

Consulting Engineer Has Repeated Success With Therma-Fuser VAV Diffusers

HATBORO, Pennsylvania — For the past 15 years, William A. Royle Jr. & Associates has provided architects with engineering expertise in HVAC, plumbing and sprinkler design systems. The company's experience and design savvy have been used not only in standard office buildings, but also in medical facilities, spas, clubhouses and large municipal installations.

"We have always tried to use the best technology available," says William Royle, Jr., engineer and owner of the company bearing his name. "Perhaps one of our best discoveries was thermally powered VAV, which we used for the first time in 1980." That project—the main office of a manufacturing facility—proved so successful that it has been in use by the engineers at Royle ever since.



William Royle, Jr.

According to Royle, thermally powered VAV provides a number of benefits either not possible with conventional types of VAV or, if possible, only at increased expense. Because they require no external controls or wiring and operate well in low pressure ductwork, thermally powered diffusers provide lower installation costs. Maintenance costs also tend to be lower, because there are fewer moving parts and many users report substantial energy savings resulting from lower pressure requirements.

Perhaps one of the most important features, however, is the individual temperature control that is possible with thermally powered VAV diffusers. Recent surveys by BOMA indicate that discomfort is one of the major complaints received from building tenants. One office may be too cold, while another on a sunny exposure may be too hot. In the past, individual temperature control was possible only at significant expense and, even then, it often did not work well. In addition to handling temperature discomfort problems, thermally powered dif-

fusers also help solve problems such as dumping and stagnant air.

"Over the years, we have found that thermally powered VAV makes clients happy," says Royle. "They also make it easy for us to solve heating and cooling problems that previously required much more design work."

Thermally Powered VAV Provides Comfort to Senior Citizens

Recently, Royle designed the HVAC system for a clubhouse in a retirement village that he describes as a "heating and cooling nightmare. The 50,000 sq. foot, single-story building was irregularly shaped and had large areas of glass conducive to hot spots. In addition, one area of the building was adjacent to the indoor swimming pool, which created additional problems."

To make matters worse, the clubhouse roof was peaked in some areas, flat in others, creating additional heat gain problems in the flat areas. Finally, the developer insisted on heat pumps, which don't work well with conventional VAV. "Heat pumps require a constant CFM, and standard VAV can't provide that," says Royle. "In fact, we are probably one of the first engineering consulting firms to be able to use VAV with heat pumps, thanks to thermally powered units."

To solve the problem, Therma-Fuser, thermally powered VAV modules from Acutherm, were installed. According to Royle, Acutherm pioneered the efforts in thermally powered VAV and is the leading manufacturer of such systems today.

"We had other options," says Royle, "but there were problems with them." One choice was to install an automatic temperature control system, which would have been complicated and would have cost twice as much as the Therma-Fusers. The other possibility was installation of multiple air conditioning units. This would have been extremely expensive in terms of both installation (30 to 40 percent higher) and operational costs (30 percent higher). And, the peaked portions of the roof would have made physical installation of the units all but impossible.

To implement the clubhouse installation, Royle began with ten rooftop heat pumps. Each heat pump had a supply duct extending to a specific area within the clubhouse. The supply ducts were



Front View of Clubhouse

all straight, because the building's shape precluded use of looped ductwork. Branch ducts run off of the supply duct to each of 125 Therma-Fuser thermally powered VAV diffusers. Pressure in the ductwork is maintained at .15 inches of water.

Static pressure sensors are located in each main duct, approximately two-thirds of the way from the fan. A return air duct feeds back into each rooftop unit. A by-pass exists between the supply and return air ducts, with a motorized damper. When enough Therma-Fusers close, to raise the static pressure in the duct, the bypass damper opens and returns air back into the unit, thereby maintaining a constant CFM.

Keeping the State Government Cool

Another successful Royle installation is a new office building housing state government workers in Bayonne, New Jersey. The four-story, rectangular structure features large glass areas on north and south exposures and no windows at all on the east/west exposures.

The glass areas created a heat fluctuation problem which Royle solved in a unique way. He installed baseboard heat to compensate only for heat loss through the walls and windows. The baseboard thermostats were then factory-set at 70 degrees to prevent overheating. The baseboard radiation works in conjunction with the Therma-Fusers, which are factory-set at 74 degrees. A dead band is therefore provided that prevents the

(Continued)



energy waste of heating and cooling simultaneously.

"This is a good way to deal with heat loss, and I have used it in a number of similar situations," says Royle.



State Gov't. Building—Bayonne, N.J.

Royle installed a rooftop air conditioning unit for each floor with supply air shafts terminating in looped ductwork systems on each level. The supply and return air shafts run parallel to one another, with a by-pass between them. Static pressure controllers are located about midway through each looped ductwork system. Each floor also has 15 Model HC heating and cooling Therma-Fuser units.

First costs ran approximately 30 to 40 percent less than they would have with conventional VAV. "The state workers have been in since February, 1988," says Royle. "When we went back for final inspection in the summer, we received nothing but compliments on the heating and cooling system."

Therma-Fusers Meet Retrofit Problems with Ease

Thermally powered VAV is also an economical answer to many retrofit problems as well as for new construction. When a well-known law office took over a 24,375 sq. ft. three-story brick building in Norristown, Pennsylvania, "travelling shadows" created a problem. In this phenomenon, shadows cast by adjacent structures onto the law office create temperature fluctuation problems that can wreak havoc with conventional heating and cooling systems.

According to Royle, the existing HVAC equipment could not be salvaged. The air conditioning system was at least 30 years old, the ductwork was disintegrating, and the hot water boiler was in terrible condition. "We decided to gut the entire HVAC system and start from scratch," says Royle.

The new design consists of a "split system" air conditioning set-up on the first and second floors, with two air handling units located in the ceiling of each floor connected to condensing units on the roof. This was necessary because the building owner didn't want to give up floor space to supply and return air shafts.

On the first floor, a straight ductwork system delivers air to 22 Therma-Fusers at .15 inches pressure. Static pressure sensors are located about two thirds of the way from the air handling units. The second floor has a similar configuration, however, the Therma-Fusers are not yet installed.

According to Royle, this floor is rental space, and the thermally powered VAV

units will simply be dropped into the ceiling grid in the proper location once the new tenant has established an office layout.

"The units are so easy and fast to install that costs are held to a minimum," says Royle. "And moving a unit is no problem at all. This is a real change from the old days when, if you didn't get it right the first time, you could count on significant expense and disruption of office work to correct the mistake."



Law Office in Norristown, PA

The third floor uses continuous loop ductwork and is divided into four exterior and one interior zones. Thirty-eight diffusers are installed here.

"The Therma-Fusers make it easy to do what is necessary on each floor," says Royle. "You could say that their flexibility and ability to provide solutions in difficult design situations makes them popular with my engineers. The architects and building owners like thermally-powered VAV because of the economies provided, while tenants appreciate a comfortable working environment made possible by individual temperature control. In short, thermally-powered VAV diffusers create a win-win situation for all involved."



1766 Sabre Street
Hayward, CA 94545
(510) 785-0510
FAX: (510) 785-2517