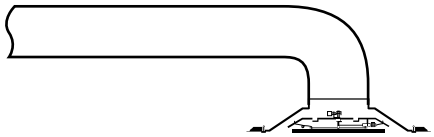
# THERMA-FUSER™ VAV DIFFUSERS

## THE FACTS ABOUT VAV HEATING

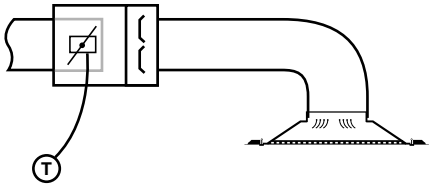
### THESE WORK

### THIS DOESN'T

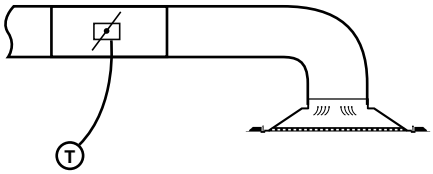
**VAV Heating With A TF-HC Therma-Fuser Diffuser**



**Constant Volume Heating With Fixed Diffuser and VAV Box**




**VAV Heating With Fixed Diffuser and Modulating Damper or Box**

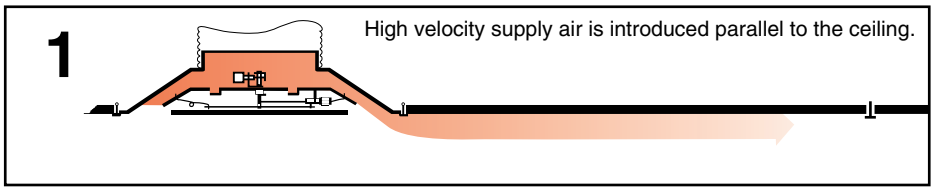


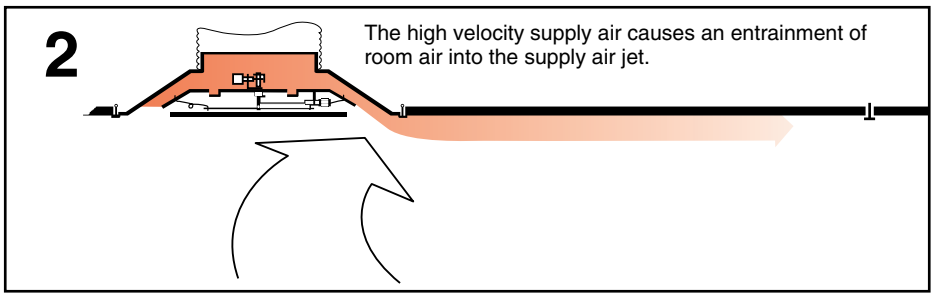

## HIGH VELOCITY: KEY TO OVERHEAD HEATING WITH AIR

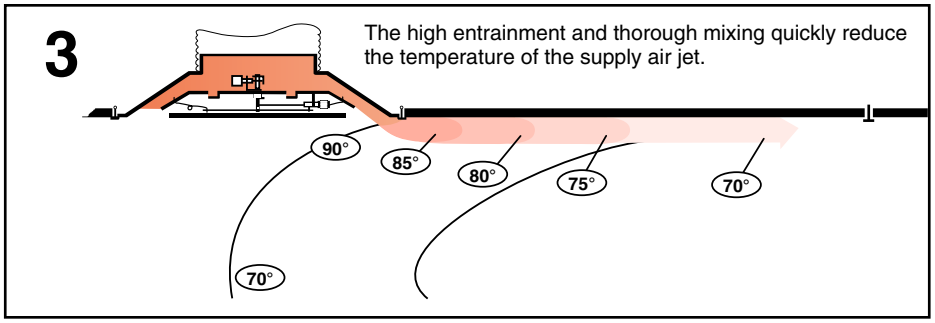
The key to successful heating from the ceiling is relatively high discharge velocity, which provides high entrainment and good room air motion. Rapid mixing produced by entrainment quickly lowers the temperature of the supply air, eliminating buoyant warm air at the ceiling. Good room air motion further reduces stratification by gently circulating the mix throughout the room.

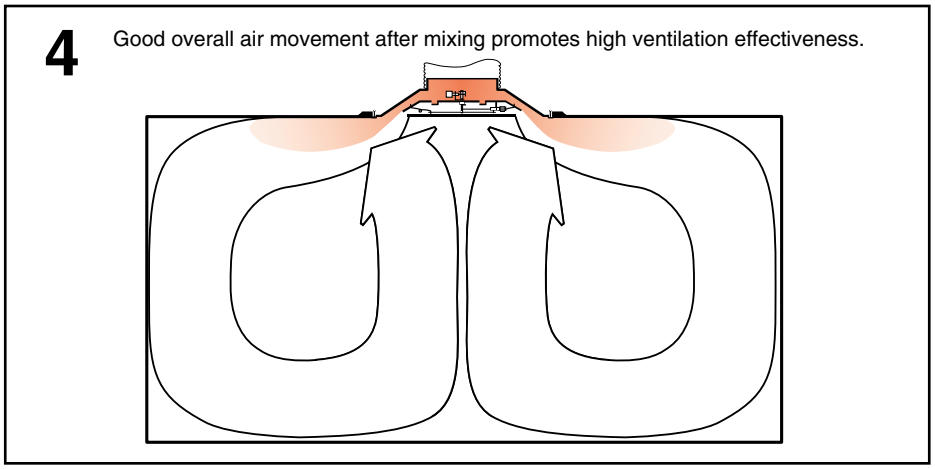
The Therma-Fuser diffuser's variable opening results in an almost constant high velocity at both full flow and turn down. By varying supply air volume directly at the edge of the diffuser, Therma-Fuser diffusers maintain a discharge velocity of approximately 1500 fpm/7.6 m/s even at low flows.

Fixed diffusers can have high discharge velocity when using constant volume supply. As a result heating is often done with either fan powered boxes or by going to a fixed flow when using standard VAV boxes.

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# DESIGN GUIDELINES

## 1. Follow standard industry guidelines for overhead air heating.

- Heat loss less than 350 BTU/hr/lineal foot/336 W/m
- Indoor glass surface temperature 50°F/10°C or greater
- Supply air temperature less than 95°F/35°C.

Buildings meeting ASHRAE 90.1-1989 are within these guidelines.

Sufficient for buildings with heat loss less than 350 BTU/hr/lineal foot/336 W/m.

## 2. Try to locate Therma-Fuser diffusers so that the distance to the outside wall is between the 100 fpm/.51 m/s and 150 fpm/.76 m/s throw.

Locating Therma-Fuser diffusers is no different than locating standard diffusers. Location is determined by the largest air volume and throw expected, usually the maximum cooling volume. Most guidelines suggest that diffusers be placed so that the 50-100 fpm/.25-.50 m/s velocity just reaches the wall, with the maximum velocity at the wall being 150 fpm/.76 m/s (our preference for outside walls). Maximum installation height for heating is 12 ft/3.7 m heights below 10 ft/3 m are preferred.

Standard guidelines should also be followed when putting multiple diffusers in the same room. When possible the diffusers should be no closer together than twice the throw at the 150 fpm/.76 m/s level. Ideally they should be located somewhere between twice the 50 fpm/.25 m/s and 100 fpm/.50 m/s levels. Where these locations are determined by the cooling air volumes it is certain that the lower heating air volumes will produce throws that fall well within the guidelines.

Therma-Fuser diffusers can be located closer together than other diffusers without risk of opposing air jets forcing cool air into the occupied zone while in the cooling mode. Because high entrainment and thorough mixing warm the cool supply air, it reaches room temperature before it enters the occupied zone.

## 3. Use a four way blow pattern.

Extensive testing in the Acutherm labs shows that for heating, a properly located square Therma-Fuser diffuser with a four way blow pattern produced the highest percentage of points in the occupied zone that fell within the temperature and velocity ranges set by the ASHRAE comfort standard 55-1992. Also tested were three way blow patterns and a linear Therma-Fuser diffuser both located at the window. These produced a lower percentage of points in the ranges set by the comfort standard.

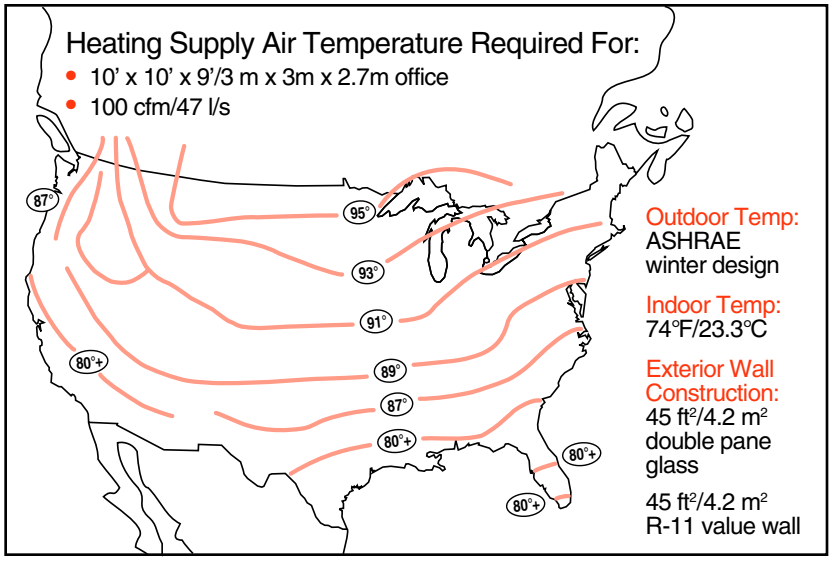
## 4. Maintain supply air temperature between 80°F/26.5°C and 95°F/35.0°C.

The supply air temperature should be chosen as low as possible. This reduces stratification in two ways. First, a lower temperature means the air is less buoyant and mixes better with room air. Second, more air is delivered to the room which aids in mixing of supply and room air. The approximate supply air temperature required can be estimated using the map shown here.

## Why It Is Not Necessary To Blow Warm Air Down Windows

The idea that down blow heating is necessary came from the time when buildings used single pane glass and were not well insulated. Even in cold climates, most of today's buildings with double pane glass and those meeting ASHRAE 90.1-1989 have perimeter heat losses less than 250 BTU/hr/lineal foot/240 W/m. Also, the inside surface temperatures of well insulated double pane glass in cold areas such as Minneapolis (-16°F/-27°C winter design) are well above 50°F/10°C.

These buildings do not approach the guidelines where down blow heating is recommended (350 BTU/hr/lineal foot/336 W/m). In addition, low heat losses mean that spaces in cold climates can be heated with lower temperature air resulting in less stratification. Typical heating supply air temperatures for various regions are shown below.





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