CONTRACTOR®
THE NEWSMAGAZINE OF MECHANICAL CONTRACTING
Reprint from April 1998

Use high-limit controls in radiant floor jobs

BY JOE FIEDRICH
Hydronic heating authority

HIGH WATER temperatures mistakenly circulated through a hydronic radiant floor heating system can cause serious damage to finished floor coverings, gypsum concrete, and concrete slabs. Finished floor boards will cup, shrink, delaminate and distort. Ceramic tile and grouting can crack. Gypsum concrete will powderize and concrete slabs will develop hair line cracks.

Floor surface temperatures can get high enough to burn your feet and make your pets escape to the family couch. Oxygen diffusion barriers on distribution tubing can delaminate and flexible rubber tubing will harden into a petrified fossil.

Are high limit controls necessary in radiant floors? Most emphatically, yes!

What are the options to accomplish high limit safety control on hydronic radiant systems? The simplest form of high limit control is the installation of an immersion or strap-on aquastat on the system supply water piping; this would simply shut the circulator (s) off.

This simplistic approach would cause a no-heat call due to intermittent circulator short-cycling.

So, this circulator shutdown method should only be used as a last-resort safety device in the control chain, preventing the system from melting down, similar to the function of a low-water cut-off control on a boiler. A better solution is to do it hydraulically. This can be accomplished in different ways. You can create a hydraulic bypass right after the three- or four-way mixing valve on the radiation side of the valve, by installing a balancing valve as shown on the schematic. This valve can be in the form of a simple ball valve. It allows you to create a fixed by-pass flow of system return water, assuring that boiler water can never reach the floor distribution system even if the mixing valve should fully close its bypass, trying to dump boiler water temperature into the system.

High-limit settings on cement floor systems should never exceed 140ºF, and on dry systems installed below the subfloor 160ºF should be the limit.

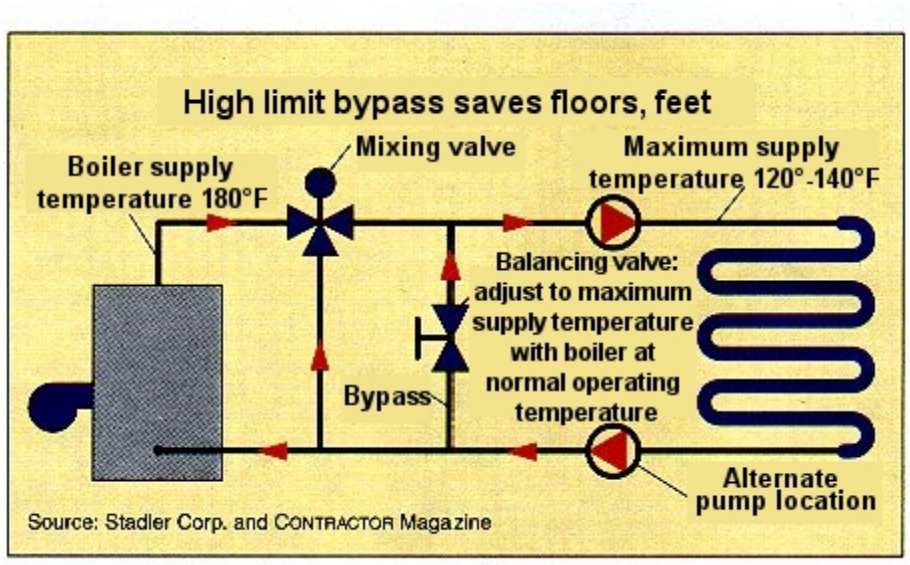
This fixed amount of system return water must be adjusted with the boiler and floor system at normal operating temperature, i.e. not during initial cold start. This takes a little fine tuning, but the big advantage of this method over circulator shut down is that the system remains operational and does not trigger a no heat call.

High limit settings on cement floor systems should never exceed 140°F, and on dry systems installed below the subfloor, 160° F should be the limit. If you have to run higher temperatures under design conditions, the basic system designed is flawed and the whole purpose of under-floor heating at low temperatures has been defeated. Dry systems installed above the subfloor should run at high limits of not more than 120°F to 140°F.

The most elegant form of high limit control is done with a variable and modulating outdoor reset control. This design has a separate safety high-limit potentiometer setting, which works off the mixing valve sensor. The high-limit control gradually will intervene as the high limit setting reaches set point.

Essentially, the priority control intersects the heating curve to protect the floors. You can easily tweak the high-limit setting up and down to fine tune it to the application.

The big advantage to this deluxe approach is that the high limit water temperature will lock in perfectly, regardless of system flow rate (various zone valves opening and closing). It will also accommodate con-



stantly changing boiler water temperatures and system return temperatures.

This subject is an extremely important one in the business of floor heating and, surprisingly, most system manufacturers never address it.

The issue is mostly one of the system liability with the control used to prevent major damage to floor coverings and floor structures. This is important because mistakes will happen during a life of a system. Unauthorized interference of people and equipment failure are unavoidable sooner or later.

The author is president of Stadler Corp. (tel. 781/275-3122), a Bedford, Mass.-based supplier of hydronic heating equipment