

Therma-Fuser™ VAV Critical to Earning All Ten LEED® Credits for Optimizing Energy



THE GOAL

For over 30 years StopWaste.Org has been helping Alameda County, California, residents and businesses adopt sustainable consumption and disposal habits. Therefore, there was no question that the 14,000 square foot, two story Oakland, California building that it purchased and renovated for its offices had to be green. The initial goal was a LEED Silver, but as the project progressed StopWaste.Org decided to aim for the highest possible rating, a LEED Platinum. An important part of achieving this goal was to earn all of the possible LEED credits for optimizing energy performance.

THE SYSTEM

To achieve the ten energy performance points, StopWaste.Org asked Rumsey Engineers, an Oakland, California based firm with extensive experience designing low energy building systems, to make the building and its HVAC systems far more efficient than a standard building – using at least 40% less energy than a standard building built to meet the stringent state Title 24 energy code.

Energy modeling was an important design tool used to optimize the building's energy performance. Modeling showed that combining increased wall insulation levels with high performance windows allowed for both large system control zones and also eliminated the need for a perimeter heating system. The investment in the envelope allowed the design team to completely eliminate reheat: this yielded significant construction cost and energy savings. The building was divided into four master zones; perimeter and core offices on the second floor, plus perimeter offices and a large board room on the first floor. The three office master zones are conditioned using a high efficiency packaged DX and gas heat rooftop air handling unit with a variable speed fan. The master zones are subzoned with 29 model ST-HC and two model TK-HC Therma-Fuser thermally powered VAV diffusers, manufactured by Acutherm.

Therma-Fuser diffusers were selected in order to gain energy savings that VAV boxes could not provide, and to avoid breaking the project budget. Rumsey Engineers' detailed energy models, created using software based on the widely used DOE2.1E engine, calculated that these systems use less energy

than a standard VAV box based system: the energy savings are realized from four sources. First, Therma-Fuser diffusers allow for economical control of small individual zones, preventing over cooling and over heating when spaces are unoccupied and providing a good measure of local control to the large and diverse system zones. Second, turndown of a Therma-Fuser system is not limited by the need to measure air velocity: this allows a very low ventilation-only minimum flow rate. This essential feature eliminates localized overcooling (no reheat system was installed or budgeted). Third, the total pressure drop over the VAV box is eliminated, saving fan energy. Finally, Therma-Fuser diffusers are ideal for a very low pressure system, this saves additional fan energy. Also, a major cost was eliminated because the Therma-Fuser diffusers did not require any external controls or electrical power: their unique design incorporates temperature-based damper actuation provided by ambient room temperature.

THE CONTROLS

Controls were kept as simple as possible to minimize project costs and to protect against efficiency decay: the inevitable misadjustments, overrides, and sensor drift that increase the energy use of more complex control systems over time.

The use of Therma-Fuser diffusers in place of VAV boxes with their accompanying controls, combined with the elimination of reheat, met the client's demands for tight, zoned control and resulted in significant budget savings. Because of the high efficiency goals, these savings were invested in high efficiency package units with variable speed fans and modulating gas valves in the heating sections.

Four carbon dioxide sensors monitor carbon dioxide levels; this indirectly detects the number of people in the building and increases or reduces the amount of outside air mixed in with return air before it is sent out to the zone. Airflow volume is controlled by the Therma-Fuser diffusers via the fan pressure control, while the CO2 sensors actuate outside air dampers.

THE RESULT

StopWaste.Org received a total project score of 54, all ten credits for optimizing energy performance and a LEED Platinum certification. Software energy modeling shows that the building outperforms Title 24-2005, California's stringent energy code, by 47%. "Occupants' comfort, energy-efficiency AND an affordable system – we wanted all three and were able to get them. Getting a LEED Platinum rating is icing on the cake," said Wendy Sommers, Senior Program Manager at Stopwaste.org.



The final scorecard of LEED points for StopWaste.Org is as follows.

54 points out of possible 69 (52 required for Platinum).

10 in Sustainable Sites

4 in Water Efficiency

14 in Energy and Atmosphere

10 **Optimize Energy Performance***

- 2 On-Site Renewable Energy
- 1 Enhanced Commissioning
- 1 Green Power

8 in Materials and Resources

- 2 Building Reuse
- 2 Construction Waste Management
- 1 Materials Reuse
- 1 Recycled Content
- 1 **Local/Regional Materials***
- 1 Certified Wood

5 in Innovation & Design Process

13 in Indoor Environmental Quality

- 1 Outdoor Air Delivery Monitoring
- 2 Construction IAQ Management Plan
- 3 Low-Emitting Materials
- 1 Indoor Chemical & Pollutant Source Control
- 1 Controllability of Systems, Lighting
- 1 **Controllability of Systems, Thermal Comfort***
- 1 **Thermal Comfort, Design***
- 1 Thermal Comfort, Verification
- 2 Daylight & Views

***The Therma-Fuser system assisted with a total of 13 points of the 54 awarded.**