Fundamentals of Hydronic Design

- Radiant based HVAC
- IAQ + ICQ = IEQ
- Efficient & Effective
- Constant flow, variable temp
- Variable flow, constant temp
- Large $\Delta t$'s on distribution
- Larger $\Delta t$'s on boilers
- Modulating injection valves
- Differential press. controls
- Exp tank sized on low temp
- Multi Story – use HEX/floor
Fundamentals of Hydronic Design

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Some slides contained animations in the original .ppt format which have been eliminated in the conversions to Adobe’s .pdf format.
The Proper Way of Piping a Boiler

- Pumping away from boiler, air separator, and expansion tank. Air separates best at lowest pressure (suction side of circulator) and highest temperature (discharge side of boiler). Discharge pressure on circulator will be equal to the static fill pressure plus the differential pressure created by the circulator. Suction pressure will operate at approximately static fill pressure.
• **The Improper Way of Piping a Boiler**
  - Pumping away from boiler but towards the air separator, and expansion tank. Discharge pressure is limited to the static fill pressure. Suction pressure on circulator becomes reduced by the differential pressure created by the circulator and could be operating at a negative pressure in locations throughout the system. This contributes to air problems including corrosion, noise and reduced pumping efficiency.
The Improper Way of Piping a Boiler

- Pumping towards the boiler, air separator and expansion tank. Circulator discharge pressure is limited to the static fill pressure. Suction pressure on circulator becomes reduced by the differential pressure created by the circulator and could be operating at a negative pressure in locations throughout the system. This contributes to air problems including corrosion, noise and reduced pumping efficiency.
The Improper Way of Piping a Boiler

- Pumping towards the boiler and away from air separator, and expansion tank. Discharge pressure on circulator will be equal to the static fill pressure plus the differential pressure created by the circulator. Suction pressure will operate at approximately static fill pressure. Pressure relief valve will see the higher circulator pressure reducing the operating range. This leads to frequent blow off and replacement of water through fill regulators contributing to air problems including corrosion, noise and reduced pumping efficiency. Cold water filling of a hot boiler can also lead to severe damage.
For best performance & safety

- The system circulator should pump away from the boiler, expansion tank, air separator and fill assembly.
- A low water cut-off should be installed on every boiler
- There should always be a minimum of two temperature controllers, one for safety (high limit) and one for control.
- Protect non condensing boilers from return water temperatures below 140 °F
- Pipe all relief valves and backflow to drain
- All drain valves must have caps on them
- Relief and safety valves must never be capped!
• Controls

Related Presentations:
Circulators, flow, differential pressure and expansion tanks.
Fundamentals of Hydronic Design

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This material is presented as an educational service and is supported by downloading the Guide to Indoor Comfort Quality and the Architectural Guide to Radiant Based HVAC Systems

Radiant Based HVAC Systems