The Full Spectrum Of Modern Panel Radiators

by John Siegenthaler, P.E.

Today's models combine aesthetics with performance.

What constitutes a “radiator” has changed considerably in the last 20 years. The cast-iron behemoths that kept us warm in the middle of the 20th century are headed the way of the wagon wheel. They served their purpose well and are undeniable pieces of Americana, but energy costs, better insulated buildings, less predictable internal gains, transportation costs and aesthetic expectations demand a different heat emitter product if hydronics is to keep pace with other heating options.

Figure 1. Myson Inc.

Enter modern panel radiators. Their aesthetics can turn the heads of owners, architects and interior designers, while their performance complements the operating characteristics of modern low-energy buildings.

The market for European-style panel radiators continues to grow in North America. There are now several companies offering a wide range of products from a “utilitarian” fluted panel to exquisite panels that are far more likely to be viewed as sculpture rather than heat emitters.

Panels are available in dozens of sizes, shapes and colors. Some project less than 2 inches from the wall. Others squeeze into the narrow wall spaces often present in kitchens and bathrooms. Places where conventional fin-tube baseboard or older standing cast-iron radiators are out of the question. This month we’ll take a look at several styles of panel radiators and discuss the benefits they offer.

Fluted Panels

Figure 2.

One of the most common types of panel radiator is manufactured from a press-formed steel sheet. The forming process produces “flutes” or channels that join to a formed header at the top and bottom. The front and back sheets are welded together to create a sealed unit with lots of surface area yet relatively low water content. The portion of the radiator is called the water plate. Steel fins are attached to the rear side of this plate to enhance convective output.

The completed assembly is pressure-tested, chemically cleaned and finished with high-quality powder coat or enamel paint. Figure 1 shows a typical installation of a fluted-panel radiator.

For high-heat output requirements, two single-water-plate/fin assemblies are connected back-to-back. Common side panels and a top grille make for a clean, simple appearance. Many radiators of this type also have an integral flow-regulating valve in the upper right corner. This valve can be fitted with a nonelectric thermostatic actuator to allow flow modulation through the radiator in response to room temperature. More on this later.

Flat Pipes

Figure 3.

Another common type of panel radiator is built using flat steel tubes arranged in parallel

and connected to headers at both ends. The tubes can be oriented horizontally or vertically. Units from 3 inches to 70 inches wide and up to 29 1/2-feet long can be manufactured, allowing for hundreds of possible sizes. Most panels of this type also have several optional locations for piping connections.

Horizontally oriented panels are commonly installed under windows or low on exterior walls as shown in Figure 2. Panels with heights of 6 inches to 12 inches are installed as an alternative to fin-tube baseboard. They are equipped with steel fins on their rear side to enhance convection and are well-suited to counteracting drafts under large windows. Taller but narrower horizontal panels pack higher heat output into less horizontal wall space.

Vertical panel radiators (Figure 3), using the same flat tubes, are great problem solvers in tight confines such as bathrooms and kitchens, where empty wall space is hard to come by. For example, a 12-inch-wide by 7-foot-tall panel has a heat output equivalent to about 7 1/2 feet of fin-tube baseboard, yet could easily fit on a wall that's too narrow for other uses.

Figure 4. Cordivari

Round Tubes

Still another variety of panel radiator is the tubular towel warmer. Again the concept is simple; a rack of horizontal steel tubes connected to vertical headers at each side. By leaving out a few tubes here and there, a space is created for a towel to be draped over the panels. Special standoff mounts hold the panel about 3 inches away from the wall so the towel has space to drop down behind it.

Besides the obvious use in bathrooms, this type of radiator is great in entry foyers or mudrooms, where it quickly dries and warms coats, umbrellas and scarves.

One manufacturer offers tubular towel warmers in sizes from 20-inches wide by 30-inches tall, to 30-inches wide by 69-inches tall. Their heat output ranges from about 2,000 to 7,000 Btu/hr. at an average water temperature of 170 degrees F. The bottom of each header has 1/2-inch FPT connections. Most panels are mounted with a set of angle valves at the bottom of the headers. These nickel-plated brass valves allow flow through the panel to be regulated. Because they are equipped with unions, they also allow the panel to be isolated and removed from the wall if necessary for painting.

Figure 5. Jaga

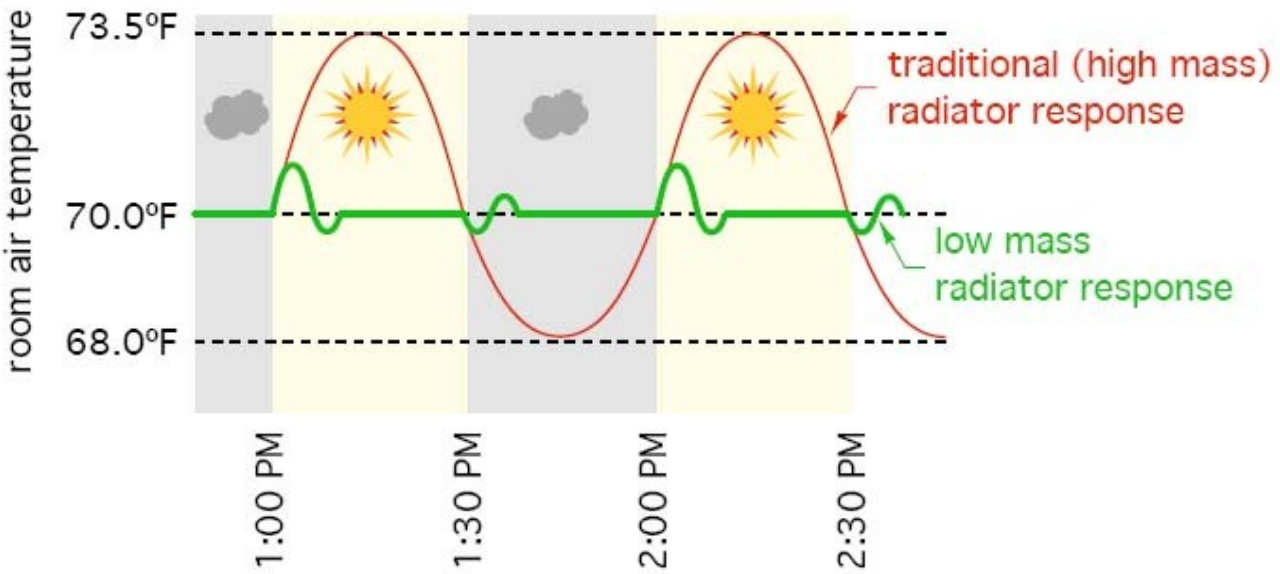
Thermal Artistry

Beyond these basic steel and tubular assemblies lies the realm of "designer radiators." A seemingly endless variety of shapes, colors and accessories guaranteed to surprise and amaze those who think of radiators as ugly 600-pound chunks of cast iron. Perhaps even more amazing is the silent comfort these works of art deliver as warm water circulates through them. Two examples are shown in Figures 4 and 5.

Beyond their basic function as heat emitters, panel radiators have been creatively integrated as architectural elements. They have been used as room dividers, coat racks, benches and even stair railings.

Benefits Galore

Figure 6.

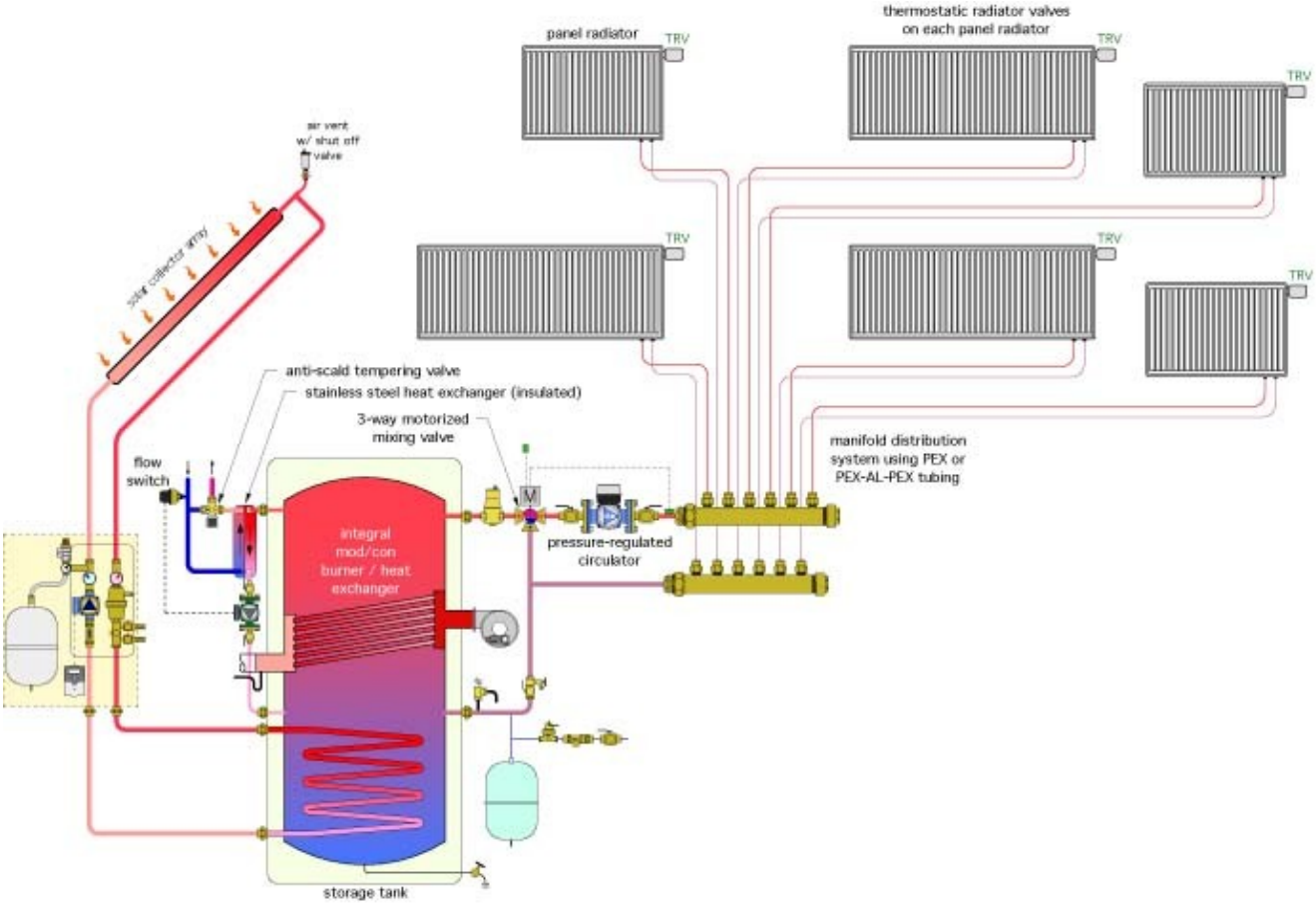


One pre-eminent feature of panel radiators is their fast thermal response. Because they contain far less metal than their cast-iron predecessors, and relatively little water, panel radiators can warm up quickly. Equally important, they can cool off quickly as internal heat gains develop in a room. This fast response allows panel radiators to "track" the required heat input requirements of a room far better than higher mass radiant floor panels. This concept is shown in Figure 6.

This characteristic makes panel radiators ideal for passive solar buildings where solar heat gains can change rapidly and over a wide range. It also makes them perfect for room-by-room zoning.

Another benefit of panel radiators is the ability to operate them with a large difference between supply and return water temperature. While radiant floor circuits serving rooms expected to have barefoot-friendly floors can operate with perhaps a 15-degree temperature drop under design load conditions, panel radiators can operate with twice this temperature drop. This allows half the flow rate to carry the same amount of heat. Lower flow rates mean smaller piping and lower power circulators, both of which reduce first cost and life cycle operating cost.

Piping Preferences



Even the most stylish radiator can't deliver anticipated thermal delights without proper piping. Although there are several ways a group of panel radiators can be piped into a system, I strongly advocate use of homerun distribution systems. In this approach, each radiator has its own supply and return tube that originate from a manifold station as shown in Figure 7.

This piping method offers several benefits. First, the PEX or PEX-AL-PEX tubing runs to each panel radiator seldom need to be larger than 1/2 inch. In many cases, 3/8-inch tubing can be used. The low flow rates associated with higher temperature drops are what allow these small tubes to do the job.

Small-diameter PEX or PEX-AL-PEX tubing is easy to route through framing cavities. If you can pull an electrical cable from point A to point B, chances are you can also pull through a length of 3/8-inch PEX or PEX-AL-PEX tubing. This makes the homerun approach ideal for retrofit jobs.

Homerun distribution systems also deliver the same water temperature to each panel. The size of the panels doesn't have to be adjusted to compensate for supply temperature drops as it does with series or diverter-type systems. If the supply water temperature is adjusted by outdoor reset, all panels benefit equally.

Finally, homerun systems used in combination with thermostatic valves at each panel radiator are ideally suited for the next generation of pressure-regulated circulators now gaining a foothold in the North American market. Each time a thermostatic valve adjusts flow in a panel, the circulator senses

the attempted change in system pressure drop and quickly reacts by changing its speed to cancel out the change.

With this approach, there is no need for a differential pressure bypass valve in the system. The savings associated with eliminating this valve go a long way toward covering the higher cost of the pressure-regulated circulator. In short, it's a marriage made in hydronics heaven.

Panel radiators are rugged enough for commercial and rental properties, yet elegant enough to turn heads in high-end custom homes. They are uniquely suited to the needs of modern buildings and, as such, they will assume an important role in the future of North American hydronics.

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