3. QUICK START

This chapter is intended to provide a summary of the steps for drawing a cross section and calculating the results. Each section references places in this manual that explain procedures in more detail.

The examples shown are for typical window cross sections. However, all of THERM's features (except for the Condensation Index Model which only applies to glazing systems) can be used to model two-dimensional representations of products.

3.1. Draw Cross Section and Select Materials

(for detailed instructions, see Chapter 5, "Drawing Cross-Section Geometry")

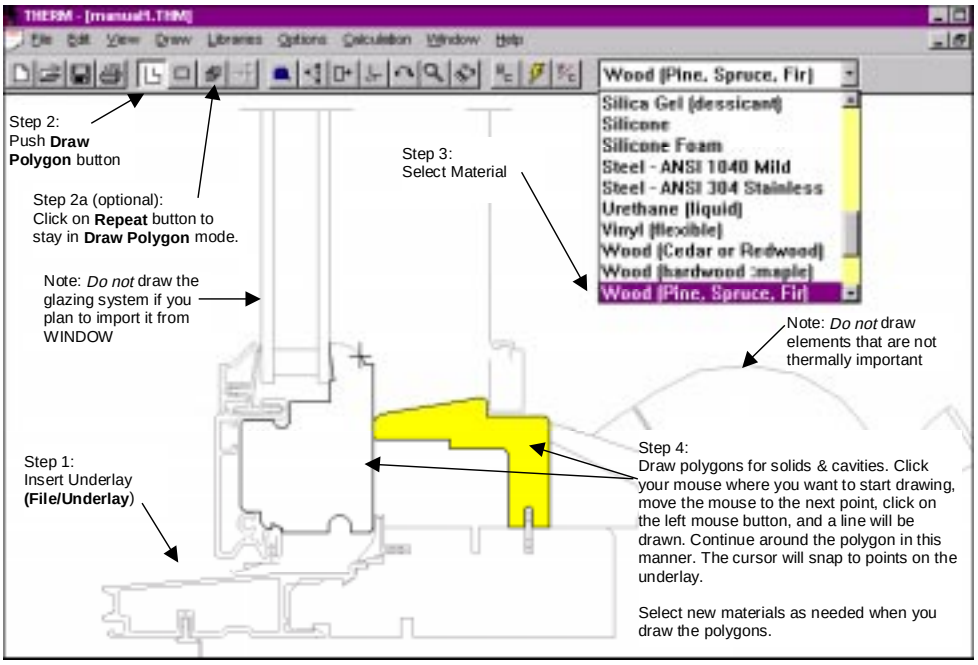
1. If tracing an underlay, bring in a DXF or bitmap file (using **File/Underlay**); to draw the cross section geometry yourself, go to the next step.

2. Press the **Draw Polygon** or **Draw Rectangle** toolbar button.

3. Select the material for the element you are drawing from the pull-down list in the upper right of screen. (Type the first few letters of the material to scroll through the list without using the mouse).

4. If using an underlay, trace the cross-section elements with your mouse, or work from a dimensioned drawing using THERM's step function (type a value to set the step size; when you press an arrow key the cursor will move by the step distance in the direction of the arrow key; see Section 5.5, "Drawing Using the Keyboard"). THERM recognizes the vertices of the DXF file and will snap the lines being drawn to the underlay. Select new materials as needed before you draw each component, and the materials will be automatically assigned to that component. Draw all components except the glazing system, which will be inserted later.

   If the cursor is snapping to lines or points inappropriately, zoom in (click on the right mouse button) to reduce cursor sticky distance (**Shift-right** mouse click zooms out), or use **Draw/Snap Settings**.



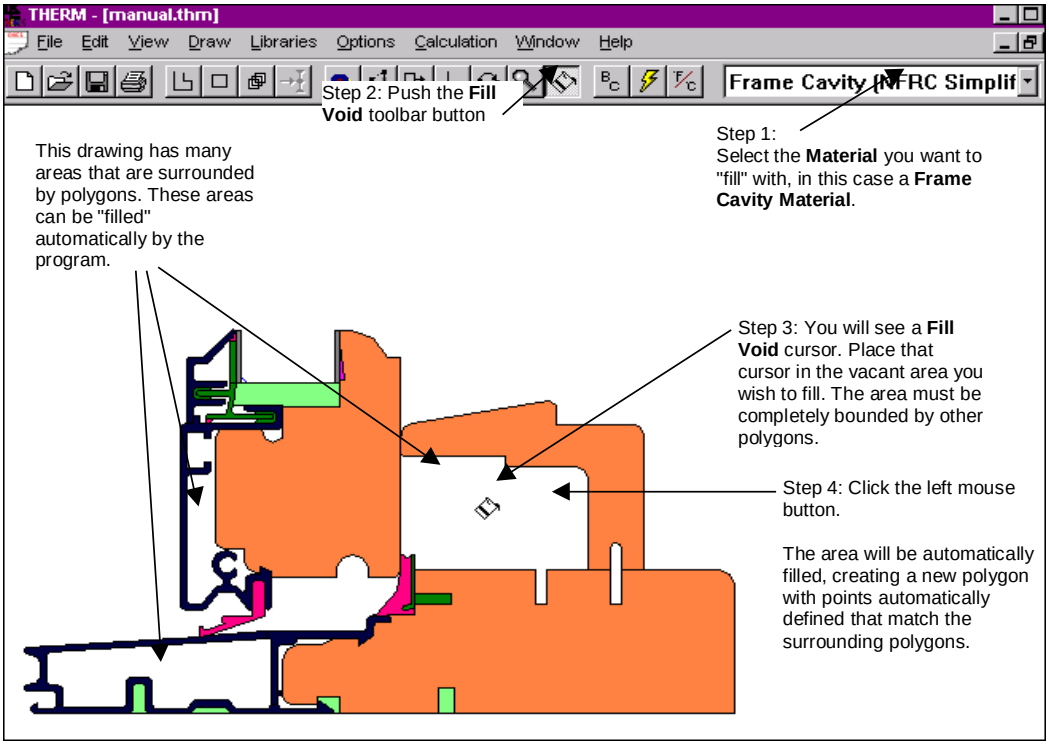
3.2. Drawing Features

There are several powerful drawing features in THERM, including fill void; insert, move and delete points; move, cut, copy, and paste polygons; and flip and rotate the entire cross section. See Section 5.6 "Editing Polygons" for an in-depth discussion of these features.

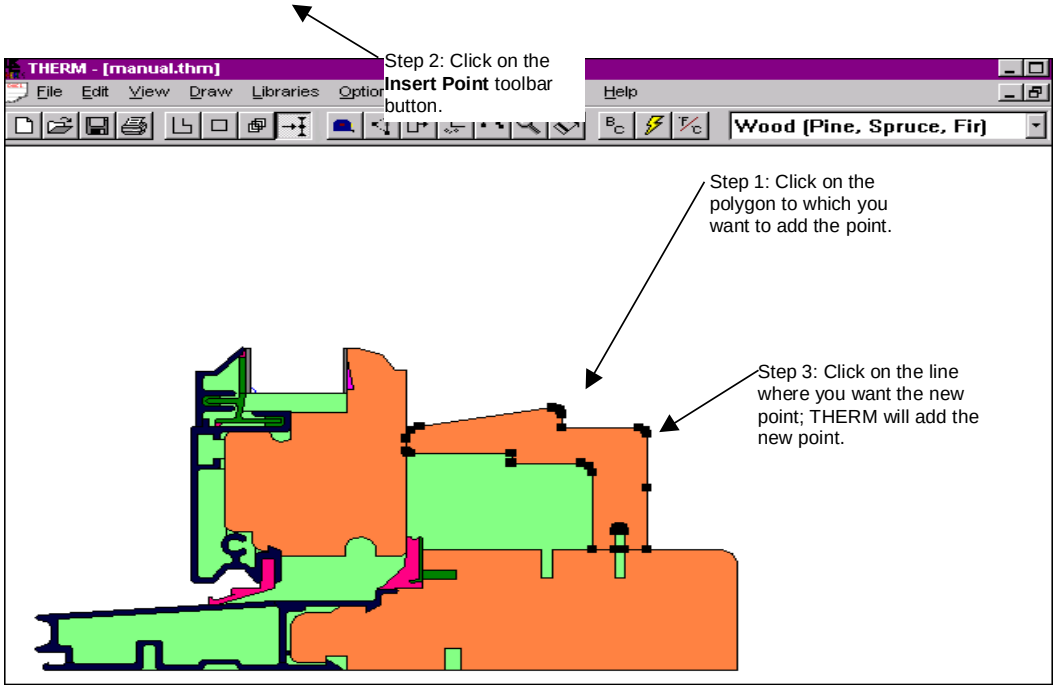
1. **Fill Void feature:** An area of the drawing that is completely surrounded by polygons can be automatically "filled" by THERM, using the **Fill Void** toolbar button.

   To fill an area, first select the **Material** you want to "fill" with, such as the **Frame Cavity (NFRC Simplified)** material shown in the figure below. Then push the **Fill Void** toolbar button, and a **Fill Void** cursor will be displayed. Put the cursor inside the area to be filled and press the left mouse button. (If the area to be filled is smaller than the cursor, zoom in by pressing the right mouse button). THERM will automatically create a polygon that fills the area.

   For THERM to perform its calculation, the cross section must not contain any voids or overlaps (see Section 6.3.2, "Finding Voids and Overlaps"). THERM drawing features that are designed to minimize unintentional creation of voids and overlaps as you are drawing include the fill void feature, the "snap" feature (see Section 5.3.3, "Snap Settings") and the dynamic overlap checking as you draw polygons.



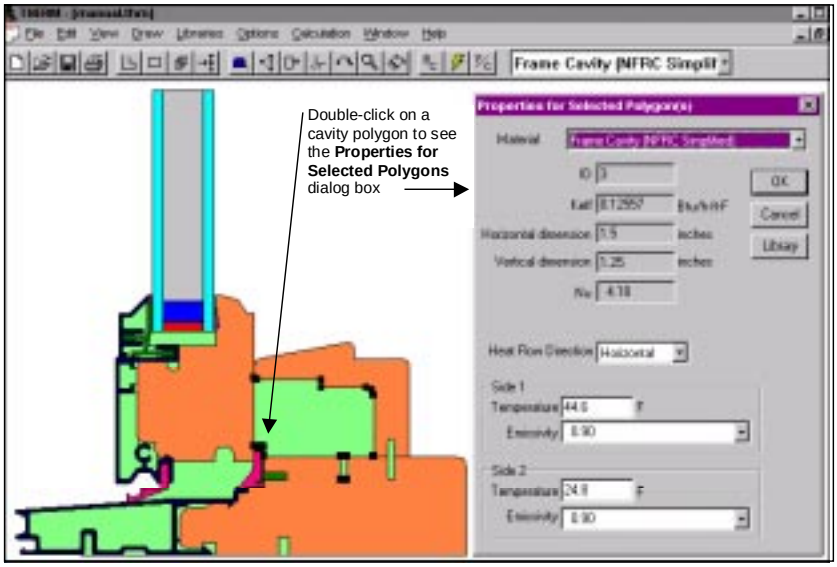
2. **Insert Points**: If you need to insert new points into a polygon, use the following steps:
   - Click on the polygon to which you want to add the point
   - Click on the **Insert Points** toolbar button
   - Move the mouse cursor over the location on the polygon where you want to add the point.
   - Click the left mouse button. A new point will be added.



3.3. Materials
(see Section 5.10, "Assigning Materials After Drawing Polygons" and Section 5.11, "Defining New Materials")

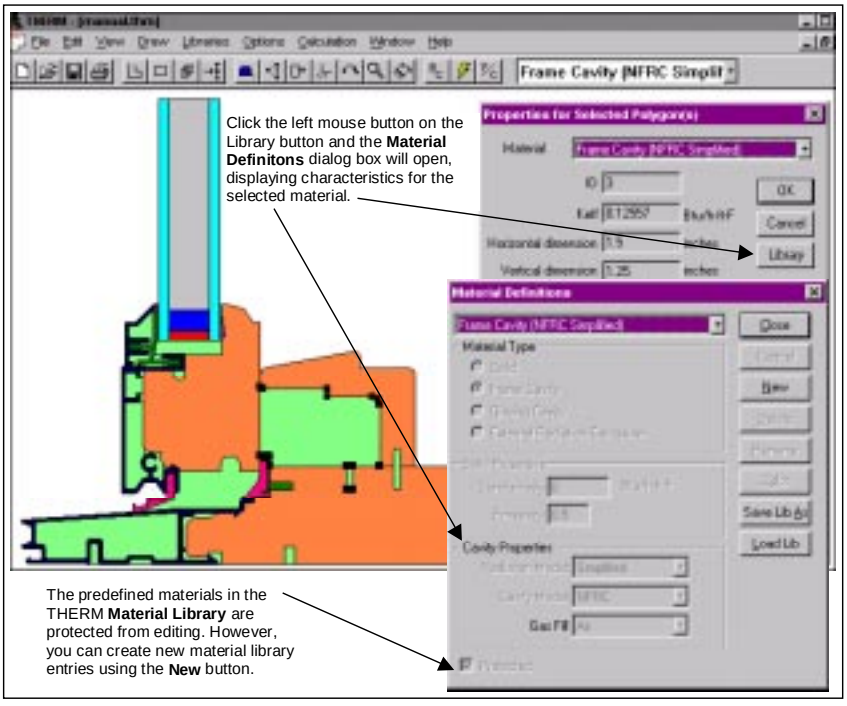
Materials can be specified as you are drawing; they can also be changed after polygons have been created.

1. Double-click on a polygon; the **Properties for Selected Polygon(s)** dialog box will be displayed. Depending on the type of material selected for the polygon (**Solid**, **Frame Cavity**, or **External Radiation Enclosure**), different values will be displayed in the dialog box.



2. From **Properties for Selected Polygon(s)**, you can press the **Library** button, and the **Material Definitions** dialog box will be displayed. From **Material Definitions**, you can view all the entries in the **Material Library** in order to see more detailed characteristics of each material.

3. The THERM material library contains predefined materials that cannot be edited; however, from the **Material Definitions** dialog box you can create new material library entries, using the **New** button.



3.4. Insert Glazing System (see Chapter 5, "Drawing Cross-Section Geometry")

1. On the left-hand side of the glazing unit, draw a rectangle to represent the sealant between the glazing and the frame.

2. Use the **Locator**, accessed from **Draw/Locator**, to define the lower left corner of the glazing system to be inserted.

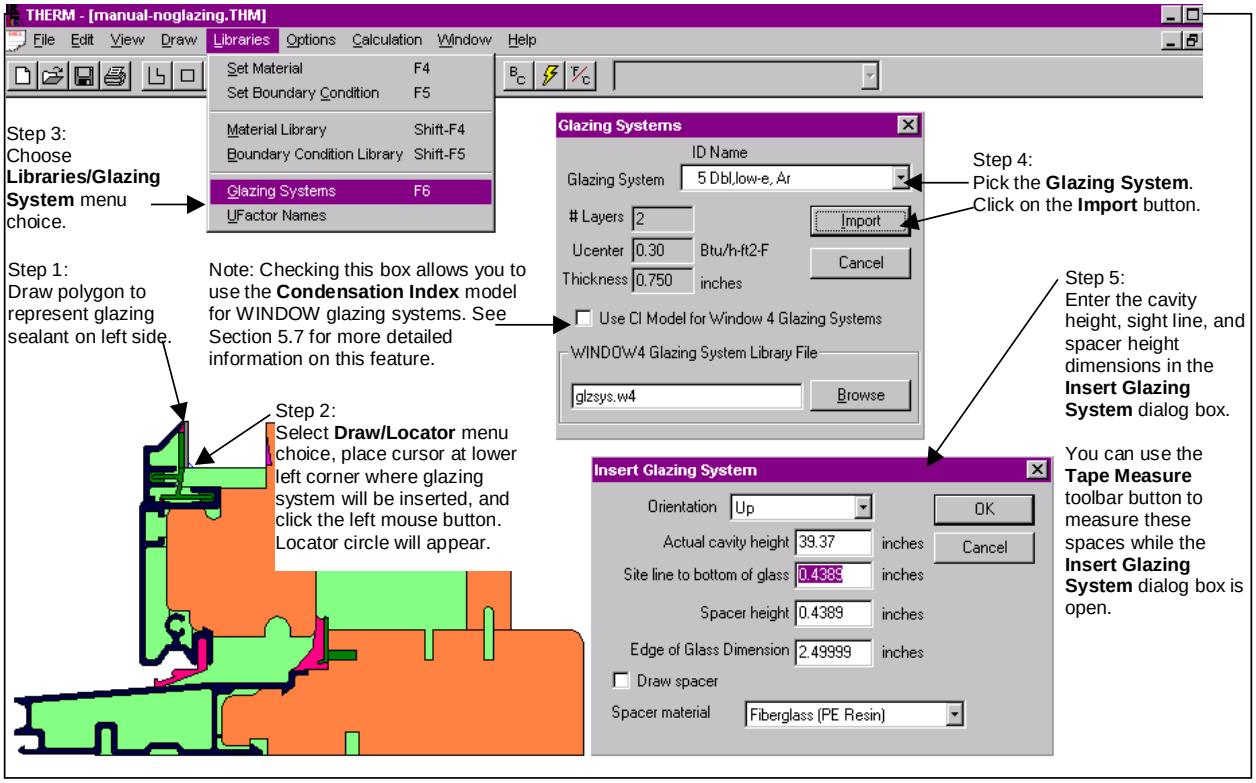
3. Select the **Libraries/Glazing System** menu choice to access the **Glazing Systems** dialog box, and choose a glazing system previously created in WINDOW 4.

4. From the **Glazing System** dialog box, use the pull-down list to select a glazing system from the WINDOW4 (glzsys.w4) library; click on the **Import** button. You can use the **Browse** button to change to a glazing system library in another directory.

5. The **Insert Glazing System** dialog box will appear. Enter all information in the input fields, in particular the cavity height (if you are using the Condensation Index Model), sight line, and spacer height dimensions. Leave the **Draw Spacer** box unchecked if you want to paste in a spacer from another THERM file. Press the **OK** button.

6. THERM will insert the glazing system automatically. If you get a message that the glazing system won't fit, adjust the frame components as needed.

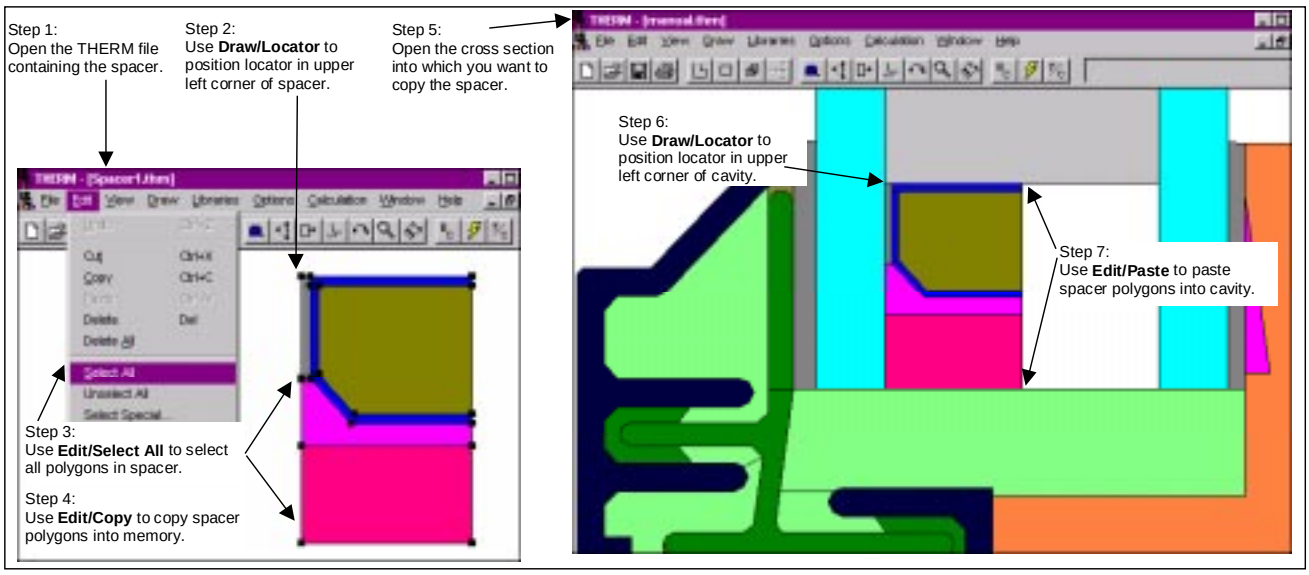
7. Add another rectangle for the sealant to fill in any gap between the right side of the glazing system and the frame.



3.5. Adding a Custom Spacer

THERM's **copy** and **paste** drawing features allow you to have libraries of components that can be used in many different cross sections. You could, for example, store a spacer in a separate THERM file that can be copied into any cross section you are drawing. You can also make use of the **flip** and **drawing locator** features during this process.

1. Open the THERM file containing the spacer. In the example shown, the file contains half of a spacer.
2. Use the **Draw/Locator** menu choice and click your left mouse button on the upper left corner of the spacer.
3. Use the **Edit/Select All** menu choice to select all the polygons in the spacer.
4. Use the **Edit/Copy** menu choice or **Ctrl-C** to copy all the selected polygons into memory in standard Microsoft Windows™ style.
5. Use the **File/Open** menu choice to open the cross section into which you want to copy the spacer.
6. Use the **Draw/Locator** menu choice to position the locator in the upper left corner of cavity where the spacer will go. The location of the Locator in this file should match the position where you placed the locator on the spacer; the program will match up the two locator positions when you paste the spacer.
7. Use the **Edit/Paste** menu choice or **Ctrl-V** to paste the spacer into the second cross section. The program will place the copied spacer by matching the two locator positions. Now you have positioned your half spacer in the cross section. To complete the spacer, continue with the following steps.



8. Use the **Window** menu to select the spacer file.

9. In the spacer file, use the **Draw/Flip/Horizontal** menu choice to flip the spacer; this new shape will form the second half of the spacer when pasted into the cross section. (THERM applies the flip and rotate functions to the entire cross section).

10. Use the **Draw/Locator** menu choice and click your left mouse button on the upper right corner of the spacer.

11. Use the **Edit/Select All** menu choice to select all the polygons in the spacer geometry.

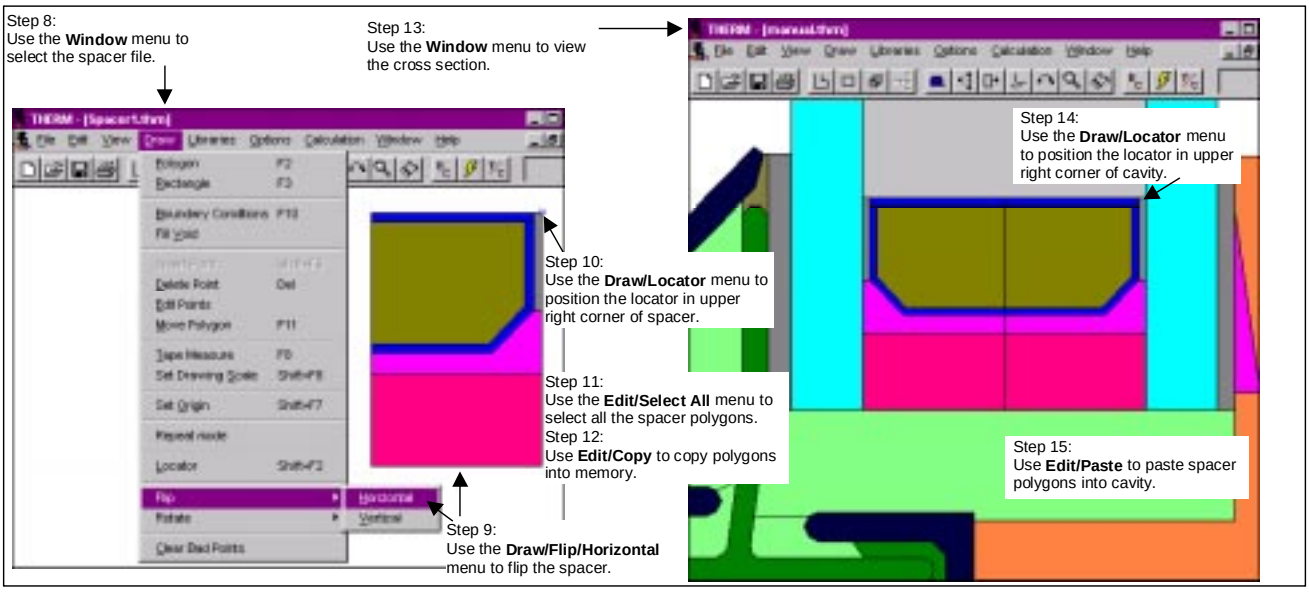
12. Use the **Edit/Copy** menu choice or **Ctrl-C** to copy the "flipped" spacer polygons.

13. Use the **Window** menu to view the cross section into which you already pasted the first half of the spacer.

14. Use the **Draw/Locator** menu choice to position the locator in the upper right corner of the cavity to which you want to match the upper right corner of the spacer.

15. Use the **Edit/Paste** menu choice or **Ctrl-V** to paste the spacer into the cross section. The program will place the copied spacer by matching the two locator positions. Now the second half of the spacer is in position.

16. Use the **File/Save** menu choice to save the cross section containing the new spacer.

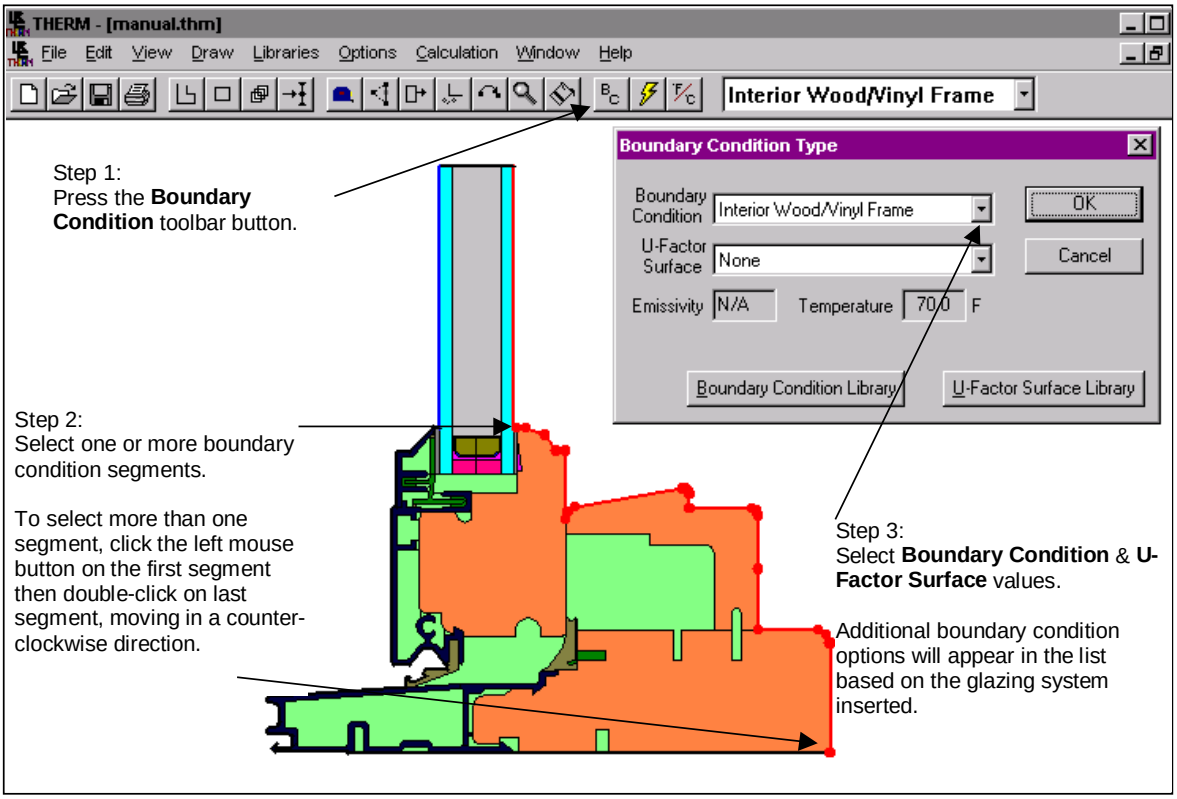


3.6. Specify Boundary Conditions (see Section 6, "Defining Boundary Conditions")

1. Press the **Boundary Conditions** toolbar button. The external boundary is automatically drawn, indicated by a thick line. (A default boundary condition of **Adiabatic** is assigned).

2. To change the default boundary condition, select a boundary segment (double-click the left mouse button on a boundary segment) or multiple contiguous boundary segments (hold the **Shift** key down, click the left mouse button on the first segment and the last segment, moving in a counter-clockwise direction, and then press **Enter**; use the **Ctrl** key in the same manner to select multiple non-contiguous boundary segments). You must have at least two non-adiabatic boundary conditions for the program to perform a simulation.

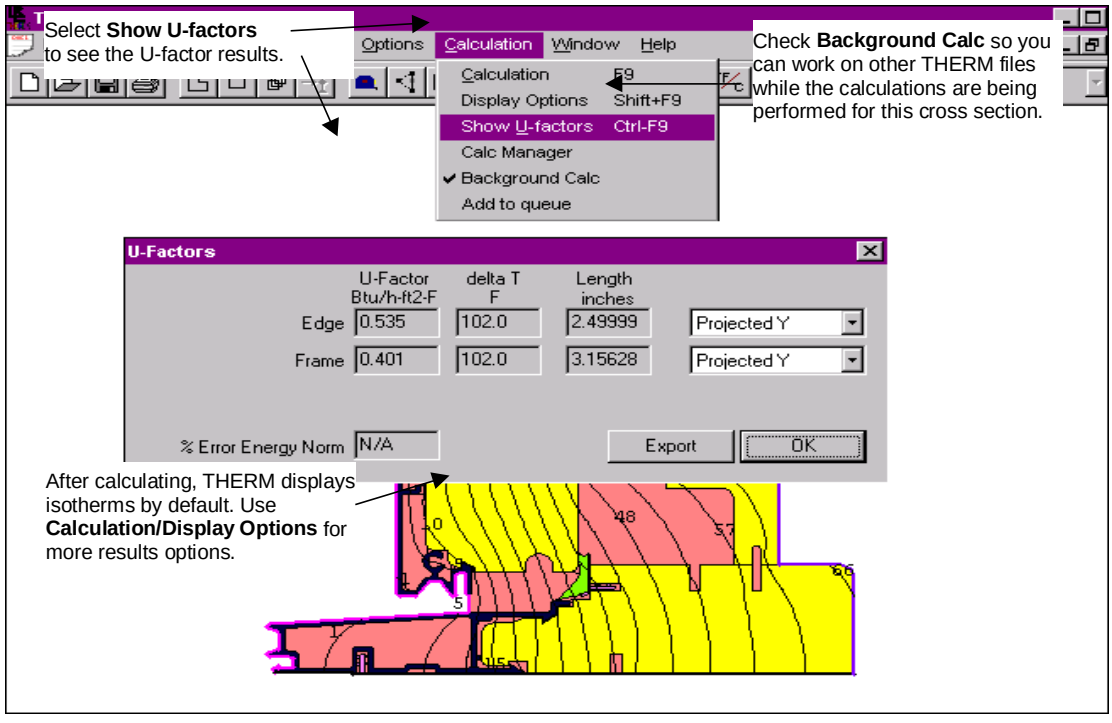
3. The **Boundary Condition Type** dialog box will appear. Pick the appropriate **Boundary Condition** and **U-Factor Surface** choices for each boundary segment.



3.7. Run Simulation and View Results (see Chapter 7, "Calculating Results")

1. Press the **Calculation** toolbar button. 
2. THERM automatically generates a finite-element mesh to perform the calculation. The status of the calculation is displayed in the status bar at the bottom of the THERM window.
3. Results will be displayed as isotherms on the cross section when the calculation is completed.
4. From the **Calculation** menu, select **Display Options**.
5. Select the desired graphic display option and check the **Draw Results** box.
6. Select the **Calculation/Show U-factor** menu choice to see the U-factor values. If U-Factor values are blank, then you need to assign **U-Factor Surface** labels to the surfaces of interest (double-click on the boundary segment to assign these labels.)

Other graphic results can be accessed using the **Calculation/Display Options** menu choice.

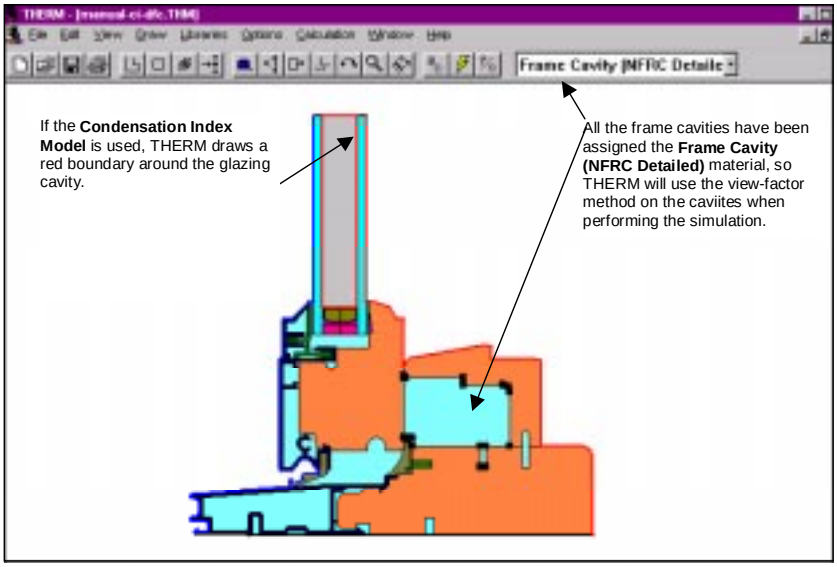


3.8. THERM's Advances in Modeling

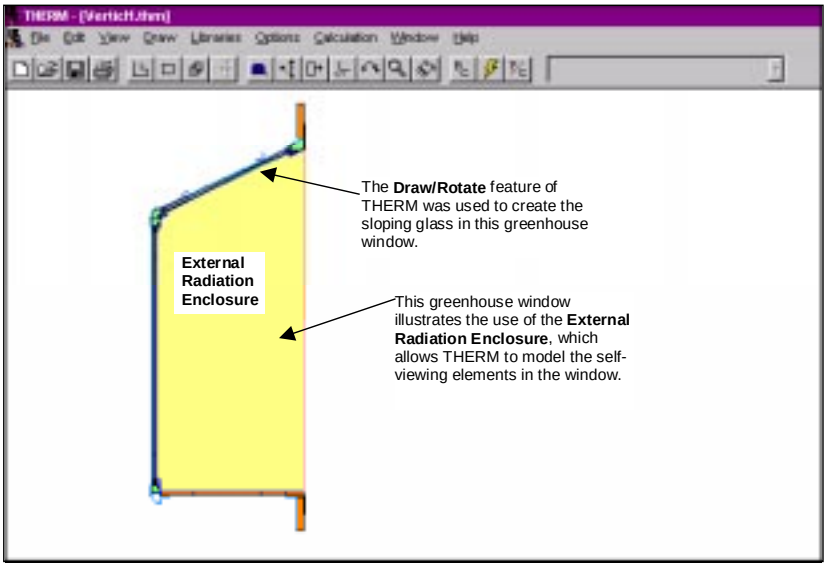
Several features in THERM represent advances in thermal modeling. These include the Condensation Index Model for glazing cavities and the view-factor radiation model for frame and glazing cavities and external radiation enclosures.

1. Assigning frame cavities a material defined with the **Detailed Frame Cavity** model allows the program to use the view-factor method when performing the simulation. See Section 5.11, "Defining New Materials," for a more detailed discussion of this feature.

2. If you use the **Condensation Index Model** for an imported WINDOW glazing system, the program will use local film coefficients and a detailed radiation model to give more accurate local temperatures. THERM draws a bold red line around the glazing cavity boundaries to indicate that the **Condensation Index Model** is in effect. See Section 5.9, "Inserting a Glazing System," for more details about this feature.



3. The THERM file below illustrates a greenhouse window cross section in which the **Draw/Rotate** feature has been used to tilt the upper glazing. In addition, the interior area enclosed by the window is defined as an **External Radiation Enclosure**, so the program will model the window using the view-factor radiation methodology. See Section 5.11.4 for more information.



3.9. Toolbar Reference Table

Button	Description	Menu / Choice	Short cut
	New THERM file	File / New	Ctrl+N
	Open existing THERM file	File / Open	Ctrl+O
	Save THERM file	File / Save	Ctrl+S
	Print THERM file	File / Print	Ctrl+P
	Draw Polygon	Draw / Polygon	F2
	Draw Rectangle	Draw / Rectangle	F3
	Repeat Mode This button can be used with the Draw Polygon, Draw Rectangle, Insert Point, Tape Measure, Edit Points, Move, and Fill Void buttons to repeat those functions.	Draw / Repeat Mode	
	Insert Point	Draw / Insert Point	Shift F6
	Turn on Tape Measure	Draw / Measures	F8
	Edit Points	Draw / Edit Points	
	Move polygon or rectangle	Draw / Move	F11
	Set drawing origin	Draw / Set Origin	Shift F7
	Change Snap Settings	Draw / Snap Settings	F12
	Turn on Zoom to enlarge view of drawing	View / Zoom	*Zoom to fit: F7* *Zoom In*: right mouse button *Zoom Out*: shift right *Center:* Ctrl-right mouse button
	Fill void	Draw / Fill Void	
	Define Boundary of cross section	Draw / Boundary Conditions	F10
	Begin Simulation	Calculation / Calculation	F9
	Switch Unit Systems between SI and IP	Options / Switch Units	

3.10. Other Shortcuts

Description	Menu/Choice	Shortcut
Material Library	Libraries / Material Library	Shift-F4
Boundary Condition Library	Libraries / Boundary Conditions	Shift-F5
Set Material	Libraries / Set Material	F4
Set Boundary Condition	Libraries / Set Boundary Condition	F5
Snap to point or polygon within sticky distance of the cursor		Space bar
Snap to the last point drawn		End
Decrease the step size by a factor of 10.		Ctrl-Arrow key