



Therma-Fuser™ Systems



Acutherm was spec'd here

Energy Modeling Guide for Therma-Fuser™ systems

Proven Energy Savings

Energy Savings

Therma-Fuser™ VAV diffusers allow for all low-pressure system designs. No energy is required to operate the diffuser's controls. As U.S. Green Building Council members, Acutherm is proud to produce energy efficient VAV diffusers that prevent over cooling and over heating — producing **15%-47% energy savings** when compared to traditional VAV Systems.

Sustainability

Unlike conventional building controls, Therma-Fuser™ thermally-powered VAV diffusers have no complicated electronics or pneumatics, and as a result require no maintenance. We are so confident of their reliability that we warrant them for 10 years.

Comfort

With each Therma-Fuser™ VAV diffuser acting as an individual VAV zone of control, every area of a building can have separate, optimized temperature settings. The individual selects their comfort setting and the average temperature is maintained within 1½°F/0.9°C. Therma-Fuser™ VAV diffusers also provide a constant discharge velocity with comfort benefits of higher throws, no dumping, better room air movement and uniform temperature distribution.

Experience

Since 1978 Acutherm's thermally powered VAV diffusers have been exceeding people's individual comfort requirements. Our dedication to innovation began with the Acutherm Therma-Fuser™ VAV diffuser and continues with our associated products and accessories.

ACUTHERM PRODUCTS



Square VAV Diffusers



Round VAV Diffusers



Linear VAV Diffusers



Accessories



Pressure Control



Temperature Control

STEPS THAT CAPTURE THE ENERGY SAVINGS OF THERMA-FUSER™ VAV DIFFUSER SYSTEMS USING ENERGY MODELING SOFTWARE:

1. Low Pressure Systems

The Therma-Fuser™ VAV diffuser is a low-pressure terminal device that may be used as the basis of a low-pressure system design.

2. Low Turndown Ratio

The Therma-Fuser™ VAV diffuser is capable of turning down to 10% or lower. A lower turndown ratio means that the cool air may be reduced further, delaying and/or eliminating the use of heat to prevent sub-cooling.

3. Identify High Load Spaces

Spaces that due to usage, schedule and/or location require the most cooling should be identified and individually zoned.



4. Develop a Realistic Model

Averaging simplifies energy modeling, however, applying average schedules and loads across a building does not accurately portray the diversity found in a real building.



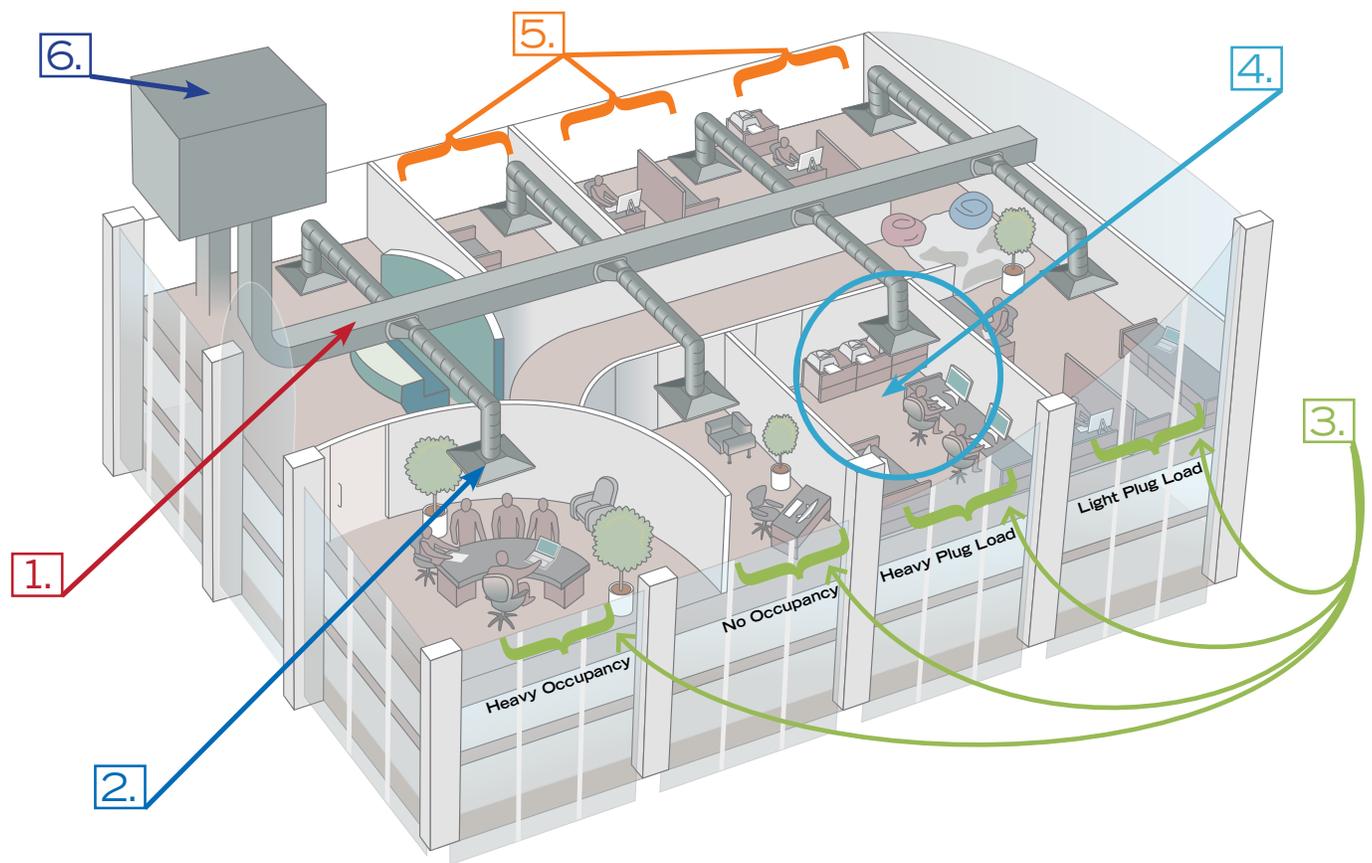
5. Individual Temperature Control

Every Therma-Fuser™ VAV diffuser is a zone of control with a thermostat and modulating damper built in to each diffuser. Many small zones of control prevent overcooling and overheating when individual spaces are unoccupied.



6. Avoid Reheat

Reheating cooled air wastes energy and is prohibited with many energy codes. The best way to avoid re-heat is to eliminate it.



This guide is intended to provide instructions, details, and tips specifically for energy modeling of a Therma-Fuser™ system using EnergyPro and other energy modeling software. A thorough understanding of the software and energy modeling experience are required for accurate building simulation results.

Why EnergyPro Modeling Software?

EnergyPro is a comprehensive energy analysis program providing 8670 (annual hour by hour) energy simulation using the DOE 2.1 engine maintained by Lawrence Berkeley National Laboratories. It conforms to the ASHRAE guidelines and is one of only two software packages currently approved for California's Title-24 (one of the most stringent codes in the world). The software will automatically calculate the loads to ASHRAE 183 and is the only energy modeling program that automatically calculates the baseline building required

by ASHRAE 90.1, Title-24 and LEED for comparison of results. Also included are tools for sizing the mechanical equipment and life cycle cost modeling.

For more information on EnergyPro modeling software, contact:

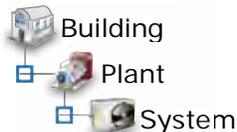
- EnergySoft at (415) 897-6400 or online at www.energysoft.com
- Software Sales at 415.897.6400 ext. 300
- EnergyPro Technical Support and modeling questions at support@energysoft.com

1. Low Pressure Systems (Low Horsepower Fans)

The Therma-Fuser™ VAV diffuser is a low pressure terminal device that may be used as the basis of a low pressure system design. By designing low pressure duct runs using low pressure drop fittings and eliminating unnecessary pressure drops required by other systems, a lower total system pressure may be achieved resulting in the selection of a lower horsepower fan. A reduction of 0.25"wg static pressure can result in a fan motor with 20-25% less horsepower. Reducing static pressure by 0.5"wg and 0.75"wg can reduce fan horsepower by 30-40% and 40-50% respectively.

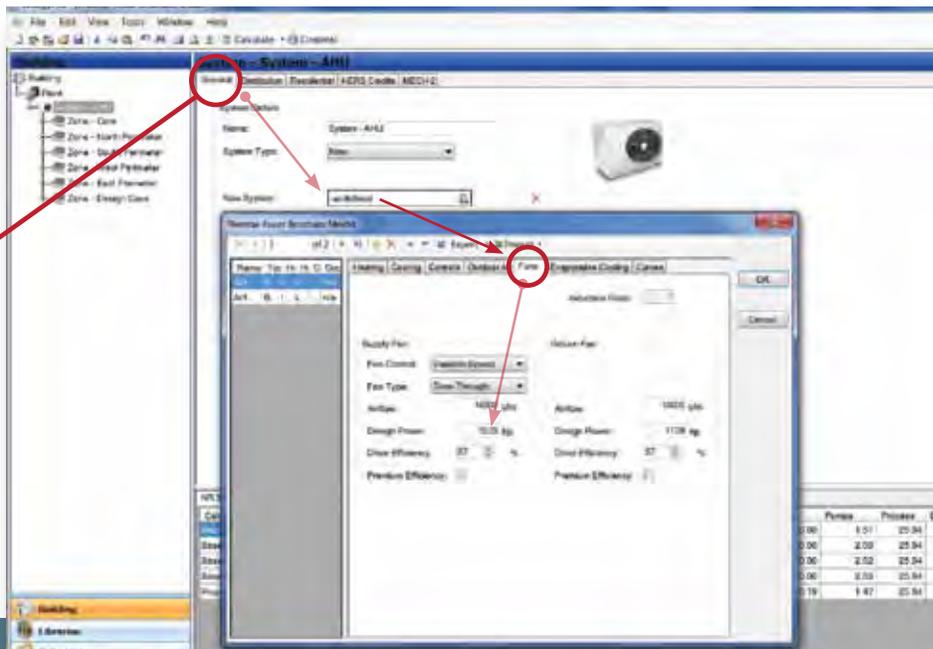
1. Design a low pressure system using the Therma-Fuser™ VAV diffuser as a basis of design.
2. Select the smallest fan with lower horsepower.
3. Enter the fan horsepower into the model as follows:

Go to:



Then:

- Select **General** tab.
- ↳ Select the **System**.
- ↳ Select **Fans** tab.
- ↳ Enter both the Supply and Return Fan Power.



2. Low Turndown Ratio

The Therma-Fuser™ VAV diffuser is capable of turning down to 10% or lower. A lower turndown ratio means that the cool air may be reduced further, delaying/negating the use of heat to prevent sub-cooling. EnergyPro calculates the minimum amount of air required to meet ventilation standards and will automatically increase the turndown ratio where required to meet the standards.

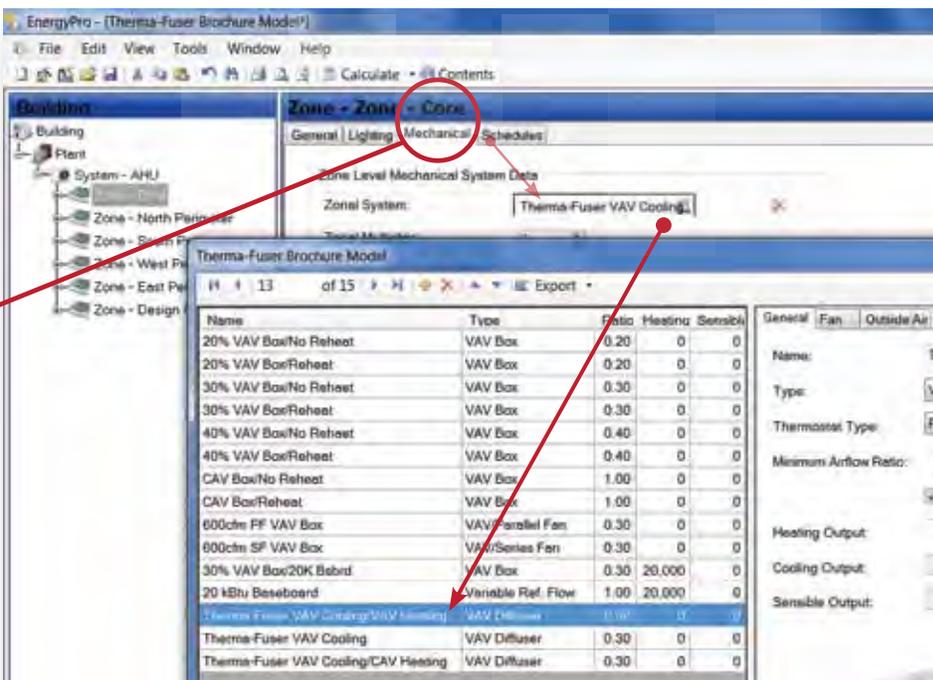
1. Enter the Therma-Fuser™ Diffuser into the model as follows:

Go to:



Then:

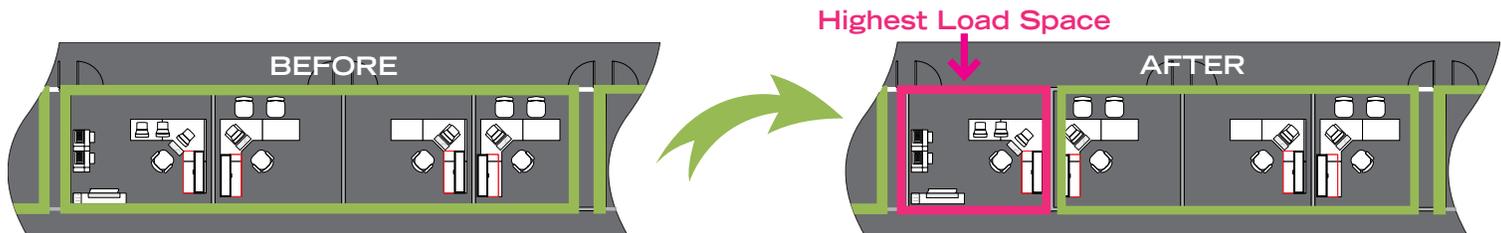
- Select **Mechanical** tab.
- ↳ Select the **System**.
- ↳ Select **Therma-Fuser VAV**.



3. Identify High Load Spaces

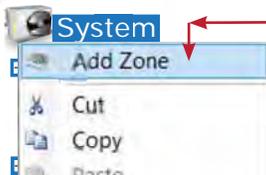
There will be a few spaces in every building where their usage, schedule and/or location is such that the load is consistently high requiring more cooling than most of the other spaces. A good example is an office with multiple monitors, computers, printers and a copier or a break room with a chilled vending machine, a refrigerator and a microwave oven. These spaces should be identified and individually zoned (i.e. do not average them into a zone with other spaces) to correctly model any supply air temperature reset strategies. Modeling an average load across the building will allow the supply air temperature to be warmer than will actually occur producing inaccurate results.

1. Identify the space(s) with the highest loads as seen below, highlighted with pink.



2. Create a zone for each space of high load as follows:

Go to:



Right click on **System** and select **Add Zone**.

Then:

↳ Select the new **Undefined Zone** and complete the information for one space of high load.

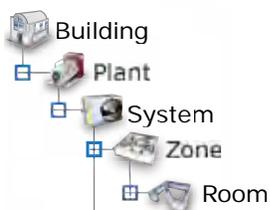
4. Develop a Realistic Model (Do Not Average)

It is easy, but not realistic, to apply an average and use a single load or schedule across a building. Averages do not accurately portray the diversity found between individual rooms in a real building. To more accurately model the building and utilize the Therma-Fuser system's ability to adapt to diversity, use several different loads and schedules.

1. Assign different receptacle loads throughout the zones and apply different process loads where applicable to vary the total load in each zone. For example, an executive office might be 0.45 W/sqft, a typical office 0.8 W/sqft and a small server closet 10 W/sqft.

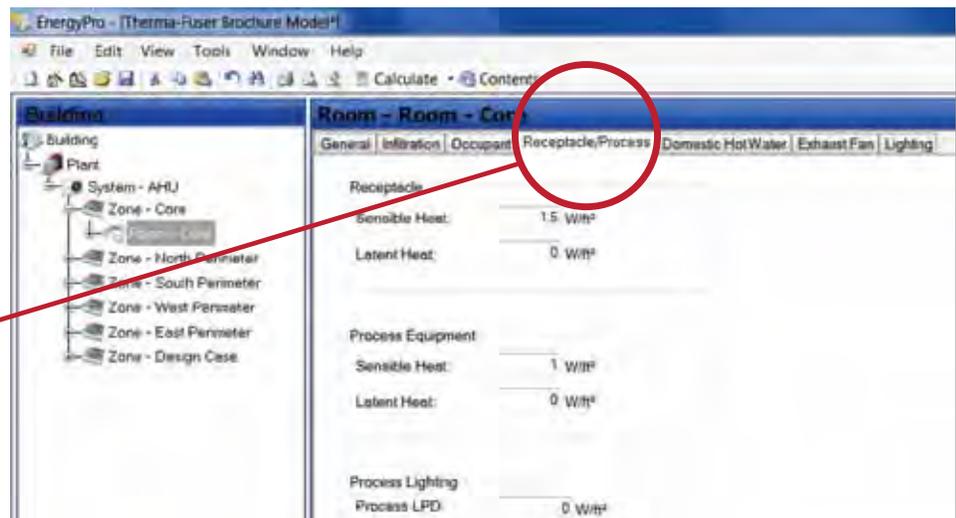
- a. Create different receptacle and process loads as follows:

Go to:



Then:

Select **Receptacle/Process** tab and enter the different loads.



4. Develop a Realistic Model continued...

2. EnergyPro provides a wide range of schedules for occupancy, lighting, receptacles, etc... based upon the ASHRAE standards. These schedules are an average for typical usage. It is quite easy to create a couple of additional schedules in the Schedules Library and then randomly apply these schedules to different zones. Multiple schedules will better model the energy savings of the Therma-Fuser™ VAV diffuser system when comparing to other systems, but may not be compliant with some standards.

a. Create a different schedule in the library as follows:

- ↳ Select **Libraries** menu. (below the Building Tree)
- ↳ Select **Schedules** icon.
- ↳ Select a similar schedule.
- ↳ Select **Add**.
- ↳ Select a day of the week and adjust the load profile by dragging the bar chart.

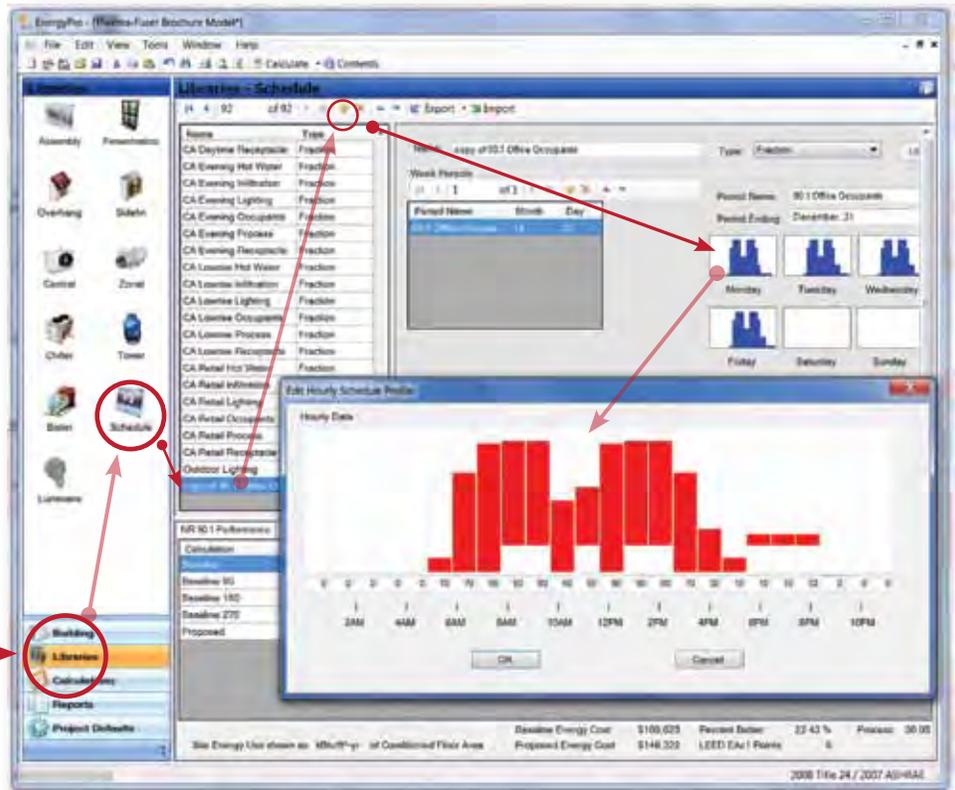
b. Apply different schedules as follows:

Go to:



Then:

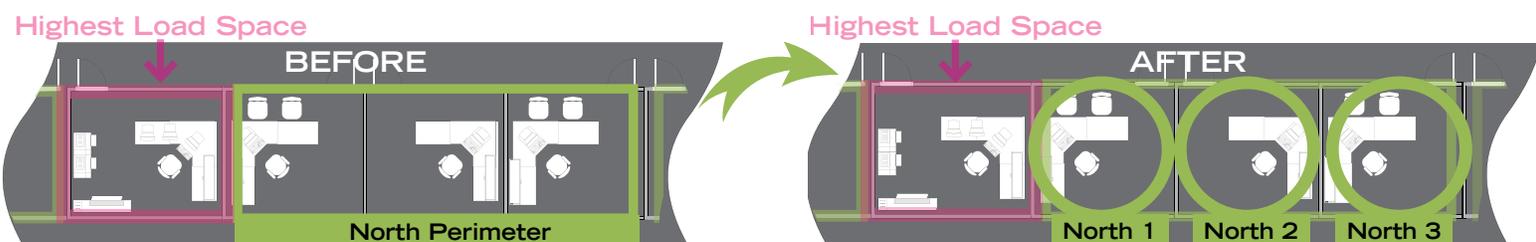
- Select the **Schedules** tab
- ↳ Select one of the alternate schedules.



5. Individual Temperature Control (Smaller Zones)

Every Therma-Fuser™ VAV diffuser is a zone of control with a thermostat and modulating damper built in to each diffuser. Many small zones of control prevent overcooling and overheating when individual spaces are unoccupied. Try further reducing the size of each zone in the model to fully capture the energy savings provided by Therma-Fuser™ VAV diffuser's small zones of control. Increased zoning will better model the energy savings of the Therma-Fuser system when comparing to other systems, but may not be compliant with some standards.

1. Further subdivide the building into smaller zones, as shown below.



5. Individual Temperature Control continued...

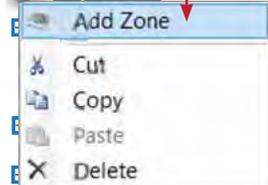
2. Create the new zones as follows:

Go to:

Building

Plant

System



Right click on System and select **Add Zone**.

Then:

↳ Select the new **Undefined Zone** and complete the information.

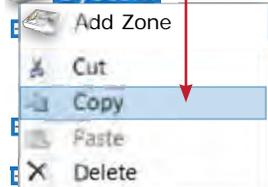
-OR- for a series of similar zones:

Go to:

Building

Plant

System



Right click on **System** and select **Copy**.

Then:

↳ Right click on **System** again and select **Paste**. Repeat as required. Do not forget to go back and adjust the schedules and receptacle loads on each to create diversity. (See #4 - Develop a Realistic Model.)

6. Avoid Reheat

Reheating cooled air wastes energy. The best way to avoid reheat is to eliminate it. Try designing a system with multiple air handlers to create zoning that does not require any reheat. Or, depending upon the climate, designing a system with Outside Air (OSA) temperature reset may also negate the need for reheat.

If reheat cannot be eliminated, try reducing the need by designing a system that uses a slightly **higher supply air temperature**. An increase in the supply air temperature will require a larger volume of air, but use the model to find the ideal compromise between reheat energy and fan energy.

1. Adjust the supply air temperature as follows:

Go to:

Building

Plant

System

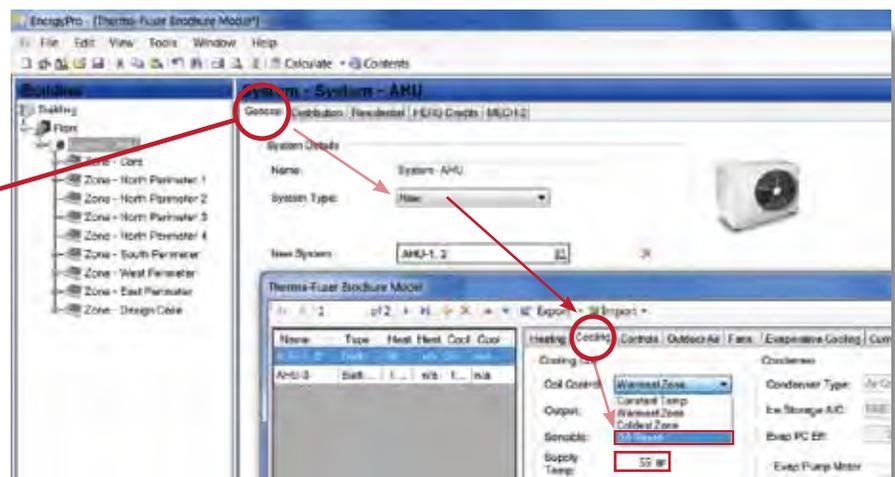
Then:

Select **General** tab.

↳ Select the **System**

↳ Select **Cooling** tab

↳ Enter the **Supply (air) Temp**





For additional details on capturing the energy savings of the Therma-Fuser™ VAV system, Acutherm products or system design please contact our Engineering Department directly at (510) 785-0510 or info@acutherm.com.



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