

# THERMA-FUSER™

VARIABLE AIR VOLUME DIFFUSER SYSTEMS



Therma-Fuser Systems™

## SUSTAINABLE DESIGN GUIDE



**StopWaste.Org**  
LEED-NC Platinum

**Energy Foundation**  
LEED-CI Platinum

**Adobe East Tower**  
LEED-EB Platinum

**Standard Refrigeration**  
LEED-NC Platinum

**SUSTAINABLE DESIGN**  
FORM 010.901 REV 0911



### A Therma-Fuser™ VAV Diffuser System Can Help Achieve Credits under the LEED® 2009 Green Building Rating System

The US Green Building Council's (USGBC) mission is "To transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life." The USGBC LEED® Green Building Rating System is a performance oriented system where credits are earned for satisfying certain criteria. LEED certification applies only to green building projects, but individual products can contribute to points under the rating system.

Therma-Fuser™ diffusers will serve as an integral part of the HVAC system in a LEED certified building by:

- A) Creating the ultimate low energy approach by designing an all low pressure, low turndown, individually zoned system.
- B) Providing Individual Temperature Control.
- C) Maintaining Excellent Thermal Comfort.
- D) Producing High Room Air Change Effectiveness.
- E) Monitoring Individual Spaces.
- F) Offering Innovative Benefits.

Up to 26 credits may be influenced by using a Therma-Fuser system – over half way to a LEED certified building!

The following pages explain how a Therma-Fuser system can help achieve buildings that are environmentally responsible, profitable, and healthy places to live and work.

## How Therma-Fuser Diffuser Systems Can Help

### A) Create the ultimate in low energy systems and achieve:

#### New Construction EA Prerequisite 2: Minimum Energy Performance

Whole building energy simulation demonstrating 10% improvement for new buildings (5% improvement for major renovations) over Appendix G of ASHRAE 90.1-2007 (or Title 24-2005 Part 6). Or prescriptive compliance with ASHRAE Advanced Energy Design Guides for small buildings. Or prescriptive compliance with Advance Buildings Core Performance Guide.

#### New Construction EA Credit 1: Optimize Energy Performance

Whole building energy simulation demonstrating 12% to 48% improvement over Appendix G of ASHRAE 90.1-2007. Or prescriptive compliance with ASHRAE Advanced Energy Design Guides for small buildings. Or prescriptive compliance with Advance Buildings Core Performance Guide.

Also applicable to:

Commercial Interiors - EA Prerequisite 2 and EA Credit 1.3  
Existing Buildings O&M - EA Prerequisite 2 and EA Credit 1  
Schools - EA Prerequisite 2 and EA Credit 1

A Therma-Fuser diffuser system can save energy by -

- a) Creating all low pressure systems with low energy lower horsepower fan motors.  
Therma-Fuser diffusers function at low pressure between 0.25"wg and 0.05"wg. Designing an all low pressure system will reduce the pressure by 1"wg to 1.25"wg from a typical medium pressure VAV system<sup>1</sup>.
- b) Reducing fan energy with a variable frequency drive when the VAV system turns down.  
Therma-Fuser diffusers are a VAV damper, actuator and thermostat packaged in a diffuser. Tests run on two similar floors of the same building where on one floor a variable speed drive was added, resulted in annualized energy savings of 77,948 kWh for the floor with the variable speed drive<sup>2</sup>.
- c) Creating small zones of control  
Each Therma-Fuser diffuser is a zone of control providing individual room control - refrigeration and heating energy is reduced because no portion of the building is over cooled or over heated<sup>3</sup>.
- d) Turning down more than other VAV terminal units further reducing fan energy.  
To maintain control, typical pressure independent VAV terminal units can only turndown to 25-30%. Therma-Fuser diffusers can turndown to less than 10% and maintain individual temperature control. This additional turndown increases the savings achievable by a variable speed drive on the fan and further reduces over cooling and over heating.
- e) Requiring no additional energy to operate.  
The Acutherm Therma-Fuser diffuser is not electric, pneumatic or system powered. It is powered by the temperatures in the room and the temperatures in the duct.
- f) Simplifying controls.  
Simple controls protect against "efficiency decay", the inevitable maladjustments, overrides and sensor drift that increase the energy use of more complex systems.

See Acutherm Form 5.2 Designing Modular VAV Systems for more information.

<sup>1</sup> Given a 50,000cfm system and a 75% efficient fan motor, that is approximately a 10hp to 12hp reduction on the fan motor and a \$10,000 to \$12,000 saving per year to run the motor.

<sup>2</sup> "Side-by-Side Test Program Verifies Variable-Frequency Energy Savings" article printed in the May, 2004 HPAC Engineering magazine, pg EGB19.

<sup>3</sup> An independent study performed on Trace 600 resulted in significant energy savings (40% on interior zones and 29% on perimeter zones) when individual room control was compared to multi-room control (see Acutherm Form 2.3 for more details).

## How Therma-Fuser Diffuser Systems Can Help (continued):

### **B) Provide Individual Temperature Control with Therma-Fuser diffusers and achieve:**

New Construction - IEQ Credit 6.2: Controllability of Systems – Thermal Comfort

Provide individual temperature controls for 50% of the building occupants to enable adjustments to meet individual needs and preferences. "Individual adjustments may involve individual thermostat controls, local diffusers at floor, desk or overhead levels, ..."

Also applicable to:

Commercial Interiors - IEQ Credit 6.2

Schools - IEQ Credit 6.2

Every Therma-Fuser diffuser is a VAV zone of control providing individual set points for both heating and cooling. Provide individual temperature control with a Therma-Fuser diffuser serving each space.

### **C) Maintain Excellent Thermal Comfort with Therma-Fuser diffusers and achieve:**

New Construction - IEQ Credit 7.1: Thermal Comfort – Design

Design HVAC systems to meet the requirements of ASHRAE Standard 55-2004.

Also applicable to:

Commercial Interiors - IEQ Credit 7.1

Schools - IEQ Credit 7.1

Acutherm's Therma-Fuser diffusers supply superior air distribution by varying the discharge opening as air volume varies producing an almost constant, high discharge velocity. High discharge velocity results in:

- High entrainment, good Coanda effect<sup>1</sup> and rapid mixing of supply air.
- Better throw, higher room air movement and uniform temperature distribution.
- No dumping of cold air and superior penetration of warm air.
- High ADPI<sup>2</sup>

at both design flow and turndown!

### **D) Produce High Room Air Change Effectiveness with Therma-Fuser diffusers and achieve:**

New Construction - IEQ Prerequisite 1: Minimum Indoor Air Quality Performance

Meet the minimum requirements of Sections 4 through 7 of ASHRAE Standard 62.1-2007.

Also applicable to:

Commercial Interiors - IEQ Prerequisite 1

Existing Buildings O&M - IEQ Prerequisite 1

Schools - IEQ Prerequisite 1

Acutherm's Therma-Fuser diffusers supply superior air distribution by adjusting the discharge opening as air volume varies producing an almost constant, high discharge velocity. High discharge velocity results in better throw, enhanced room air movement and improved room air mixing producing increased room air change effectiveness<sup>3</sup> at both design flow and turndown!

See Acutherm Form 2.1 Therma-Fuser VAV Modules Are Better Than VAV Boxes Superior Air Distribution for more information.

<sup>1</sup> The phenomena in which a jet of fluid attaches itself to a nearby surface.

<sup>2</sup> Air Diffusion Performance Index is a technique for measuring comfort.

<sup>3</sup> The ability to deliver ventilation air within the room.

## How Therma-Fuser Diffuser Systems Can Help (continued):

### **E) Monitor Individual Spaces with Therma-Fuser E-Series diffusers and achieve:**

New Construction - EA Credit 5: Measurement and Verification

To provide for the ongoing accountability of building energy consumption over time, install control diagnostics for the corrective action process.

New Construction - IEQ Credit 7.2: Thermal Comfort - Verification

Provide a permanent monitoring system to ensure that building performance meets the desired comfort criteria.

Also applicable to:

Commercial Interiors - EA Credit 3 and IEQ Credit 7.2

Existing Buildings O&M - EA Credit 3.1 and IEQ Credit 2.3

Schools - EA Credit 5 and IEQ Credit 7.2

Monitor air flow rate, space temperature, supply air temperature, space set point and unit status at each diffuser with the Therma-Fuser model EF (or EL) DDC interoperable VAV diffuser and zone static pressure (E-PIM) through the building automation system and trigger alarms for spaces outside set criteria.

The model EF (or EL) diffuser also provides CO<sub>2</sub> sensor compatibility. Reacting to a signal from the building management system, the EF diffuser can switch from controlling space temperature to controlling the air volume into the space.

See Acutherm Form 50.1 The EF Interoperable Therma-Fuser Diffuser for more information.

### **F) Offer Innovative Benefits with Therma-Fuser diffuser systems and achieve:**

New Construction ID Credit 1: Innovation in Design

Innovation in design - significant, measurable environmental performance using a strategy not addressed in LEED 2009. Exemplary performance - substantially exceed a LEED 2009 performance credit (i.e. double the credit requirement).

Also applicable to:

Commercial Interiors - ID Credit 1

Existing Buildings O&M - ID Credit 1

Schools - ID Credit 1

i. Innovative Design – Sustainable: Adapts to Floor Layout Changes

Since each Therma-Fuser diffuser is a VAV zone of control providing individual set points for both heating and cooling, when floor layouts are changed, there is no need to change the HVAC system. (See Acutherm Form 2.5G Therma-Fuser VAV Modules Are Better Than VAV Boxes Easily Adapts to Office Layout Changes for more information.)

ii. Innovative Design – Sustainable: No Required Maintenance

Each thermally powered Therma-Fuser diffuser comes with a 10 year warranty and has no recommended maintenance other than occasional cleaning of the visible surfaces. (See Acutherm Form 2.4G Therma-Fuser VAV Modules Are Better Than VAV Boxes Low to No Maintenance for more information.)

iii. Innovative Design – Thermally Powered

Acutherm Therma-Fuser diffuser's self contained thermal actuator requires no additional energy to operate; not electric (no wires), not pneumatic (no tubing), and not system powered.

## Where Therma-Fuser Diffuser Systems Can Help:

### LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST

*How Therma-Fuser  
Diffuser Systems  
Can Help*

		<b>26 Possible Points</b>	↓
<b>Sustainable Sites - SS</b>			
<input checked="" type="checkbox"/>	Prerequisite 1 Construction activity Pollution Prevention	Required	
<input type="checkbox"/>	Credit 1 Site Selection	1	
<input type="checkbox"/>	Credit 2 Development Density and Community Connectivity	5	
<input type="checkbox"/>	Credit 3 Brownfield Redevelopment	1	
<input type="checkbox"/>	Credit 4.1 Alternative Transportation—Public Transportation Access	6	
<input type="checkbox"/>	Credit 4.2 Alternative Transportation—Bicycle Storage and Changing Rooms	1	
<input type="checkbox"/>	Credit 4.3 Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3	
<input type="checkbox"/>	Credit 4.4 Alternative Transportation—Parking Capacity	2	
<input type="checkbox"/>	Credit 5.1 Site Development—Protect or Restore Habitat	1	
<input type="checkbox"/>	Credit 5.2 Site Development—Maximize Open Space	1	
<input type="checkbox"/>	Credit 6.1 Stormwater Design—Quantity Control	1	
<input type="checkbox"/>	Credit 6.2 Stormwater Design—Quality Control	1	
<input type="checkbox"/>	Credit 7.1 Heat Island Effect—Nonroof	1	
<input type="checkbox"/>	Credit 7.2 Heat Island Effect—Roof	1	
<input type="checkbox"/>	Credit 8 Light Pollution Reduction	1	
<b>Water Efficiency - WE</b>		<b>10 Possible Points</b>	
<input checked="" type="checkbox"/>	Prerequisite 1 Water Use Reduction	Required	
<input type="checkbox"/>	Credit 1 Water Efficient Landscaping	2-4	
<input type="checkbox"/>	Credit 2 Innovative Wastewater Technologies	2	
<input type="checkbox"/>	Credit 3 Water Use Reduction	2-4	
<b>Energy and Atmosphere - EA</b>		<b>35 Possible Points</b>	
<input checked="" type="checkbox"/>	Prerequisite 1 Fundamental Commissioning of Building Energy Systems	Required	
<input checked="" type="checkbox"/>	<b>Prerequisite 2 Minimum Energy Performance</b>	<b>Required</b>	← A
<input checked="" type="checkbox"/>	Prerequisite 3 fundamental Refrigerant Management	Required	
<input checked="" type="checkbox"/>	<b>Credit 1 Optimize Energy Performance</b>	<b>1-19</b>	← A
<input type="checkbox"/>	Credit 2 On-Site Renewable Energy	1-7	
<input type="checkbox"/>	Credit 3 Enhanced Commissioning	2	
<input type="checkbox"/>	Credit 4 Enhanced Refrigerant Management	2	
<input checked="" type="checkbox"/>	<b>Credit 5 Measurement and Verification</b>	<b>3</b>	← E
<input type="checkbox"/>	Credit 6 Green Power	2	
<b>Materials and Resources - MR</b>		<b>14 Possible Points</b>	
<input checked="" type="checkbox"/>	Prerequisite 1 Storage and Collection of Recyclables	Required	
<input type="checkbox"/>	Credit 1.1 Building Reuse—Maintain Existing Walls, Floors and Roof	1-3	
<input type="checkbox"/>	Credit 1.2 Building Reuse—Maintain Existing Interior Nonstructural Elements	1	
<input type="checkbox"/>	Credit 2 Construction Waste Management	1-2	
<input type="checkbox"/>	Credit 3 Materials Reuse	1-2	
<input type="checkbox"/>	Credit 4 Recycled Content	1-2	
<input type="checkbox"/>	Credit 5 Regional Materials	1-2	
<input type="checkbox"/>	Credit 6 Rapidly Renewable Materials	1	
<input type="checkbox"/>	Credit 7 Certified Wood	1	

Where Therma-Fuser Diffuser Systems Can Help (continued):

**LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS CHECKLIST**

*How Therma-Fuser™  
Diffuser Systems  
Can Help*

<b>Indoor Environmental Quality - IEQ</b>		<b>15 Possible Points</b>
<input checked="" type="checkbox"/>	<b>Prerequisite 1 Minimum Indoor Air Quality Performance</b>	<b>Required ← D</b>
<input checked="" type="checkbox"/>	Prerequisite 2 Environmental Tobacco Smoke (ETS) Control	Required
<input type="checkbox"/>	Credit 1 Outdoor Air Delivery Monitoring	1
<input type="checkbox"/>	Credit 2 Increased Ventilation	1
<input type="checkbox"/>	Credit 3.1 Construction Indoor Air Quality Management Plan—During Construction	1
<input type="checkbox"/>	Credit 3.2 Construction Indoor Air Quality Management Plan—Before Occupancy	1
<input type="checkbox"/>	Credit 4.1 Low-Emitting Materials—Adhesives and Sealants	1
<input type="checkbox"/>	Credit 4.2 Low-Emitting Materials—Paints and Coatings	1
<input type="checkbox"/>	Credit 4.3 Low-Emitting Materials—Flooring Systems	1
<input type="checkbox"/>	Credit 4.4 Low-Emitting Materials—Composite Wood and Agrifiber Products	1
<input type="checkbox"/>	Credit 5 Indoor Chemical and Pollutant Source Control	1
<input type="checkbox"/>	Credit 6.1 Controllability of Systems—Lighting	1
<input checked="" type="checkbox"/>	<b>Credit 6.2 Controllability of Systems—Thermal Comfort</b>	<b>1 ← B</b>
<input checked="" type="checkbox"/>	<b>Credit 7.1 Thermal Comfort—Design</b>	<b>1 ← C</b>
<input checked="" type="checkbox"/>	<b>Credit 7.2 Thermal Comfort—Verification</b>	<b>1 ← E</b>
<input type="checkbox"/>	Credit 8.1 Daylight and Views—Daylight	1
<input type="checkbox"/>	Credit 8.2 Daylight and Views—Views	1
<b>Innovation in Design - ID</b>		<b>6 Possible Points</b>
<input checked="" type="checkbox"/>	<b>Credit 1 Innovation in Design</b>	<b>1-5 ← F</b>
<input type="checkbox"/>	Credit 2 LEED Accredited Professional	1
<b>Regional Priority</b>		<b>4 Possible Points</b>
<input type="checkbox"/>	Credit 1 Regional Priority	1-4

**LEED 2009 for New Construction and Major Renovations**

100 base points; 6 possible innovation in Design and 4 regional Priority points

<b><u>LEED Certification</u></b>	<b><u>Points Required</u></b>
Certified	40–49 points
Silver	50–59 points
Gold	60–79 points
Platinum	80 points and above

*Total Possible Credits  
Therma-Fuser™  
Diffuser Systems*

**26**

*Over Half Way  
to Certified!*

Reference: LEED 2009 for New Construction and Major Renovations November 2008