

Benefits of Zoning with Hydronic Systems

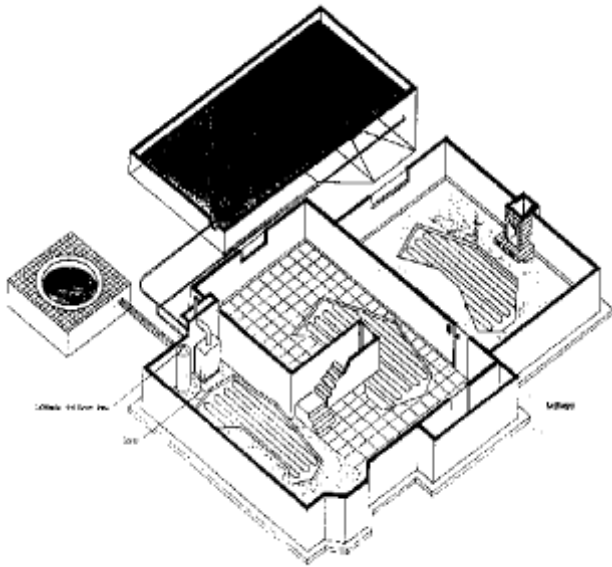
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One boiler can supply heat for many purposes:

- Radiant Floor Panels Domestic water heating, hot tubs, and a pool.
Blower coils.
Radiant wall panels
Garages
Walks and driveways
Baseboard
Tile or parquet floors
Hot Tub

Advantages of Zoning

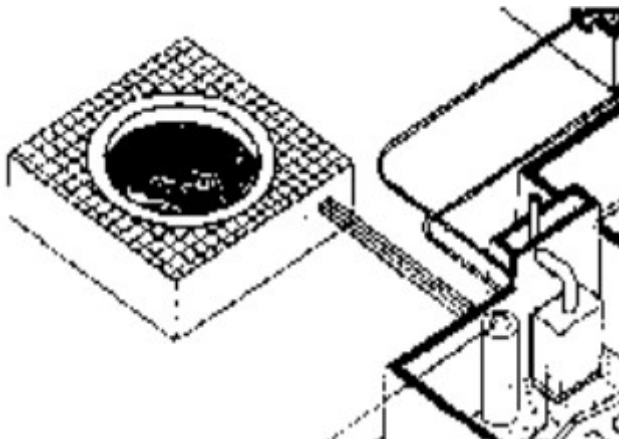
- Security and comfort
Comfort
Control
Savings
Deciding When to Zone
Considerations
One Pipe Circuit
Two Pipe Reverse Return Circuit
Zoning with Circulators
Electric Zone Valves
Motorized Steam Valves
Convectors
Non-Electric Zone Valves
Non-electric radiator valves on one-pipe steam systems



Radiant Floor Panels

A ranch home with a basement can double in living space. After cleaning and insulating a basement floor, radiant tubing becomes part of a new flooring surface. Children will play on a warm rug surface in a new recreation or bed room. The home increases in value.

Domestic water heating, hot tubs, and a pool.



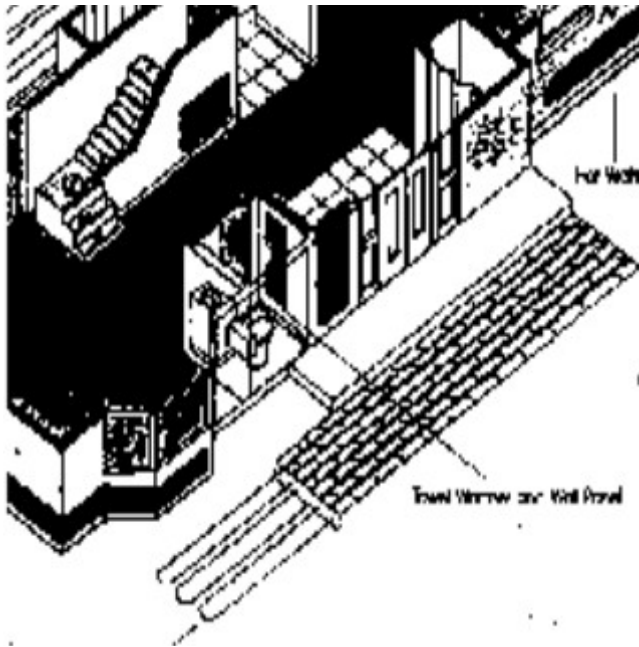
A warm air heated home would require an additional source of heat, in the form of a boiler, to do these tasks. Heating a home with a boiler eliminates buying several expensive furnaces.

Blower coils.

Warm air from water heated air coils dries clothes. Instant heat from coils creates

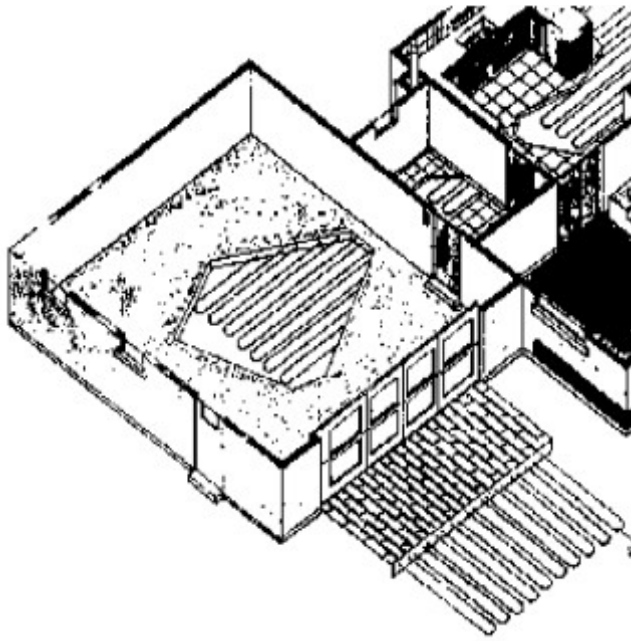
a curtain of warm air to keep cold air from entering open doorways. Additional zones supplied by a boiler will heat:

Radiant wall panels



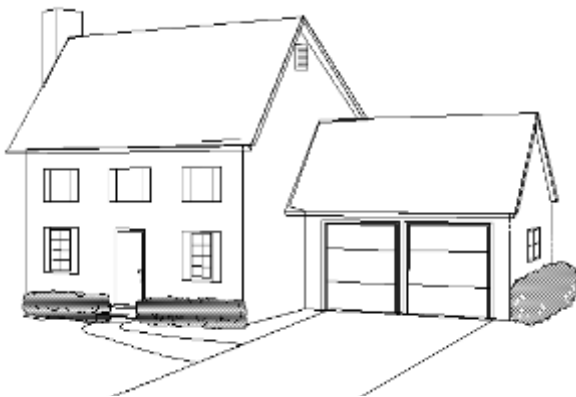
While doors are open, heat is sent from warm panels right to people without heating air in between. Guests feel comfortable while entering, much as sunshine feels warm on the face and hands in cold outdoors.

Garages



Warm floors heat the entire undersurface of the automobile. Cars start quickly with oil pans prewarmed. Home automobile repair is comfortable. Heating units are invisible and can not be struck with vehicles.

Walks and driveways



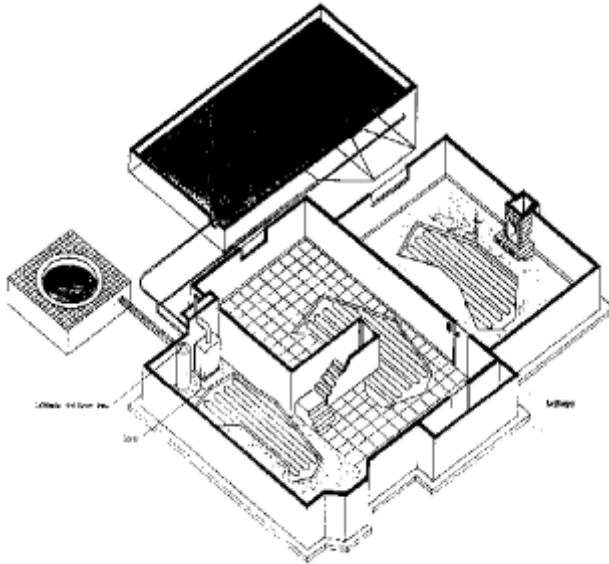
Heated surfaces prevent ice and snow damage. Ice can not accumulate to misalign brick or stone. Plows become unnecessary. Chemicals are not applied on landscaping. Labor and overexertion are eliminated. Without slips and slides, insurance claim probability is dramatically reduced. The boiler also heats:

Baseboard

Baseboard beneath glass heats air before it can fall across the floor to chill feet. Copper tubing inside baseboard wall units contain very little water. Baseboard sends any heat in the water into the room within two minutes after thermostat

satisfaction. If the owner purchased a setback thermostat, the room starts to cool while unoccupied.

Tile or parquet floors



Radiant tubing included in floors keep the floor at one warm temperature. Floors will no longer cool and heat as weather changes. Cracking and heave damage stops. Remaining warm, moisture content stays more even. Bare feet on a warm floor is no longer a shock.

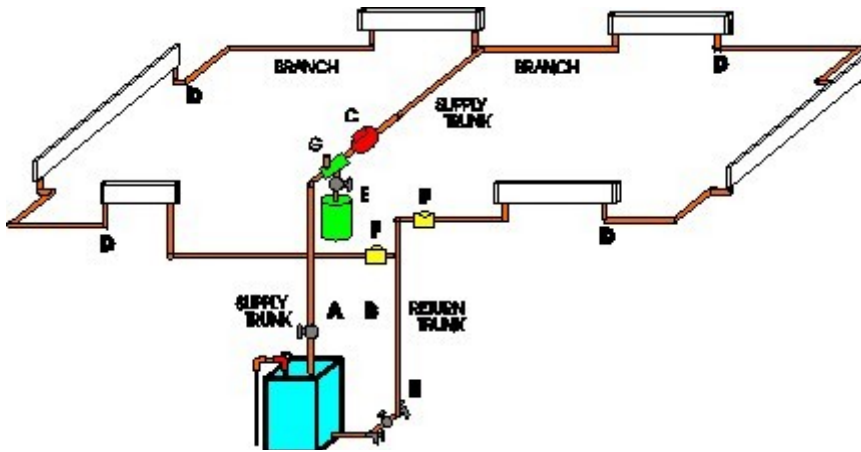
Hot Tub

A boiler can create and recover more hot water, at less cost, than any other residential heating device

Principles of Zoning

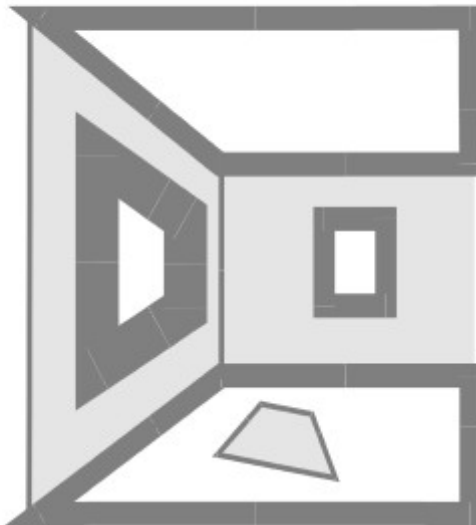
Definition: A zoned system is a room or group of rooms in a building which are served by separate piping circuits and a control device used to regulate room temperature. The main purpose is to independently control the temperature to a given area. The most satisfied customers are the ones who take pride in are secure in their ability to control comfort.. If the sun ducks behind the clouds on a January afternoon and the wind starts to howl, theyre comfortable. If mom turns the oven up high to cook a roast, theyre not hot.

Security and comfort



If they like to sleep in a cool room but worry about the baby catching cold, they can adjust the temperature in each room to just the right point -- so that everyone can be comfortable. Pride - They can do this because you zoned their heating system.

Comfort



When you have the sun shining on the south side of the house, on a cold winters day, the heat inside builds up higher than you want. If the thermostat is on the cold side of the house, you may keep circulating heat throughout. You can see that it is definitely and advantage to have the north and the south sides controlled separately, yet maintaining temperatures close to each other. The homeowner may want to keep his bedrooms cool during the day, especially with fuel costs so

high. The owner may want to keep a reduced temperature in the basement playroom, until it is occupied. Reinforce the homeowners favorable judgment, so he is truly convinced he wants the benefit hydronics can offer for zoning.

Control

Offers flexibility by allowing the homeowner to provide the desired temperature in all areas of the home, regardless of changes in load conditions. Technical correction -- Can balance out systems that contain two or more types of radiation such as baseboard and radiant floor panel systems. Comfort -- Improves comfort by delivering heat to an area only when called for.

Savings

Reduces fuel consumption by maintaining different temperatures throughout a structure. The number of desirable zones depends on the layout and orientation of the house, and the owners wishes. For those of us in the comfort business, zoning provides a tremendous opportunity to build a business. Satisfied customers bring new work. Obviously it will cost more, but the cost of zoning is only a small fraction of the total cost for installing a heating system, and it is a one-time cost which will save fuel every day.

The average outside temperature is 8 to 10 degrees higher during the day. Eighty to ninety percent of all heat from sources other than the heating system -- lights, sunshine, appliances, occupants -- is generated during the day and may easily provide forty percent of the total heat required during this period. Both factors support the theory that night setback saves fuel, as the heating system must provide a higher percentage of the required heat at lower outside temperatures. Thus, not setting back the thermostat would mean that the system would have to use more fuel to reach the desired comfort level.

Table of Heat Losses and System Temperatures for 70 DTD Home

Outdoor Temperature (Fahrenheit)	Time Outdoor Temperatures Warmer	House Heat Loss (Btuh)	System Water Temperature (Fahrenheit)
60	12%	14,760	79
50	31%	44,300	95
40	51%	73,840	112
30	76%	103,400	130
20	92%	132,920	146
10	98%	162,480	163
0	100%	192,000	180

One of the greatest advantages of residential zoning is daytime setback, when families are at work and school. There are ten or more hours of setback potential during the day, compared with only seven to eight hours at night. Lowering the

thermostat setting is the simplest way to reduce fuel consumption and the first to be mandated by public officials when fuel shortages become acute.

The government agencies involved in energy consumption have traditionally insisted that night set-back saves fuel. Studies conducted by ASHRAE, thermostat manufacturers and others within the HVAC industry generally support this contention. The Annual Fuel Utilization Efficiency (AFUE) test procedure, required by the Department of Energy, for residential boilers (smaller than 300,000 Btuh input), determines how much heat is lost while the burner is off. Both the time while the burner is running, and the time when the burner is off, are part of the test procedure. The longer a burner is off, the more heat is lost up the chimney, from the jacket and along pipe. The larger the outside surface of a boiler, the more heat can be lost per square foot. A typical single boiler's full output is needed for less than 20 percent of the year, when the coldest weather appears. The boiler will run at less the 1/2 load for 3/4 of the heating season. It fires at full capacity to meet a partial load.

Actual tests conducted by the Brookhaven National Laboratory, among others, in occupied homes have shown that a 10-degree night setback results in fuel savings up to 15 percent. According to the December 1991 survey by Professional Builder and Remodeler Magazine, 61.4 percent of potential home buyers are willing to pay more for a zoned system. Almost any size home can benefit from zoned systems, saving from fifteen to twenty-five percent or more in heating and cooling energy costs.

Deciding When to Zone

Most buildings can benefit, especially:

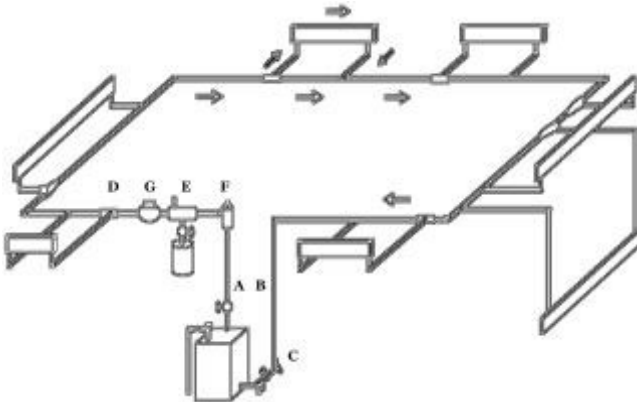
Larger homes split level homes, and similar types, in which one section of the house is likely to retain its heat longer than the another. Buildings with different occupancies. Commercial buildings. Buildings that need independently controlled rooms such as hotels and motels. Buildings that need instant heat like hospitals and nursing homes. Buildings where conditions at the thermostat are not typical Located in an isolated room. Rooms whose needs change based on the sun, seasons, or occupancy.

Considerations

Radiation of different metals can be installed on the same circuit , if the circuit is within one room. The heat storage capacity of cast iron will enter the room long after lighter copper tube baseboard has contributed its heat. The thermostat in that room will control that circuit. If a series circuit passes through several isolated rooms, terminal units of different materials can not be used. The zone thermostat placed in the cast iron, floor slab, or steel radiated room will continue to sense heat long after the other room on that circuit using baseboard has cooled. A thermostat in a baseboard room will call for heat before a larger mass

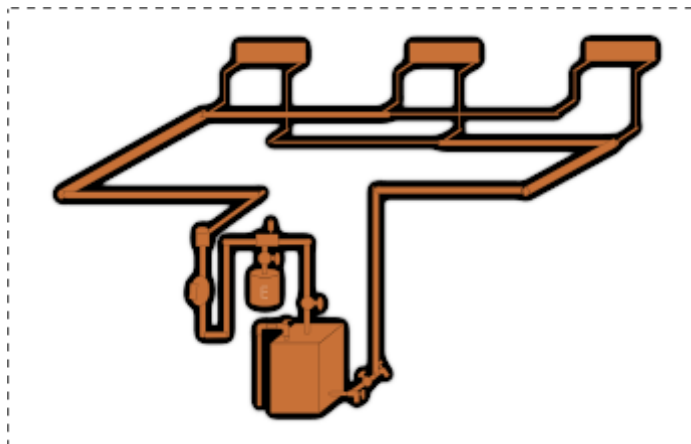
of radiation has contributed its heat to another room. Zoning can initially cost more than a series loop or multiple circuit piping, but ultimately will save more because of more precise comfort control, leading to reduced energy consumption.

One Pipe Circuit

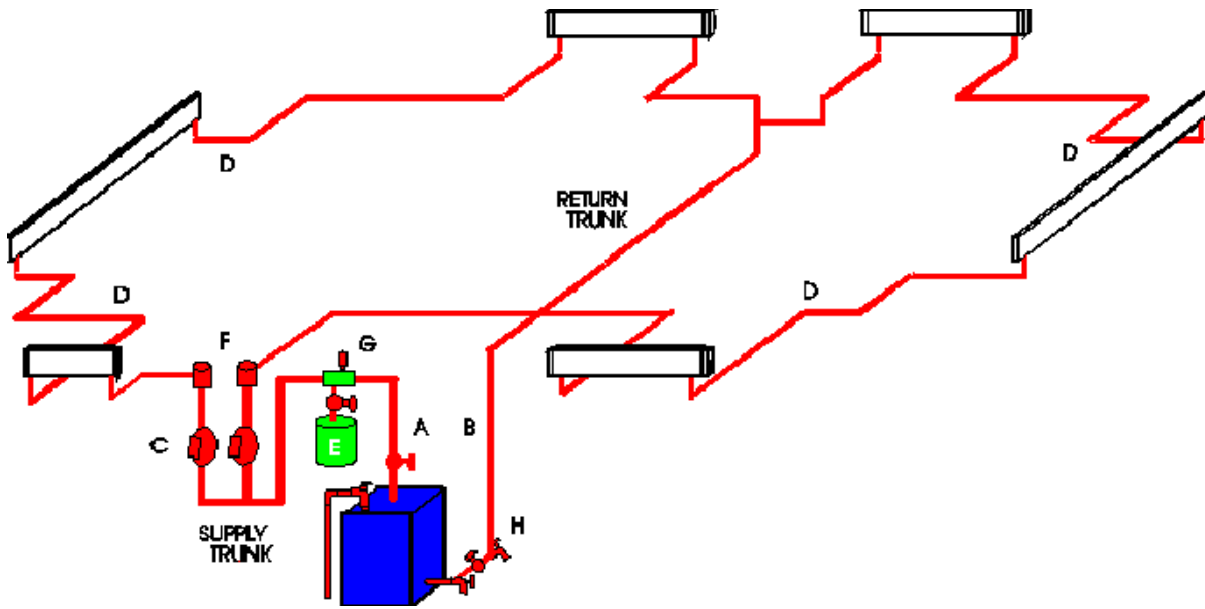


One-pipe and two-pipe circuits permit water to branch off from the main to individual radiation loops. Each branch loop can be controlled separately by zone valves.

Two Pipe Reverse Return Circuit

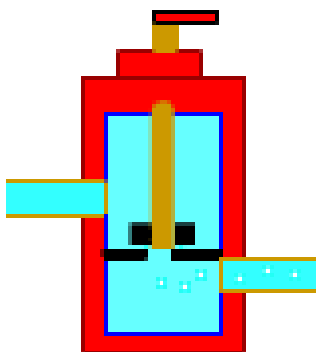


Zoning with Circulators



It typically costs more to zone with circulators than with zone valves. Circulators offer reliability, longevity, and have virtually no problems with leaks or sticking. When zoning with circulators, you are always going to have some heat, even if one circulator fails, others will continue sending heat. Each separate circuit has its own circulator to move the water. A separate thermostat controls the operation of each zone relay. A separate relay serves each zone.

A flow control valve must be installed with each circulator: Most flow control valves feature a manual adjustment (a lever or screw on top) that permits the valve to be opened to allow gravity circulation of hot water from the boiler. This adjustment would be engaged when the circulator(s) would not be able to pump water from the boiler, as in a power outage. The purpose of the flow control valve is to prevent the flow of heated water through the zones that are not in operation.



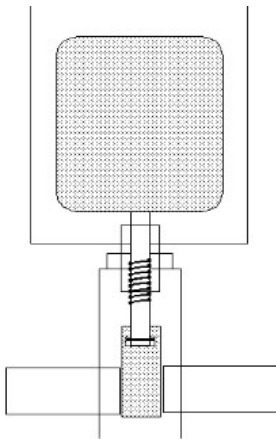
They contain a weighted check valve that when normally closed, keeps hot water from rising out of the boiler when the circulator is off. Under normal operating conditions, the valve will prevent gravity circulation of water through the zone when the circulator is not operating. When the circulator is activated, the force of

the water pushes the weight up, allowing heated water to go out to the circuit.

Always follow manufacturers installation instructions. Each circulator can be sized to the flow requirements of that one zone. When using circulators in residential application with less than 12 feet of head, location of the circulators is not critical. In a commercial system with heads greater than 12 feet, it is always best to pump away from the expansion tank.

There is little velocity noise when zoning with circulators. The flow rate of the circulator is matched to the one zone, not the entire system. Commercial systems may use staged multiple circulators. The system circulator should be sized to provide proper flow in all zones simultaneously . Multi-zone controllers are available featuring an arrangement of pre-wired switching relays for control of multiple circulators from a single, easily installed unit

Electric Zone Valves



Zoning with zone valves is generally less expensive than zoning with circulators. Many electric zone valves have a manual by-pass opener. If there is a power failure, the zone valve motor fails, or the system circulator fails, the valve can be opened manually. Heated water can reach the zone by gravity or by the action of other zone circulators. Some electric zone valves fail into the open position. They do not require manual openers. Zone valves can be installed anywhere in the zone circuit, even inside the radiator covers. They take up less space and weigh much less than circulators. They are frequently at location F below.

Zone valves are extremely reliable, almost all commercial systems are zoned with valves. Electric zone valves are electrically operated water valves that open and close in response to a call from a thermostat calling for heat. Thermostat contacts close completing an electrical circuit through a zone valve motor and transformer. An end switch makes a connection activating a relay. The relay starts a circulator, and/or a burner. When a call for heat is satisfied, the thermostat opens its contacts, the zone valve motor circuit opens, the valve shuts, the end switch opens deactivating the relay.

Motorized steam valves

Used in many commercial applications such as churches, schools or libraries.

Caution: Fast opening valves can draw water out of the boiler, motorized steam valves should open slowly.

Convectors

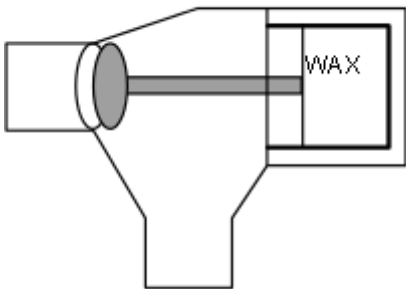
Convectors can be piped similar to baseboard. A typical convector is 6 deep by 36 long by 24 high. That 6 by 24 convector puts out about 5100 Btuh when supplied with 1800F. water.

Method of sizing: Divide 5100 into the maximum carrying capacity of a pipe to get the maximum amount of convectors it can serve. Pipe Size (Copper) Maximum Btuh Capacity of Pipe 5100 Btuh

- Each 1/2" provides 5100 btuh, so 15,000 requires (3) 1/2 inch
- 3/4" provides 40,000 (8)
- 1" provides 80,000 (16)
- 1-1/4" provides 140,000 (27)

Non-Electric Zone Valves

Non-electric zone valves control individual room temperatures and are installed on room radiators or baseboards. By sensing room temperatures, non-electric zone valves modulate the flow of water to the baseboards or radiators. They are self-contained, wireless and automatic. Valves are installed on the inlet side of the baseboard or radiator and can have remote sensors.



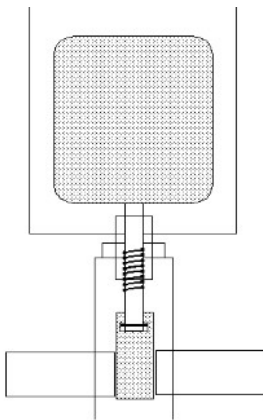
As a room cools, wax inside the operator contracts and opens the valve. As hot water enters the radiator or baseboard, a wax filled operator senses the warming action and expands, modulating the flow of water. Individual pieces of baseboard, convectors, or radiators can be zones. Since the valve cannot start and stop a circulator, the circulator should remain on all the time or a timer control can be installed. A by-pass valve or one-pipe loop should be installed to divert water around closed zone valves. Non-electric valves work best in one-pipe or two-pipe systems. A non-electric valve would shut off flow to an entire

series circuit. Non-electric zoning requires continuous circulation. Boiler water constantly moves out to the building

Non-electric radiator valves on one-pipe steam systems

A non-electric radiator valve replaces an existing steam vent. The valve prevents overheating. The valve sensor stops radiator venting when the room temperature is satisfactory. The valves maintain temperature at a selected level, prevents overheating, balances the system, and saves energy. A non-electric radiator valve replaces a radiator shutoff valve.

Valves on two-pipe steam systems.



A motorized valve prevents overheating. The valve sensor stops steam from entering the radiator when the room temperature is satisfactory.

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