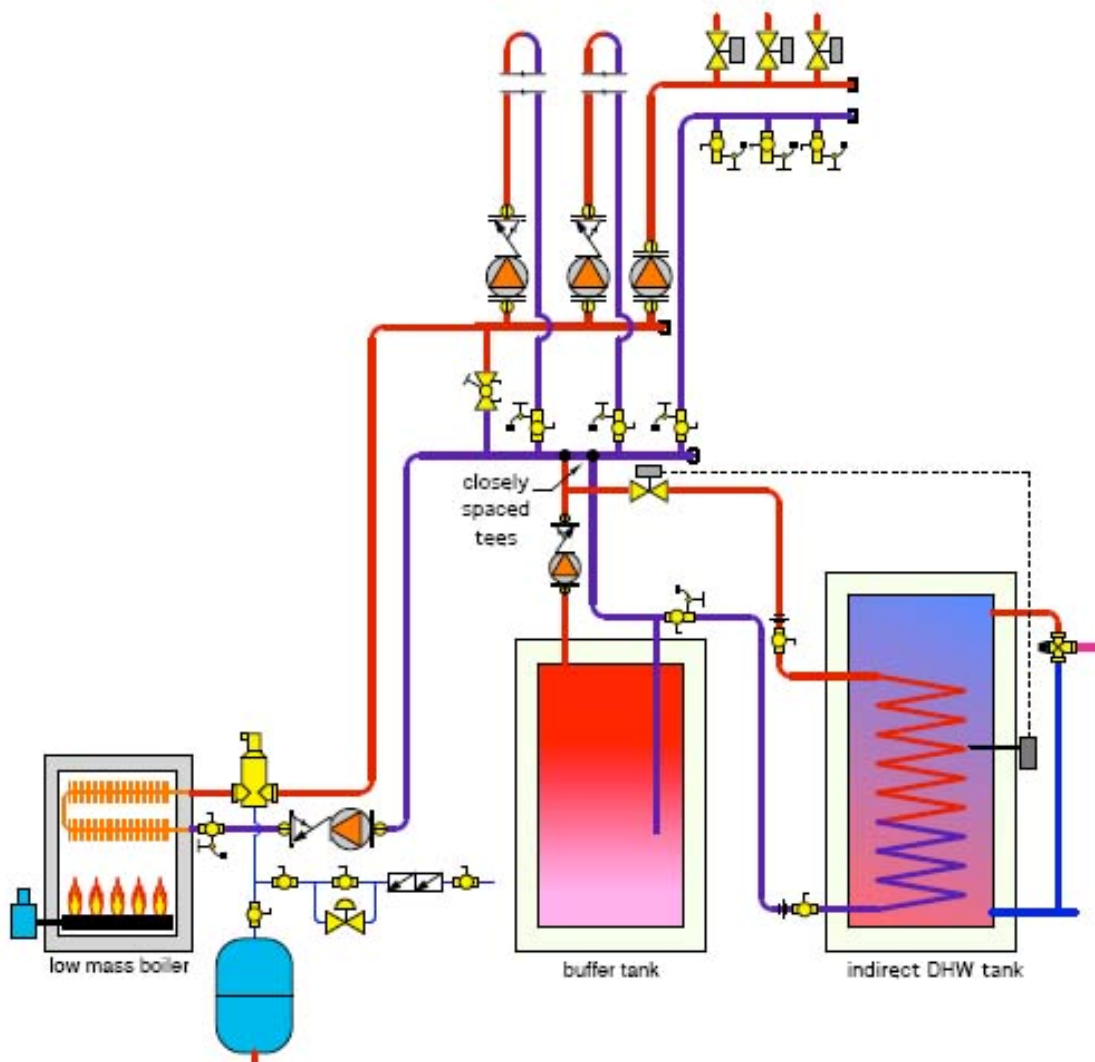


Peculiar Piping

The Glitch

Overview: An installer plans to use a low mass boiler with several heating zones and an indirect water heater. Fearing burner short cycling, he adds a buffer tank, and pipes it all together as shown below.

Exercise: Can you spot at least five details that are incorrect?



The Fix

To say this system is a piping aberration is going easy on it.

1. The indirect water heater should not interact with the buffer tank when it needs heat. The indirect tank has sufficient thermal mass of its own to prevent boiler short cycling. Even if the zone valve leading to the indirect opens when the tank aquastat calls for heat there would be very little flow through the tank. Most of the flow created by the buffer tank circulator would just do a U-turn at the closely spaced tees and head back into the buffer tank.

2. When it operates, the boiler circulator would create differential pressure between the headers at the top of the schematic. Although the zone valves would likely not bleed hot water to their zones when closed, it is very likely there will be unexpected flow into the two zones using circulators. The forward opening resistance of their check valves would not be able to hold back the differential pressure created by the boiler circulator.

3. The boiler circulator is pumping toward the expansion tank connection point. It should be pumping away from this point.

4. The circulators are shown with their inlet very close to the supply header. There should be at least 12 pipe diameters of straight pipe leading into the circulators.

5. There is no differential pressure bypass valve shown on the headers serving the zone valves.

6. The left-most zone circuit will not be able to draw heated water from the buffer tank.

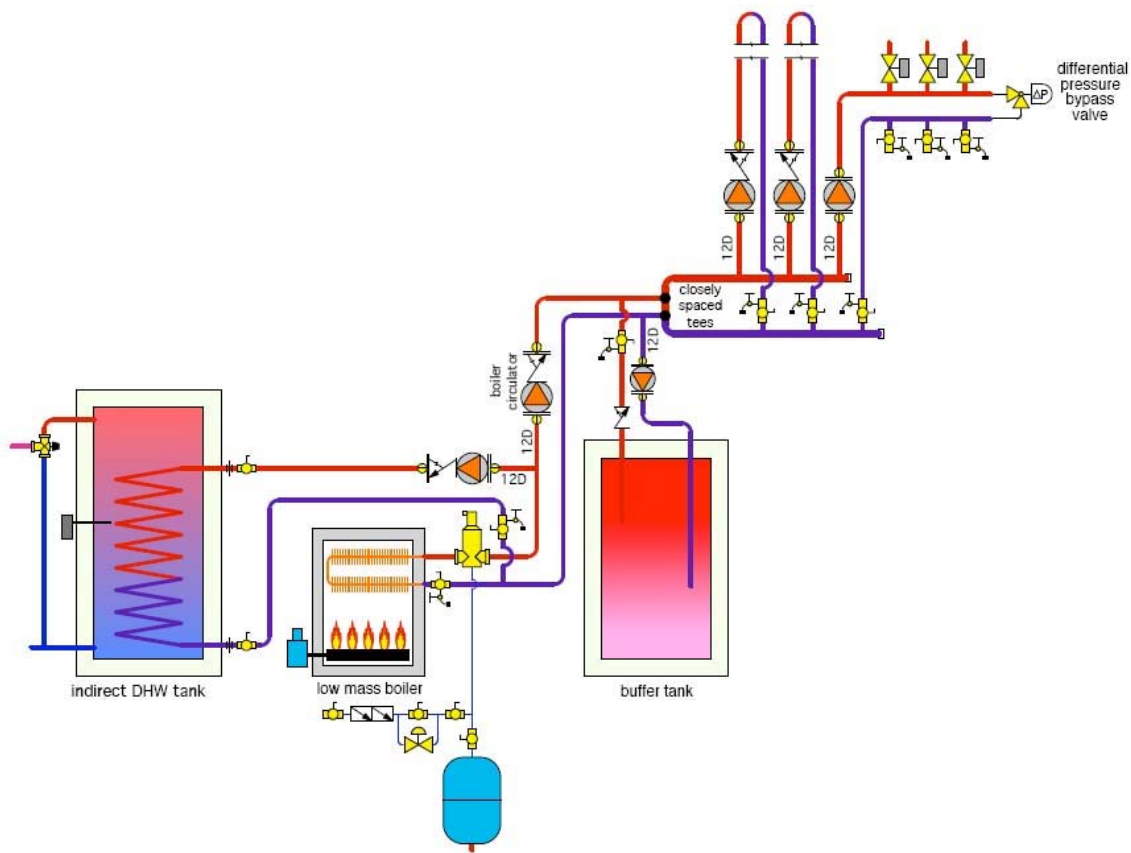
7. Although the heat exchanger of the indirect tank has its inlet at the top and outlet at the bottom, the temperature gradient inside the tank is inverted. This would imply upside down temperature stratification, and nature is not going to allow that. (Just seeing if you're paying attention.)

The fix drawing shows all corrections to the above problems.

The indirect water heater is piped as a separate circuit, and would likely operate with priority control.

Upon a call for space heating, the system's controls check to see if the buffer tank is sufficiently warm to serve as the heat source. If so, the boiler is not fired, the boiler circulator remains off, and the buffer tank circulator operates. When the buffer tank has cooled through its differential, the boiler fires and the boiler circulator operates. The buffer tank circulator remains on. Heated water is supplied to the active zone(s), and any excess heat is routed to the buffer tank, causing its temperature to rise. If the buffer tank climbs back up to its upper temperature setting the boiler and boiler circulator are turned off, and the above sequence repeats itself.

A spring-load check valve at the top outlet of the buffer tank helps prevent heat migration.



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