelines and local code requirements. When in question contact the equipment manufacturer.
- Thermal expansion tank pre-charge pressure and system fill-valve setting match the system design pressure.
- Circulating pumps in the proper location and orientation. Recommended location is on the supply pipe after the system expansion tank.
- Circulating pump size, pipe size, valves, and accessories as specified in the system design requirements.
- Required flow control valves present and proper position.
- Boiler or heat source operating temperature as specified.

C) Controls

- Electrical schematic provided for the system controls. If not, try each zone control individually, observe operation and compare to expected results.
- Control settings match the system design specifications, or accepted industry standards.
- Room temperature controls or thermostats located and installed and wired properly.
- Thermostat anticipators set to match the current draw of the controls.

D) System Start Up

- Fill the boiler and boiler room piping.
- Check for and repair any leaks.
- Fill and purge distribution system. This is usually done one zone or manifold at a time. Some installers prefer to fill and purge circuits individually.
- System cleaned and flushed.
- Suitability of system fluid verified: acceptable pH, freeze protection, potability, etc.
- System control settings checked:
 - Reset control heating curve or slope, heating curve shift or parallel displacement, maximum and minimum supply temperatures.
 - Set thermostatic or manual mixing valve to achieve design supply water temperature for each zone, if applicable.
 - Thermostat anticipator settings should correspond to control current draw.
 - Set pressure differential bypass valve if used.
- Start and operate the boiler or other heat source.
- Proper and safe operation of heat source verified, (refer to the equipment manual) venting system, controls and safety devices.
- Operate one zone at a time and evaluate flow to each zone.
- Check operation of other control valves installed.
- With system zones ON verify that there is a normal temperature difference between the system supply and return. Typical 20°F (11°C).
- With zones running under load the boiler should cycle. If not: repurge, check circulator operation, check control valves, check boiler operating temperature.
- Owner has received proper instruction on system operation and use.
- Owner has been provided with the system design specification, equipment and component documents, warranties, and operation.