

MEMATE™ HVAC 2005 Tutorial

by Energy and Mechanical
Systems Consultants, Inc

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Chapter 1. Getting Started

1.1. Overview

The Tutorial is designed to help you get familiar with MeMate HVAC 2005. Simply follow the Tutorial and perform all of the steps in the same order as described here.

The Tutorial will give you a general picture of MeMate philosophy, abilities, and approach to the system design. You can find additional information in the MeMate User Manual. It covers MeMate commands and features not mentioned in this Tutorial.

With Tutorial, you will go through MeMate operations demonstrated in the MeMate Multimedia Demonstrations. You may want to view respective segments of the Demonstration before working with a particular step of the Tutorial.

Please note that Tutorial has been developed in I-P system only. If you are unfamiliar with I-P system units, we recommend you to use the Tutorial as a learning tool and simply input the numbers as shown here. You will easily transition to Metric system on your real-life project.

MeMate requires AutoCAD 2000 or later installed in your computer. There are no special hardware requirements imposed by MeMate. If AutoCAD works on your machine, so does MeMate.

To apply MeMate HVAC successfully, you need very little knowledge of AutoCAD. Basically, you have to know how to:

- **open** and **save** drawings,
- use **zoom** command,
- pick a single entity,
- select entities using select objects options,
- pick a point on the screen,
- input numeric and alphanumeric values in the dialogs and in the command prompt area.

Optionally, you may use AutoCAD **move** command to improve the presentation of the final drawing, and **layer** and **plot** commands to produce a hard copy of the drawing.

1.2. Using This Tutorial

The following typographic conventions are used in the Tutorial:

AutoCAD and MeMate PROMPTS ARE PRINTED USING THIS TYPEFACE

Bold print is used for:

MeMate commands, for example: **Room input**

AutoCAD commands, for example: **area**

Dialog buttons and fields, for example: **U-Value**

User input, for example: **74** or **step2**


Files and directories names, for example: **c:\memate\projects**

Bold italic print is used for the description of suggested user input

Bold italic red print is used for important highlights

 means press Enter key

For example, the line

Command: **memate** 

tells you to do the following: at Command: prompt type **memate** and press Enter.

Throughout the Tutorial, for every step, we will help you to input values in the dialog boxes. When it comes to pointing and selecting on the screen, we'll show you where to point and what to pick. For example, when you read the following line in this Tutorial

* POINT TO ROOM CORNER : *point to* **02-03**

a cross with the leader from the rectangle labeled **02-03** shall be displayed on the screen. Move crosshairs to the center of the cross and press pick button.

Similarly, when you read

* PICK ROOM TABLE : *pick* **04-02**

a small box with the leader from the rectangle labeled **04-02** shall be displayed on the screen. Move pickbox to the center of the small box and press pick button. The examples of the labels and marks are shown below.




To display labels and marks relevant to a particular step of the Tutorial, you will use the commands **step2** through **step12**. These commands are designed to help you with Tutorial and will not be used in the normal MeMate operation. You will enter respective commands in the beginning of the tasks as shown later in this Tutorial. The command **step0** simply erases all marks.

1.3. Launching MeMate

MeMate installation program adds **mh2k5.fas** file to AutoCAD Startup Suite, which, in turn, loads MeMate HVAC 2005 screen menu and makes MeMate commands available every time you open AutoCAD.

You can add **mh2k5.fas** file to AutoCAD Startup Suite manually by using AutoCAD **appload** command.

Command: **appload** 

Next, in Load/Unload Applications dialog, browse to **c:\memate\mh2k5** folder and drag **mh2k5.fas** file to Startup Suite icon. In result, **mh2k5.fas** will be loaded at the next AutoCAD startup. You may also load **mh2k5.fas** in your current drawing by selecting **mh2k5.fas** again and clicking **Load** button.

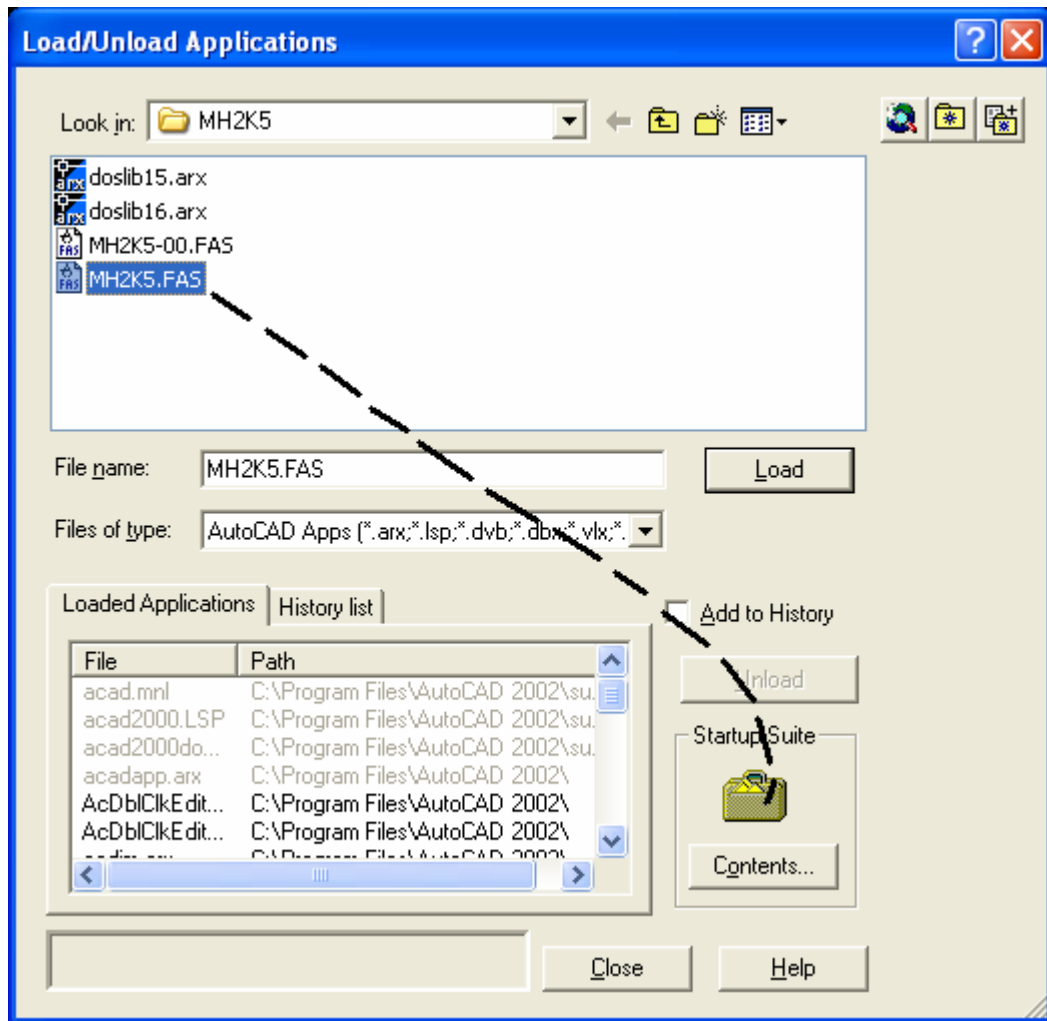



Figure 1.

Program is ready to run when **MeMate HVAC 2005** item is visible in the menu bar and all MeMate commands are accessible via pull-down menu.



Figure 2.

If you don't have **MeMate HVAC 2005** in the menu bar, enter **memate** command to load MeMate menu

Command: **memate** 

If you run the Tutorial prior to purchasing your copy of MeMate, the program will work in DEMONSTRATION Mode. MeMate will display warnings similar to following:

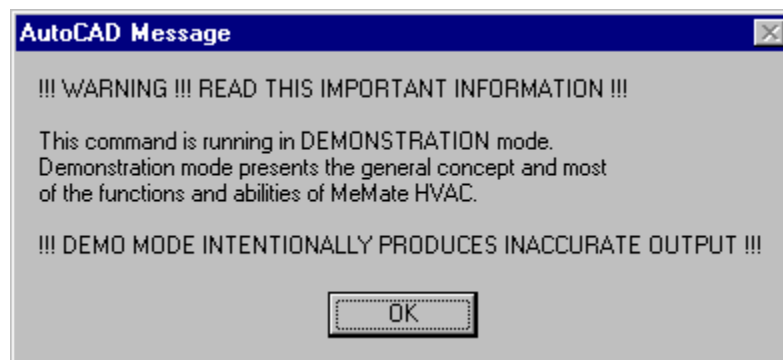


Figure 2.

Chapter 3. Building Envelope

3.1. Project General Information

Input of project general information is recommended as Step1 for any new project. Here, you will review an example of the input.

Pick **MeMate** in the pull-down menu bar, then pick **BUILDING ENVELOPE** command.

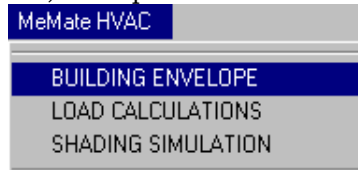


Figure 4.

In the Authorization dialog, select Authorization Level, input Authorization Code and click **Authorize** button to continue. See User Manual for more details on MeMate Authorization options and AUTHORIZATION command.

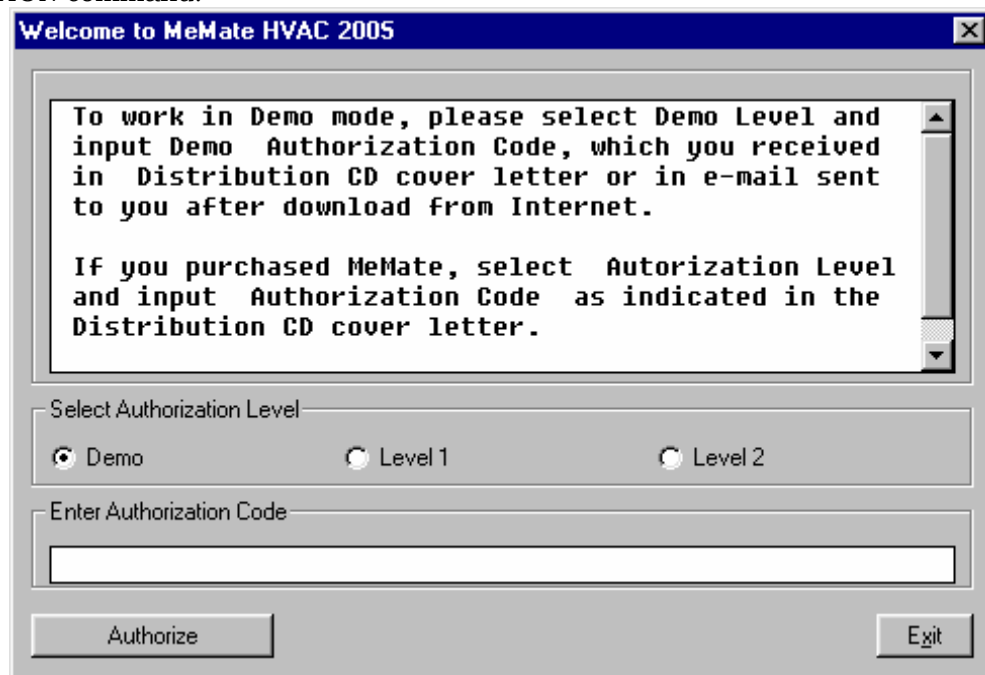


Figure 5.

In the Project Code dialog, pick TEST in the list of projects and click **OK** button.

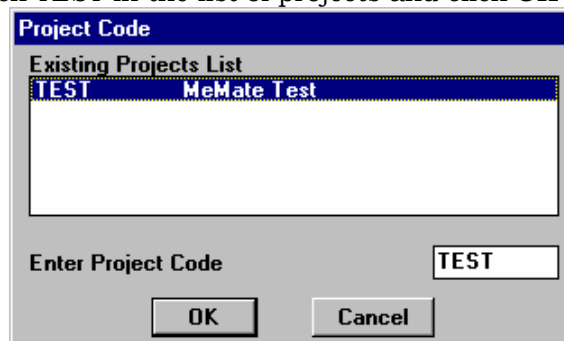


Figure 20.

Main **BUILDING ENVELOPE** command dialog presents all of the command options. Click **Project Info** button to review a sample of the project information input.

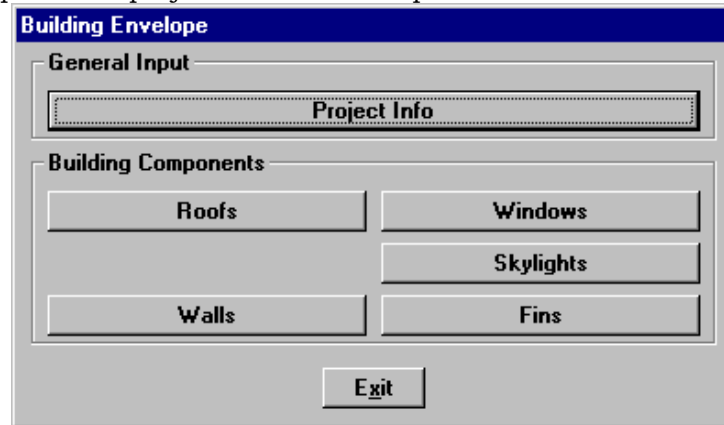


Figure 21.

Review Project General Data dialog and click **OK** button.

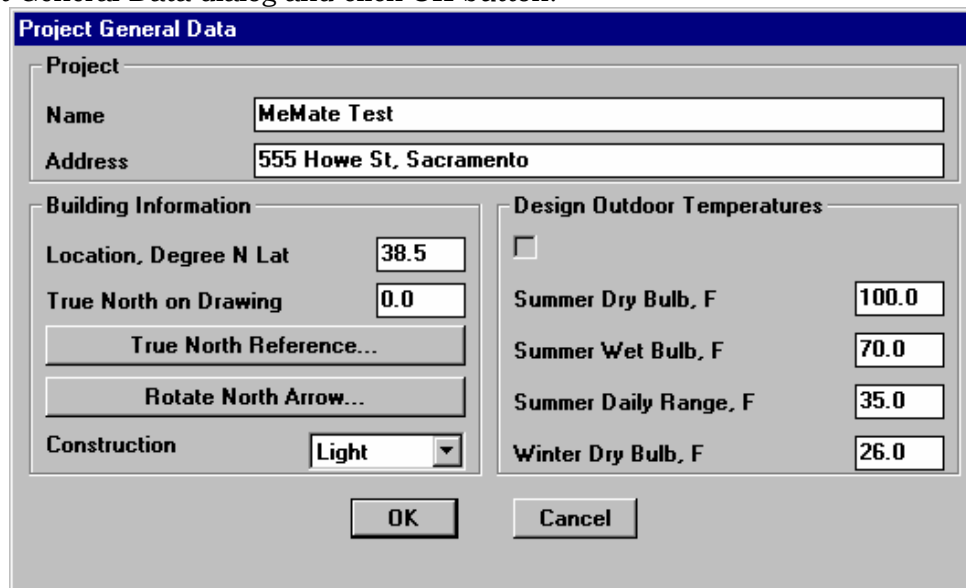


Figure 22.

Project Information is stored in the project directory on your hard drive. The information can be easily modified at any point of your project and it is always associated with a particular project code. MeMate retrieves stored information accordingly to the project code specified for the current drawing. Project Information will be shared between all drawings with the same project code.

Similarly to Project Information, a set of building components can be defined for the entire project and shared between all drawings with the same project code. It includes the information about construction, composition, and thermal properties of roofs, walls, floors, windows, skylights, etc.

In the Building Envelope dialog (shown in Figure 21,) click **Roofs** button to review a sample of building component input.

In the Roofs dialog, select **ROOF1** in the list of assemblies and click **Modify** button.

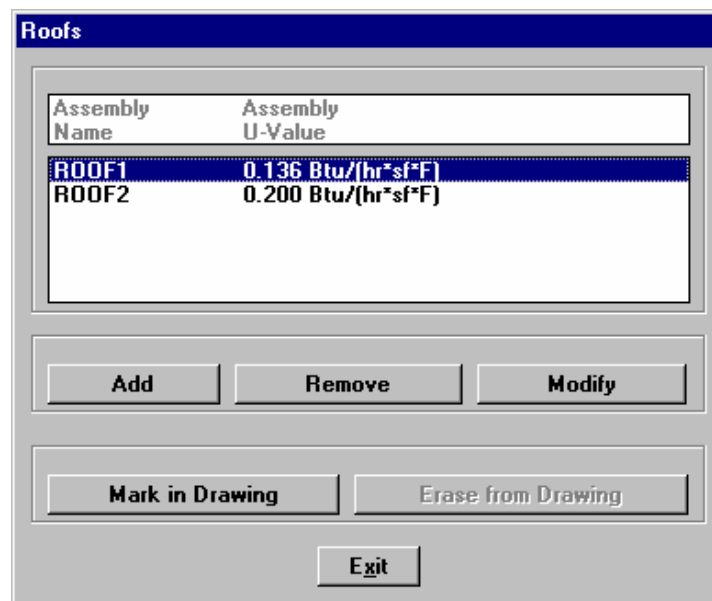


Figure 23.

In the Add or Modify Roof dialog, click **OK** button.



Figure 24.

In the Roofs dialog (shown in Figure 23,) click **Exit** button.


In the Building Envelope dialog (shown in Figure 21,) click **Exit** button to terminate the command.

Building Components data is stored in the project directory on your hard drive. The information can be easily modified at any point of your project and it is always associated with a particular project code. MeMate retrieves stored information accordingly to the project code specified for the current drawing and uses it for load calculations. Building Components data will be shared between all drawings with the same project code.

3.2. Mark Building Components

In order to specify the physical sizes and orientation of building components, you have to identify them in the drawing. The Tutorial command **step2** will help you to do that.

Enter Tutorial command **step2**

Command: **step2** 

Pick **MeMate** in the pull-down menu bar, then pick **BUILDING ENVELOPE** command.

In the Building Envelope dialog (shown in Figure 21,) click **Walls** button.

In the Walls dialog, select **WALL1** from the list of assemblies and click **Mark in Drawing** button.

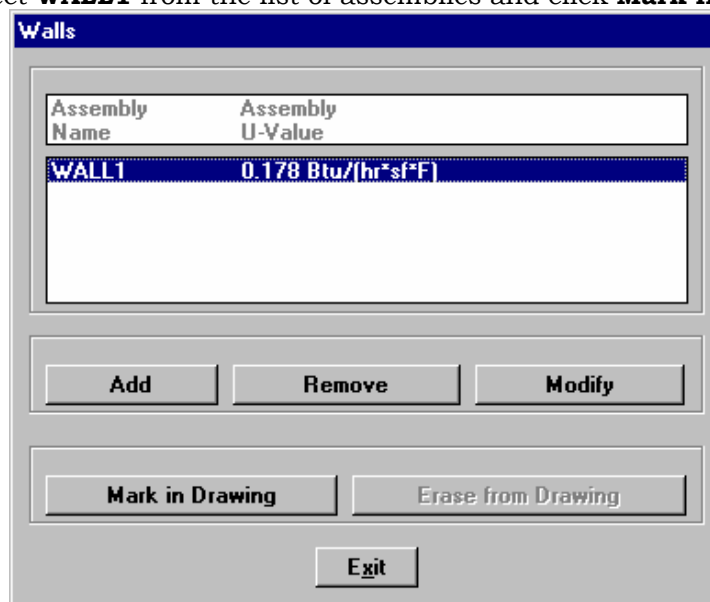




Figure 25.

```

** MARKING WALL1
* POINT TO FIRST END OF WALL1 / <Exit> : point to 02-01
* POINT TO SECOND END OF WALL1 / <Exit> : point to 02-02
* POINT INSIDE THE BUILDING : point to 02-05
* FIRST END OF NEXT WALL1 / Continue / <Exit> : c 
* POINT TO SECOND END OF WALL1 / <Exit> : point to 02-03
* POINT INSIDE THE BUILDING : point to 02-05
* FIRST END OF NEXT WALL1 / Continue / <Exit> : 

```

In the Walls dialog (shown in Figure 25,) click **Exit** button.

In the Building Envelope dialog (shown in Figure 21,) click **Windows** button.

In the Windows dialog, select **WINDOW1** from the list of assemblies and click **Mark in Drawing** button.

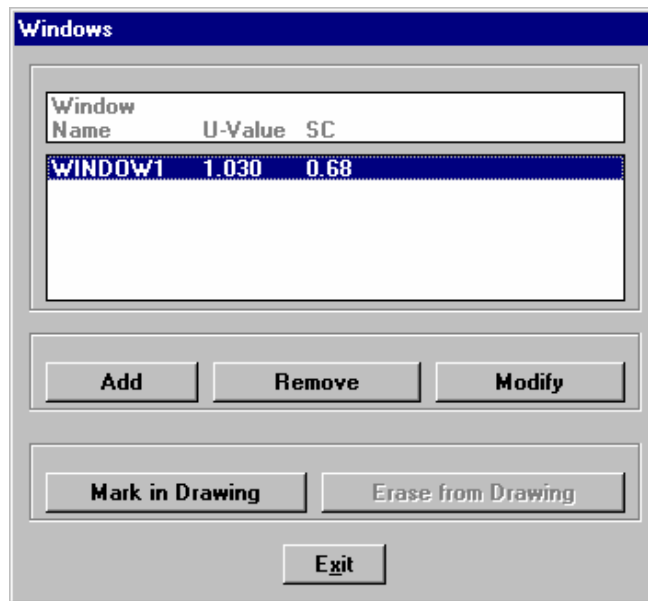


Figure 26.

In the Mark Window dialog, input window height and type of interior shading as shown below and click **OK** button when done.

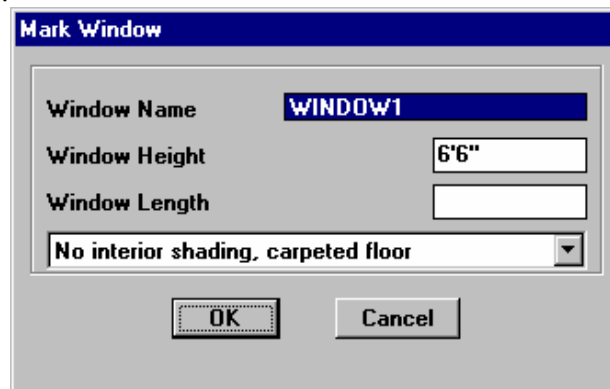


Figure 27.

- ** MARKING WINDOW1
- * POINT TO FIRST END OF WINDOW1 / <Exit> : *point to 02-06*
- * POINT TO SECOND END OF WINDOW1 / <Exit> : *point to 02-07*
- * POINT TO FIRST END OF WINDOW1 / <Exit> :

In the Windows dialog (shown in Figure 26,) click **Exit** button.

In the Building Envelope dialog (shown in Figure 21,) click **Exit** button to terminate the command.

Building components' marks are stored in the drawing as AutoCAD entities. MeMate retrieves the thermal properties of marked building components accordingly to their names (such as WALL2.) You can modify building components' data as shown in Step1 without changing the marks in the drawing.


Chapter 4. LOAD CALCULATIONS Command

4.1. Room Load Calculations

The Tutorial command **step4** will help you to identify rooms/spaces on the floor plan and input the data relevant to heat gain/loss calculations in these rooms. To define the rooms' locations and sizes, you simply point to room corners. MeMate marks the **boundaries** by yellow dashed polylines accordingly to specified corners. As with building components, the room boundaries and room input will be saved in the drawing. During load calculations, MeMate automatically finds the rooms, gets their location, length, area, height, temperatures, internal load, etc.

See Chapter 3 of MeMate User Manual for additional information on LOAD CALCULATIONS command.

Enter Tutorial command **step4**

Command: **step4** 

For demonstration purposes, some of the rooms are already marked in the drawing. We'll mark two rooms matching their physical walls.

Pick **MeMate** in the pull-down menu bar, then pick **LOAD CALCULATIONS** command.

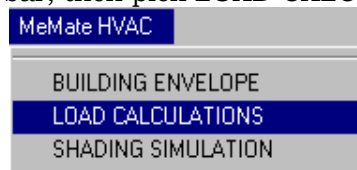


Figure 28.

Main **LOAD CALCULATIONS** command dialog appears on the screen

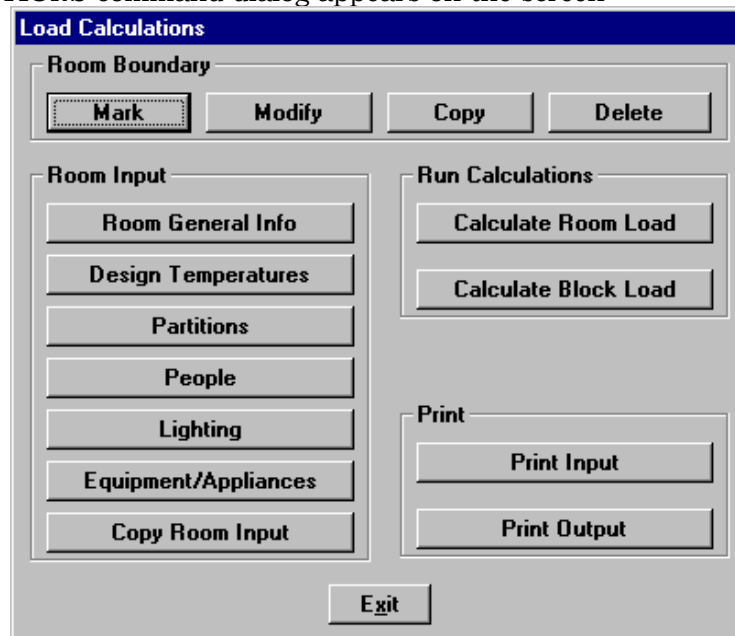


Figure 29.

First, we mark NW corner room. The pointing marks and labels for this room are red. In the Room Boundary section of the dialog, click **Mark** button.

In the Room Description dialog, click **Pick Text or Attribute...** button

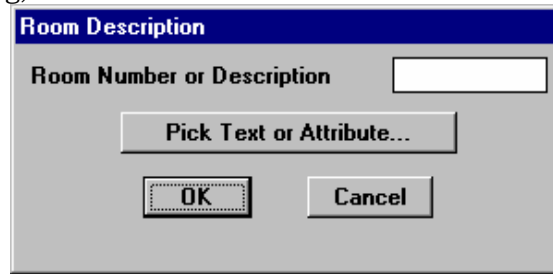



Figure 30.

* PICK ROOM DESCRIPTION IN THE DRAWING : *pick 04-*

01

Picked room number **101** shall appear in the **Room Number or Description** field. Click **OK** button. Alternatively, you can type **101** in the **Room Number or Description** field.

Now, we specify the corners of this room.


- * POINT TO ROOM CORNER : *point to 04-02*
- * POINT TO NEXT CORNER : *point to 04-03*
- * POINT TO NEXT CORNER : *point to 04-04*
- * POINT TO NEXT CORNER / <Done> : *point to 04-05*
- * POINT TO NEXT CORNER / <Done> : 
- * POINT TO INSERT ROOM TABLE : *point to 04-06*

Yellow dashed polyline in the drawing represents room boundary. If you've picked room corners correctly, the polyline shall match the walls with reasonable precision. A magenta **room table** is a "container" for load calculation results for this particular room.

In the Load Calculations dialog (shown in Figure 29,) click **Mark** button in the Room Boundary section.

In the Room Description dialog (shown in Figure 30,) input **102** in **Room Number or Description** field and click **OK** button.

Now, specify the corners of room 102.

- * POINT TO ROOM CORNER : *point to 04-07*
- * POINT TO NEXT CORNER : *point to 04-08*
- * POINT TO NEXT CORNER : *point to 04-09*
- * POINT TO NEXT CORNER / <Done> : *point to 04-10*
- * POINT TO NEXT CORNER / <Done> : 
- * POINT TO INSERT ROOM TABLE : *point to 04-11*

The Load Calculations dialog (shown in Figure 29) re-appears on the screen. We completed marking the boundaries. As you may have noticed, we disregarded the columns inside the rooms. If you believe that such an approximation is unacceptable, you can mark the corners exactly. MeMate doesn't limit the number of corners in a particular room. Note that all room tables shown in the drawing are **magenta**. Magenta table indicates insufficient input in the corresponding room and alerts that you cannot calculate heat gain/loss in that room. See Chapter 3 of MeMate User Manual for more information on marking and editing room boundaries.

Now, we input the room data needed for load calculations. In the Load Calculations dialog (shown in Figure 29,) click **Room General Info** button in the Room Input section.

* PICK ROOM TABLE TO RETRIEVE INPUT / <Skip> : 

Fill out the fields of Room General Info dialog as shown below and click **OK** button.

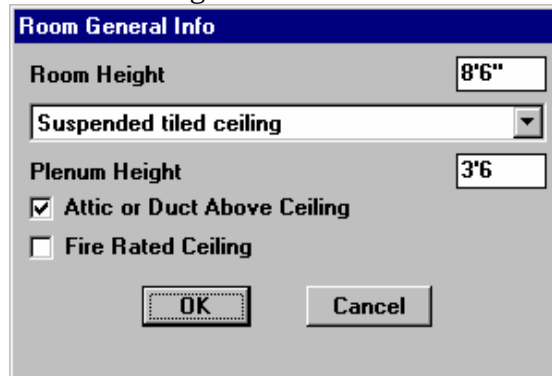



Figure 31.

** SELECT ROOM TABLES TO APPLY INPUT...

Select objects: **w** 

First corner: *point to* **04-12**

Other corner: *point to* **04-13**

Select objects: 

In the Room Input section of the Load Calculations dialog (shown in Figure 29,) click **Design Temperatures** button.



* PICK ROOM TABLE TO RETRIEVE INPUT / <Skip> : 

Fill out the fields of Design Temperatures dialog as shown below and click **OK** button.



Figure 32.

** SELECT ROOM TABLES TO APPLY INPUT...

Select objects: **w** 
 First corner: *point to* **04-12**
 Other corner: *point to* **04-13**
 Select objects: 

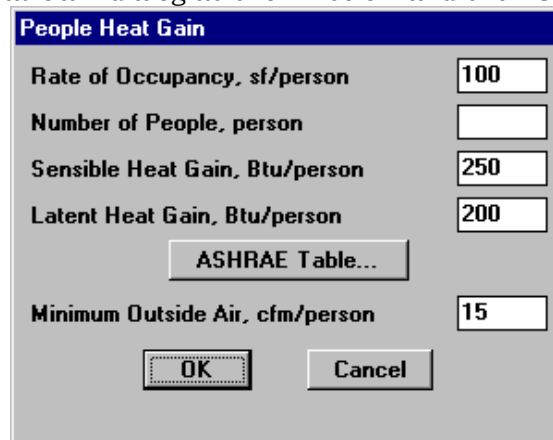
The color of room tables has been changed to green.

Magenta color of the room table indicates that there is insufficient input for load calculations in the corresponding room. Green color of the room table indicates that there is a mandatory input for load calculations.

For demo purposes, we assume that there is no heat gain/loss through partitions. In the Room Input section of the Load Calculations dialog (shown in Figure 29,) click **People** button.



* PICK ROOM TABLE TO RETRIEVE INPUT / <Skip> : 

Fill out the fields of People Heat Gain dialog as shown below and click **OK** button.



People Heat Gain	
Rate of Occupancy, sf/person	100
Number of People, person	
Sensible Heat Gain, Btu/person	250
Latent Heat Gain, Btu/person	200
ASHRAE Table...	
Minimum Outside Air, cfm/person	15
OK Cancel	

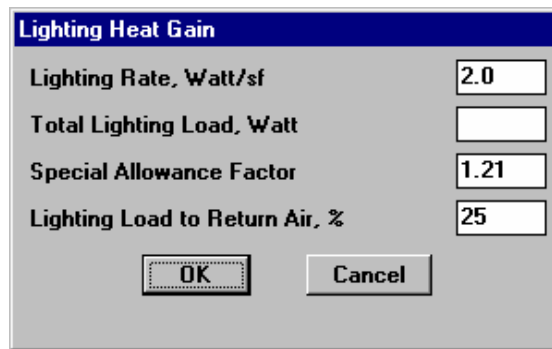
Figure 33.

** SELECT ROOM TABLES TO APPLY INPUT...
 Select objects: **w** 
 First corner: *point to* **04-12**
 Other corner: *point to* **04-13**
 Select objects: 

In the Room Input section of the Load Calculations dialog (shown in Figure 29,) click **Lighting** button.

* PICK ROOM TABLE TO RETRIEVE INPUT / <Skip> : 

Fill out the fields of Lighting Heat Gain dialog as shown below and click **OK** button.



Lighting Heat Gain

Lighting Rate, Watt/sf	<input type="text" value="2.0"/>
Total Lighting Load, Watt	<input type="text"/>
Special Allowance Factor	<input type="text" value="1.21"/>
Lighting Load to Return Air, %	<input type="text" value="25"/>

Figure 34.

** SELECT ROOM TABLES TO APPLY INPUT...

Select objects: w

First corner: *point to* **04-12**

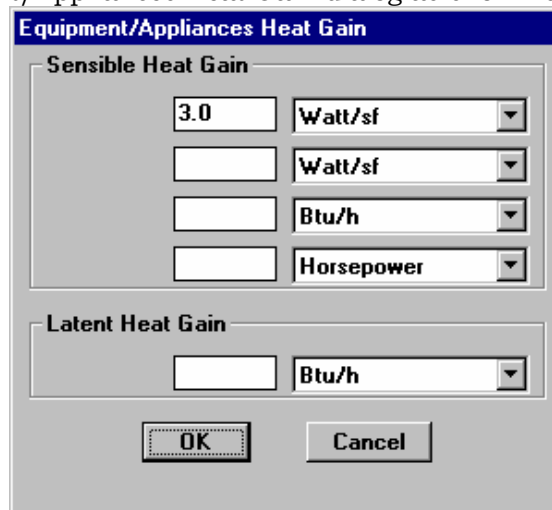
Other corner: *point to* **04-13**

Select objects:

In the Load Calculations dialog (shown in Figure 29,) click **Equipment/Appliances** button in the Room Input section.

* PICK ROOM TABLE TO RETRIEVE INPUT / <Skip> :

Fill out the fields of Equipment/Appliances Heat Gain dialog as shown below and click **OK** button.



Equipment/Appliances Heat Gain

Sensible Heat Gain

<input type="text" value="3.0"/>	<input type="text" value="Watt/sf"/>
<input type="text"/>	<input type="text" value="Watt/sf"/>
<input type="text"/>	<input type="text" value="Btu/h"/>
<input type="text"/>	<input type="text" value="Horsepower"/>

Latent Heat Gain

<input type="text"/>	<input type="text" value="Btu/h"/>
----------------------	------------------------------------

Figure 35.

** SELECT ROOM TABLES TO APPLY INPUT...

Select objects: w

First corner: *point to* **04-12**

Other corner: *point to* **04-13**

Select objects:

For demo purposes, we can modify input in Room 103 (conference room.) In the Room Input section of the Load Calculations dialog (shown in Figure 29,) click **People** button.

* PICK ROOM TABLE TO RETRIEVE INPUT / <Skip> : *pick* **04-14**

In the People Heat Gain dialog, input **20** in the **Number of People** field as shown below and click **OK** button.

Figure 36.

** SELECT ROOM TABLES TO APPLY INPUT...
 Select objects: *pick* **04-14**
 Select objects:

Similarly, you can edit any input in any room or group of rooms.

In the Load Calculations dialog (shown in Figure 29,) click **Calculate Room Load** button in the Run Calculations section.

** SELECT ROOM TABLES TO CALCULATE...
 Select objects: **w**
 First corner: *point to* **04-12**
 Other corner: *point to* **04-13**
 Select objects:

It shall take few seconds to calculate load in each room.


In the Load Calculations dialog (shown in Figure 29,) click **Print Output** button in the Print section.

** SELECT ROOM TABLES FOR OUTPUT...
 Select objects: **w**
 First corner: *point to* **04-12**
 Other corner: *point to* **04-13**
 Select objects:

The results of load calculations are displayed on the screen. You can scroll through output and review the results.

Now, we'll zoom to room table to see the load calculations results in a brief form.

Command: **zoom**


All/Center/Dynamic/Extents/Left/Previous/Vmax/Window/<Scale(X/XP)> : **w** 


First corner: *point to* **04-13**

Other corner: *point to* **04-15**

In the room table, MeMate prints **space sensible** cooling and heating load and airflow.

To return to previous view

Command: **zoom** 

All/Center/Dynamic/Extents/Left/Previous/Vmax/Window/<Scale(X/XP)> : **p** 

Room boundaries and load input are stored in your drawing. You can easily modify the boundaries and load input in any room at any point of your project and then recalculate the load.


Chapter 5. Air Distribution Devices

5.1. Design Room Air Distribution


The Tutorial command **step5** will help you to design and place two supply diffusers in Room 101 where load has been calculated. For demonstration purposes, some of the air distribution devices are already placed in the drawing.


MeMate sizes the devices automatically based on your input of airflow and NC level. The size selection table is built-in. You always have an ability to modify size manually.


Enter Tutorial command **step5**.


Command: **step5** 

To freeze the layers with marked building components

Command: **layer** 

?/Make/Set/New/ON/OFF/Color/Ltype/Freeze/Thaw/LOck/Unlock: **f** 

Layer name(s) to Freeze: **mm-blid*** 

?/Make/Set/New/ON/OFF/Color/Ltype/Freeze/Thaw/LOck/Unlock: 

Pick **MeMate** in the pull-down menu bar, and then pick **AIR DISTRIBUTION DEVICES** command.

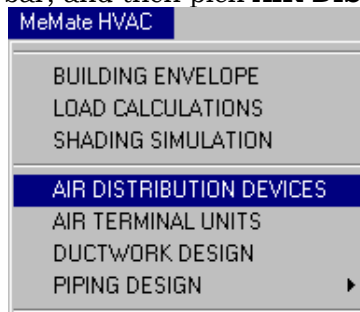


Figure 37.

Final Plot Scale dialog appears on the screen if you haven't yet specified the scale for the current drawing.

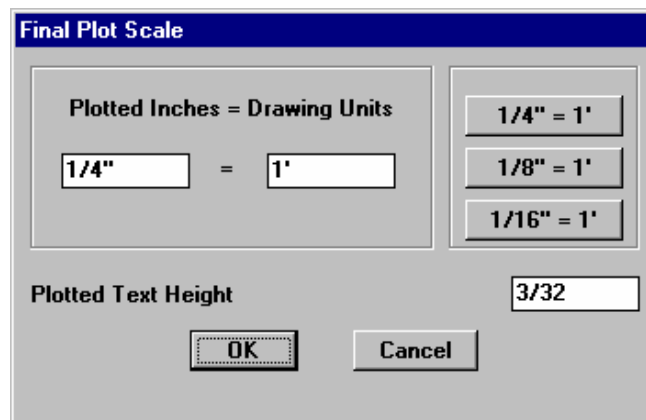


Figure 38.

In the main **AIR DISTRIBUTION DEVICES** command dialog, click **Room Air Distribution** button. Please note that MeMate displays overall air balance in the current drawing in the Room Air Distribution section of the dialog.

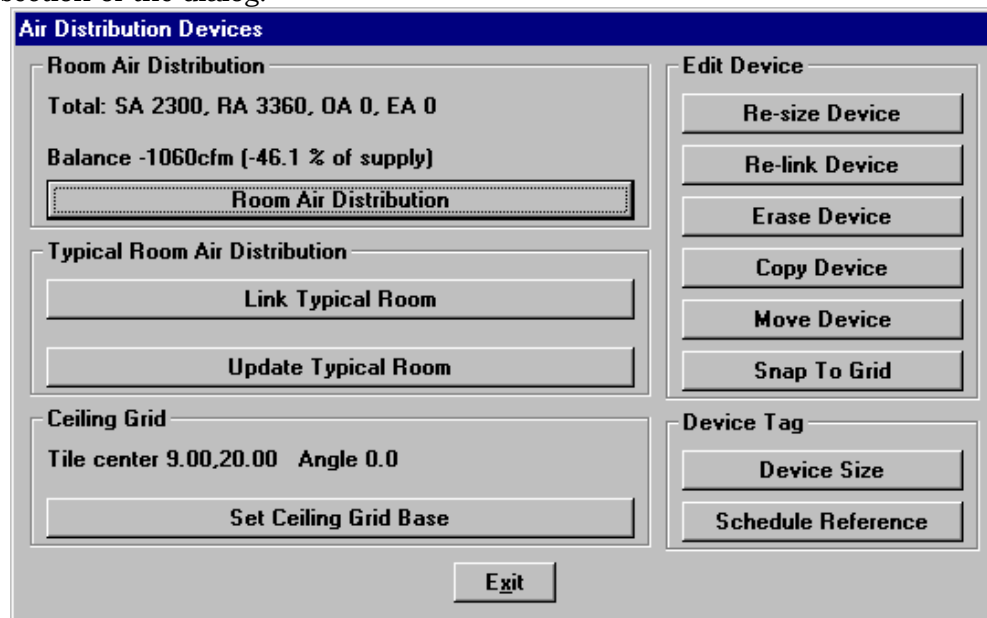


Figure 39.

In the Room Air Distribution dialog, click **Link to Room** button.

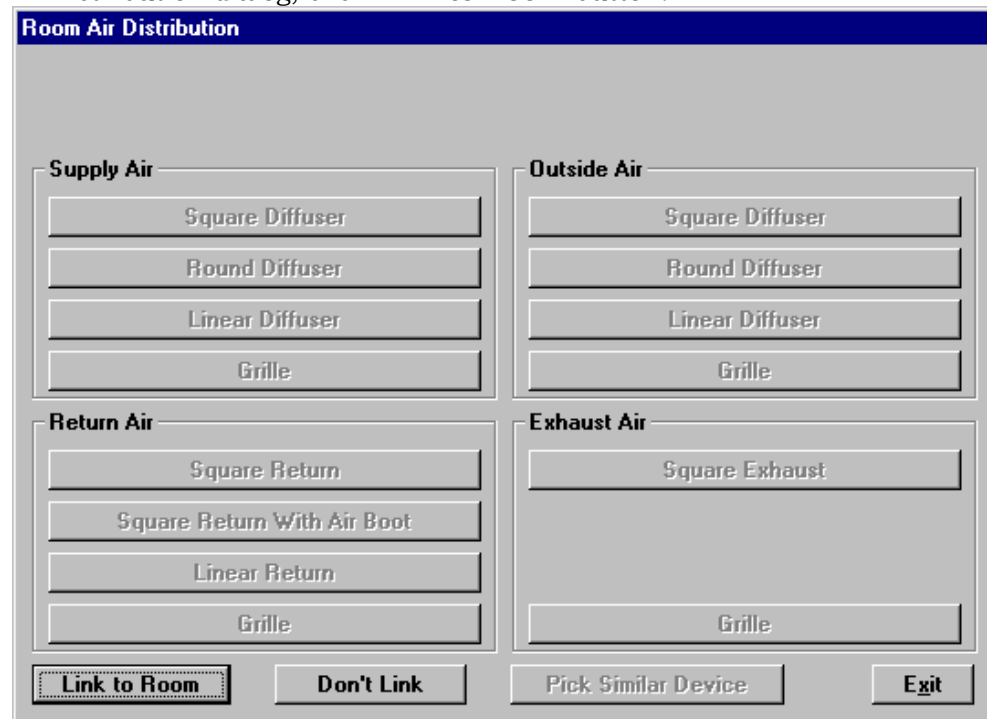


Figure 40.

* PICK ROOM TABLE TO LINK AIR DISTRIBUTION / <Cancel> : pick **05-01**

Linking devices to the rooms allows MeMate to track rooms' air balance and to display the air balance information continuously.

The Room Air Distribution dialog re-appears on the screen. Please note the room airflow information is displayed in the upper part of the dialog. To design square supply air diffuser, click **Square Diffuser** button in the Supply Air section.

Room Air Distribution

Room 101
 Calculated airflow: Supply air 1337 cfm, Outside air 47 cfm.
 Provided: Supply 0, Return 1300, Outside 0, Exhaust 0.

Supply Air

Square Diffuser
 Round Diffuser
 Linear Diffuser
 Grille

Outside Air

Square Diffuser
 Round Diffuser
 Linear Diffuser
 Grille

Return Air

Square Return
 Square Return With Air Boot
 Linear Return
 Grille

Exhaust Air

Square Exhaust
 Grille

Link to Room Don't Link Pick Similar Device Exit

Figure 41.

In the Size and Place Air Distribution Device dialog, input **675** in the Airflow, cfm field and click **Ceiling** button.

Size and Place Air Distribution Device

Room 101... Designing Supply Air Distribution Device.
 Calculated airflow: Supply air 1337 cfm, Outside air 47 cfm.
 Provided: Supply 0, Return 1300, Outside 0, Exhaust 0.

Selection

Airflow, cfm: 675
 NC Level: 30
 Ceiling: Tiled, not rated
 Volume Damper
 No fire damper

Size

Neck: round
 Neck Size, in: 16
 Panel Size: 24x24
 Modify Size
 Restore Default Size

Place

Ceiling
 Ceiling Grid
 Wall
 Below Duct
 Duct Side

Exit

Figure 42.

* POINT TO DEVICE LOCATION AND ROTATE AS NECESSARY : *point to 05-02* and press Enter.

The Size and Place Air Distribution Device dialog re-appears on the screen. The room air balance information in the upper portion of the dialog reflects 675 cfm of supply already placed in the room. To place another 675-cfm supply diffuser, click **Ceiling** button.

* POINT TO DEVICE LOCATION AND ROTATE AS NECESSARY : *point to* **05-03**
and press Enter.

In the Size and Place Air Distribution Device dialog (shown in Figure 42,) click **Exit** button.

In the Room Air Distribution dialog (shown in Figure 41,) click **Exit** button.

In the main **AIR DISTRIBUTION DEVICES** command dialog (shown in Figure 39,) click **Exit** button to terminated the command.

MeMate offers a variety of tools to design and modify the air distribution while keeping track of the airflow, overall and in individual rooms/spaces. The color of room table indicates the balance between supply/outside and return/exhaust air in respective room.


See Chapter 5 of MeMate User Manual for additional information on MeMate AIR DISTRIBUTION DEVICES command and its options.

Chapter 6. Air Terminal Units

6.1. Design VAV Terminal

The Tutorial command **step6** will help you to design VAV air terminal with water reheat to service three rooms on the northern exposure.

Enter Tutorial command **step6**.

Command: **step6** 

Pick **MeMate** in the pull-down menu bar, then pick **AIR TERMINAL UNITS** command.

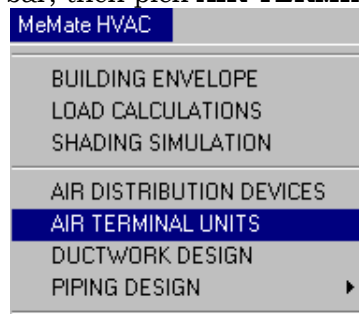


Figure 43.

In the main **AIR TERMINAL UNITS** command dialog, click **Water Reheat** button in the VAV Boxes section.

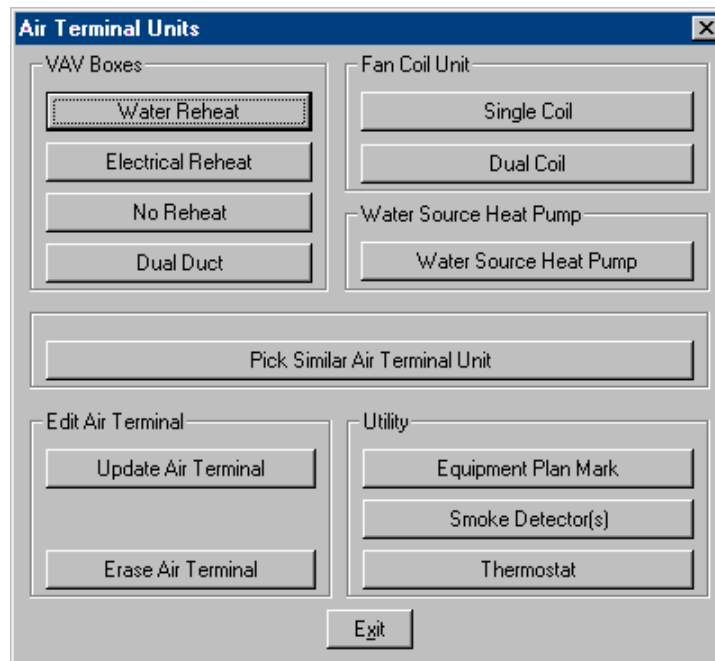


Figure 44.

In the Design Single Duct VAV Air Terminal dialog, click **Select Rooms** button to specify the rooms to be serviced by the air terminal.

Figure 45.

- * PICK FIRST ROOM TABLE SERVICED BY THIS AIR TERMINAL / <Cancel> : *pick 06-01*
- * PICK NEXT ROOM TABLE SERVICED BY THIS AIR TERMINAL / <Cancel> : *pick 06-02*
- * PICK NEXT ROOM TABLE SERVICED BY THIS AIR TERMINAL / <Cancel> : *pick 06-03*
- * PICK NEXT ROOM TABLE SERVICED BY THIS AIR TERMINAL / <Cancel> :

From the selected tables, MeMate collects the block cooling and heating load and totals the airflow of supply air distribution devices. A brief summary is displayed in the upper right part of the Design Single Duct VAV Air Terminal dialog.

You can click **Block Load Output** button to get more detailed information.

Based on the obtained load, MeMate selects default VAV's size from the built-in selection table. You can change the sizes manually if necessary.

MeMate leaves height input blank if a particular element of air terminal is round. In this example, the VAV's inlet is round, so MeMate displays **diameter** in the width field of the **Inlet W x H** and leaves height field blank.

Fill out the fields of the Design Single Duct VAV Air Terminal dialog as shown below and click **OK** button.

Figure 46.

- * POINT TO UNIT LOCATION AND ROTATE AS NECESSARY : *point to 06-04*
then *point to 06-05*

The point **06-05** defines unit orientation. After you point to unit location **06-04**, you can drag unit rotation. The rubber-band line from the unit to crosshairs indicates the direction of discharge.

- * POINT TO PLAN MARK LOCATION : *point to 06-06*
- * PICK ROOM TABLE TO SPECIFY THERMOSTAT LOCATION : *pick 06-02*
- * POINT TO THERMOSTAT LOCATION AND ROTATE AS NECESSARY: *point to 06-07*
and press Enter.

In the main **AIR TERMINAL UNITS** command dialog (shown in Figure 44,) click **Exit** button to terminated the command.


See Chapter 6 of MeMate User Manual for additional information on MeMate AIR TERMINAL UNITS command.

Chapter 7. Ductwork Design

7.1. Design Zone Supply Ductwork

The Tutorial command **step7** will help you to design zone supply ductwork downstream of VAV. To design the system, we'll specify design settings and develop a single-line layout of the system. Then, MeMate will size the system and convert single-line layout to double-line accordingly to specified settings.

Enter Tutorial command **step7**.

Command: **step7** 

Pick **MeMate** in the pull-down menu bar and then pick **DUCTWORK DESIGN**.

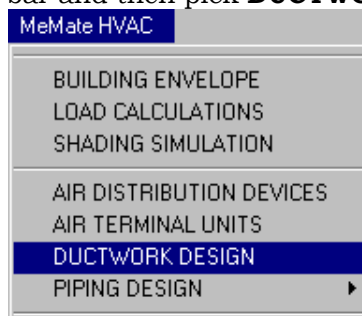


Figure 47.

In the Ductwork Design dialog, click **Ductwork Layout...** button

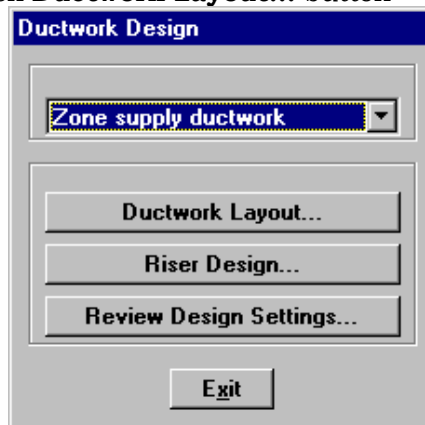
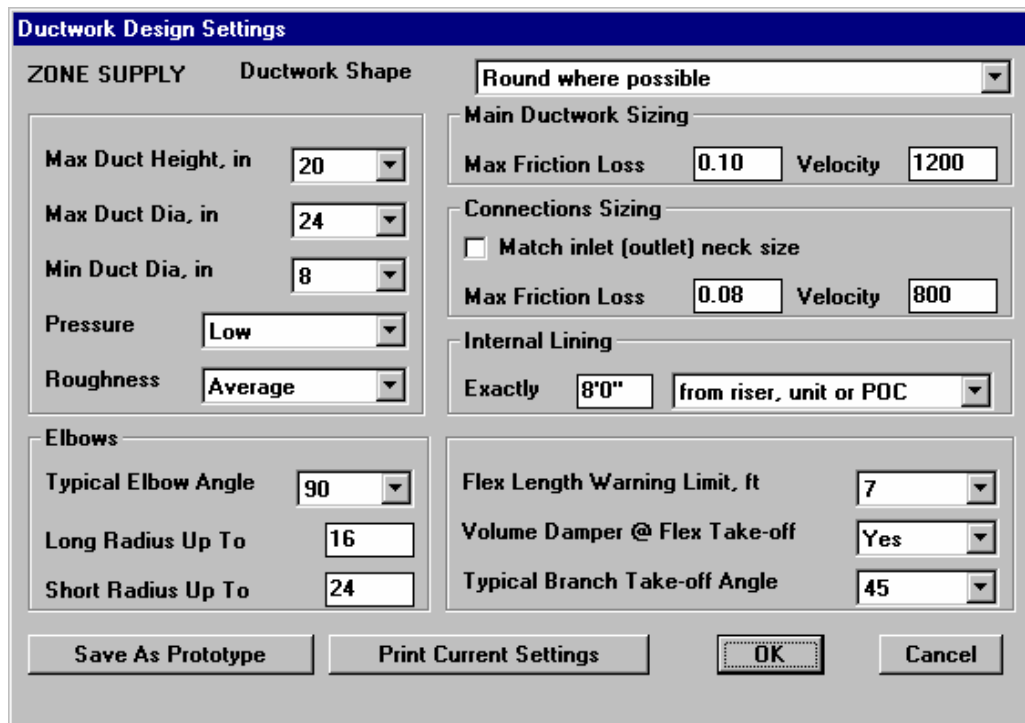


Figure 48.

The design settings have not been defined yet for current project, so MeMate displays the Ductwork Design Settings dialog. Once you define the settings, MeMate saves them and obtains automatically. See Chapter 7 of MeMate User Manual for detailed information on design settings.

In the Ductwork Design Settings dialog, input values as shown below and click **OK** when done.



Ductwork Design Settings

ZONE SUPPLY Ductwork Shape Round where possible

Max Duct Height, in 20

Max Duct Dia, in 24

Min Duct Dia, in 8

Pressure Low

Roughness Average

Elbows

Typical Elbow Angle 90

Long Radius Up To 16

Short Radius Up To 24

Main Ductwork Sizing

Max Friction Loss 0.10 Velocity 1200

Connections Sizing

Match inlet (outlet) neck size

Max Friction Loss 0.08 Velocity 800

Internal Lining

Exactly 8'0" from riser, unit or POC

Flex Length Warning Limit, ft 7

Volume Damper @ Flex Take-off Yes


Typical Branch Take-off Angle 45

Save As Prototype Print Current Settings OK Cancel

Figure 49.

* PICK SUPPLY AIR RISER, AIR TERMINAL OR P.O.C. / <New P.O.C.> : *pick* **07-01**

In the Ductwork Layout dialog, click **Draw Duct** button to draw rigid ducts.



Ductwork Layout

ZONE SUPPLY

Plenum Box

Draw Duct

Correct Layout

Flex Duct Connection

Rigid Duct Connection

OK Cancel


Figure 50.

MeMate automatically starts the duct from the discharge of the VAV.

Note that MeMate takes care of the accuracy of the ductwork layout. It turns Ortho mode ON and uses object snap modes transparently. So, just point close to the point marks.

* SEGMENT ENDPOINT : *point to* **07-02**


```

!!! LENGTH OF DRAWN SEGMENT 4'6" !
* SEGMENT ENDPOINT / Custom angle / Exit / Undo / <Switch angle>: point to 07-03
!!! LENGTH OF DRAWN SEGMENT 23'7" !
* SEGMENT ENDPOINT / Custom angle / Exit / Undo / <Switch angle>: e 

```

In the Ductwork Layout dialog (shown in Figure 50,) click **Draw Duct** button.


```

* DUCT START POINT : point to 07-02
* SEGMENT ENDPOINT : point to 07-04
!!! LENGTH OF DRAWN SEGMENT 32'5" !
* SEGMENT ENDPOINT / Custom angle / Exit / Undo / <Switch angle>: e 

```

Now, we'll use flexes to connect the diffusers starting from the leftmost. To connect a diffuser, you pick it and specify flex start point, e.g. the point where flex connects to the rigid duct. To help you locate pick and point marks, we used different colors for each diffuser. In the Ductwork Layout dialog (shown in Figure 50,) click **Flex Duct Connection** button.

```

* PICK DIFFUSER OR GRILLE / <Cancel> : pick 07-05
* DUCT START POINT : point to 07-06
* PICK DIFFUSER OR GRILLE / <Cancel> : pick 07-07
* DUCT START POINT : point to 07-08
* PICK DIFFUSER OR GRILLE / <Cancel> : pick 07-09
* DUCT START POINT : point to 07-10
* PICK DIFFUSER OR GRILLE / <Cancel> : pick 07-11
* DUCT START POINT : point to 07-12
* PICK DIFFUSER OR GRILLE / <Cancel> : pick 07-13
* DUCT START POINT : point to 07-04
* PICK DIFFUSER OR GRILLE / <Cancel> : e 

```

In the Ductwork Layout dialog (shown in Figure 50,) click **OK** button.

MeMate begins ductwork calculations and, when it is done, displays a Ductwork Calculations Complete dialog. There, click **OK** button.

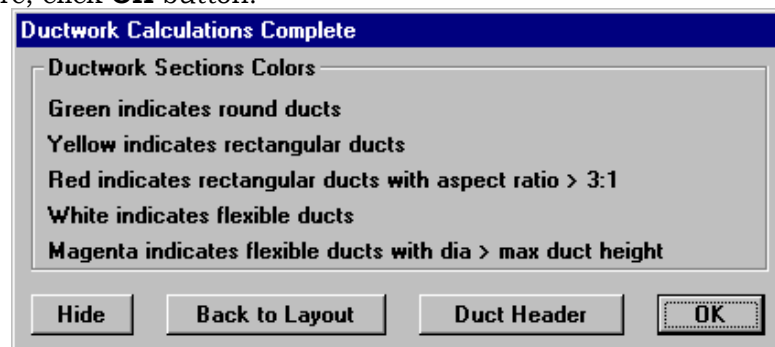


Figure 51.

In the Ductwork dialog, click **Convert to Double Line** button.

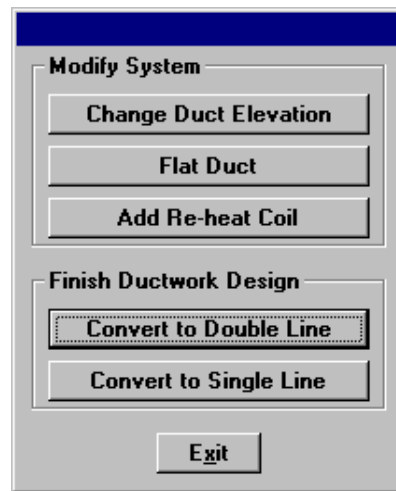


Figure 52.

MeMate converts single-line layout into double line and brings up the Ductwork Design dialog (shown in Figure 48.) There, click **Exit** button. The design of the zone supply ductwork is complete.

Now, we'll demonstrate one of the ENGINEERING CHECKS commands. Pick **MeMate** in the pull-down menu bar, pick **ENGINEERING CHECKS**, and then pick **Air terminal data** command.

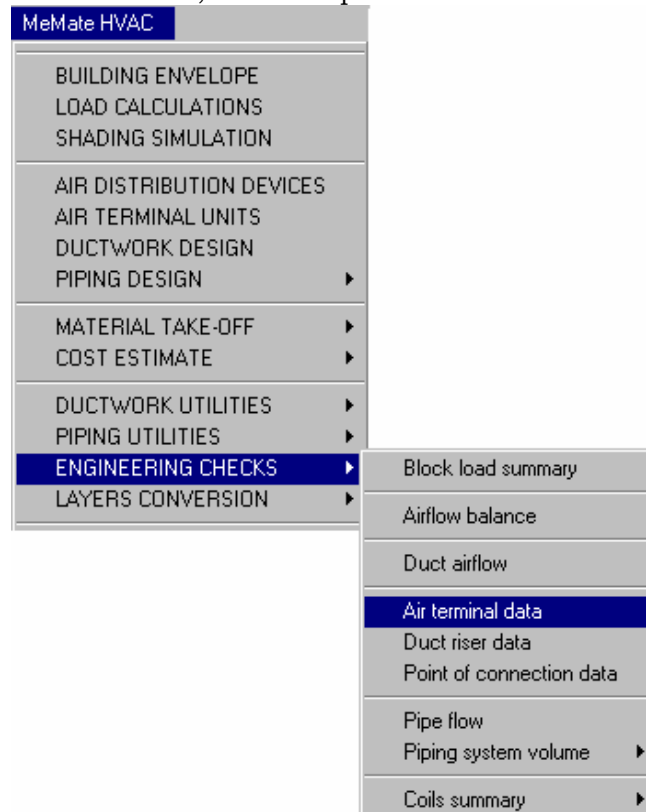


Figure 53.

* PICK AIR TERMINAL / <Cancel> : *pick 07-01*

You can interrupt the tutorial now and examine your drawing. Take a closer look at the ductwork. Note, that ***single-line layout remains in the drawing***. It will allow you easily re-design the system if necessary. Before plotting, you can turn off the layers with single-line layout.

Chapter 8. Ductwork Re-Design

8.1. Re-Design Zone Supply Ductwork Using New Settings

In this section of the Tutorial, we'll change few design settings, and MeMate will re-size and redraw the system accordingly to the new settings.

Pick **MeMate** in the pull-down menu bar and then pick **DUCTWORK DESIGN** as shown in Figure 47.

In the Ductwork Design dialog, click **Review Design Settings...** button.

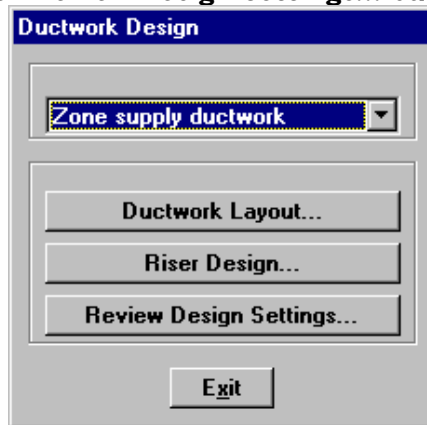


Figure 54.

The Ductwork Design Settings dialog with current design settings values appears on the screen. In the dialog, input **16** in the **Maximum Duct Height** field. In the Ductwork Shape, select **Rectangular with round connections**. In the Internal Lining box, select **Rectangular ducts only**. Click **OK** when done.

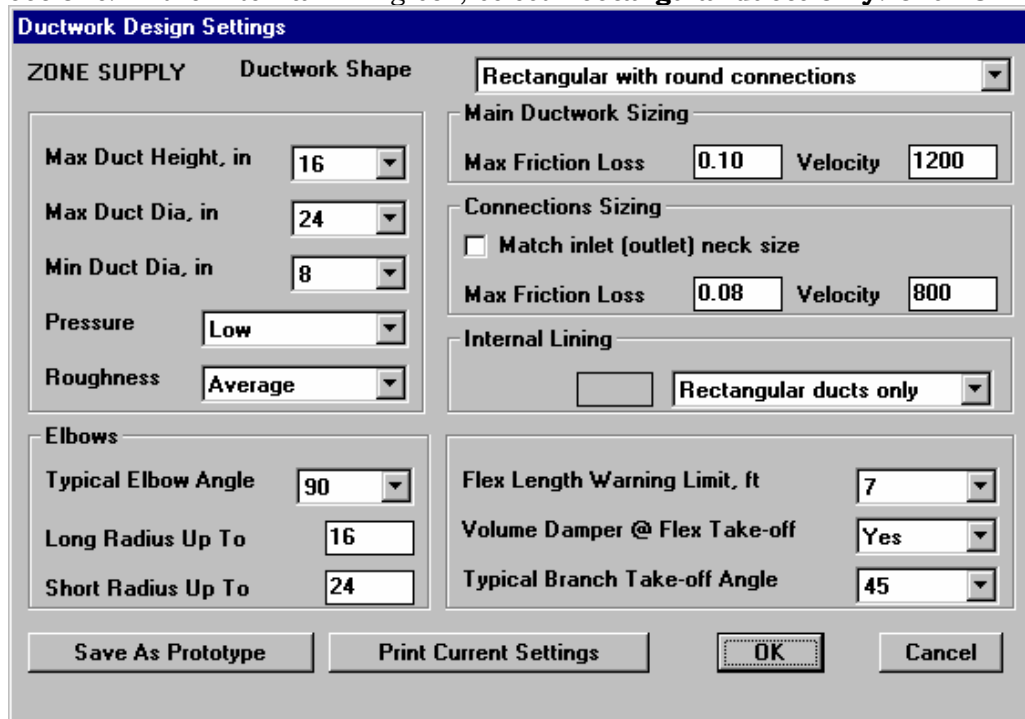


Figure 55.

In the Ductwork Design dialog (shown in Figure 48,) click **Ductwork Layout...** button.

* PICK SUPPLY AIR RISER, AIR TERMINAL OR P.O.C. / <New P.O.C.> : *pick* **08-01**

When you pick the air terminal, MeMate automatically erases double-line ductwork and leaves the single-line layout to be changed or corrected. After that, the Ductwork Layout dialog (shown in Figure 50) appears on the screen. Since we are not going to change the layout, click **OK** in the Ductwork Layout dialog. MeMate recalculates the system and sizes the ducts based on new design settings.

The Ductwork Calculations Complete dialog (shown in Figure 51) appears on the screen. There, click **OK**.

In the Ductwork dialog (shown in Figure 52,) click **Convert to Double Line** button.

MeMate converts layout into double-line ductwork and displays Ductwork Design dialog (shown in Figure 48.) Click **Exit** there to exit the command. Again, you can examine the ductwork and see what has been changed.

See Chapter 7 of MeMate User Manual for more information on **DUCTWORK DESIGN** command.

Chapter 9. Recalculate and Re-Design

In this section of the Tutorial, we'll show how easy it is to modify designed system if there are changes in your project.


Assume the following changes in the project. Conference Room 103 has to be recalculated for 30 people and to be served by an individual VAV.

To accommodate the changes, we'll recalculate the load in the room 103, re-size supply air diffuser, update VAV accordingly to new zoning and load, and modify zone supply ductwork.

9.1. Recalculate Room Load

The Tutorial command **step9** will help you to recalculate cooling and heating load in the Conference Room 103.

Enter Tutorial command **step9**.

Command: **step9** 

Pick **MeMate** in the pull-down menu bar, then pick **LOAD CALCULATIONS** command.

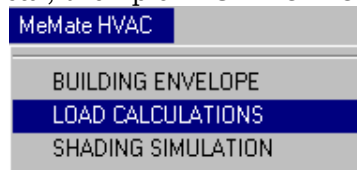


Figure 56.

In the main **LOAD CALCULATIONS** command dialog, click **People** button in the Room Input section.

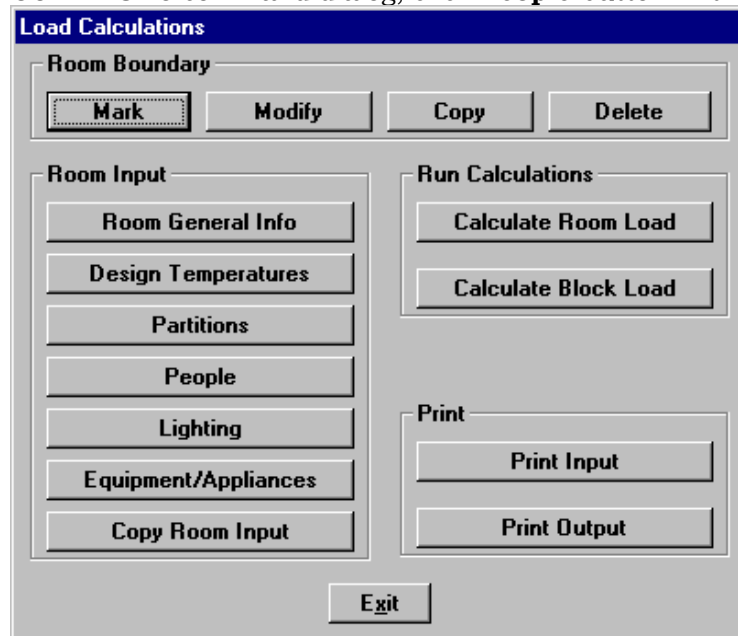


Figure 57.

* PICK ROOM TABLE TO RETRIEVE INPUT / <Skip> : *pick 09-01*

In the People Heat Gain dialog, input 30 in the **Number of People** field.

Figure 58.

```
** SELECT ROOM TABLES TO APPLY INPUT...
Select objects: pick 09-01
Select objects: ↵
```

In the Load Calculations dialog (shown in Figure 57,) click **Calculate Room Load** button.

```
** SELECT ROOM TABLES TO CALCULATE...
Select objects: pick 09-01
Select objects: ↵
```

In the Load Calculations dialog (shown in Figure 57,) click **Exit** button to terminate command.

9.2. Re-Size Air Distribution Device

The Tutorial command **step10** will show you how to re-size a ceiling diffuser in the Room 103 accordingly to recalculated airflow.

Enter Tutorial command **step10**.

Command: **step10** ↵

Pick **MeMate** in the pull-down menu bar, then pick **AIR DISTRIBUTION DEVICES** command.

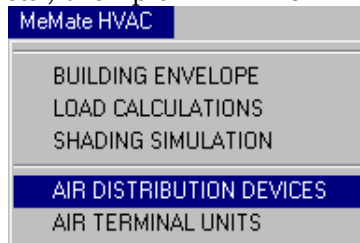


Figure 59.

In the main **AIR DISTRIBUTION DEVICES** command dialog, click **Re-size Device** button in the Edit Device section.

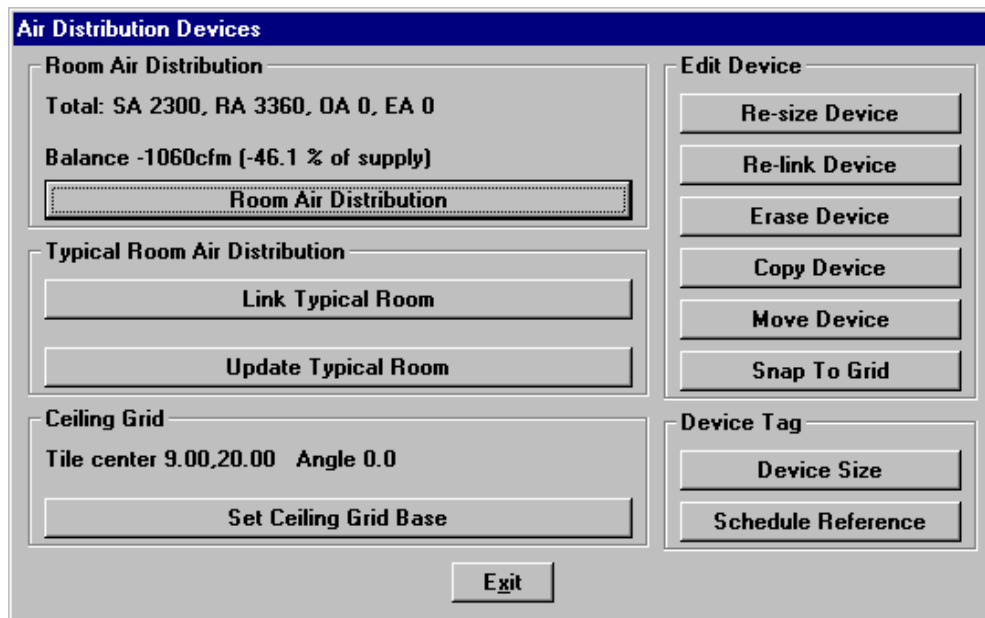


Figure 60.

* PICK AIR DISTRIBUTION DEVICE TO RE-SIZE / <Cancel> : *pick 10-01*

In the Re-size Air Distribution Device dialog, input **600** in the **Airflow, cfm** field and click **OK** button.

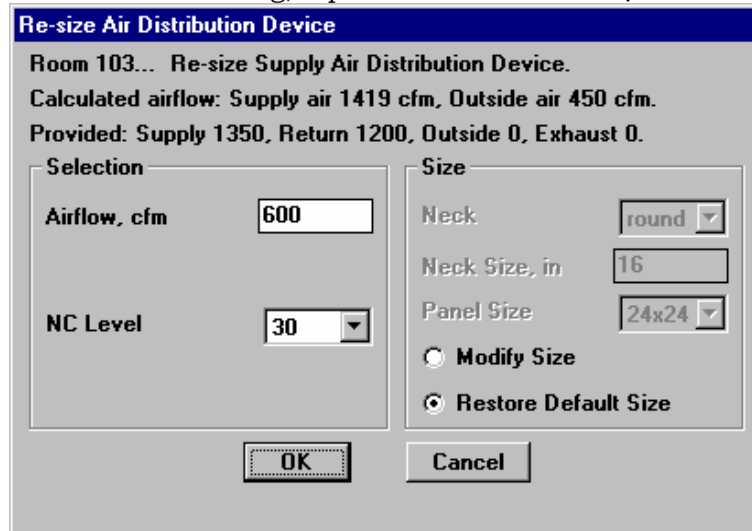


Figure 61.


* PICK AIR DISTRIBUTION DEVICE TO RE-SIZE / <Cancel> : 

In the main **AIR DISTRIBUTION DEVICES** command dialog (shown in Figure 60,) click **Exit** button.

9.3. Update Air Terminal Unit

In this section we will update the load for VAV-101 that will serve now Conference Room only.

Enter Tutorial command **step11**.

Command: **step11** 

Pick **MeMate** in the pull-down menu bar, then pick **AIR TERMINAL UNITS** command.

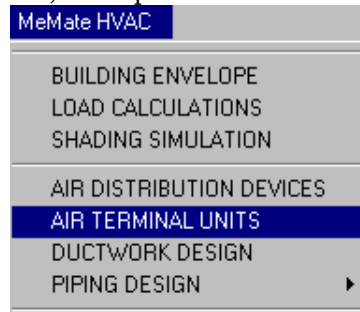


Figure 62.

In the main **AIR TERMINAL UNITS** command dialog, click **Update Air Terminal** button in the Edit Air Terminal section.

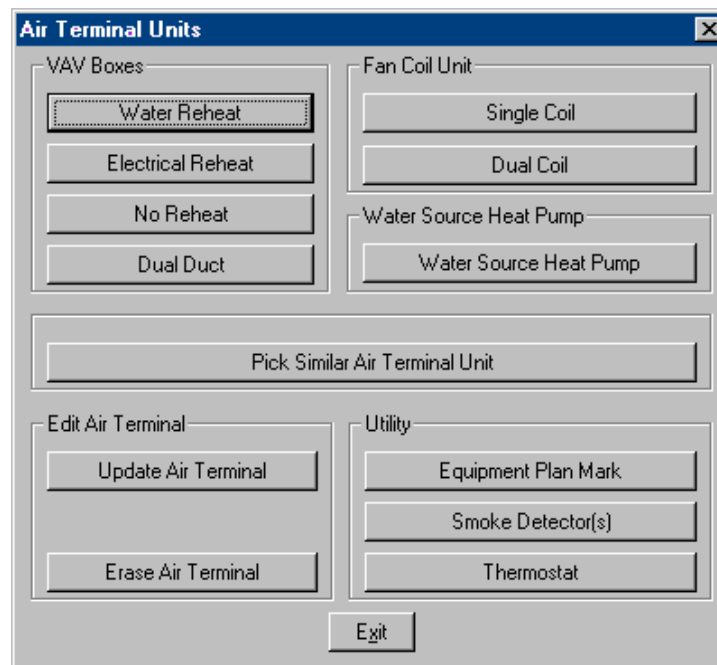


Figure 63.

* PICK AIR TERMINAL TO UPDATE / <Cancel> : *pick 11-01*

In the Update Single Duct VAV Air Terminal dialog, click **Select Rooms** button to specify the room to be serviced by the air terminal.

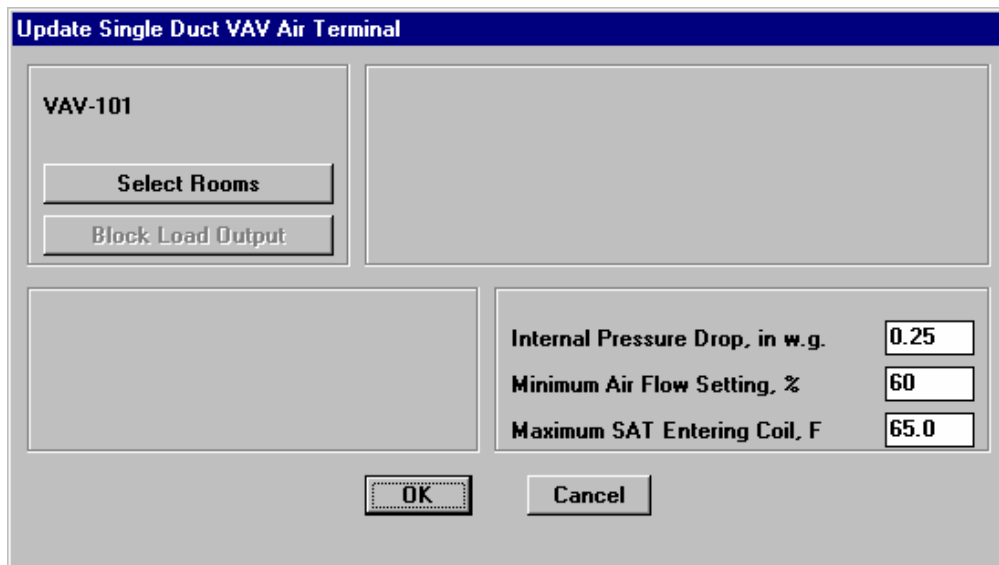


Figure 64.

- * PICK FIRST ROOM TABLE SERVICED BY THIS AIR TERMINAL / <Cancel> : *pick 11-01*
- * PICK NEXT ROOM TABLE SERVICED BY THIS AIR TERMINAL / <Cancel> :

In the Update Single Duct VAV Air Terminal dialog, click **OK** button.

In the Verify dialog, click **No** as an answer to **Relocate thermostat ?**

In the main **AIR TERMINAL UNITS** command dialog (shown in Figure 63,) click **Exit** button.

9.4. Re-Design Zone Supply Ductwork

In this section of the Tutorial, we will re-design zone supply ductwork downstream of VAV-101.

Enter Tutorial command **step12**.

Command: **step12**

Pick **MeMate** in the pull-down menu bar and then pick **DUCTWORK DESIGN**.

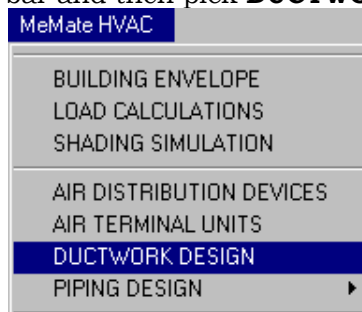


Figure 65.

In the Ductwork Design dialog, click **Ductwork Layout...** button

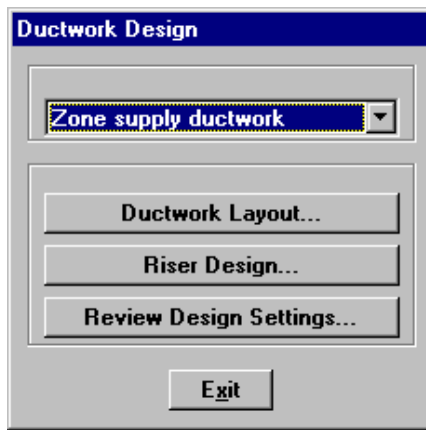


Figure 66.

* PICK SUPPLY AIR RISER, AIR TERMINAL OR P.O.C. / <New P.O.C.> : *pick 12-01*

In the Ductwork Layout dialog, click **Correct Layout** button.



Figure 67.

* PICK DUCT SEGMENT TO ERASE / <Cancel> : *pick 12-02*
 * PICK DUCT SEGMENT TO ERASE / <Cancel> : *pick 12-03*
 * PICK DUCT SEGMENT TO ERASE / <Cancel> :

In the Ductwork Layout dialog (shown in Figure 67,) click **OK** button.

In the Ductwork Calculations Complete dialog (shown in Figure 51,) click **OK** button.


In the Ductwork dialog (shown in Figure 52,) click **Convert to Double Line** button.


To conclude the task, click **Exit** in the Ductwork Design dialog shown in Figure 66.

If you would like to plot the drawing, freeze the layers with ductwork centerlines and pointing marks.

Command: **layer**

?/Make/Set/New/ON/OFF/Color/Ltype/Freeze/Thaw/Lock/Unlock: **f**

Layer name(s) to Freeze: **sk*,sf*,tutorial** 

?/Make/Set/New/ON/OFF/Color/Ltype/Freeze/Thaw/LOck/Unlock: 

What's next?

Now, when you are familiar with MeMate philosophy, approach, and techniques, you can continue to explore MeMate at your own pace. You won't have any problems to use MeMate on any background in any project and master the rest of MeMate commands.

Please refer to MeMate User Manual for complete instructions on MeMate commands not covered in this Tutorial. You will also find there some additional information about the commands you've used with Tutorial.

For material take-off and cost estimating features of MeMate, see respective chapters of MeMate User Manual.

If you are using MeMate in DEMONSTRATION Mode, please note the following limitations:

- The output is intentionally erroneous
- Few features are excluded from the demo version.
- You can calculate load in a limited number of rooms.
- You can design a limited number of air distribution devices and air terminal units.
- Demo version produces partial material take-off and partial cost estimate.