



ENERGY DEMON AT THE DOOR

Having lived with an ancient heating system and no cooling for years, a Pennsylvania congregation now sings the praises of the updated hydronics and new mini-splits that brought a mechanical renaissance to the church's various spaces.

BY JOHN VASTYAN

Heidelberg United Church of Christ in York, PA, needed a mechanical fix in a bad way. According to one church member, heating equipment at the church needed “salvation” and, more importantly, summer services were hotter than Hades.

The answer to their prayers came in a red truck driven by Dave Yates, president of York-based F.W. Behler, Inc. The system Yates proposed, when compared to the nearest competitor's bid, would be more than twice as efficient and cost \$200,000 less.

In addition to the energy and installation savings, Yates' plan for the 20,000-plus-sq-ft church was far less invasive, requiring minimal disruption to the building and the congregation. It's no surprise that F.W. Behler, Inc. was the contracting firm chosen to give the church its long-awaited mechanical makeover.

The oldest part of the building dates back to 1800; it has seen numerous additions and remodels since then. The entire building was heated by a sinfully oversized steam boiler. That came as no shock, though. The 1918 Flu Epidemic brought awareness of

the importance of fresh air in high-occupancy areas. The trend toward oversizing systems allowed for windows to be cracked for fresh air circulation, even in the dead of winter. This, in a sense, marked the beginning of IAQ consciousness.

Many systems installed during the “fresh air” era were oversized by at least 20%, often more. Of course, this also meant that church's boiler knew bang-bang short-cycling as a way of life. “They thought demons were knocking on the cellar door when that system started,” quipped Yates.

“The old system had some pretty big problems,” added Yates. With a thermal efficiency of around 30%, the old boiler at Heidelberg Church was connected to a maze of crudely patched piping. Yates' plan included converting the sanctuary's steam radiators to hot water, requiring several new, compact modulating-condensing hot-water boilers. Remaining portions of the church would be served by a new, properly sized steam system. And, to save them from summertime's inferno, Yates also planned to provide A/C to the entire, non-ducted building with ductless Fujitsu mini-split systems.

**HEATING SYSTEM SALVATION:
\$6,000 SAVED LAST YEAR**

The 5,000-sq-ft sanctuary presented quite a few challenges for the conversion. While calculating the heat load, Yates had to compensate for lower radiator temperatures (tied to outdoor reset), no longer around 215°F but a glide between 85° and 160°.

While trying to figure out if hot water running through the current radiators would be sufficient, Yates was glad to learn that, years ago, a generous layer of insulation had been blown across the entire crawl-space above the sanctuary. The subsequent Manual-J heat loss calculation revealed it would be a marriage made in heaven.

The old steam radiators were single-tube piped, requiring some work to convert them to hot water, along with the use of twin-pipe supply-side valves. The installation crew had to drill and tap each one to change all the valves and fittings. To preserve the 100-yr-old ceramic tile on the sanctuary floor, return lines were run back down with the supply lines through the pre-existing, one-pipe floor-holes.

Heating the whole sanctuary with one traditional hydronic loop would not be possible. To remedy this, Behler techs used reverse-return piping, ensuring that all the radiators reached the same temperature simultaneously.

With prolonged periods of record cold and snowfalls, the new heating system's inaugural winter was brutal. But the congregation was delighted with the quiet warmth it delivered. And, according to the church's treasurer, they also saved \$6,000 in fuel last winter alone.

**HALLELUJAH, AIR
CONDITIONING AT LAST**

When the heating problems were licked, Yates and his crews turned their attention to the A/C challenge. Cooling the big interior spaces of the church would have its challenges, too.

The system proposed by other contractors called for installation of a 150-ton chiller that would have required special permitting and also cut into the church's very limited parking space. To solve the problem, Yates specified the single- and multi-zone ductless Fujitsu mini-split systems to meet the church's A/C needs.

Without a prior A/C system of any



FIGURE 1. Top photo, front of Heidelberg United Church of Christ in York, PA. Middle photo, the main sanctuary from the balcony. Bottom photo, the old sanctuary.

kind, the building had no ductwork. "One of the many benefits of the mini-splits is that we were able to outfit the church with an A/C system that didn't require tearing down the ceiling to run ducts," said Yates.

Before the overhaul, much of the building was unbearable, such as the secretary's office. The temperature was usually around 85° in the office on any summer day. The humidity: "About as high as you could push it," said Yates.

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Energy Demon At The Door



FIGURE 2. Wiring the wall-hung outdoor units.

A 12,000 Btuh evaporator unit was installed; one of three that are connected to a 2.5-ton, triple-zone condensing unit outside. The other two evaporators, at 9,000 Btuh each, were installed in the nearby restrooms.

The secretary's office, the pastor's office, and the auditorium together required 12 tons of cooling, all easily met with the installation of a few Fujitsu multi-zones. The sanctuary received a total of 26.5 tons of cooling from 10 evaporators.

"Instead of having an on/off system sure to gobble large chunks of the operating budget, our installed system can quietly glide from 8,500 Btuh to the full 26.5-tons as needed and will react via on-board sensors wherever the congregation crowd is seated — all the while sipping only the energy required to meet demands for congregant comfort," noted Yates.

Large capacity, three-ton units were installed to throw air over large distances; a requirement for the 5,000 sq ft, 65-ft high sanctuary.

The church's 6,220-sq-ft social hall is located downstairs, on the opposite end of the building from the sanctuary. Unlike the sanctuary, where the heat load is greatly dictated by the giant stained-glass windows, the social hall has a different need for cooling. The area is often used for activities, when people create nearly twice as many Btuh as they would sitting in a sanctuary pew. There is also a large kitchen, raising the cooling needs when in use.

The social hall is one large room separated into four smaller areas by divider curtains. Each of these areas and an adjacent classroom were zoned separately. This way, if a group of people needs only half the hall, no energy is wasted by cooling the unused areas. The social hall is conditioned with 25.5 tons of cooling, delivered by nine separate air handlers. "Here again, the social



FIGURE 3. Installation of an indoor wall-hung evaporator.

hall and classrooms can work together, or separately, anywhere between 8,500 Btuh and full capacity,” explained Yates.

The 26 air handlers throughout the church connect to 23 condensing units outside, all but five of which are in a gated alley between the church and an adjacent building. To minimize their footprint, the units are racked and stacked on top of each other, two high.

On the other side of the church, the remaining five units were hung 15 ft off the ground from the exterior wall of the church. Fujitsu’s condensing units are front discharge, so mounting them close to the brick wall was no problem. As long as the back of the unit has at least four inches of clearance, efficiency isn’t affected.

“With limited outdoor space, we knew we were going to have to get creative. Fujitsu makes that a little easier,” said Yates. F.W. Behler, Inc. installs a lot of mini-splits, not only because of the efficiency, but also because of how quiet they are (the Fujitsu evaporators run as low as 22 decibels).

Before installation of the system, Yates was asked to appear before the congrega-

tion to present his plan for the new system. “Yates was very helpful in designing the system custom to our needs, and he did a great job explaining it to the congregation,” said church member Steve Green. “His company did an excellent job installing the systems. Their work is superb, and the systems are quiet and comfortable beyond our expectations. Because of the new comfort we now have, we’ve also had more summer weddings and events here, and they help to pay the bills.”


Addressing the congregation one Sunday morning after completion of the job, Yates left them with a clever parting shot.

“Y’know, Pastor, you’re in control of this environment,” he said with a wink. “If the congregation gets too comfortable in the sanctuary and forgets what a blessing it is to have A/C after so many years without it, you can always call upon a higher power to remind them. The remote control will be right in your hand. It’s small and easily concealed.

“Maybe, with the wave of a hand ... you could wield mystical powers,” he concluded. “That’d make ‘em more attentive to the sermon.” **ES**

Vastyan, a journalist whose work focuses on the plumbing and mechanical and radiant heat industries, owns Common Ground, a trade communications firm based in Manheim, PA. Vastyan is a graduate of Penn State University. He also served as a U.S. Army journalist for four years, winning the FORCES Command Journalist of the Year award in 1984. He can be reached at 717-664-0535, or at cground@ptd.net.





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