

# THERMA-FUSER™

VARIABLE AIR VOLUME DIFFUSER SYSTEMS



## SUSTAINABLE DESIGN GUIDE



SUSTAINABLE DESIGN  
FORM 010.901 REV 2104



### A Therma-Fuser™ VAV Diffuser System Can Help Achieve Credits under the LEED® v4 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:

- I. Creating the ultimate low energy approach by designing an all low pressure, low turndown, individually zoned system.
- II. Providing individual temperature control and excellent thermal comfort.
- III. Producing high room air change effectiveness.
- IV. Offering design opportunities for quiet operation.
- V. Offering Innovative Benefits.

Up to 21 credits may be influenced by using a Therma-Fuser system – over halfway 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

### I. Create the ultimate in low energy systems and achieve:

#### EA102 Minimum Energy Performance – Prerequisite

1. Whole building energy simulation – ASHRAE 90.1 2010 Appendix G baseline, 5% new construction, 3% major renovation, and 2% core and shell
2. Prescriptive compliance: ASHRAE 90.1 2010 prescriptive + ASHRAE 50% Advanced Energy Design Guide Chapter 4 HVAC and Service Water Heating
3. Prescriptive compliance to Advanced Buildings™ Core Performance™

#### EA103 Optimize Energy Performance

1. Whole building energy simulation: 1-18 Points (1-20 Healthcare, 1-16 Schools) ASHRAE 90.1 2010 Appendix G baseline 6-50% new construction, 4-48% major renovation, and 3-47% core and shell
2. Prescriptive compliance: 1-6 Points to ASHRAE Advanced Energy Design Guide – roofs and walls, glazing, interior and exterior lighting and plug loads

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 020.201 Designing Therma-Fuser™ 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):

### II. Provide Individual Temperature Control with Therma-Fuser diffusers and achieve:

EQ115 Thermal Comfort

Meet both:

Thermal Comfort Design

1. ASHRAE Standard 55-2010
2. ISO 7730:2005 Ergonomics of the Thermal Environment and CEN Standard EN 15251:2007 Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings

Thermal Comfort Control

1. Provide individual thermal comfort controls for at least 50% of individual occupant spaces. Provide group thermal comfort controls for all shared multioccupant spaces.

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.

at both design flow and turndown!

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 and Wall Adjuster serving each space.

### III. Produce High Room Air Change Effectiveness with Therma-Fuser diffusers and achieve:

EQ101 Minimum IAQ Performance – Prerequisite

1. Calculate minimum OA intake with ASHRAE 62.1-2010 ventilation rate procedure, monitor the OA intake, and comply with sections 4-7 Ventilation for Acceptable Indoor Air Quality
2. Meet CEN Standard EN 15251-2007 and EN 13779-2007

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>2</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> The ability to deliver ventilation air within the room.

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

### IV. Low Pressure Low Noise Therma-Fuser diffusers:

#### EQ124 Acoustic Performance – HVAC Background Noise

1. Calculate or measure noise to 2011 ASHRAE Handbook, HVAC Applications, Chapter 48, Table 1 or AHRI Standard 885-2008, Table 15
2. Design sound transmission paths to 2011 ASHRAE Handbook, HVAC Applications, Chapter 48, Table 6

#### Table 1

|                  |                               |       |
|------------------|-------------------------------|-------|
| Office Buildings | Executive and private offices | 30 NC |
|                  | Conference rooms              | 30 NC |
|                  | Teleconference rooms          | 25 NC |
|                  | Open-plan offices             | 40 NC |
|                  | Corridors lobbies             | 40 NC |

#### Table 6

#### Grills, Registers, Diffusers – Path 1

Path 1 – Direct sound – controlled by selecting quiet equipment

Therma-Fuser VAV diffusers can be oversized:

- Possible to oversize because the diffuser will turndown to meet space loads
- Oversizing can produce the same air volumes at lower static pressures and thus lower noise

Acutherm provides both full flow and turndown noise ratings to facilitate designers.

Noise is directly related to velocity and velocity is directly related to static pressure. A low pressure system designed around the Therma-Fuser diffusers is a low noise system.

### V. Offer Innovative Benefits with Therma-Fuser diffuser systems and achieve:

#### IN101 Innovation

Significant, measurable environmental performance using a strategy not addressed

- 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 v4 CHECKLIST

### How Therma-Fuser Diffuser Systems Can Help

#### Location and Transportation

|       |  |    |
|-------|--|----|
| LT101 | LEED for neighborhood development location | 16 |
| LT102 | Sensitive land protection                  | 1  |
| LT103 | High priority site                         | 2  |
| LT104 | Surrounding density and diverse uses       | 5  |
| LT107 | Access to quality transit                  | 5  |
| LT108 | Bicycle facilities                         | 1  |
| LT110 | Reduced parking footprint                  | 1  |
| LT111 | Green vehicles                             | 1  |

#### Sustainable Sites

|       |   |   |
|-------|---|---|
| SS101 | Construction activity pollution prevention    | R |
| SS104 | Site assessment                               | 1 |
| SS105 | Site development – protect or restore habitat | 2 |
| SS107 | Open space                                    | 1 |
| SS108 | Rainwater management                          | 3 |
| SS110 | Heat island reduction                         | 2 |
| SS112 | Light pollution reduction                     | 1 |

#### Water Efficiency

|       |                                   |   |
|-------|-----------------------------------|---|
| WE    | Outdoor water use reduction       | R |
| WE    | Indoor water use reduction        | R |
| WE    | Building-level water metering     | R |
| WE101 | Outdoor water use reduction       | 2 |
| WE102 | Indoor water use reduction        | 6 |
| WE110 | Cooling tower water use reduction | 2 |
| WE112 | Water metering                    | 1 |

#### Energy & Atmosphere

|              |  |               |
|--------------|--|---------------|
| EA101        | Fundamental commissioning and verification | R             |
| <b>EA102</b> | <b>Minimum energy performance</b>          | <b>R</b> ← /  |
| <b>EA103</b> | <b>Optimize energy performance</b>         | <b>18</b> ← / |
| EA106        | Building-level energy metering             | R             |
| EA108        | Fundamental refrigerant management         | R             |
| EA110        | Enhanced commissioning                     | 6             |
| EA118        | Advanced energy metering                   | 1             |
| EA121        | Demand response                            | 2             |
| EA123        | Renewable energy production                | 3             |
| EA126        | Enhanced refrigerant management            | 1             |
| EA128        | Green power and carbon offsets             | 2             |

Where Therma-Fuser Diffuser Systems Can Help:

**LEED v4 CHECKLIST (continued...)**

*How Therma-Fuser  
Diffuser Systems  
Can Help*

**Material & Resources**

|       |  |   |
|-------|--|---|
| MR101 | Storage and collection of recyclables                                      | R |
| MR103 | Construction and demolition waste management planning                      | R |
| MR108 | Building life-cycle impact reduction                                       | 5 |
| MR112 | Building product disclosure and optimization – environmental product decl. | 2 |
| MR114 | Building product disclosure and optimization – sourcing of raw materials   | 2 |
| MR115 | Building product disclosure and optimization – material ingredients        | 2 |
| MR123 | Construction and demolition waste management                               | 2 |

**Indoor Environmental Quality**

|              |   |          |              |
|--------------|---|----------|--------------|
| <b>EQ101</b> | <b>Minimum IAQ performance</b>            | <b>R</b> | <b>← III</b> |
| EQ104        | Environmental tobacco smoke (ETS) control | R        |              |
| EQ110        | Enhanced IAQ strategies                   | 2        |              |
| EQ112        | Low-emitting materials                    | 3        |              |
| EQ113        | Construction IAQ management plan          | 1        |              |
| EQ114        | IAQ assessment                            | 2        |              |
| <b>EQ115</b> | <b>Thermal comfort</b>                    | <b>1</b> | <b>← II</b>  |
| EQ117        | Interior lighting                         | 2        |              |
| EQ121        | Daylight                                  | 3        |              |
| EQ123        | Quality views                             | 1        |              |
| <b>EQ124</b> | <b>Acoustic performance</b>               | <b>1</b> | <b>← IV</b>  |

**Innovation**

|              |                              |          |            |
|--------------|------------------------------|----------|------------|
| <b>IN101</b> | <b>Innovation</b>            | <b>5</b> | <b>← V</b> |
| IN102        | LEED accredited professional | 1        |            |

**Regional Priority**

|      |                   |   |
|------|-------------------|---|
| RPc1 | Regional priority | 4 |
|------|-------------------|---|

| <b>LEED</b>                 | <b>Points</b>          |
|-----------------------------|------------------------|
| <b><u>Certification</u></b> | <b><u>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*

**21**

*Over Halfway  
to Certified!*

Reference: LEED v4 User Guide October 2013