

# Therma-Fuser™ VAV Diffusers Deliver Low-Temperature Air, Lower Costs to West Market Street Office Building

## *42° Air Comfortably Introduced Directly into the Rooms*

GREENSBORO, North Carolina — Benner & Fields, Inc., a design/build firm specializing in mechanical systems for commercial and industrial clients in the eastern United States, prides itself on delivering what clients want. When it comes to HVAC systems, clients want comfort and low first costs. With the help of Therma-Fuser™ VAV diffusers from Acutherm, Benner & Fields can deliver exactly what's required.

According to Philippe Vercaemert, senior vice-president of Benner & Fields, the Therma-Fuser units recently helped his company step in at the last minute and replace a VAV design that was being considered by the client, Koury Corporation, for its West Market Street office building in Greensboro, NC.

"Koury wanted to use ice storage and low temperature air to control operating costs, and then wanted ways to control first costs," says Vercaemert. "The other plan called for series fan-powered VAV boxes. By replacing

them with Therma-Fuser units, we were able to reduce first costs by about \$1 per square foot. On a 50,000 square-foot office building, that saved around \$50,000. Like all of our clients, this one wanted to keep first costs under control."

### Low Temperature Air and Therma-Fuser VAV Diffusers

The building in question is the West Market Street Office Building, a new, three-story structure of 50,000 square feet, with glass and brick veneer. Koury wanted an ice storage plant to help reduce overall life-cycle costs, figuring that by doing so, HVAC electric costs could be cut by 10 percent. However, the owner also wanted to keep first costs low. By turning to Therma-Fuser VAV modules, Vercaemert and his team submitted a bid that was 10 percent lower than the one for the system with fan-powered boxes.

"We had used Therma-Fuser VAV modules in other projects, and they

*"By replacing (series fan powered boxes) with Therma-Fuser units, we were able to reduce first costs by about \$1 per square foot."*

—Philippe Vercaemert

had worked exceptionally well," says Vercaemert. "Plus, Acutherm made available test results proving that their modules would work with low-temperature air."

The HVAC industry typically delivers 55° air for cooling. Lowering the air temperature to 42° would enable them to use smaller air handlers and ductwork, thereby lowering first costs. In addition, labor costs would be cut significantly, because Therma-Fuser units install just like a diffuser. They require no electrical connections. Finally, the costs typically associated with controls were cut in half because Therma-Fuser modular diffusers require no external thermostat.

### Teaching a New Building Old Tricks

The trick with low temperature air is introducing it into the room so that it doesn't "dump" into the occupied zone making occupants uncomfortable. Standard VAV boxes with fixed opening diffusers typically cannot handle this function, because the denser, low-temperature air drops at lower turn-down velocities, sinking

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West Market Street Office Building



to a level that affects a room's occupants.

One option is to use series continuous fan powered boxes to mix the cold air supply with air from the return plenum, thereby raising the air temperature and introducing it into the room through fixed opening diffusers at constant volume and a fixed higher velocity.

Variable opening Therma-Fuser modules offer a better option. By keeping discharge velocity high (approximately 1500 fpm at both design and turndown airflows) Therma-Fuser modules create a high induction and rapid entrainment of room air into the supply air. This mixing quickly raises the temperature. In a 74°F room, 40°F supply air is warmed to 70°F within 2.5 horizontal feet of the diffuser, with less than two inches of drop at both full and part flows. Within four horizontal feet of the diffuser, and less than three inches drop, the air is warmed to room temperature.

## The Plan

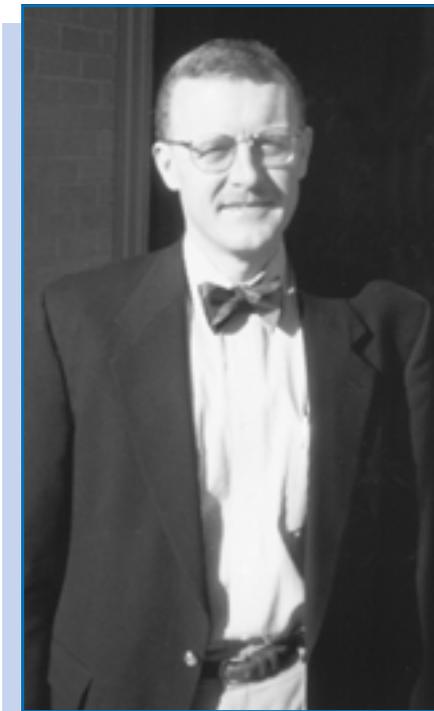
Koury accepted Benner & Fields' lower first-cost design. Outside of the building, the ice storage plant comprises a 100-ton capacity York air-cooled chiller and a Baltimore AirCoil ice storage with a nominal latent capacity of 761 ton-hours.

Twenty-five percent ethylene glycol solution is pumped to air handling units on each floor of the West Market Street building. There are three small air handling units operating in parallel on every floor. A constant supply of outside air is introduced through these air handling units.

*"Maintenance costs and tenant comfort have both improved in the low-temperature, Therma-Fuser equipped buildings."*

—Gene Greer

A common cold air duct loop on each floor supplies a mixture of outside and recirculated air. The trunk duct on each floor is approximately 30 x 24 inches, and static pressure is main-



*Philippe Vercaemert—senior vice-president of Benner & Fields.*

tained at less than 1/4-inch wg. Run-outs connect the main duct to the Therma-Fuser units. There are approximately 50 Therma-Fuser modules on each floor. Return air is handled via the ceiling plenum. The low-pressure drop ducts make possible a low-cost, low-power and low-sound fan.

"The pressure profile is very even," says Vercaemert. "We don't need static pressure sensors. The layout let us eliminate all static pressure controls, which also helped keep first costs low."

The building is heated through a perimeter heating system comprising a series of fan coil units with an independent air distribution system.

## Fewer Complaints, Lower Maintenance Costs

In addition to lower first costs, the Therma-Fuser diffusers offer additional benefits—comfort and lower operating costs. Each unit creates its own VAV zone, and there are many more zones than those provided by a series box with multiple diffusers. As a result, there are fewer complaints about discomfort due to temperature.

There are also fewer complaints about noise, because the series fan powered VAV terminals have been eliminated.

More zones also results in energy savings, because no space is over-cooled. Further energy savings are achieved because Therma-Fuser diffusers don't need electric motors.

Therma-Fuser modules also adapt easily to office layout changes. No zone is split when office walls are put up or moved, a common problem with fan powered boxes.

The units are also highly reliable, reducing maintenance costs. In fact, some customers have 20-year old Therma-Fuser units that have never required maintenance.

The Therma-Fuser units work on a simple concept. The controls and thermostat are built in and adjustable to maintain temperature to within two degrees of the set point. The units automatically vary the air flow when they sense a temperature change away from the set point, controlling delivery of cooled air into a space in response to the temperature within the space.

According to Gene Greer, vice-president of facilities for Koury Corporation, since start-up in June, 1997, the new cooling system has been a successful money-saver, as projected.

"With Therma-Fuser units, we can provide individual temperature control within each space," says Greer. "Compared to other buildings that I manage with standard VAV installations, complaints in the new buildings are down significantly. In terms of maintenance, we might have to set the temperature in a diffuser once, possibly twice, but that's it. Maintenance costs and tenant comfort have both improved in the low-temperature, Therma-Fuser equipped buildings."



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