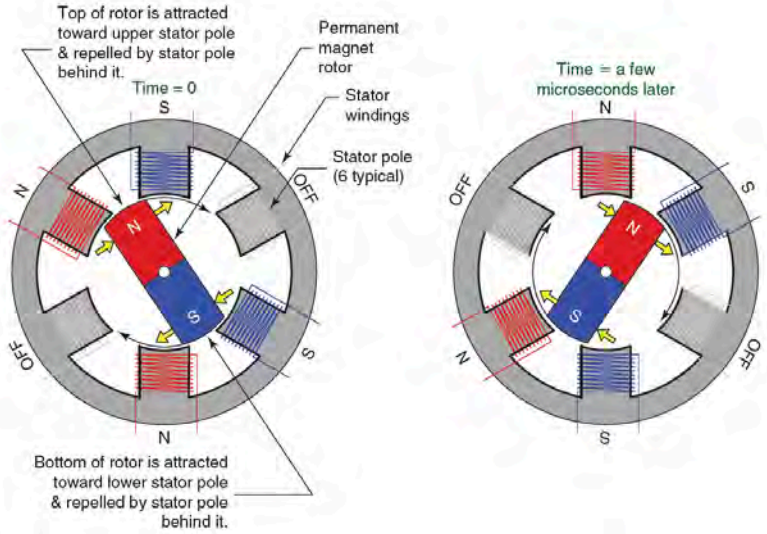
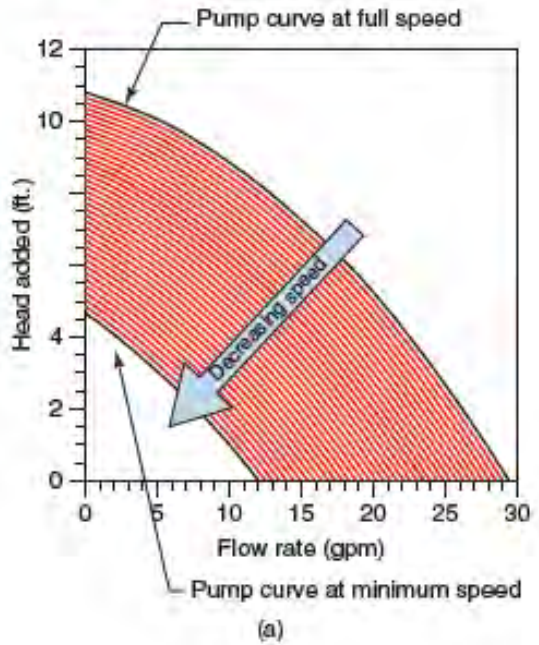
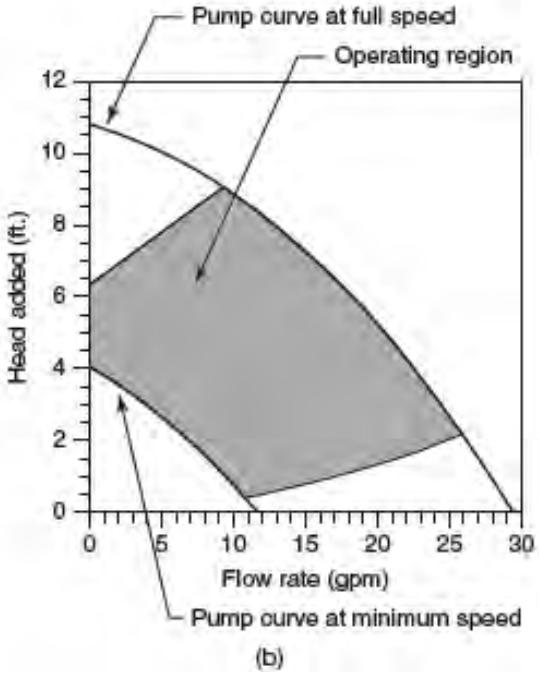
Circulators

high efficiency ECM Circulators







Circulators

high efficiency ECM Circulators

Small ECM circulators now available in North America

Grundfos Alpha: Provides constant and proportional differential pressure and three fixed speed settings. 6-50 watt electrical input.

Wilo Stratos ECO 16F: Provide constant and proportional differential pressure. 5.8-59 watt electrical input.

Bell & Gossett ECOCIRC, Provides manual adjustable speed setting (VARIO model), and proportional differential pressure (AUTO model). 5-60 watt electrical input.

Taco Bumblebee Temperature based speed control. 9-42 watts electrical input

Armstrong COMPASS Provides constant and proportional differential pressure and three fixed speed settings. 3-45watt electrical input.

Circulators

high efficiency ECM Circulators

Larger ECM circulators now available in US

Grundfos MAGNA

Taco Viridian

Heads to 45 feet,
flows to 345 gpm
power inputs to 1600 watts

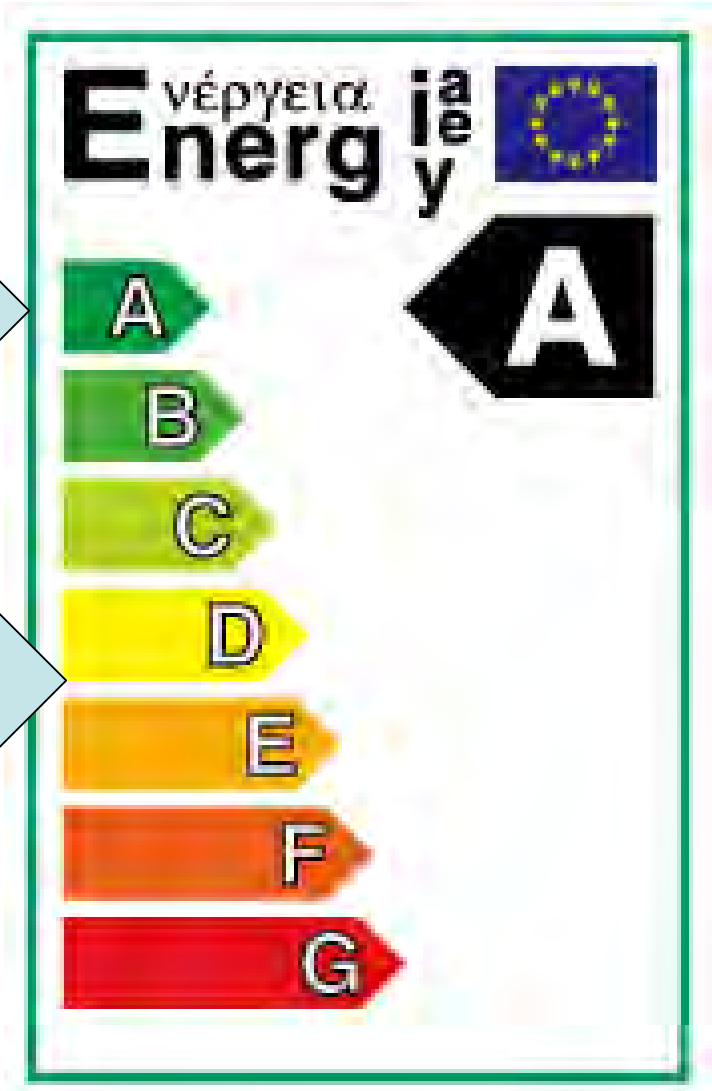
Wilo STRATOS circulators

B&G ECO XL

Circulators high efficiency ECM Circulators

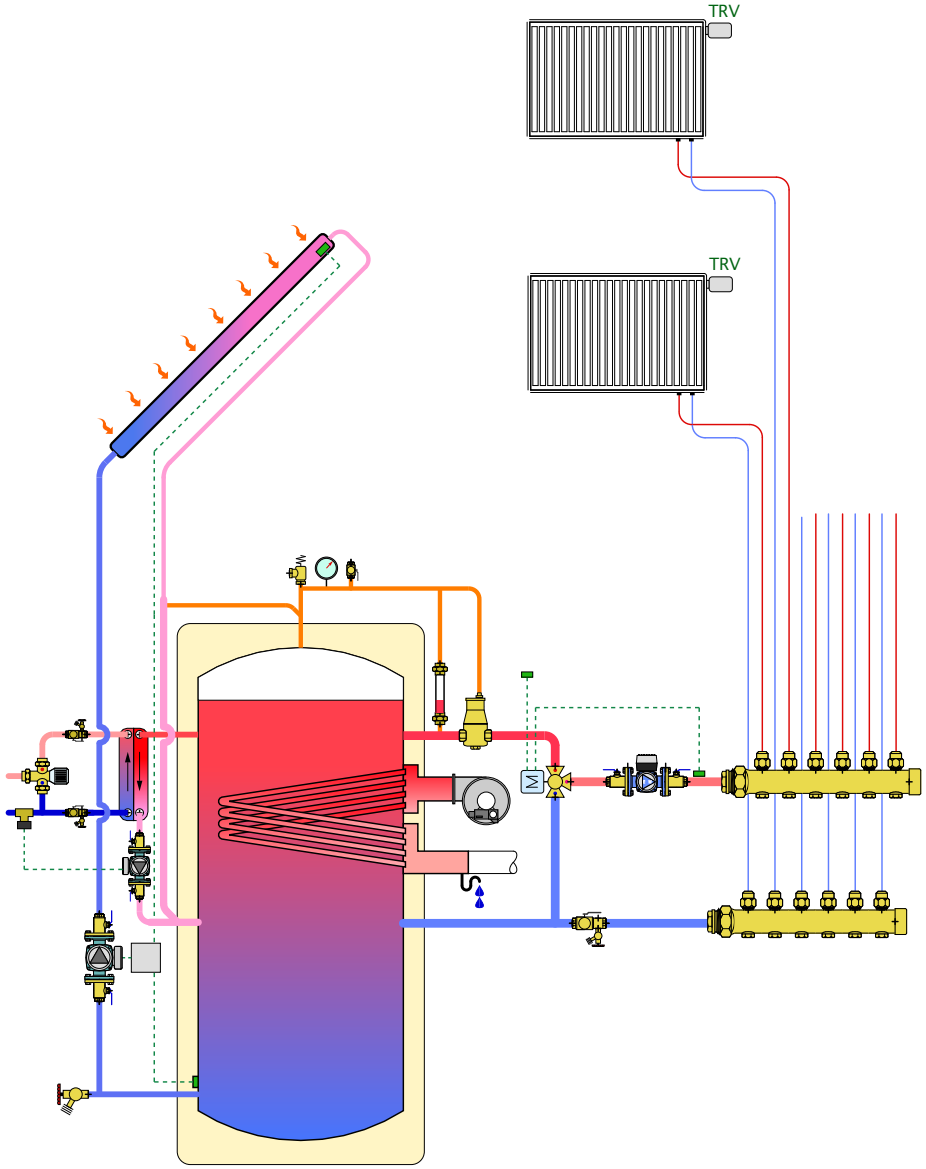
European circulator rating system

All these circulators rated “A” on the energy labeling system from Europump (European Association of Pump Manufacturers).

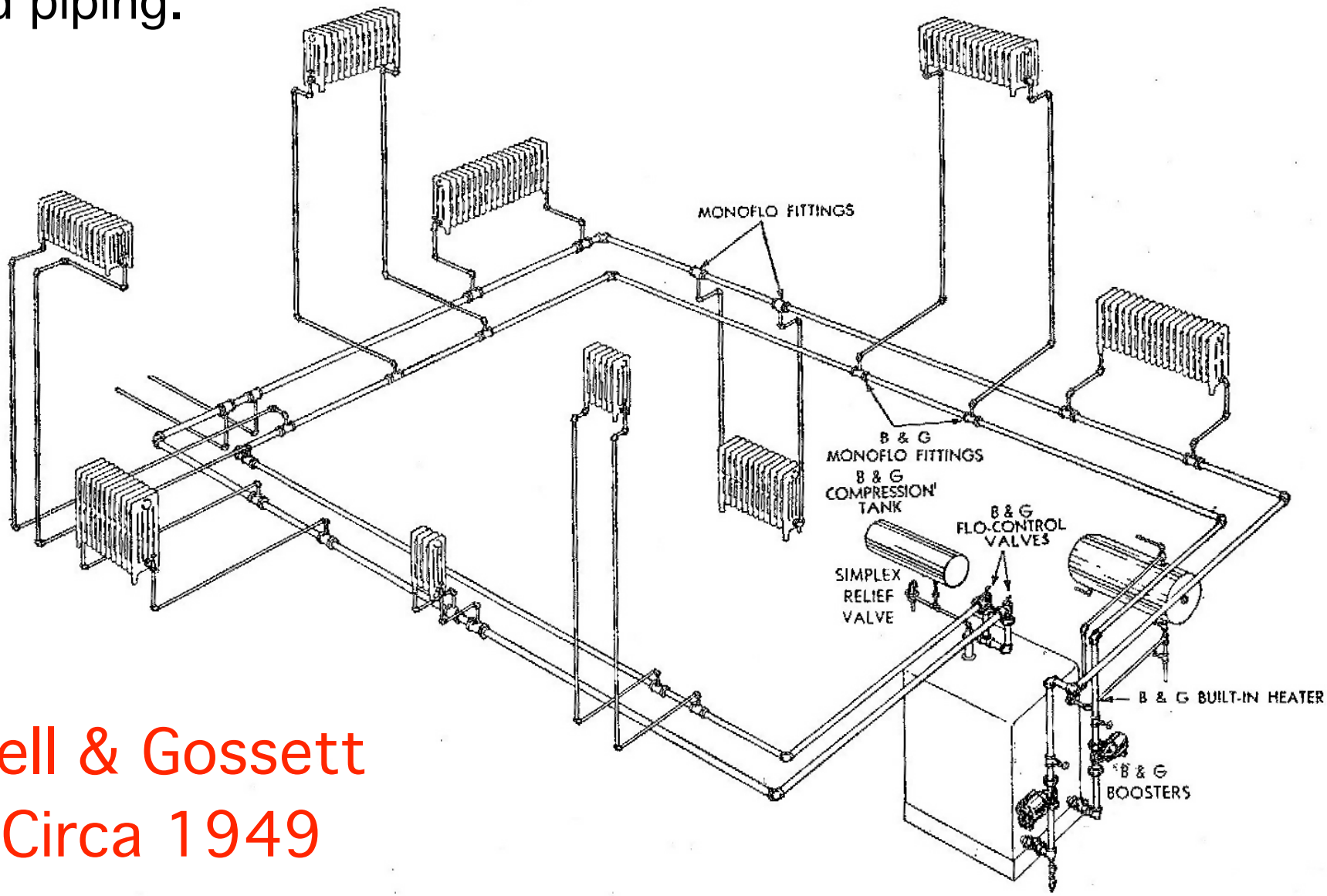


Single or multi-speed wet-rotor circulators like those commonly used in North America would be rated “D” or “E” on this scale.

Homerun distribution systems

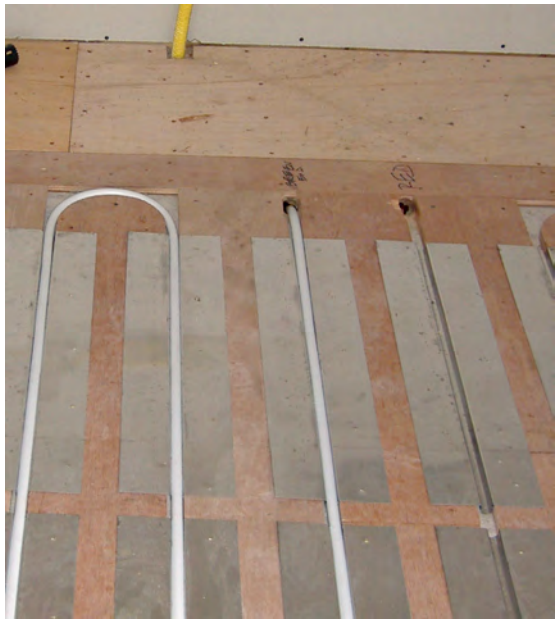


The vast majority of hydronic distribution system developed in North America over decades were based on rigid piping.

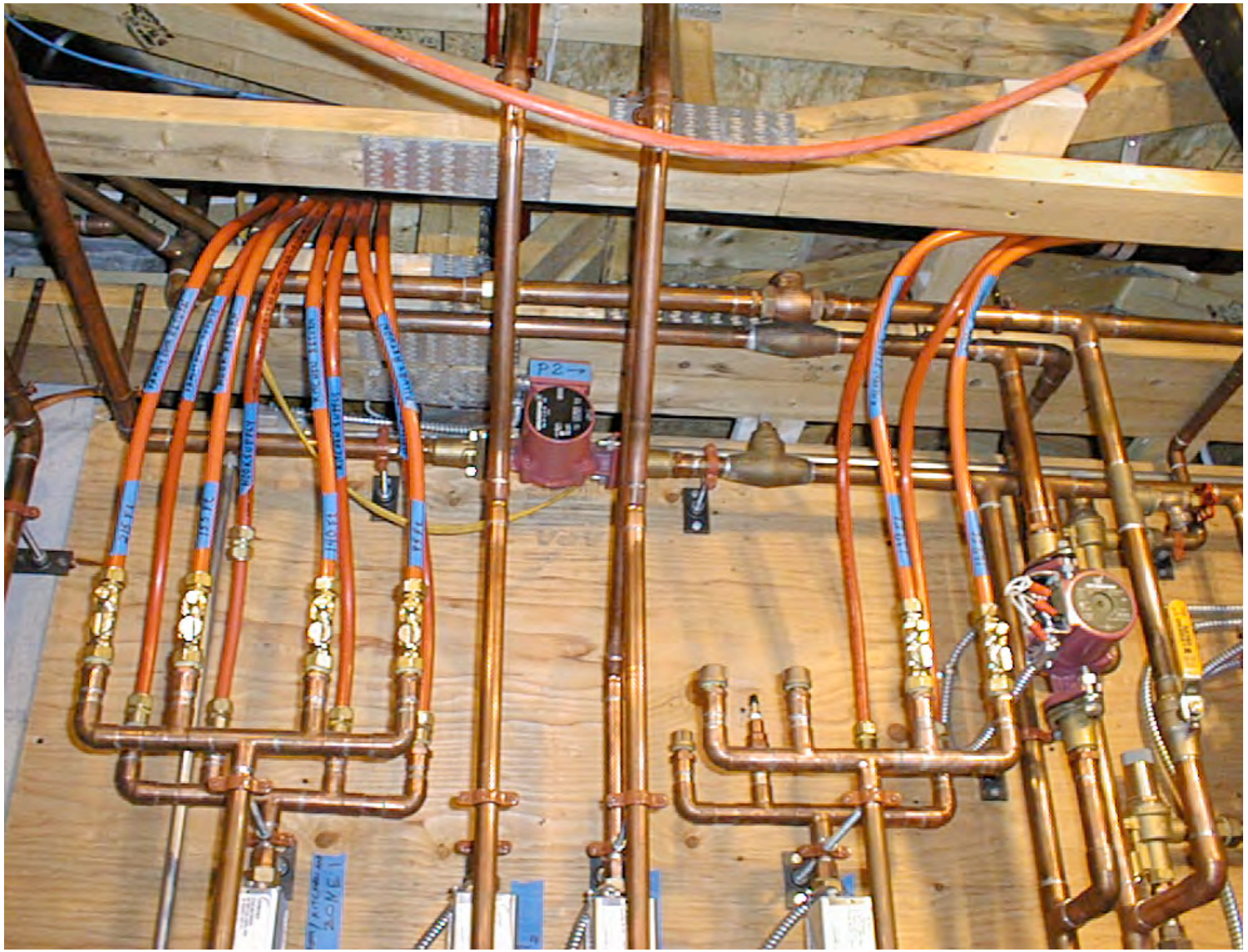


Bell & Gossett
Circa 1949

PEX tubing was introduced in North America in the early 1980s, and was viewed primarily for use in radiant floor heating applications.

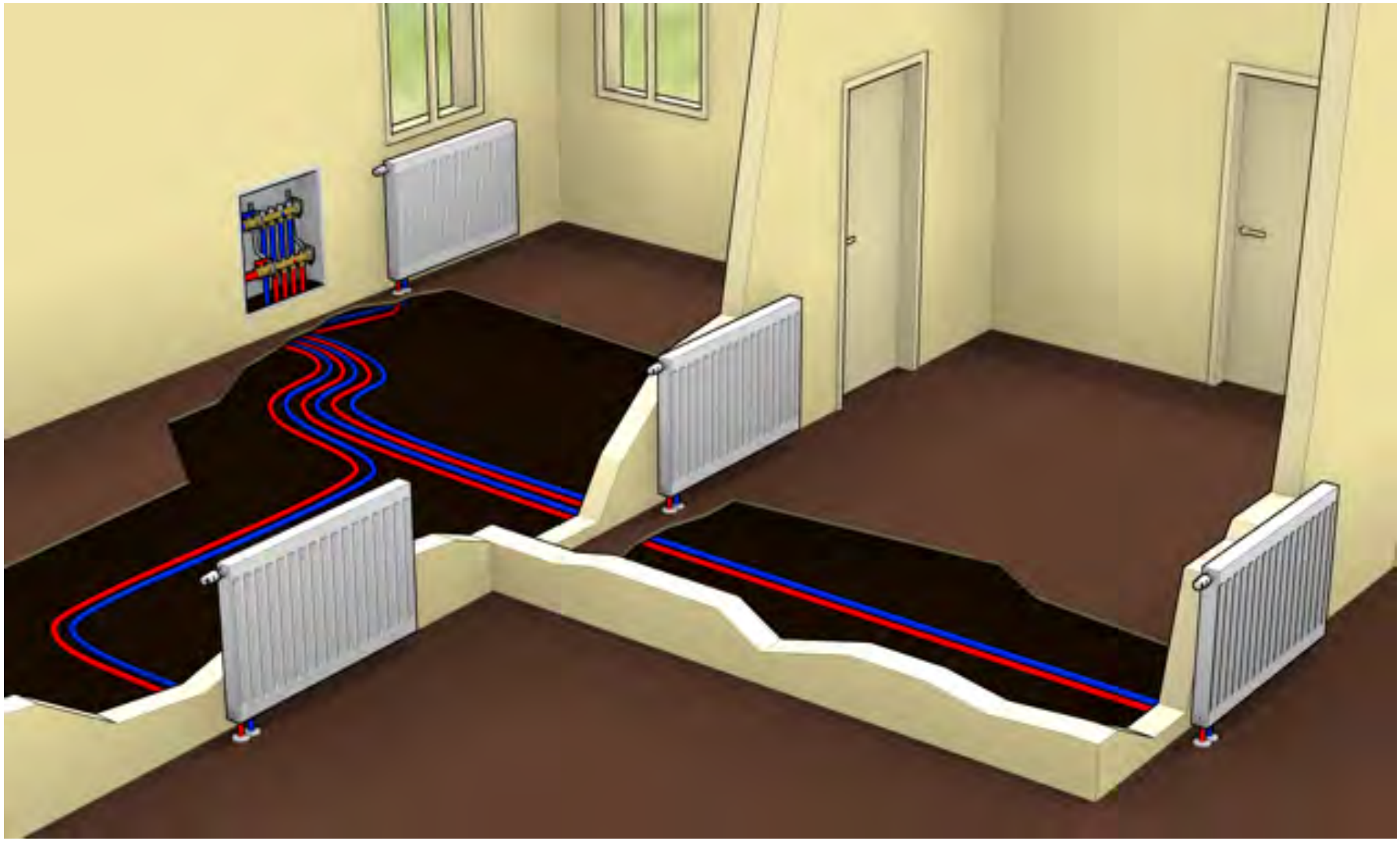


Slowly, some North American designers/installers began mixing PEX and PEX-AL-PEX tubing into system along with rigid tubing.

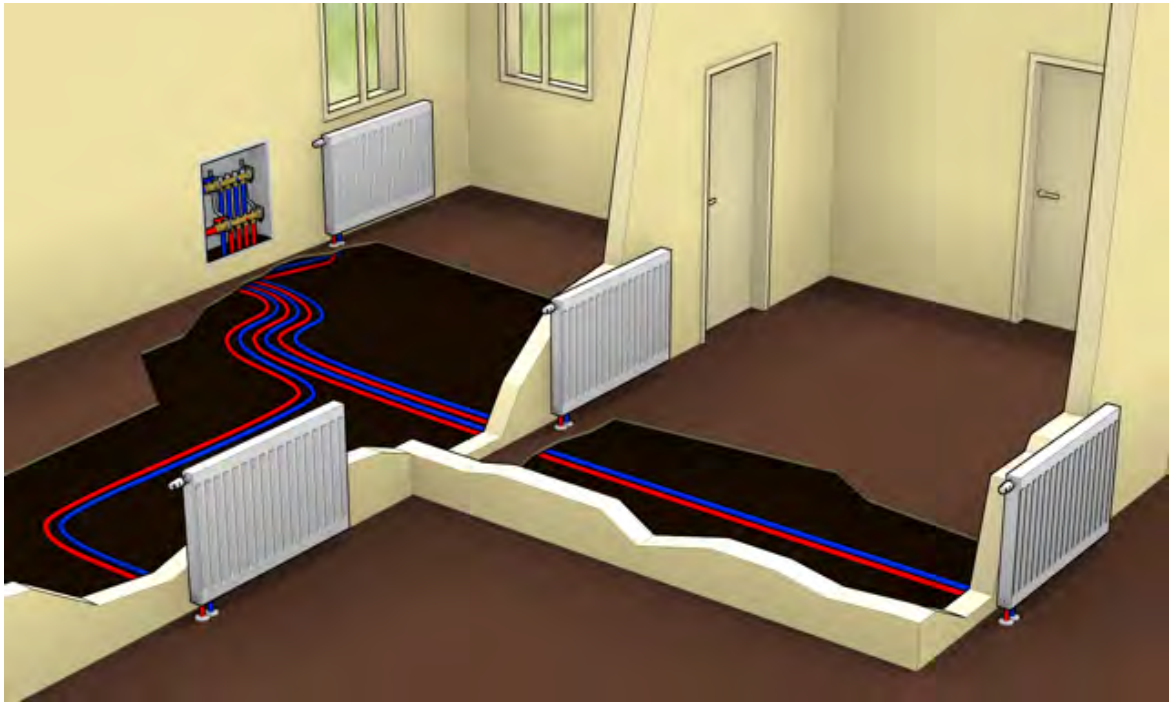


At this point, many North American heating pros recognize PEX or PEX-AL-PEX as a universal hydronic distribution pipe.

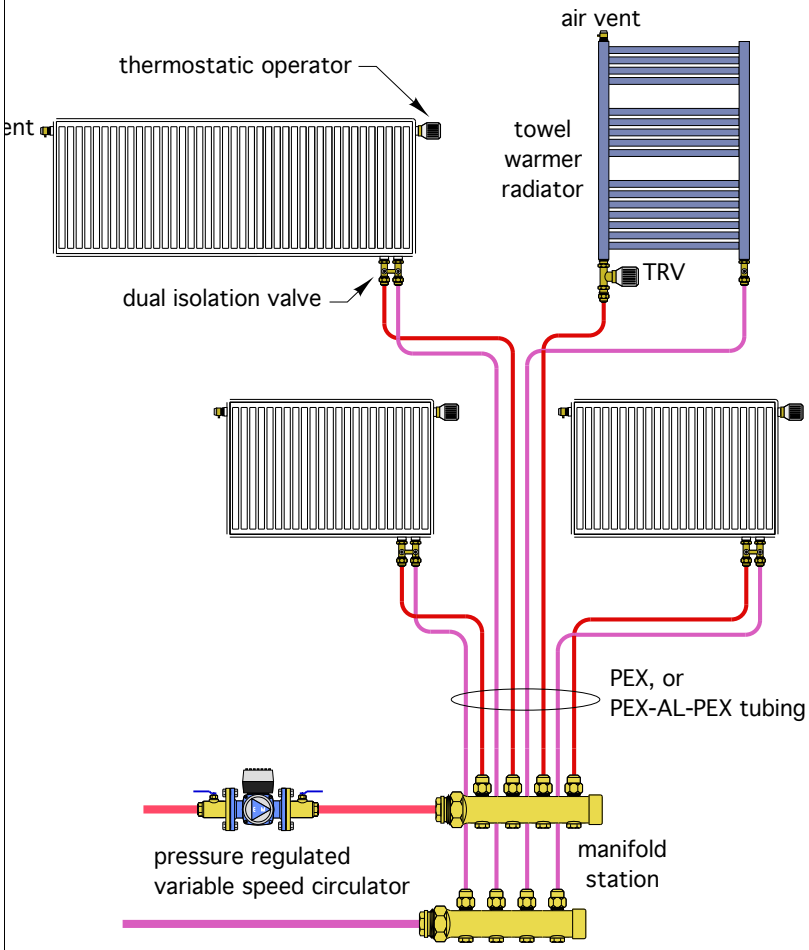
One of the best approaches using this pipe is a "homerun" system.

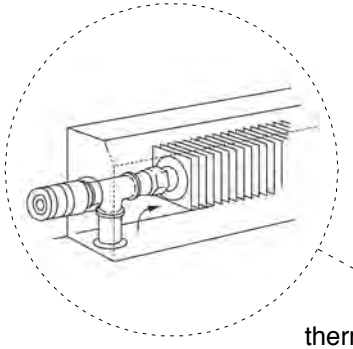


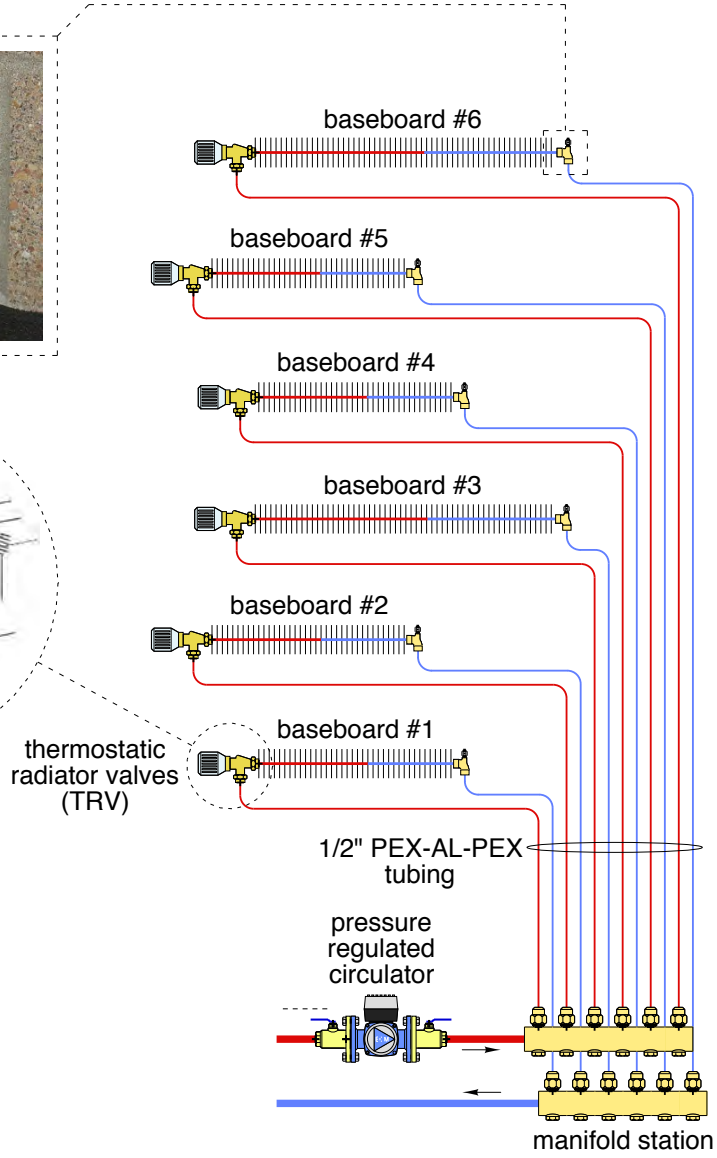
Concept: Treat the tubing like electrical cable: **If you can run an electrical cable from point A to point B within a building, you can also probably run a small diameter flexible tube set.**



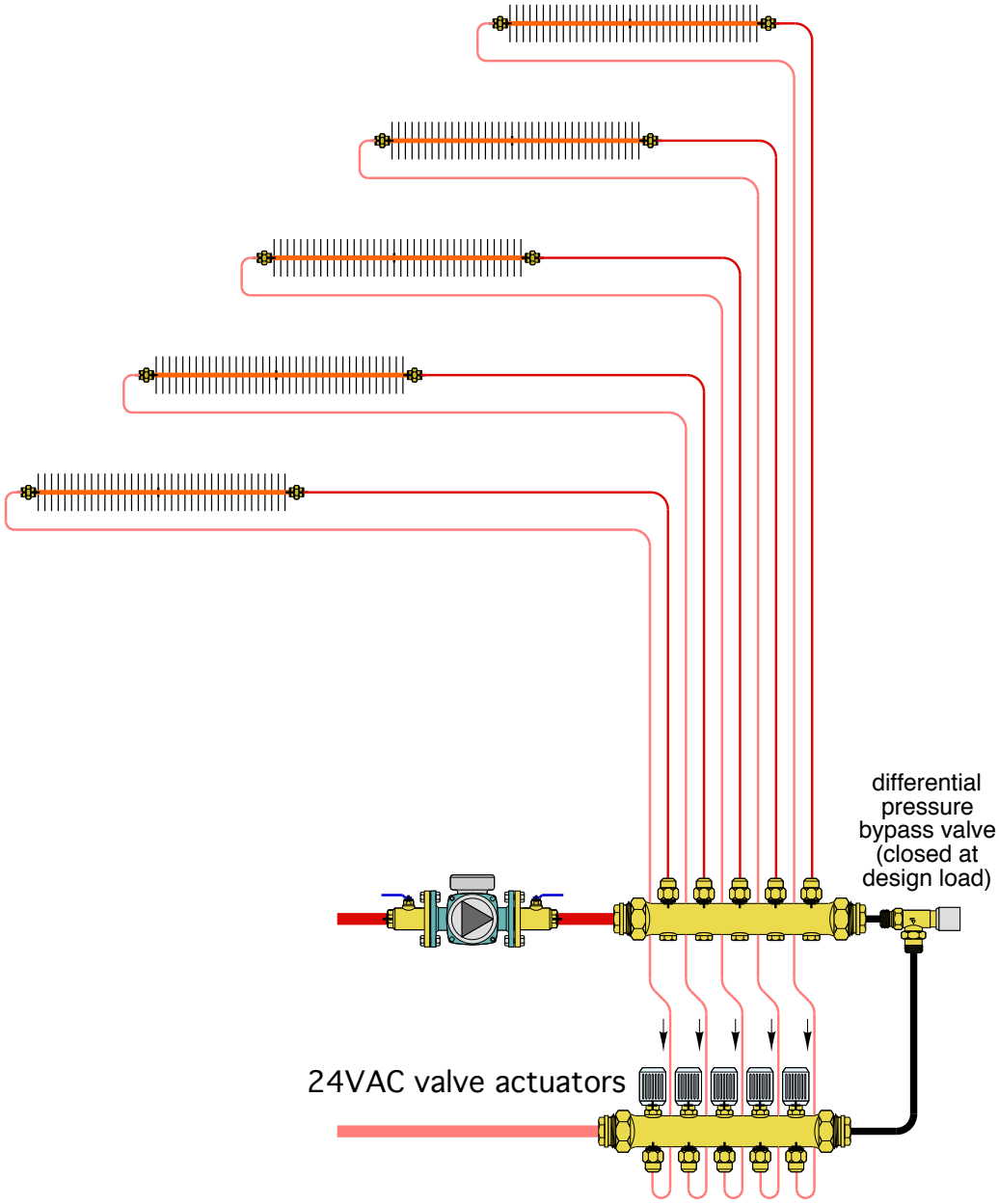
Examples of homerun distribution systems...



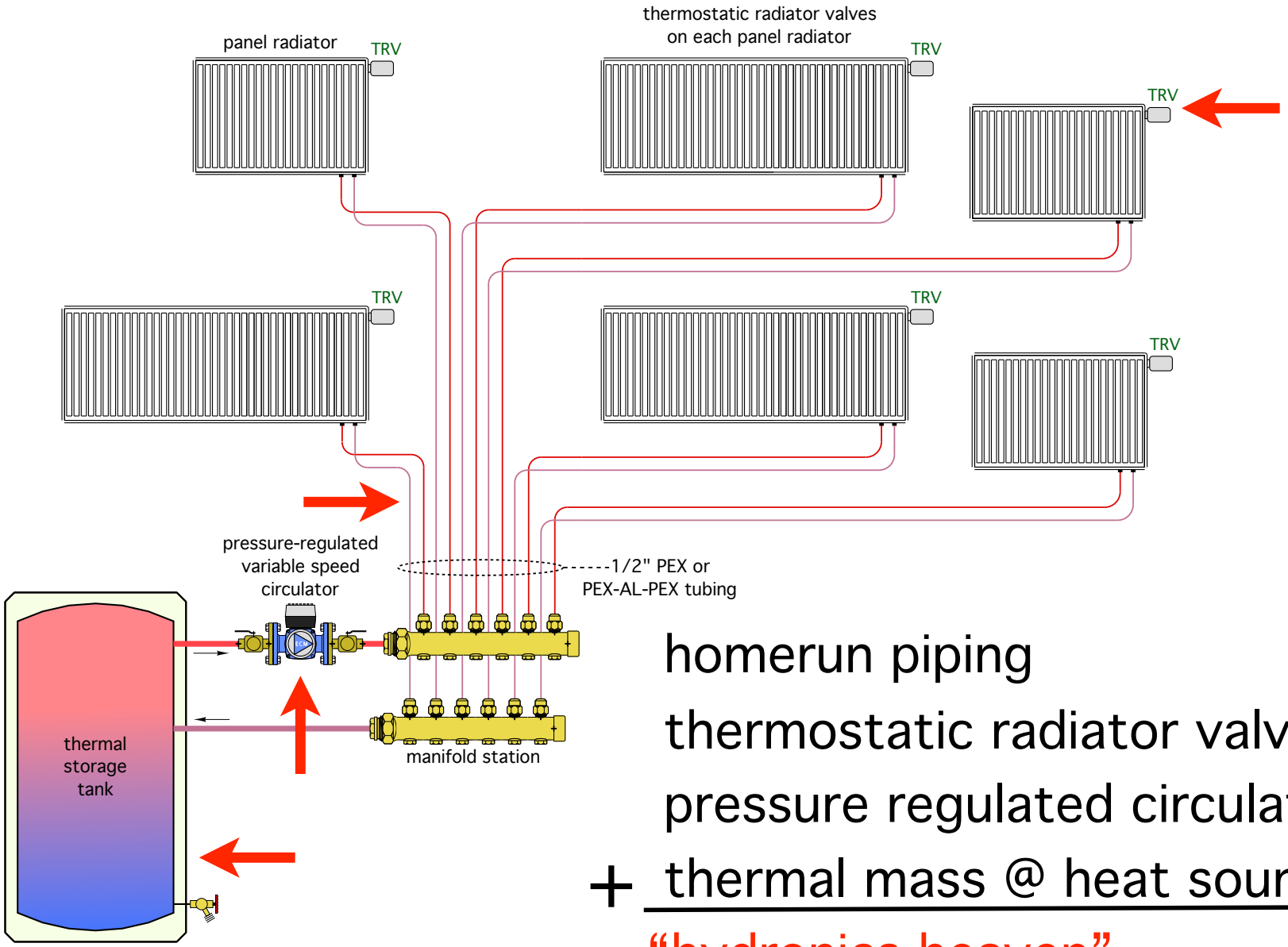




Examples of homerun distribution systems...



A simple but elegant concept...



homerun piping

thermostatic radiator valves

pressure regulated circulator

\+ thermal mass @ heat source

"hydronics heaven"

Hydronic Zoning Options

Hydronic Zoning Options

A zone in an area of a building in which the temperature is controlled by a **single thermostat**, or other temperature sensing device.

Two principal objectives of zoning:

1. Create desirable comfort conditions in various areas of a building
2. Reduce heating energy use by reducing space temperature when possible

- *A zone can be as small as a single room, or as large as an entire building.*
- *The quality of a zoned system is not judged by the number of zones.*
- *Although it's possible to make every room its own zone, it is not often necessary, and can add considerable cost and complexity*

There is no absolute "right" way to zone a building. It depends on specifics of the building as well as occupant preferences:

Hydronic Zoning Options

Zoning considerations:

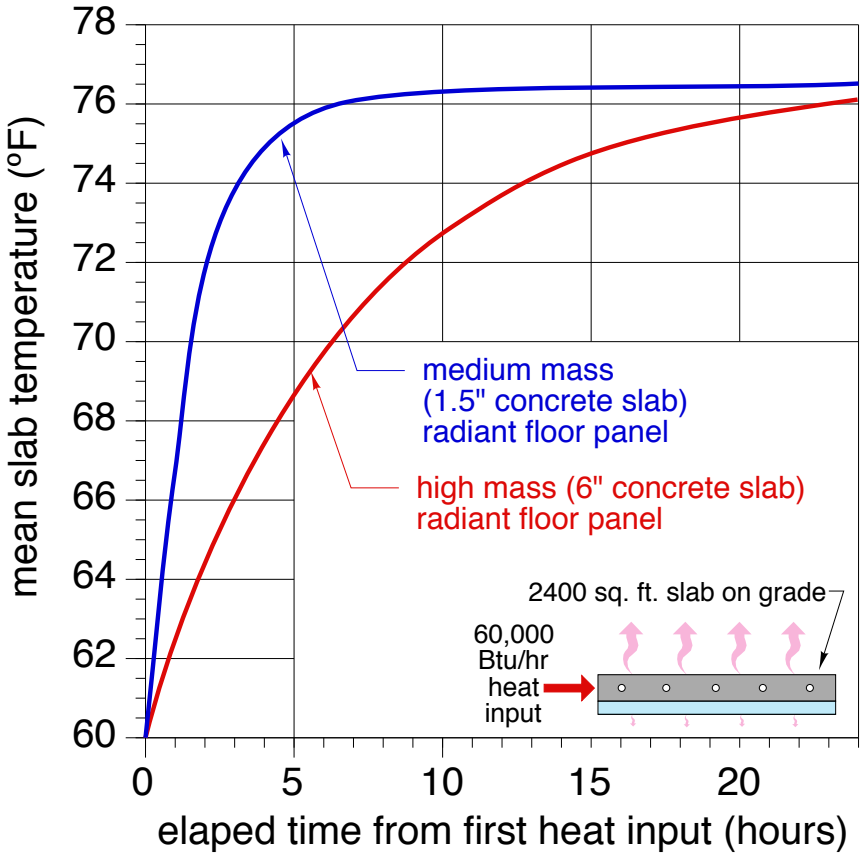
- Areas with signifiant internal heat gain from sunlight, appliances, people or equipment, should be separate zones.
- Sleeping areas are often set up as separate zones from daytime activity areas.
- Areas of the building that are infrequently used should be separate zones.
- Garages, basements, exercise rooms, workshops are often separate zones
- Master bathrooms are often zoned separately to master bedrooms (cool bedrooms and warm bathrooms.
- The 2nd floor of a house is often zoned separately from 1st floor.

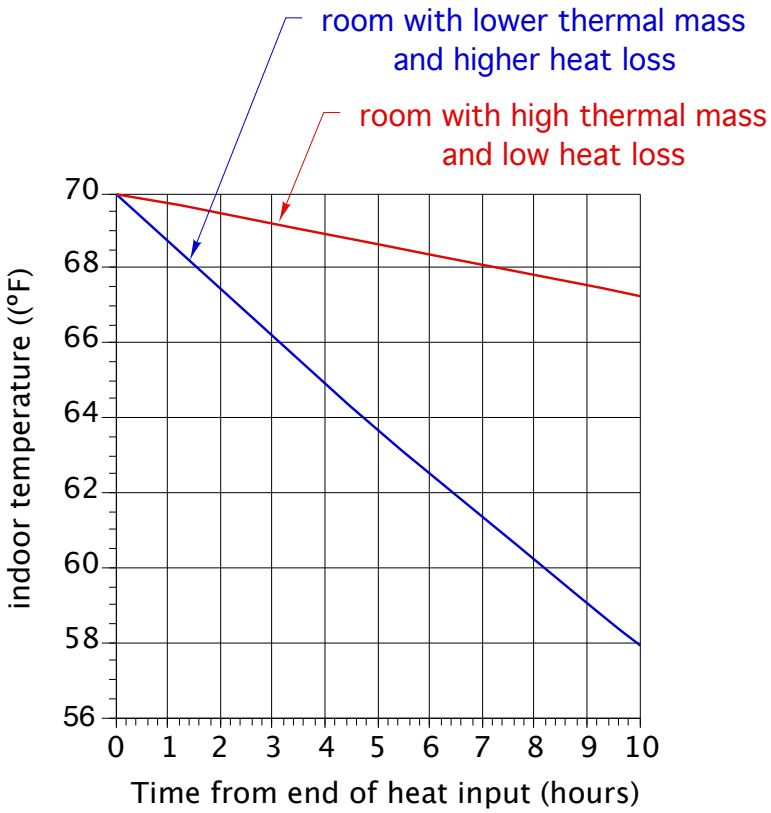
Hydronic Zoning Options

Zoning considerations:

- Consider thermal mass of the heat emitters

Don't combine high mass and low mass heat emitters on the same zone.





$$T_r = T_o + [T_{ri} - T_o]\, e^{-\left(\frac{UA}{h}\right)t}$$

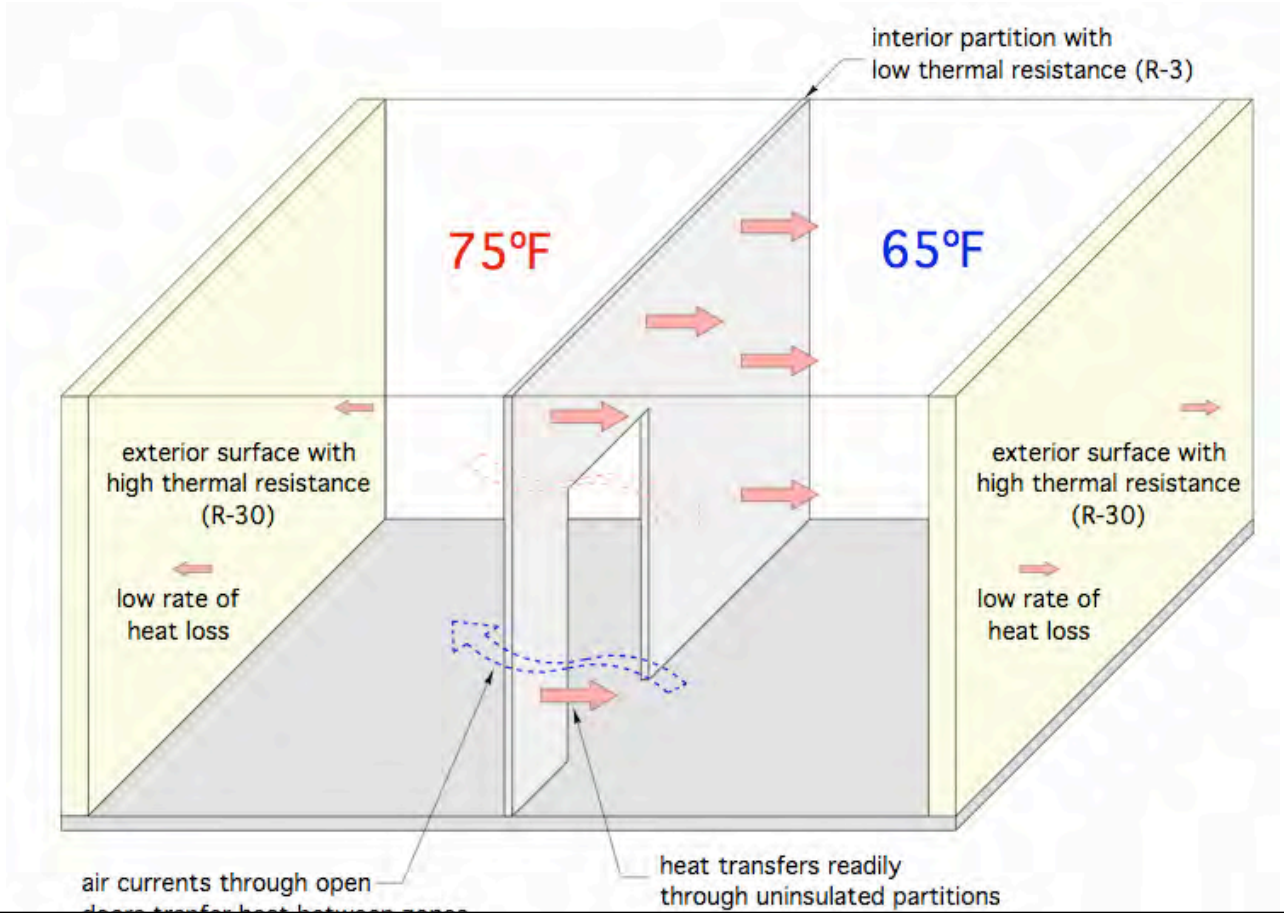
Where:
Tr = temperature of room (°F)
To = outdoor temperature
Tri = initial temp. of room when heat input stops (°F)
e = 2.718281828
UA = heat loss coefficient of room (Btu/hr/°F)
h = heat capacitance of room's thermal mass (Btu/°F)
t = elapsed time without heat input (hr)

Hydronic Zoning Options

Zoning considerations:

- Consider heat flow through interior partitions

The low the heat loss of the building envelope, the more difficult it is to maintain interior temperature differences - especially if doors are left open.



Hydronic Zoning Options

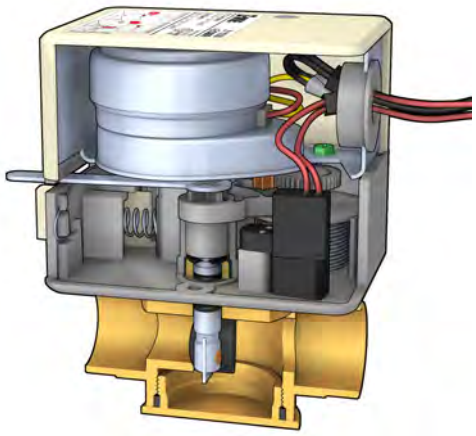
Methods of zoning

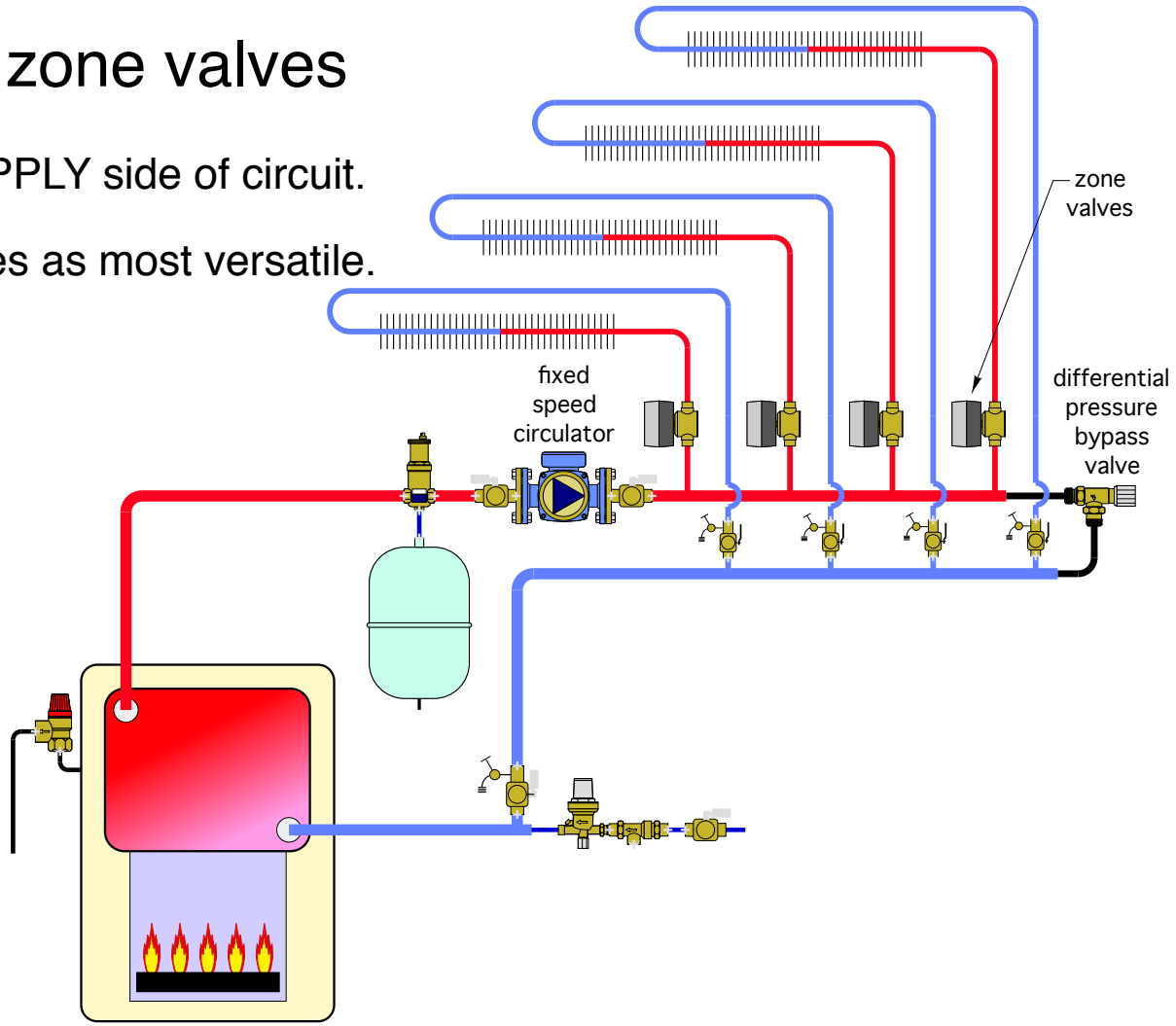
1. Zoning with on/off zone valves
2. Zoning with on/off manifold valve actuators
3. Zoning with on/off zone circulators
4. Zoning with wireless thermostatic radiator valves

Hydronic Zoning Options

1. Zoning with on/off zone valves

- Zone valves should go on SUPPLY side of circuit.
- Recommend 4-wire zone valves as most versatile.

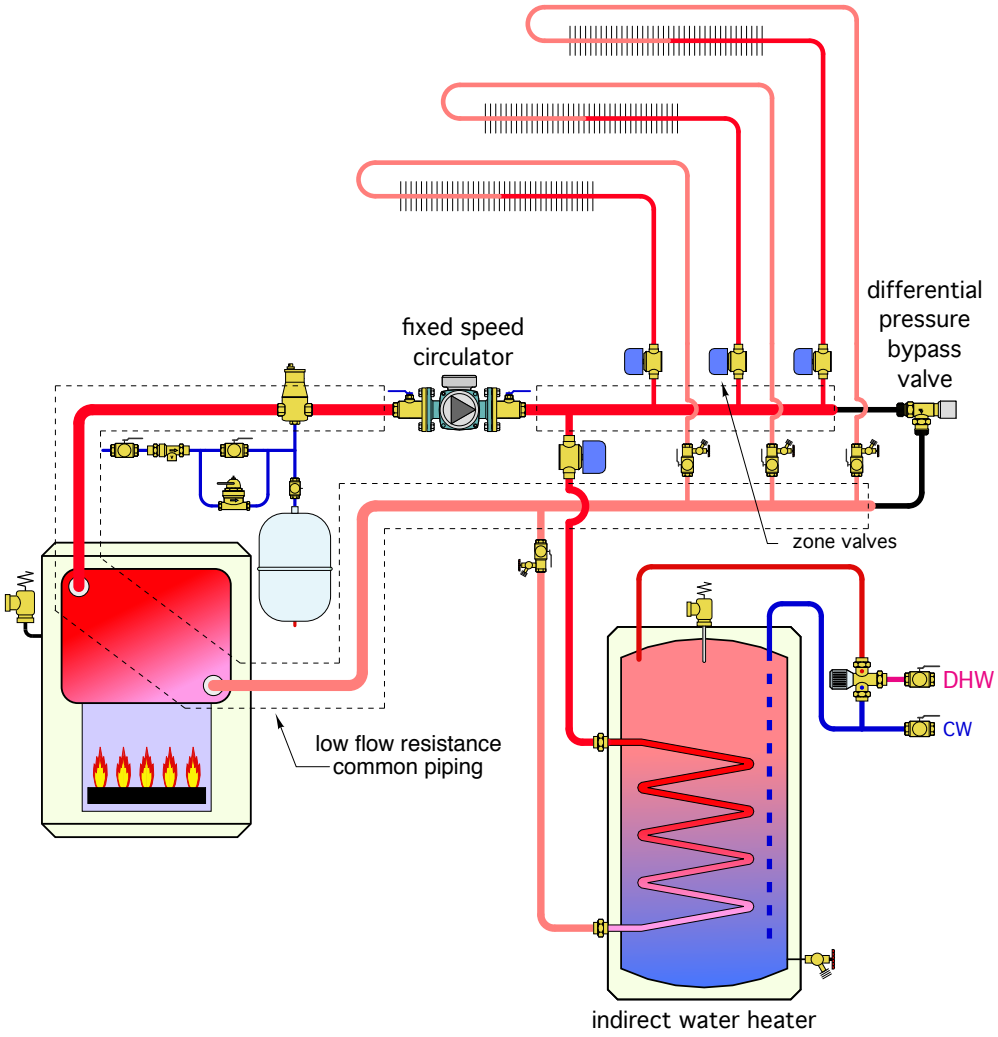


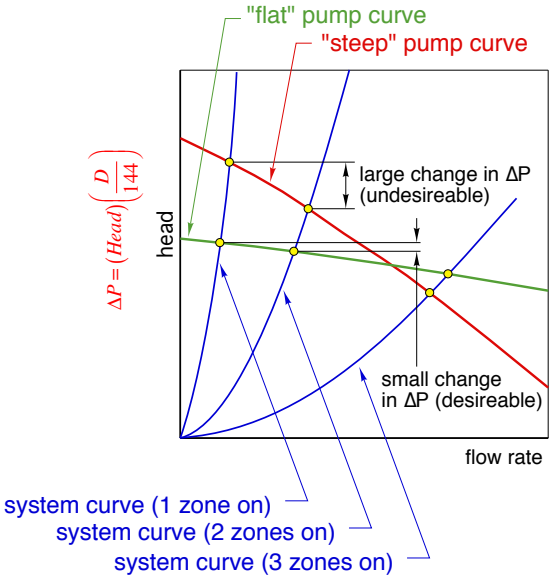


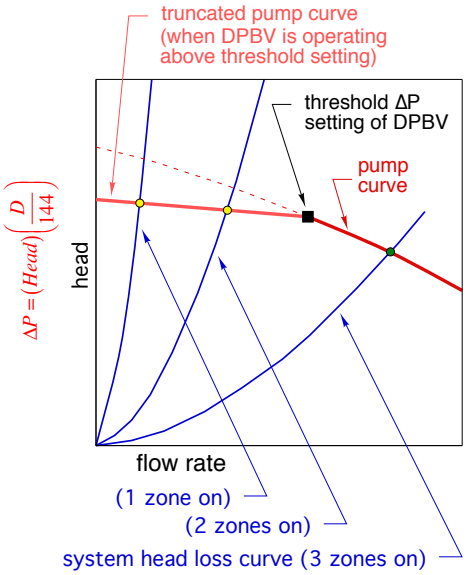
If a fixed speed circulator is used:

1. It should have a “flat” pump curve
2. the system should have a ΔP bypass valve.

1. Zoning with on/off zone valves



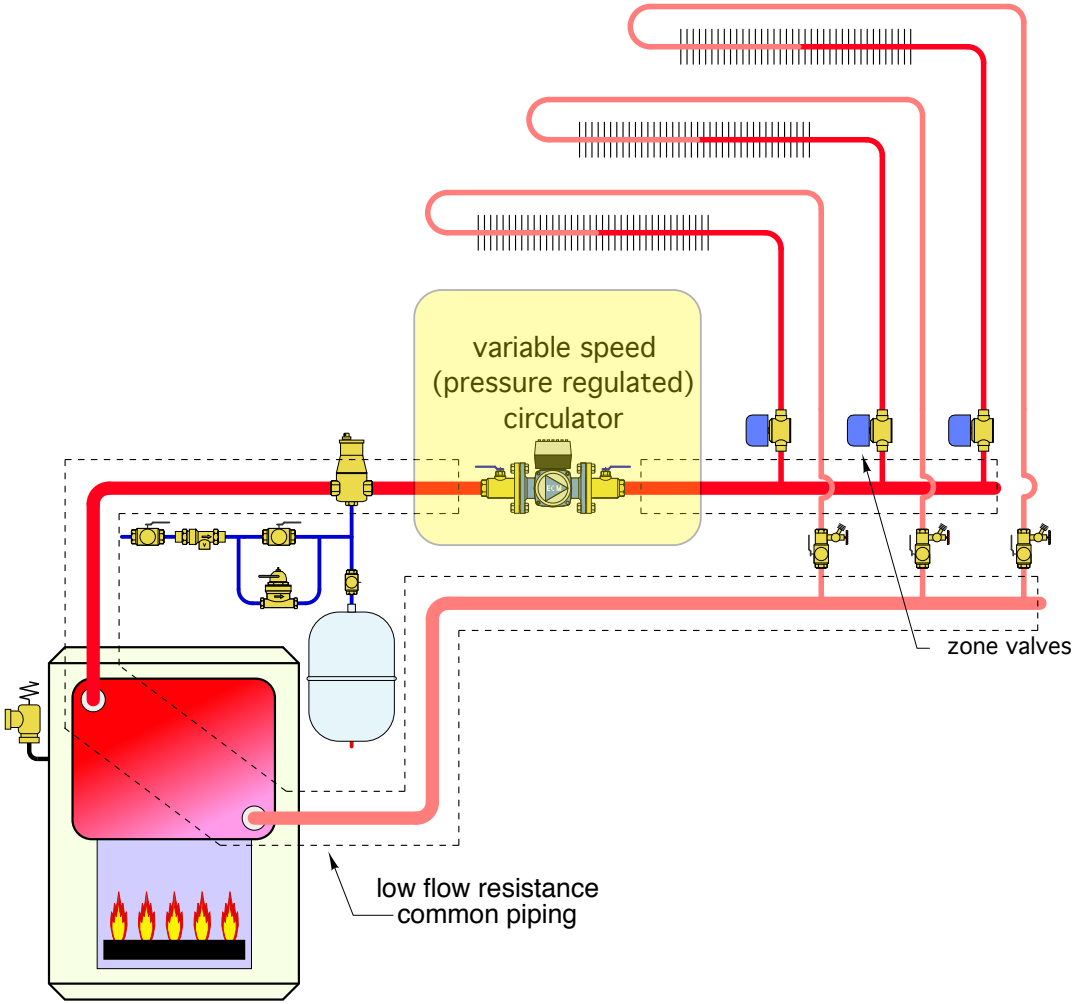


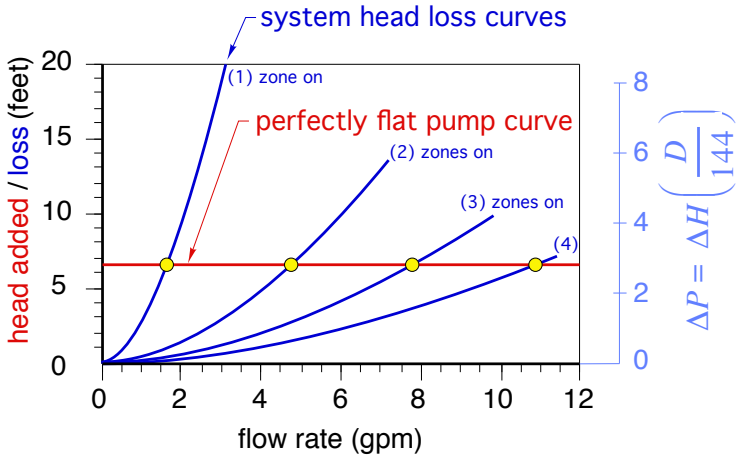


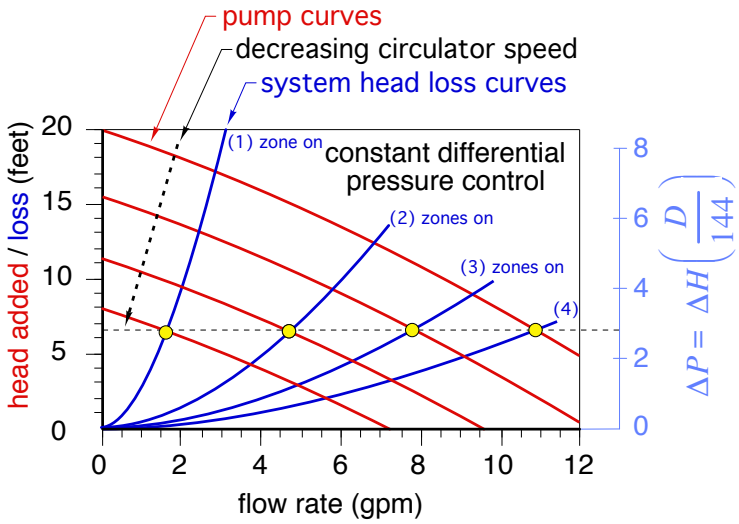
Design tip: Fixed speed circulator in combination with ΔP bypass valves are on their way out. Modern systems will use ECM-based variable speed, pressure regulated circulators.

Hydronic Zoning Options

1. Zoning with on/off zone valves







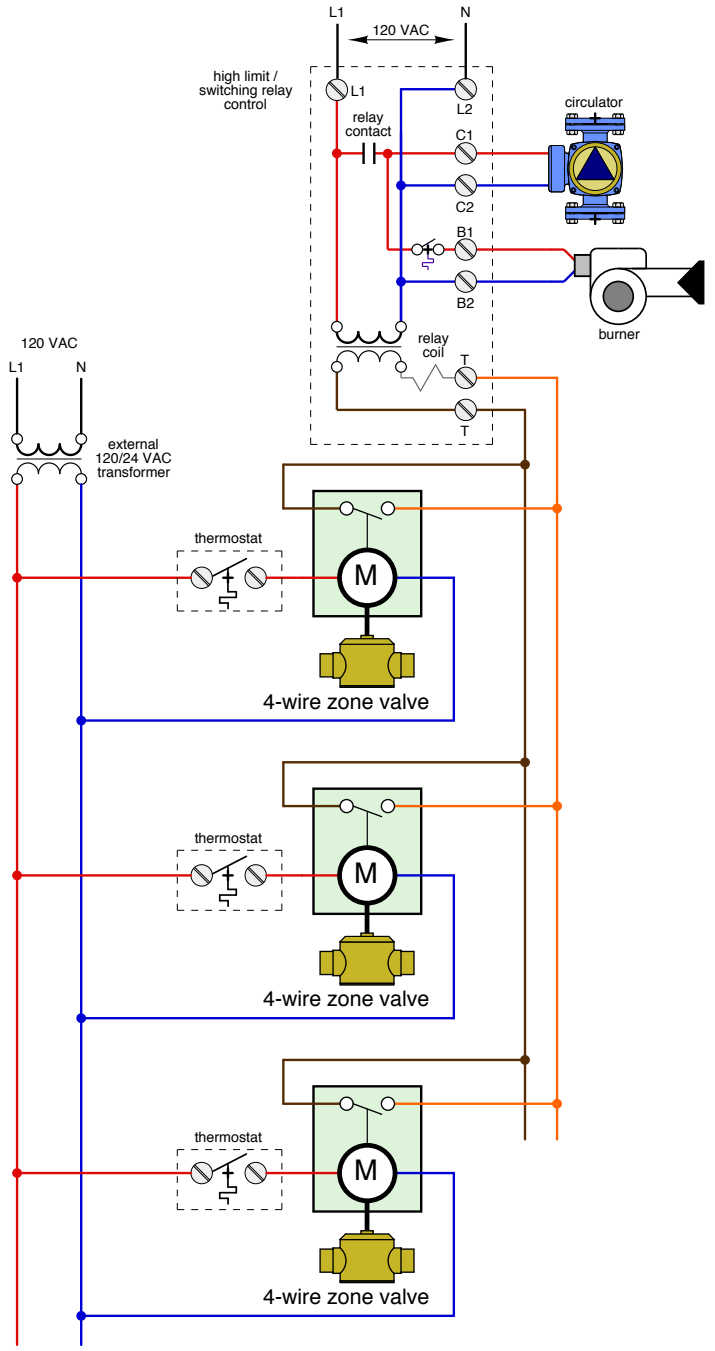
Variable speed / pressure regulated circulator configured for constant differential pressure control. No DPBV used.

Design tip: keep flow resistance of common piping as low as possible.

Hydronic Zoning Options

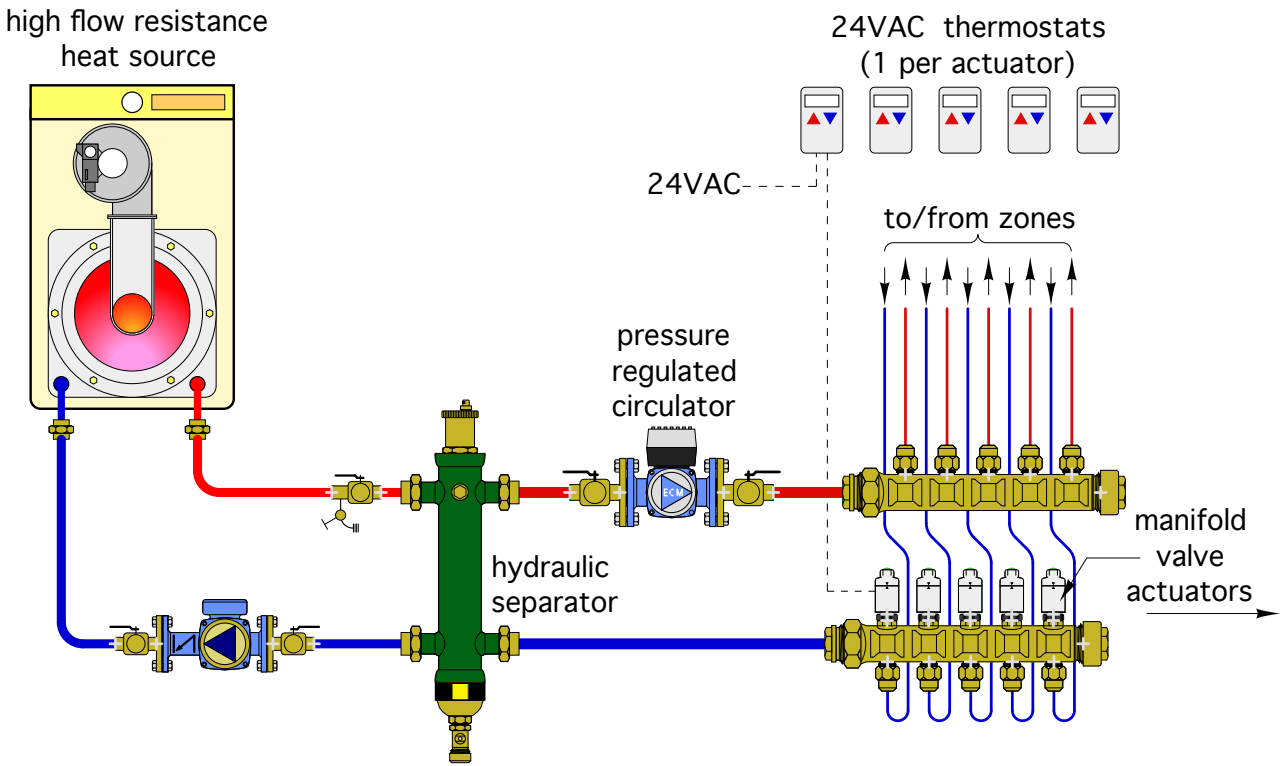
1. Zoning with on/off zone valves

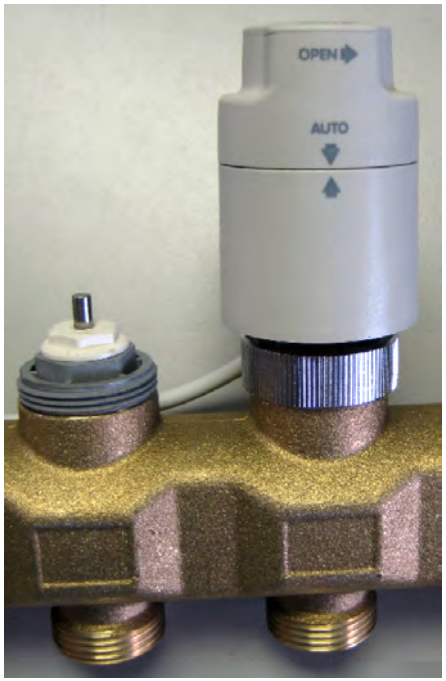
Wiring a 4-wire zone valve

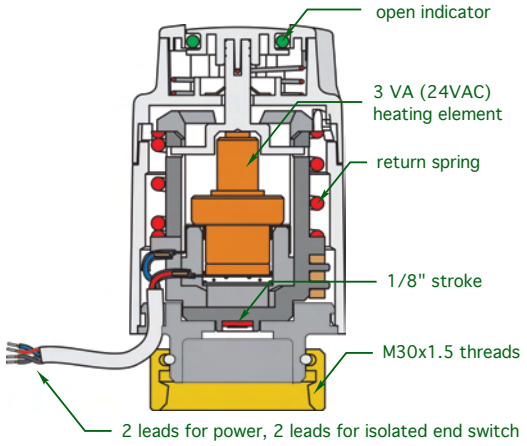


Hydronic Zoning Options

2. Zoning with on/off manifold valve actuators







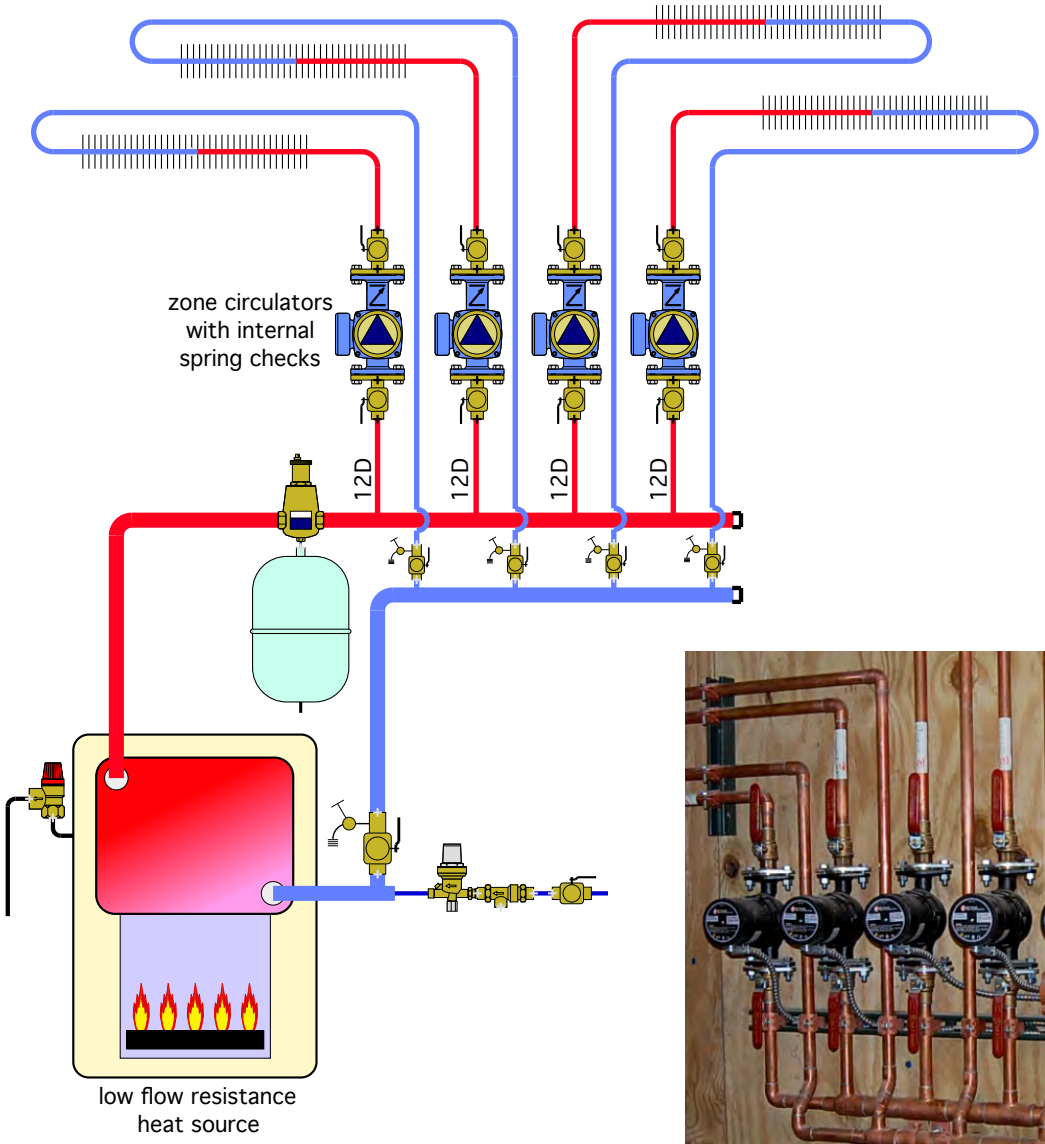
Manifold valve actuator wire identically to 4-wire zone valves. 2 wires for 24VAC power, 2 wires for isolated end switch.

Select a transformer by adding the “inrush” VA rating of all actuators, plus 5 VA safety factor.

Hydronic Zoning Options

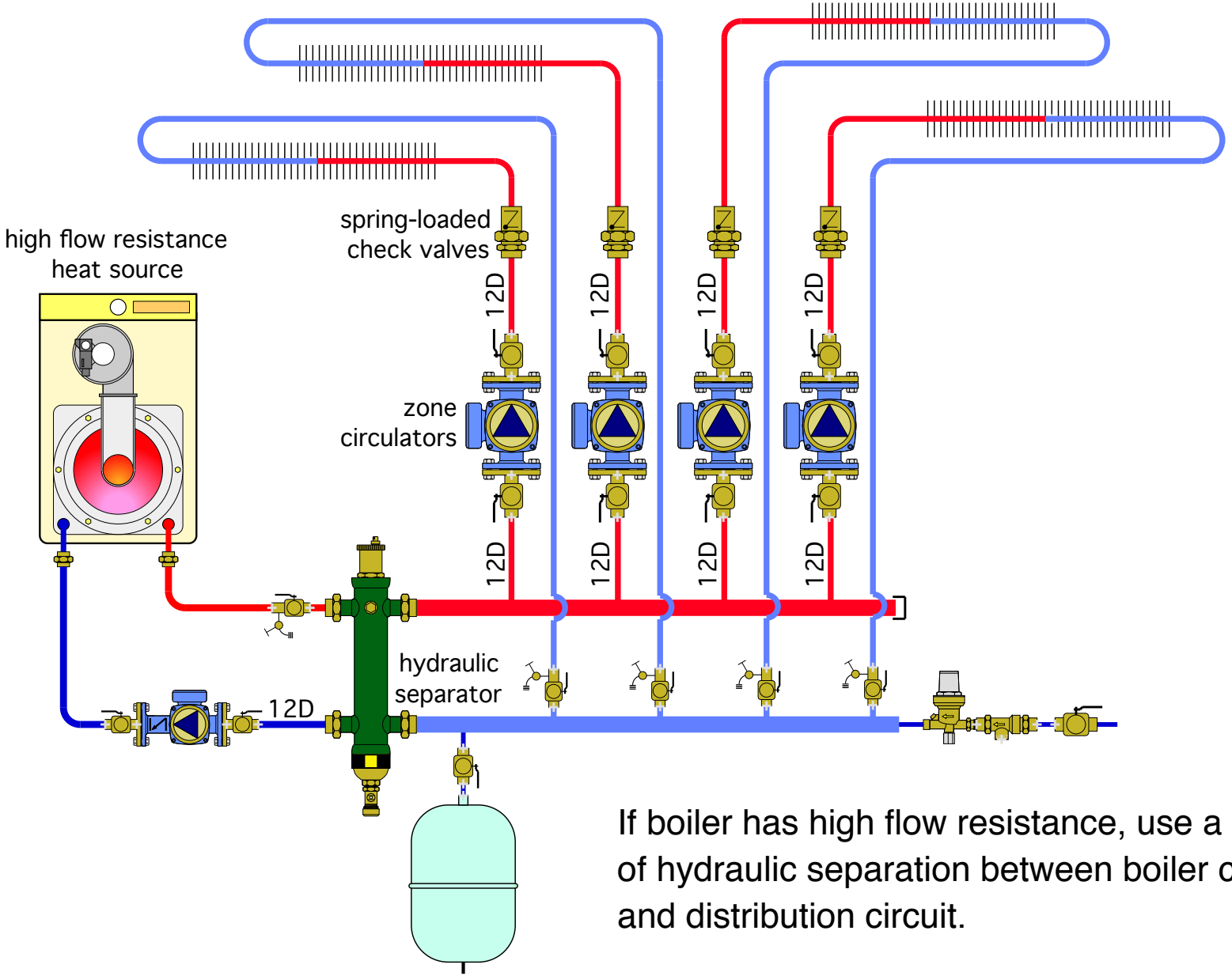
3. Zoning with on/off circulators

- Each circulator has internal check valve.
- 12 pipe diameters of straight pipe on inlet of all circulators.
- Circulators on supply, not return
- Low flow resistance heat source, and “short/fat’ headers provide hydraulic separation that prevents any significant interference of circulators.
- Use ECM circulators set for constant speed.



Hydronic Zoning Options

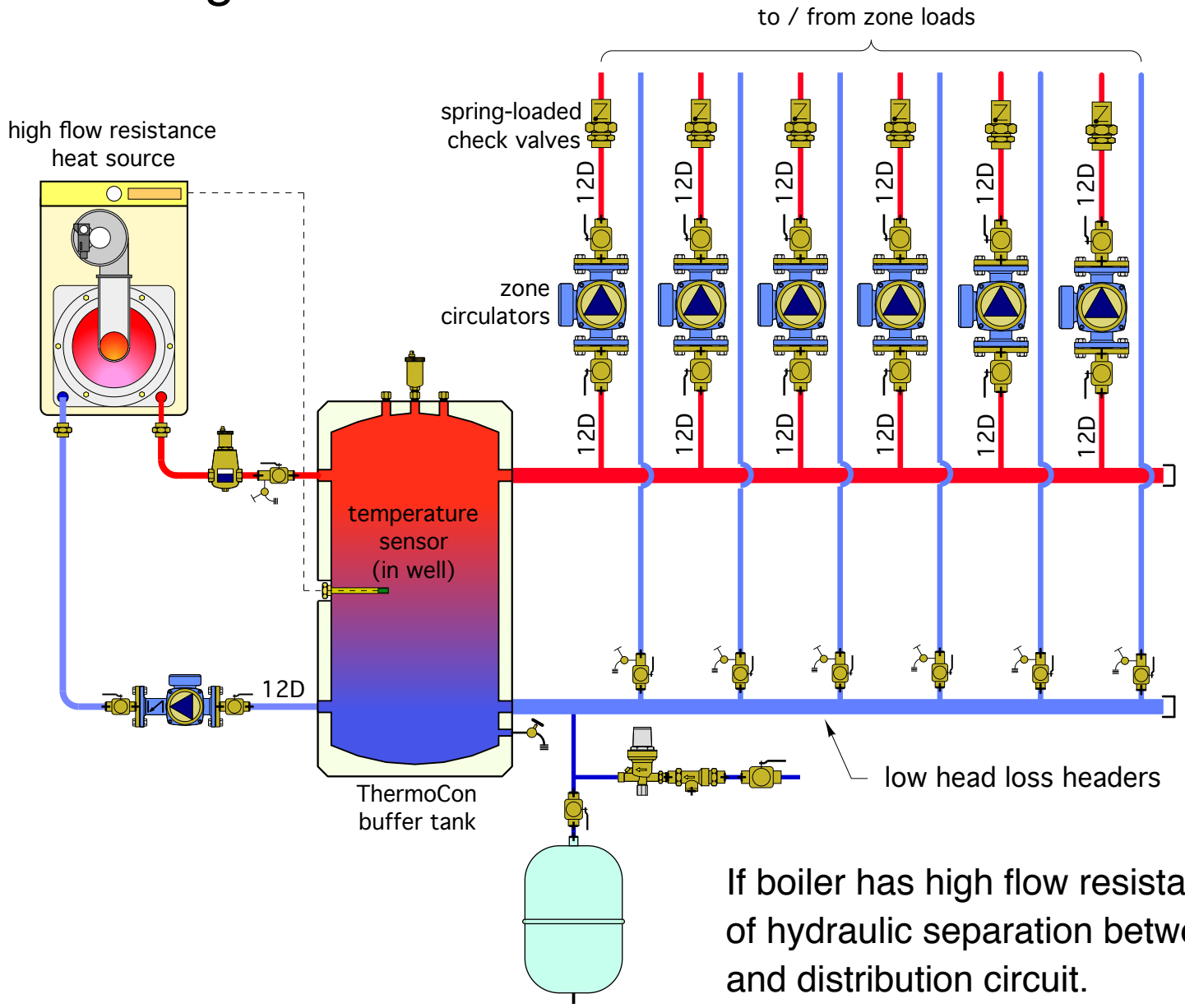
3. Zoning with on/off circulators



If boiler has high flow resistance, use a means of hydraulic separation between boiler circuit and distribution circuit.

Hydronic Zoning Options

3. Zoning with on/off circulators

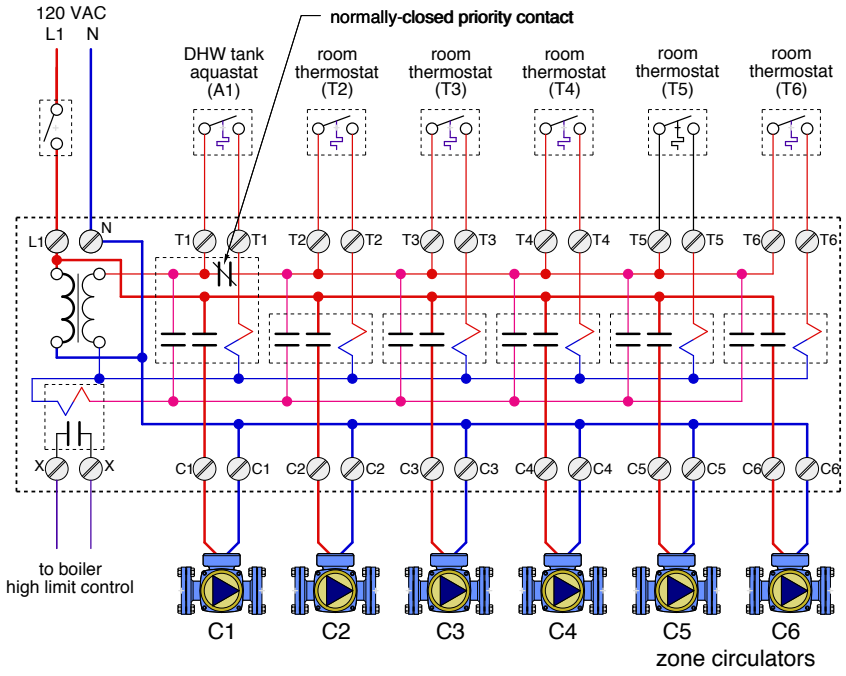


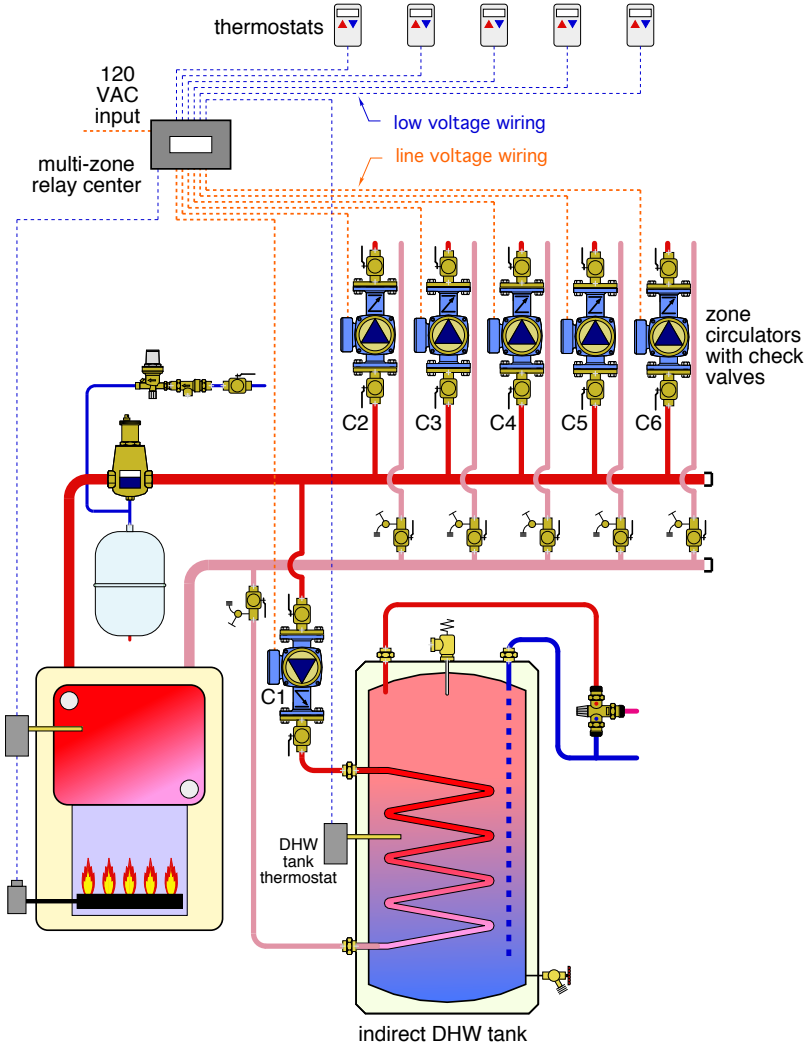
If boiler has high flow resistance, use a means of hydraulic separation between boiler circuit and distribution circuit.

Hydronic Zoning Options

3. Zoning with on/off circulators

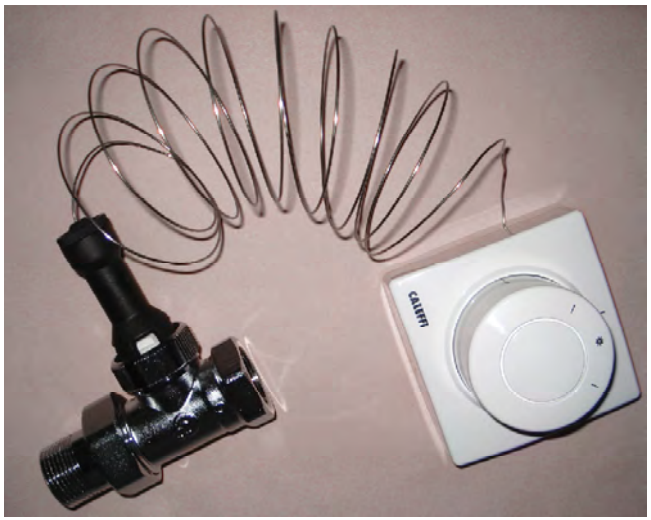
Use one of several available multi-zone relay centers to keep wiring organized.

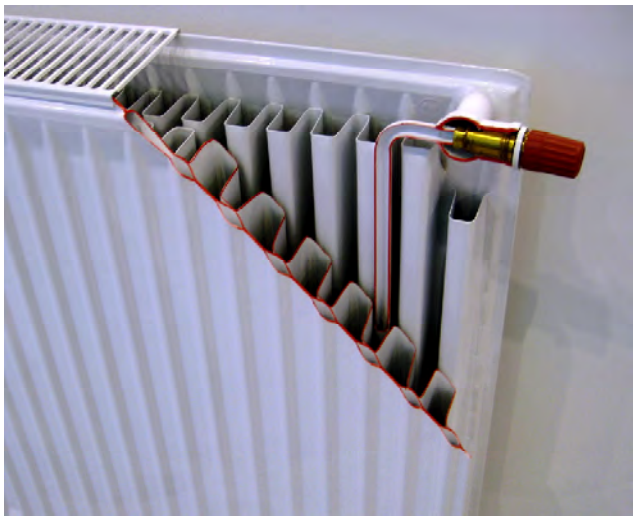


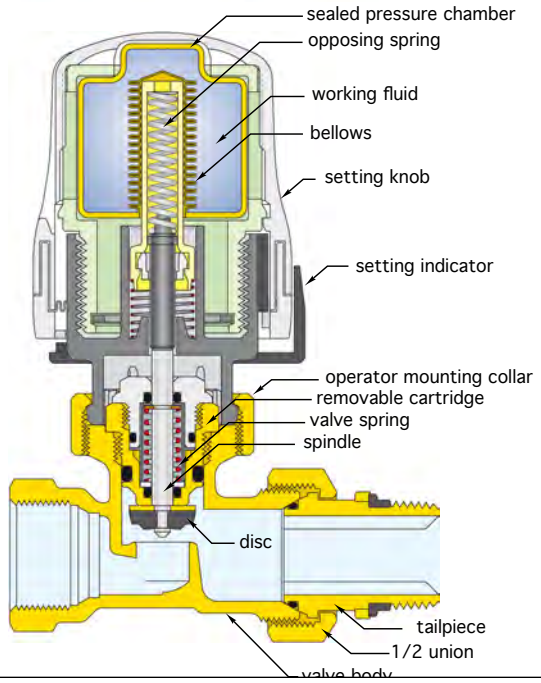


Hydronic Zoning Options

4. Zoning with thermostatic radiator valves

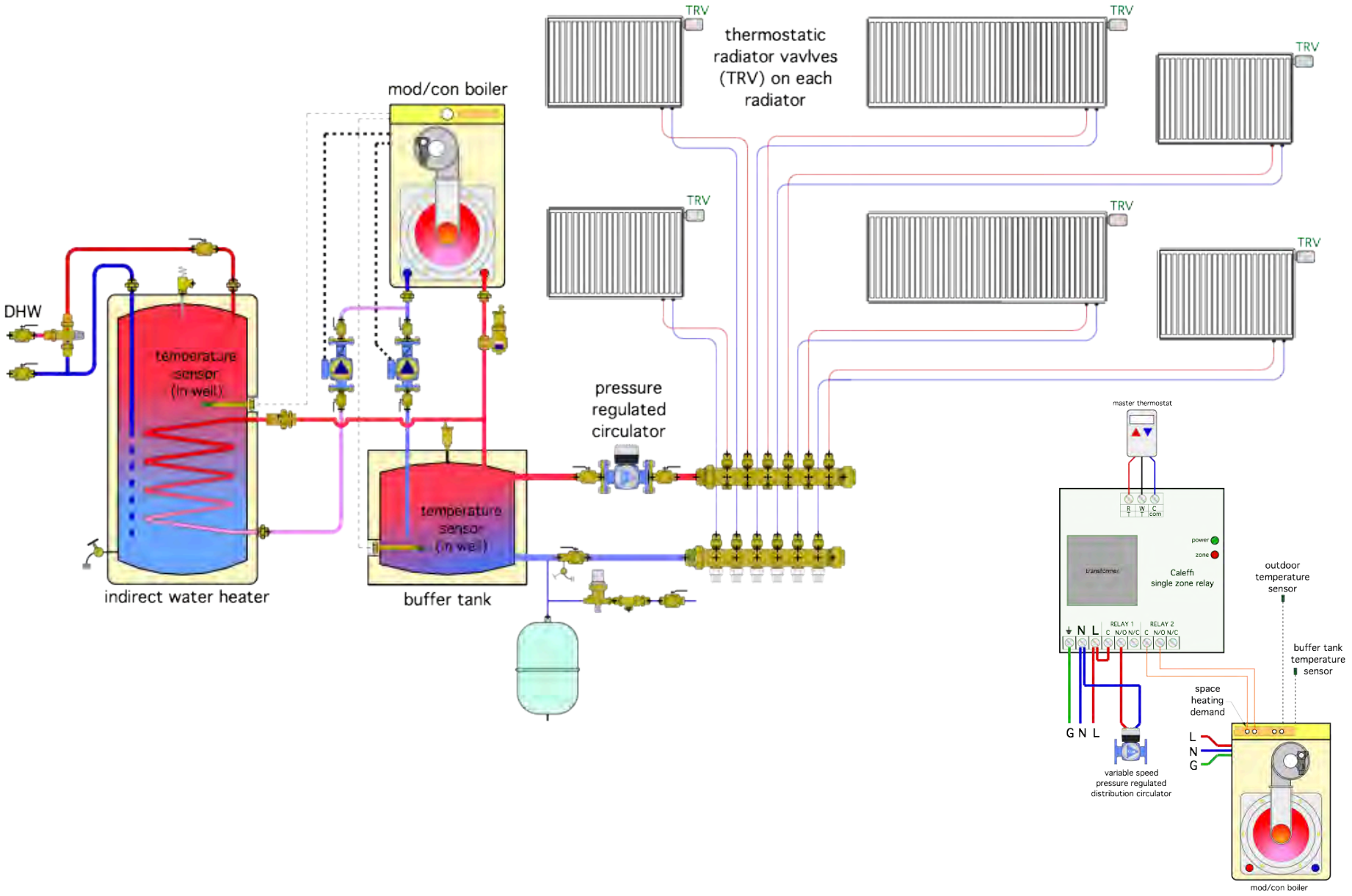






Hydronic Zoning Options

4. Zoning with thermostatic radiator valves



Parting thoughts...

1. Plan ahead...

Parting thoughts...

2. Keep it neat...

Parting thoughts...

3. Keep it simple...

"Best Practices in Modern Hydronic Heating - AN OVERVIEW

Thank you for attending today's session...

Thanks also to the planning committee, and the sponsors of this session.

ENERGY DESIGN
conference & expo

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www.hydronicpros.com