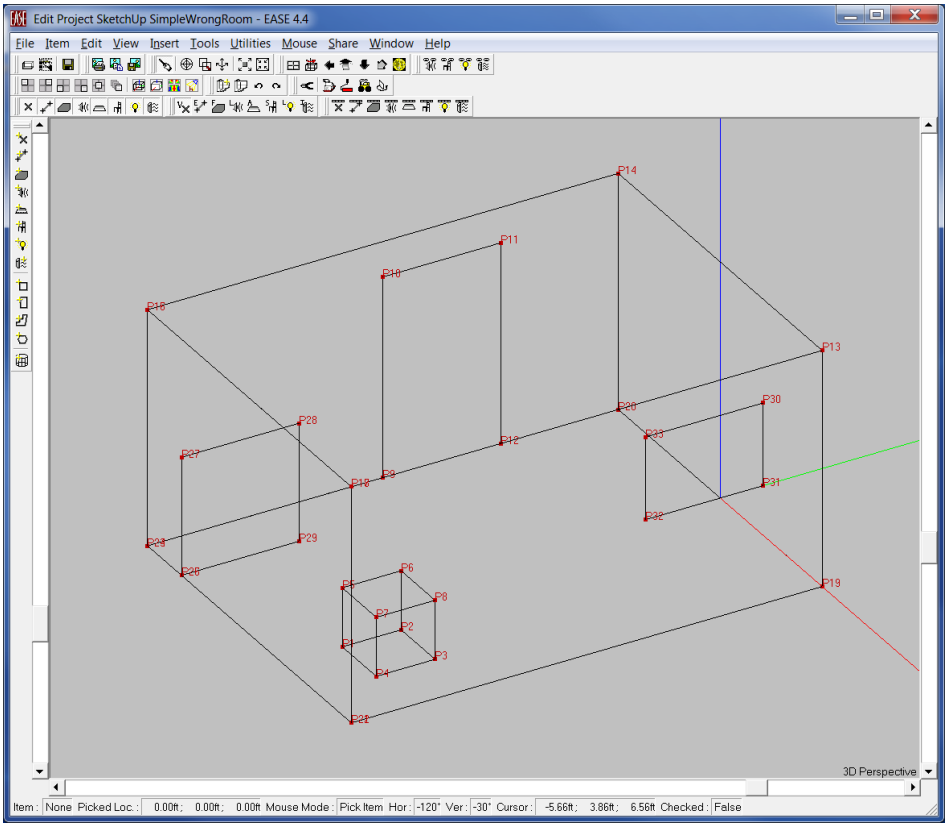
How do I fix “Face Mismatch or Hole in Room”?

This exercise addresses several common model problems that will prevent you from “closing” a room. To begin, please download the following example model:

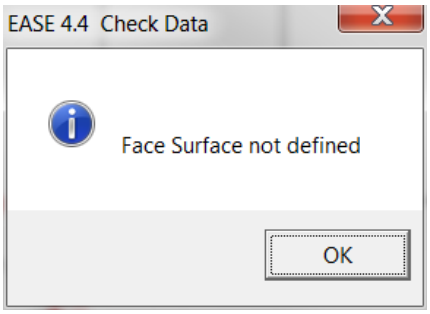
Download “Simple Room”

Then, open it in EASE by unpacking the downloaded *.zip file and double clicking “Simple Room With Holes.frd”. Press No in the message box that will appear to ignore the log-file that is created.

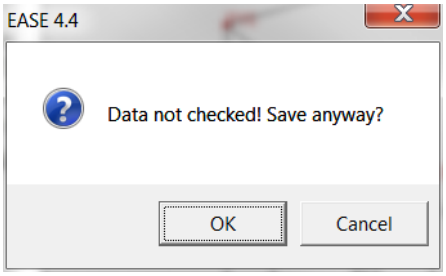


We have loaded a simple room where a number of geometry problems have been introduced and will now look at each in detail. To get better acquainted with the room use the scroll bars at the bottom and right-hand side of the screen and then get back to the default view by clicking **3D Perspective** in the toolbar or press the keyboard shortcut 3.

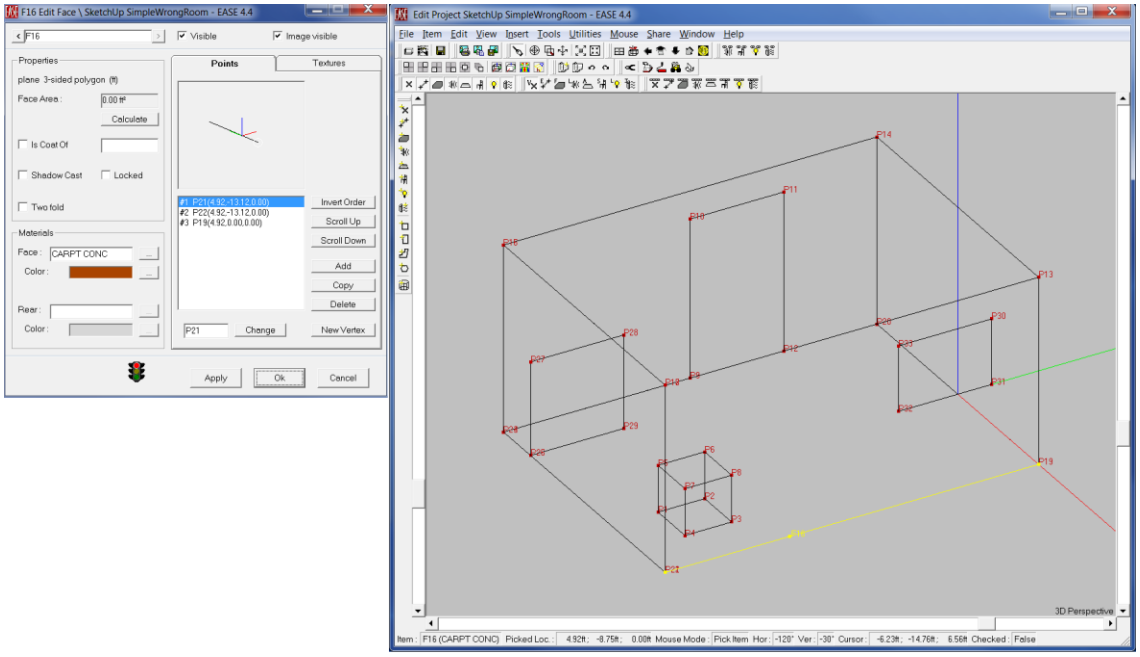
When we press F5 or click **Check Data** on the **Edit** menu to verify the current status of the model, we get the first error dialog window:



If you pressed the F6 key to **Check Data and Save**, you will get a second window. You can save your progress even if the model has problems in its current state:

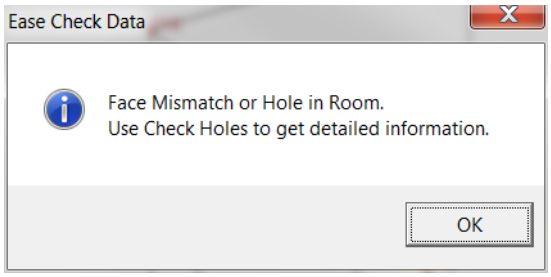


Click **OK** to see the following dialog:

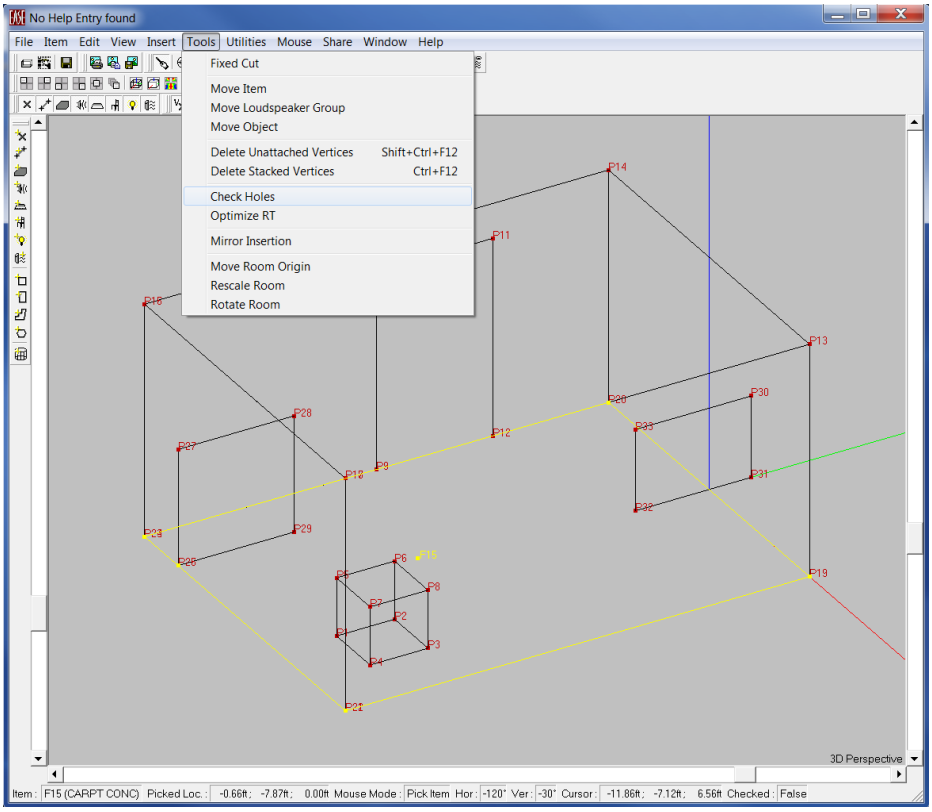


A border of the model is highlighted in yellow and the properties dialog is open for the face with the problem. Even though this item looks like an *Edge*, it is actually defined as a *Face*. The *Face* has no surface area, causing the problem. Click **OK** to close the **Properties** window and use the Delete key.

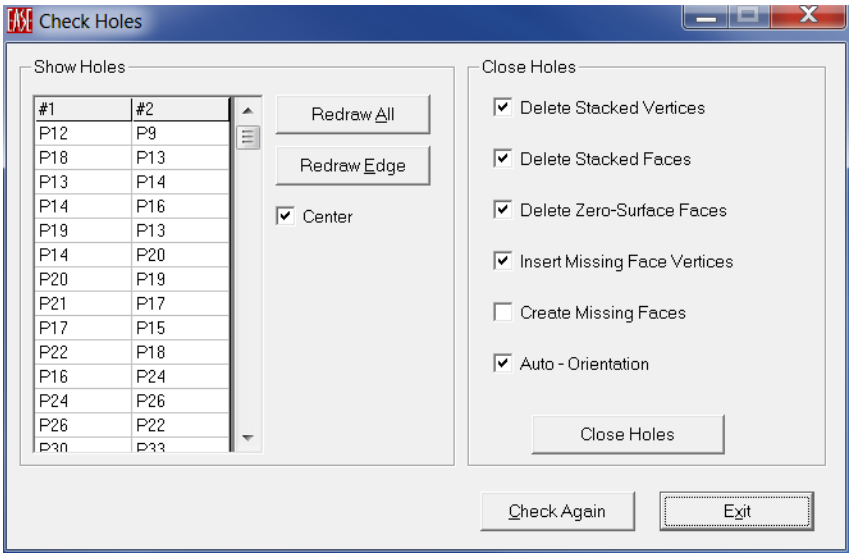
Press the F5 key again to open a new dialog:



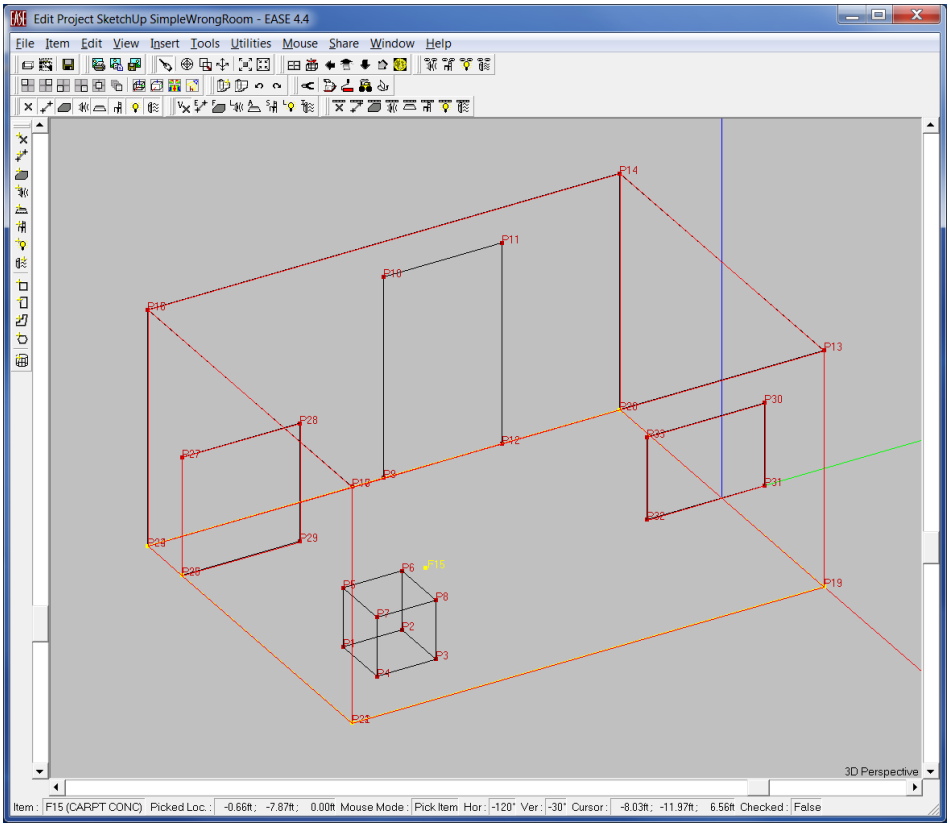
EASE has detected at least one “hole” in the room and prompts you to open the tool **Check Holes**. Click **Check Holes** on the **Tools** menu.



This opens the following window.



The **Check Holes** tool has a list of problems that it can fix. We'll now look at each one, but first, click **Redraw All** to highlight all areas in the drawing that have issues found by this utility.



Let's look at each automatic fix proposed by the **Check Holes** tool:

1. Delete Stacked Vertices
2. Delete Stacked Faces
3. Delete Zero-Surface Faces
4. Insert Missing Face Vertices
5. Create Missing Faces
6. Auto – Orientation

Then we will look at the fixes that we will need to do manually:

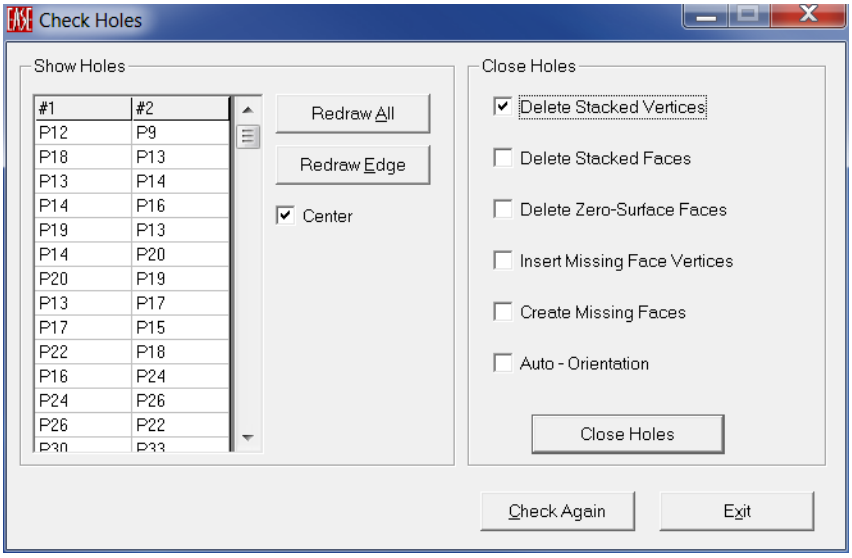
7. Two-Fold Faces
8. Internal Volumes
9. Single-Fold Coats

1. Delete Stacked Vertices

One or more vertices share the same coordinates. If we now look closely at the short wall face on the left-hand side of the screen we will see that all 4 vertices are duplicated. This will cause errors because the adjacent faces are using different vertices in their definitions.

Note: In some cases you will use different vertices to define a coat and the coated face, even if they share the same location. Using Delete Stacked Vertices would create an error in the room by merging those vertices.

We will now put a checkmark only on the first option and click ***Close Holes.***

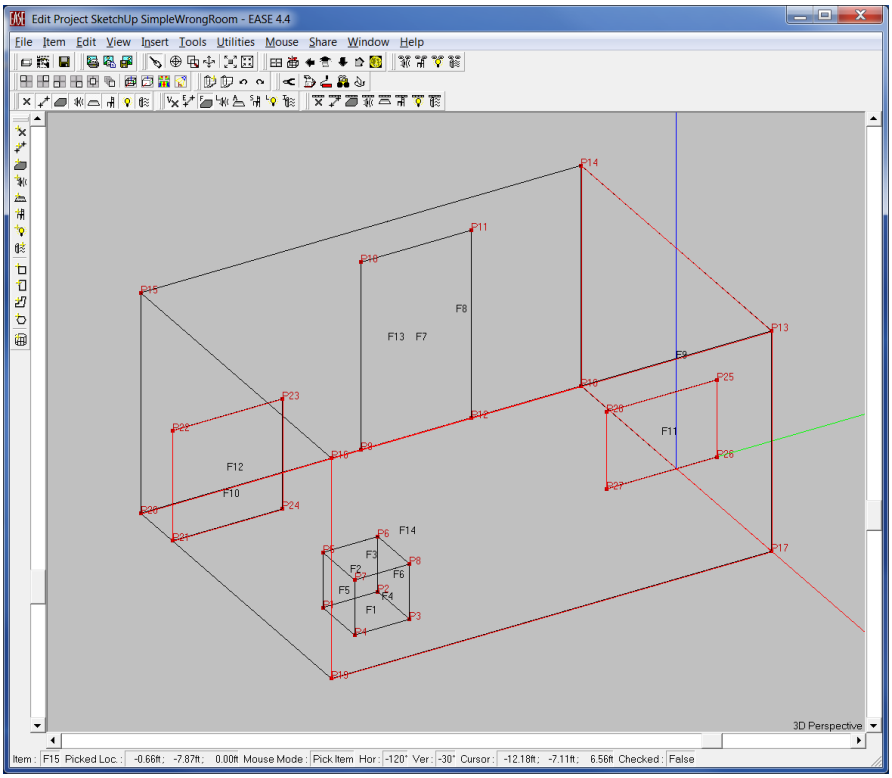


Single vertices should now be shown in those corners and if we click **Check Again** and **Redraw All** some of the red highlights should have disappeared.

Alternatively, on the **Tools** menu you can also click **Delete Stacked Vertices**.

2. Delete Stacked Faces

As with *Vertices*, if *Faces* share the exact same location this will cause errors in the model. If we now click **Face Labels** in the toolbar to turn the labels on, we will see that the left-hand side *Face* is also duplicated. We can manually delete the extra *Face* or use the second option in the list to apply an automatic fix. The result of either method is shown below:

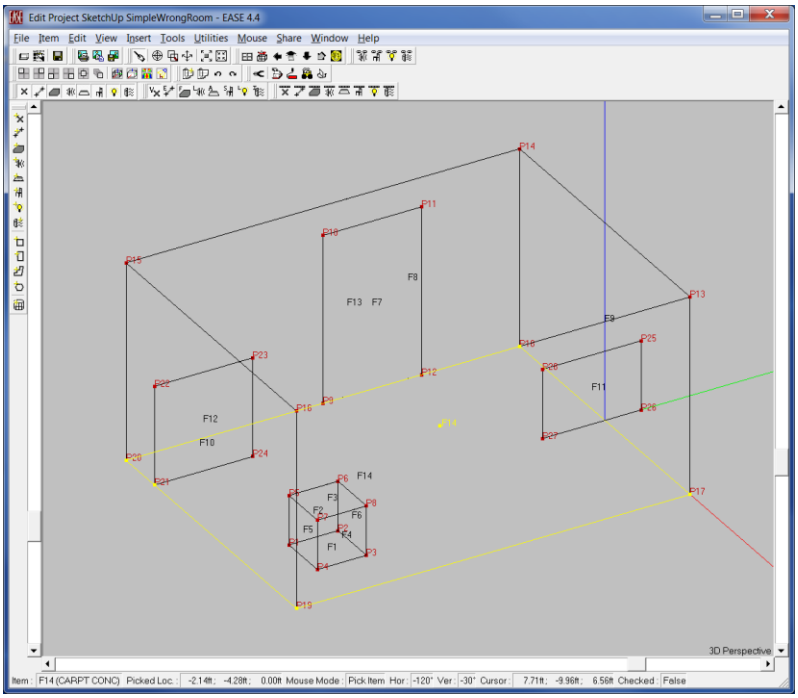


3. Delete Zero-Surface Faces

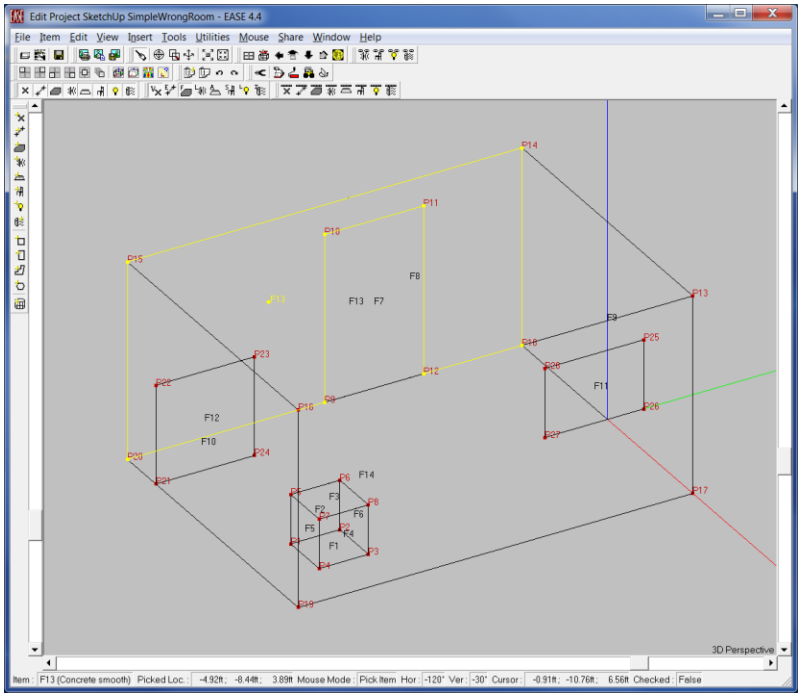
This error refers to a *Face* with only one dimension, appearing in the model as a line. We fixed this error in the first step, before opening the **Check Holes** tool. The automatic fix will eliminate Faces with a 0.00 ft^2 area.

4. Insert Missing Face Vertices

One of the borders still highlighted in red is the one between the floor and the back wall that contains the door. Click on the floor *Face* to see which vertices are included in its definition. They will be highlighted in yellow:

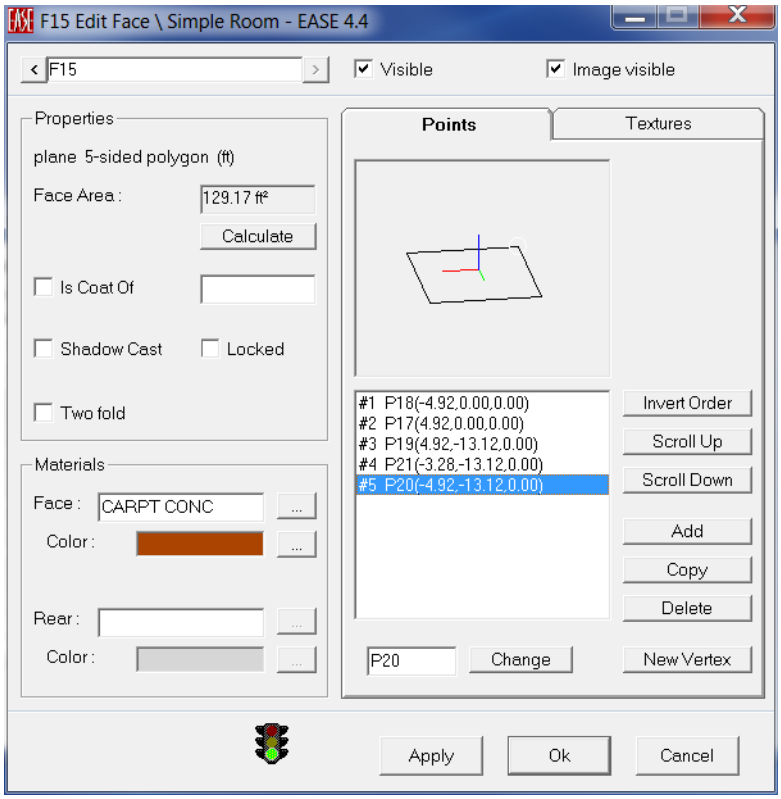


Now click on the back wall:

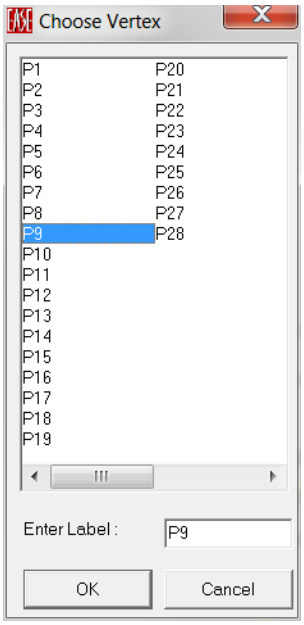


Notice that P9 and P12 are not part of the floor but they are part of the back wall and door. The border defined between P20 and P9 needs to be included in the two adjacent *Faces*. The same is true for borders P9 to P12 and P12 to P18.

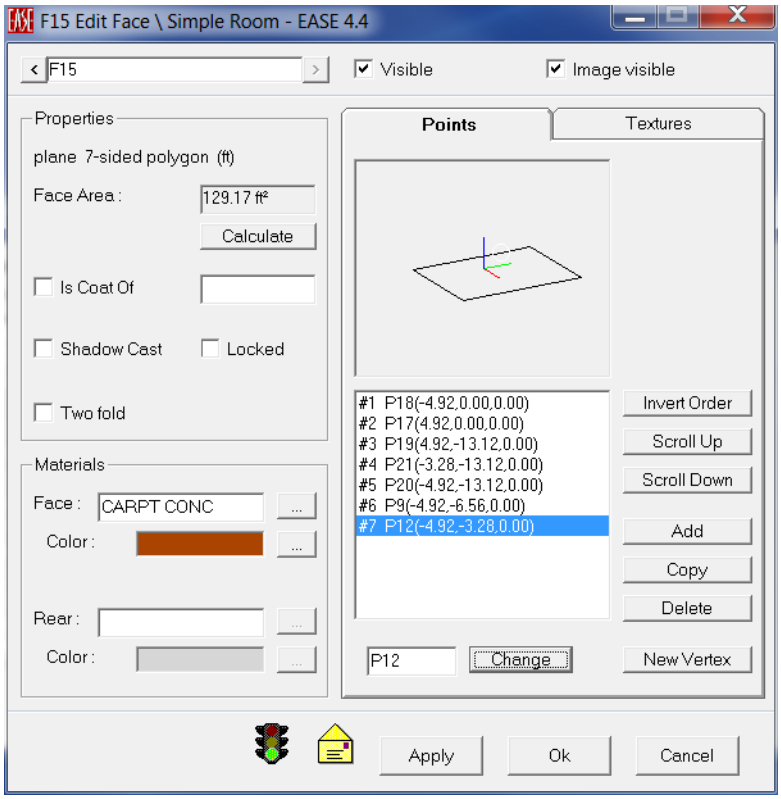
In order to add the missing vertices manually, we will open the floor **Face Properties**:



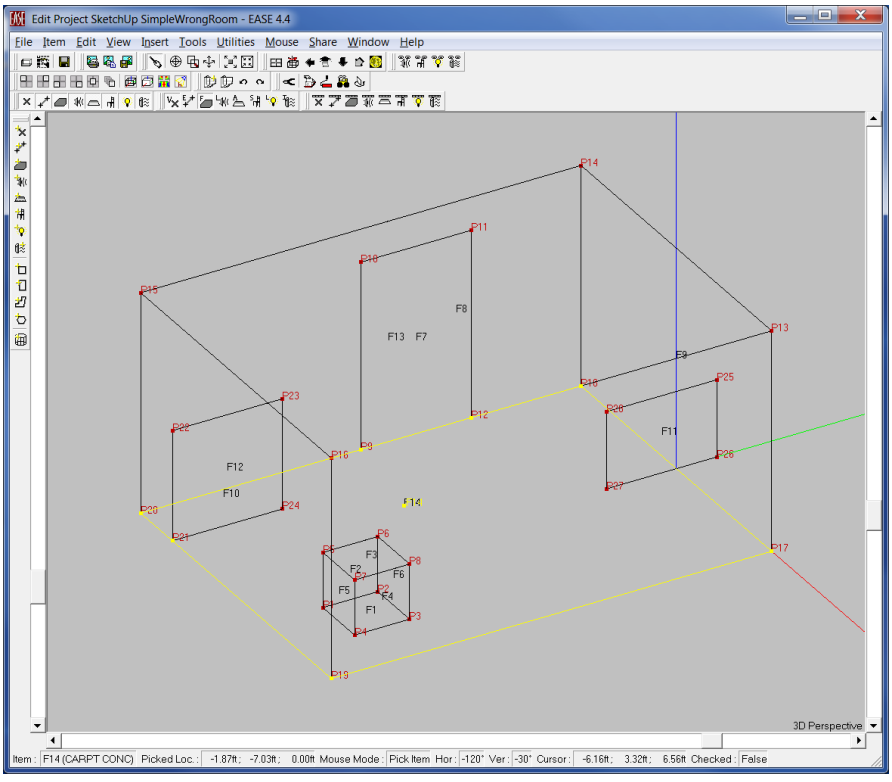
Select P20 and click ***Copy*** to duplicate that Vertex. Click **Change** with the new P20 selected in the list to change it to P9 by selecting it in the list in the **Choose Vertex** dialog, then click **OK**:



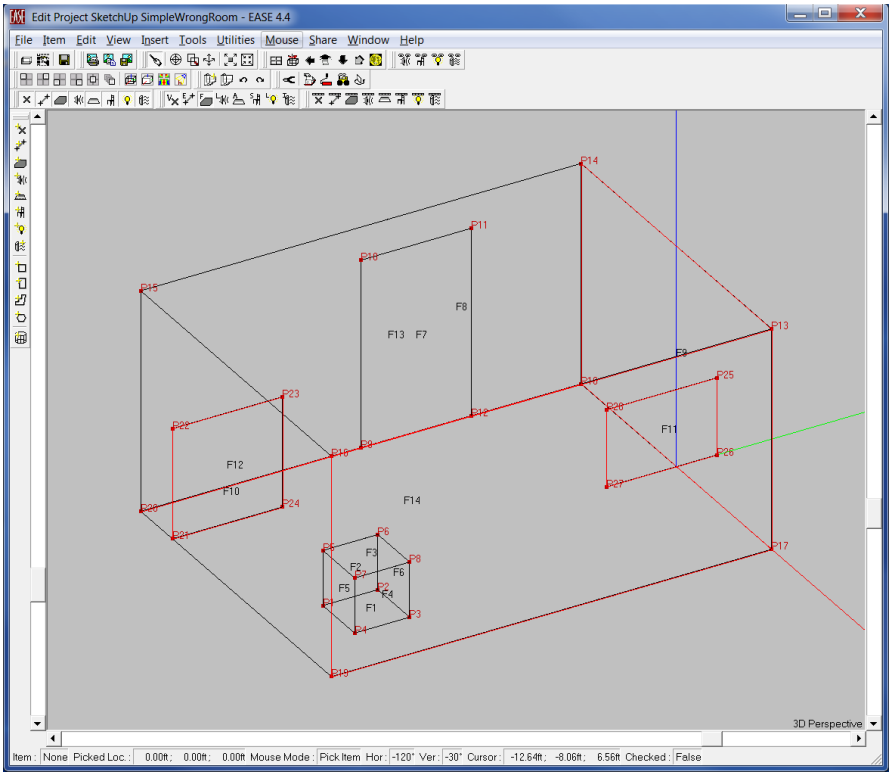
Repeat the procedure by copying P9 and changing it to P12:



F15 now has 7 *Vertices* in its definition.



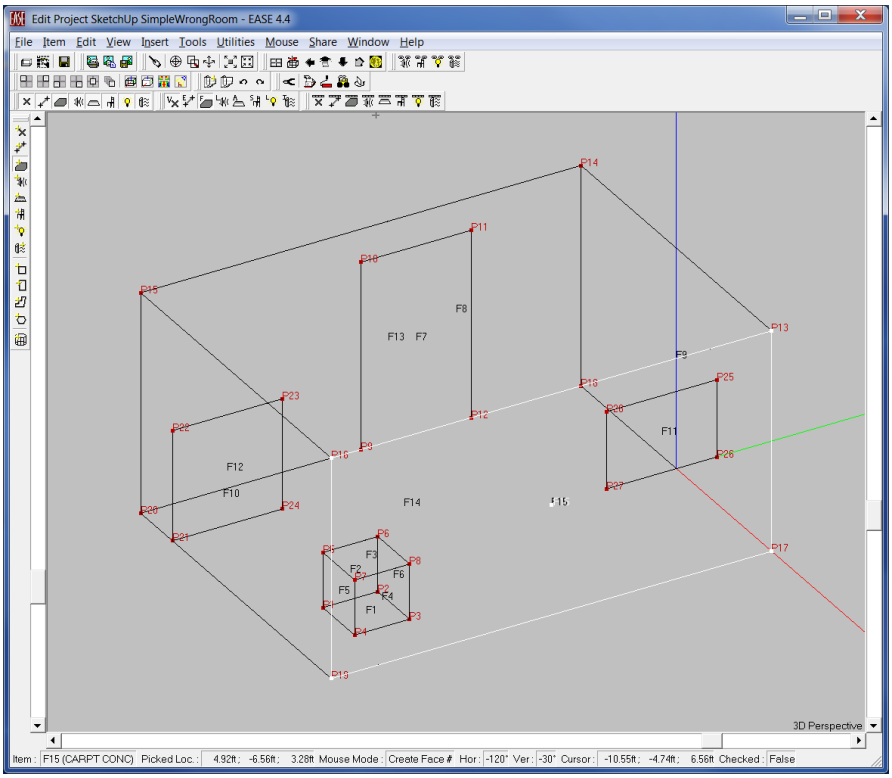
Click outside the model in the **Edit Project** window drawing to remove the selection of the floor *Face* and click **Redraw All** in the **Check Holes** dialog to show one less red border on the model:



5. Create Missing Faces

This automatic fix is the only one that was not highlighted by default when we opened the Check Holes utility. Even in a simple room like this it is extremely difficult for EASE to create missing faces without generating additional errors (typically triangulation). We recommend that missing faces are found with the help of **Check Holes** and then created manually.

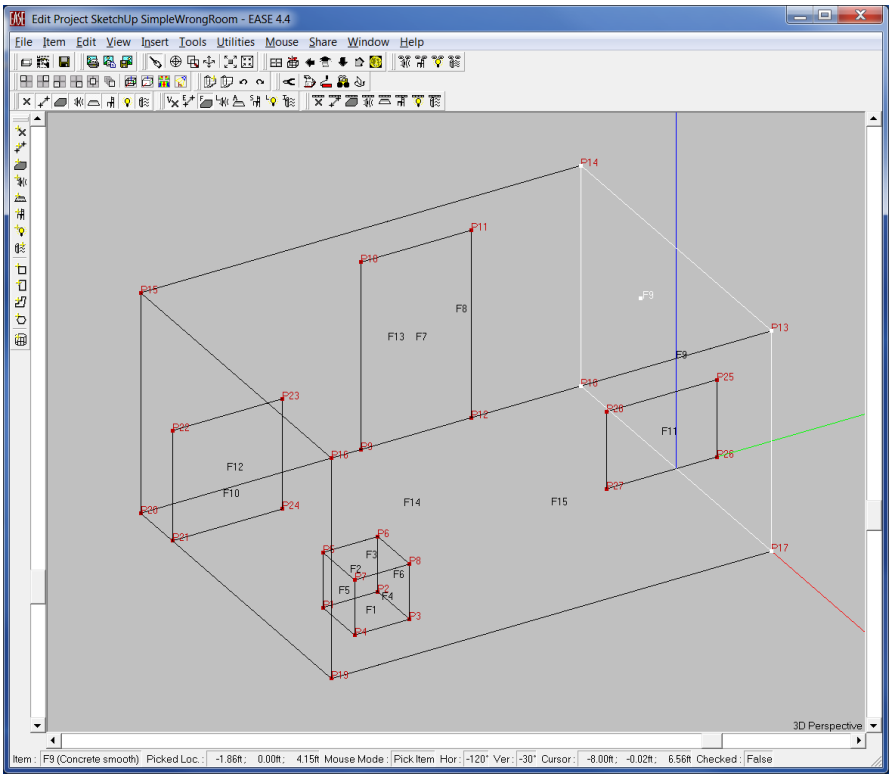
In this case, there are a few faces with red borders so we click on those to find a missing face. Having found that the room's front wall is missing, we simply add a new face:



6. Auto – Orientation

The last one of the automatic fixes corrects the orientation of faces. The yellow side of all Faces should be facing inside the room and the white side should be facing the outside.

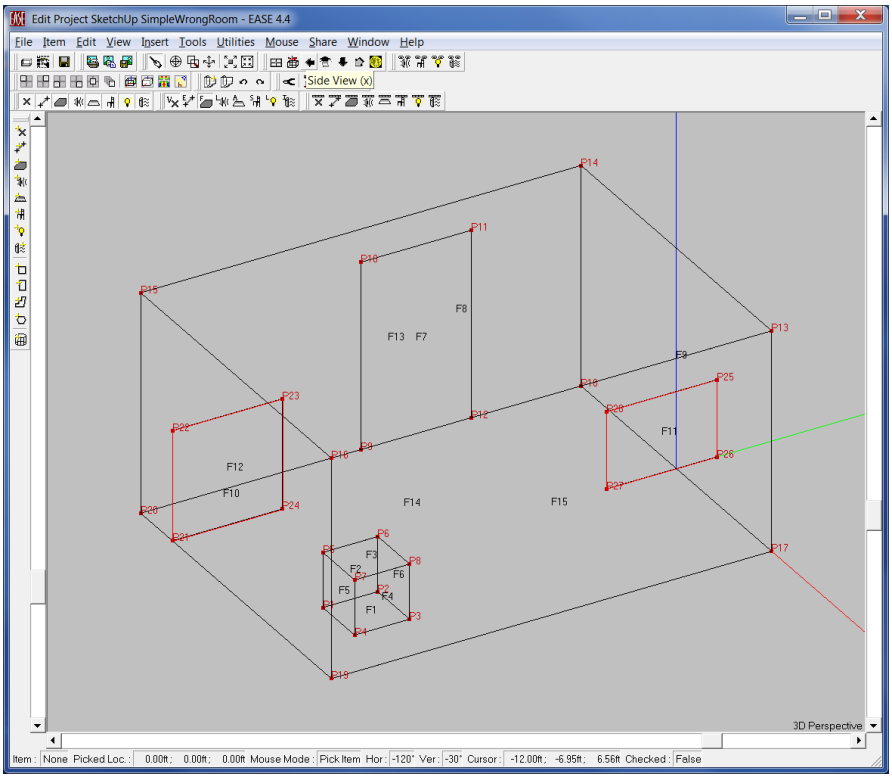
The right-hand side wall F9 is currently highlighted in red. By selecting that *Face* we see it is currently white from our point of view:



Press the **I** key to invert the orientation of a *Face*.

To automatically correct the orientation of faces in the model, first select a face that is easy to identify as correctly oriented, such as the floor. If it is incorrect, then manually invert the face. Now select the **Auto – Orientation** check box and click **Close Holes**. Next click **Check Again** to verify that it is now correct. When using **Auto – Orientation**, the selected *Face* will be used as the reference to orient the rest of the model. This means, if you apply the automatic fix with the wrong *Face* selected, you can end up with the model completely inside-out!

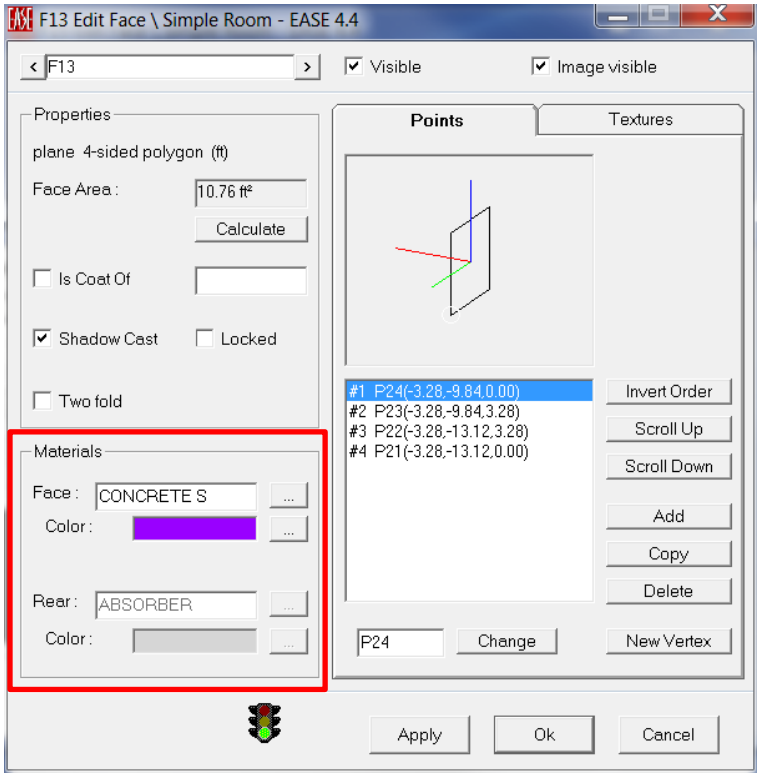
We have now used all the automatic fixes, but a few errors remain in the model:



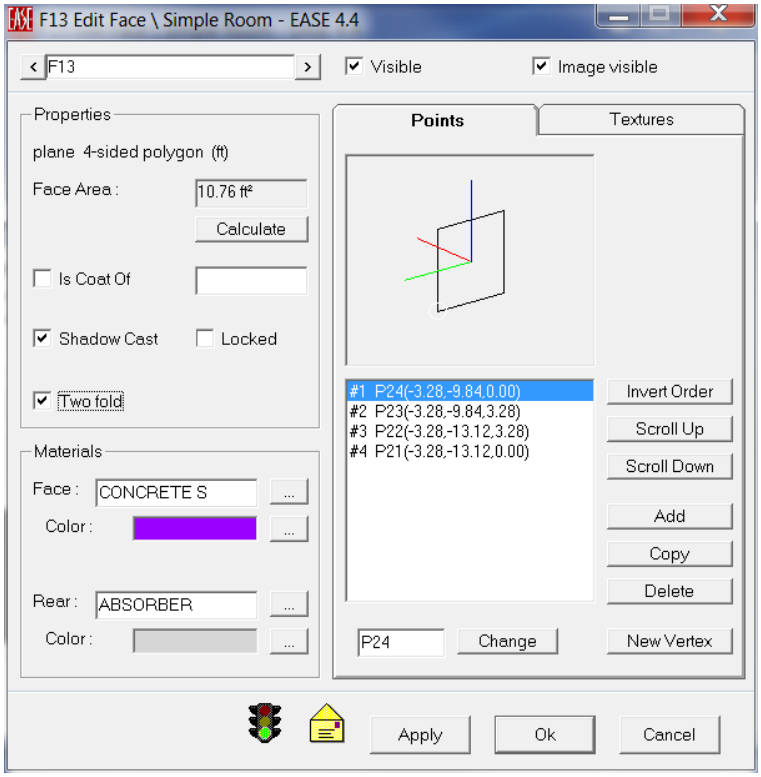
Face F12 is a free-standing panel inside the room and Face F11 is a wall panel or window on the front wall.

7. Two-Fold Faces

We have now dealt with single-side *Faces* defining the “envelope” of the room. Free-standing panel, F12, needs to have two active sides. Selecting the *Face* highlights it white. This tells us that the *Face* has a single active side. Either white or yellow are used to define the orientation of single-sided *Faces.* Open the **Face Properties** dialog by pressing the F4 key or use the right mouse button menu:



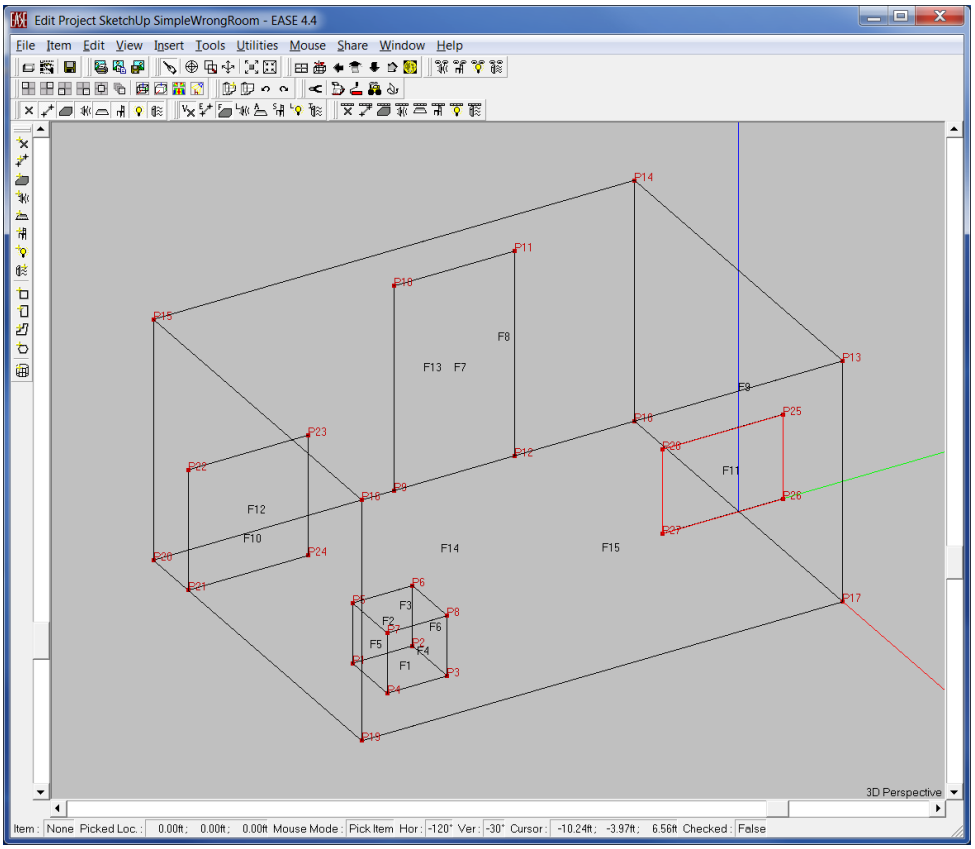
Under **Materials** we can see an active box for applying materials to the **Face** (active or yellow side), and an inactive box with a default material for the **Rear** of the *Face* (inactive or white side). Once we select the **Two Fold** check box, the **Rear** box will be active for material selection:



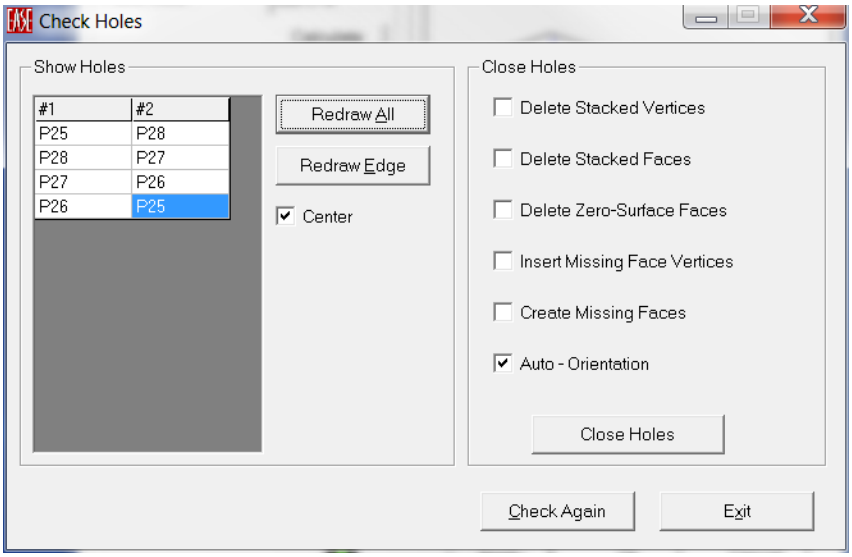
Click ***OK*** to see the *Face* turn from white to blue. *Two Fold Faces* have two active sides. The orange side will correspond to the main material (or *Face Material*) and the blue side will correspond to the *Rear Material*.

We are not concerned with materials in this exercise. Just keep in mind that a free-standing *Two Fold Face* will have two sides that are active and you can choose to apply different materials to them. Remember which side has each color to apply the materials properly.

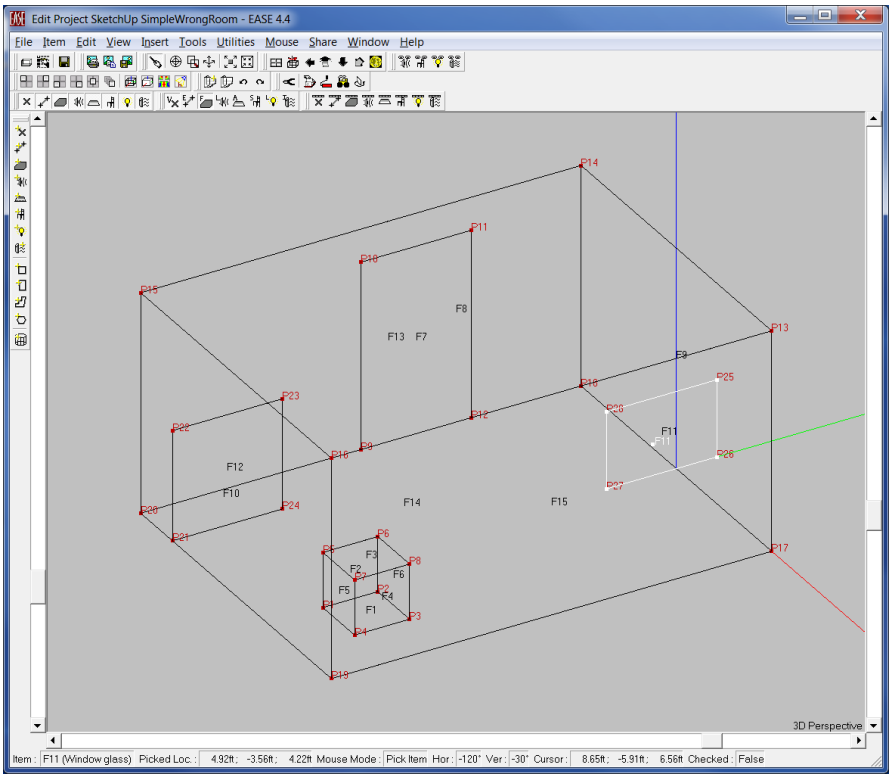
By turning F12 into a *Two Fold Face*, the red highlight should now disappear:



The list of problematic borders on the left-hand side should now have only 4 pairs of *Vertices* in the list:



The last *Face* we need to fix to complete the list is F11. Select it in the **Edit Project** window drawing:

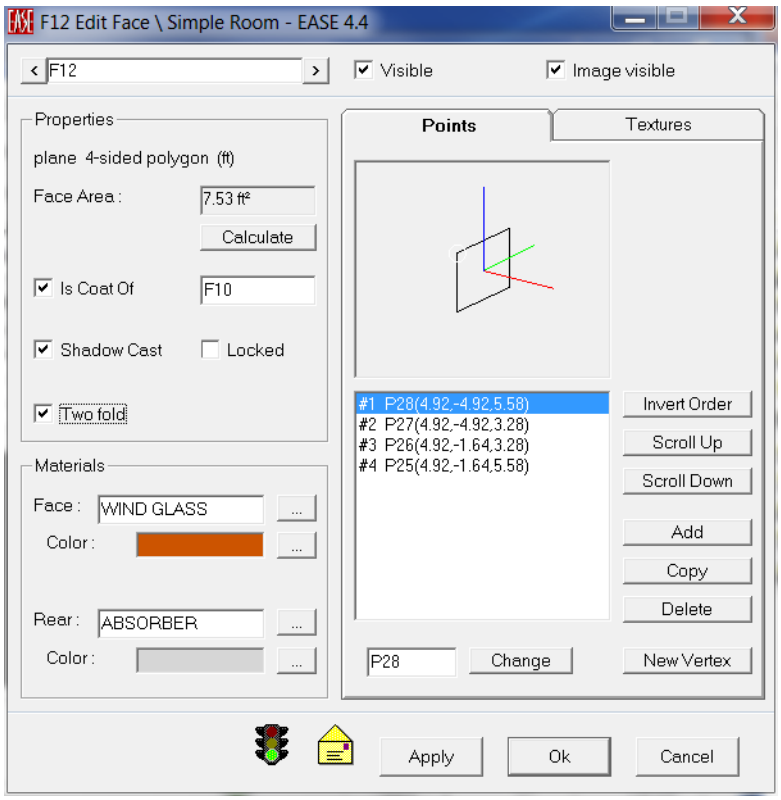


As well as with the previous face, this is a face with a single active side. The yellow side is correctly pointing towards the room since we are seeing the back highlighted in white.

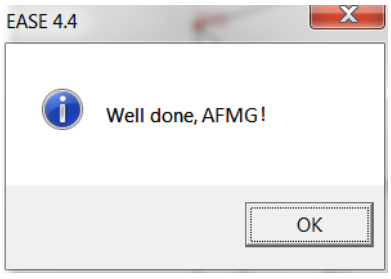
Since F11 is covering a portion of the area of F15, we need to make sure EASE is subtracting the equivalent area in its calculations. In order to do this we need to **Coat** F11 onto F15. Open the **Face Properties** window for F11, then select the **Is Coat Of** check box and click on the selection box to choose F15 as the *Face* to **Coat**.

Then select the **Two Fold** check box. F11 is now coating F15 and the active side that is hidden behind the window is subtracting an equivalent area of the wall it covers.

Note: The Rear Material is now active but in this case we recommend leaving the default ABSORBER or creating a new material to avoid confusion when looking at statistical data (i.e. percentage of Glass used)



One final click on **Check Again** should give you a new dialog:



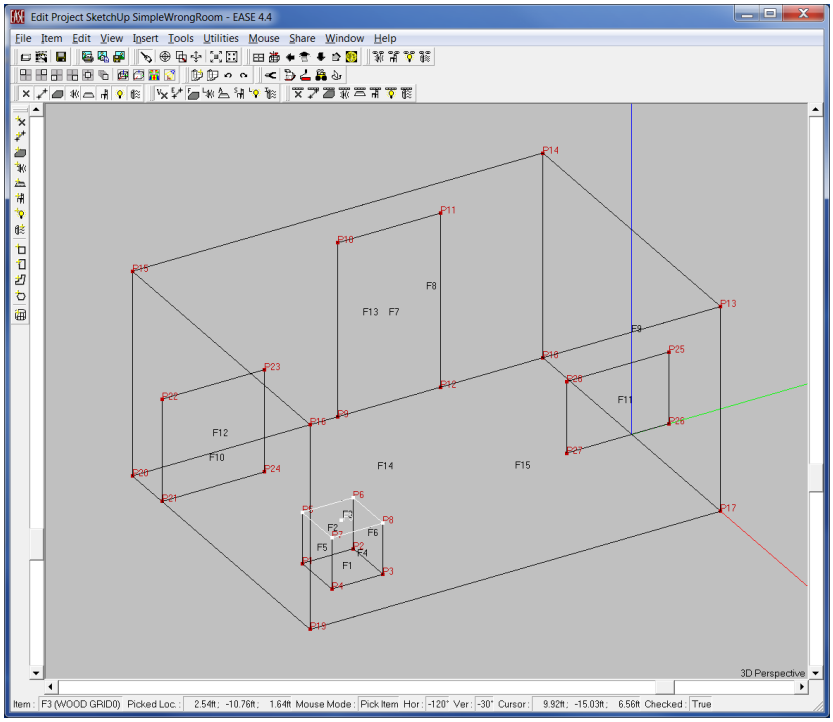
If you click **Check Data** or press the F5 key it should now complete without errors.

There are still two mistakes in this model though that we have not accounted for. Both are associated to the enclosed volume of the box in the lower left corner. These will not be indicated by EASE.

8. Internal Volumes

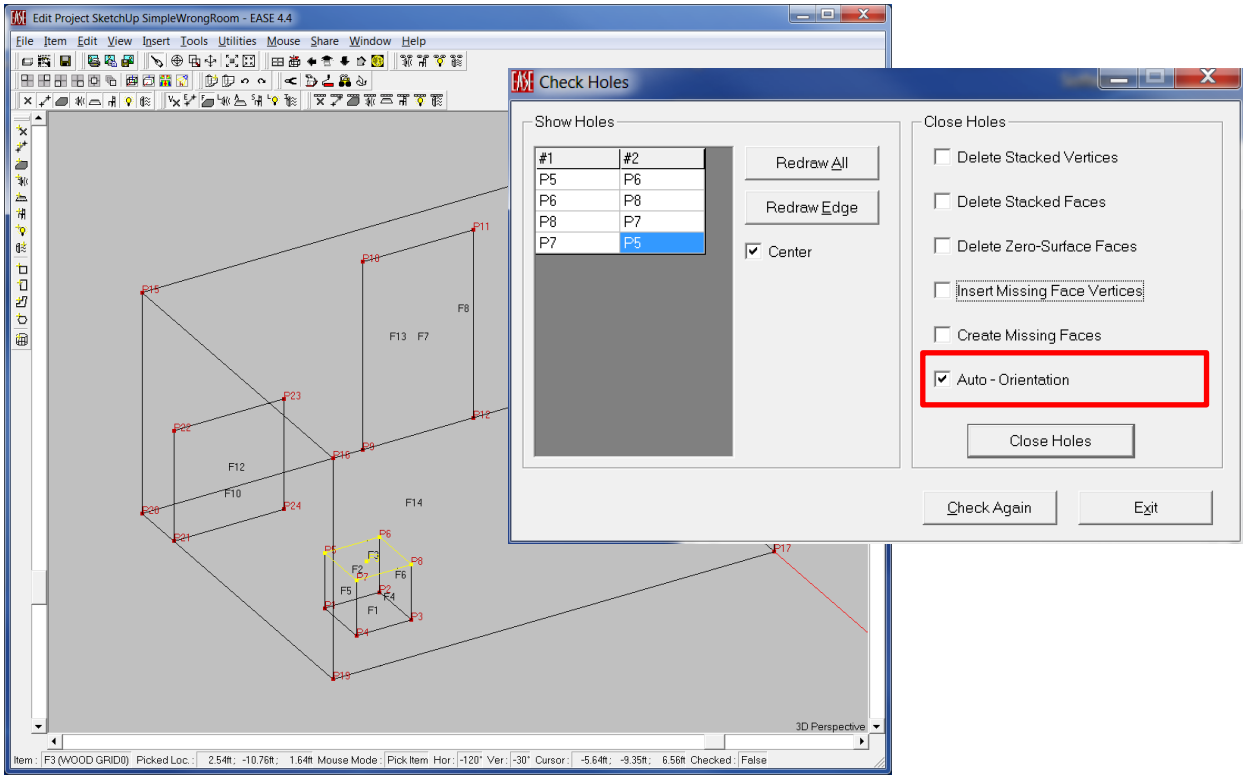
Boxes or volumes inside a room normally represent furniture, columns, and similar elements. These should have their volume subtracted from the volume of the room.

By highlighting the top of the box we see that it is currently facing “inside” the box instead of towards the room:



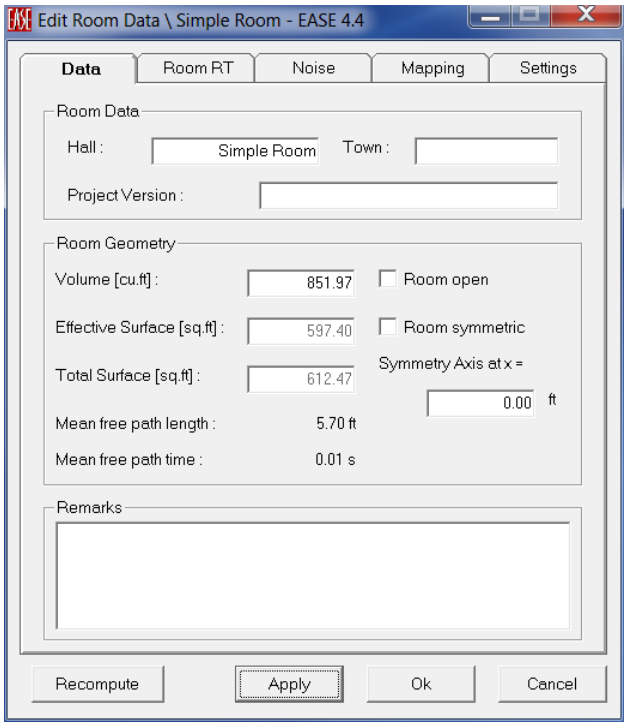
A Box or volume inside a room should have active *Faces* towards the outside of the volume itself, instead of creating a hollow space inside it. In this case, all *Faces* of the box should be inverted. We can manually do this six times; however, **Check Holes** can once more help with an automatic fix.

With the top of the box still selected, press the **I** key (or right-click and click **Invert**). Then open the **Check Holes** window and select the **Auto – Orientation** checkbox before clicking **Close Holes**:



The selected *Face* is used by EASE as a reference to orient the rest of the adjacent *Faces*.

To see the volume has changed, click **Room Data** on the **Edit** top-menu:

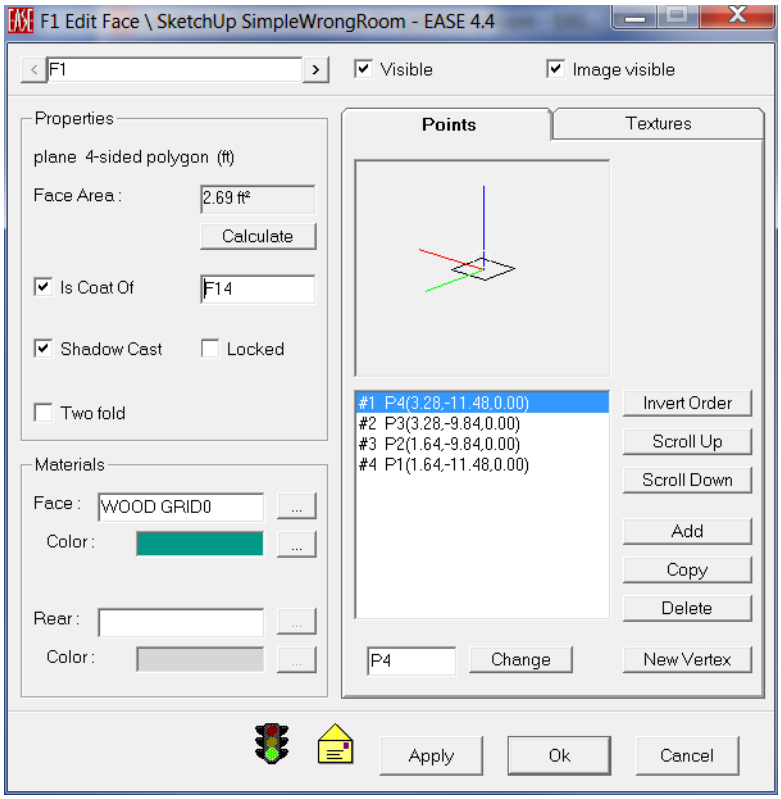


After pressing **Recompute**, you will notice that the Volume will decrease, appropriately subtracting the volume of the box inside the room.

9. Single-Fold Coats

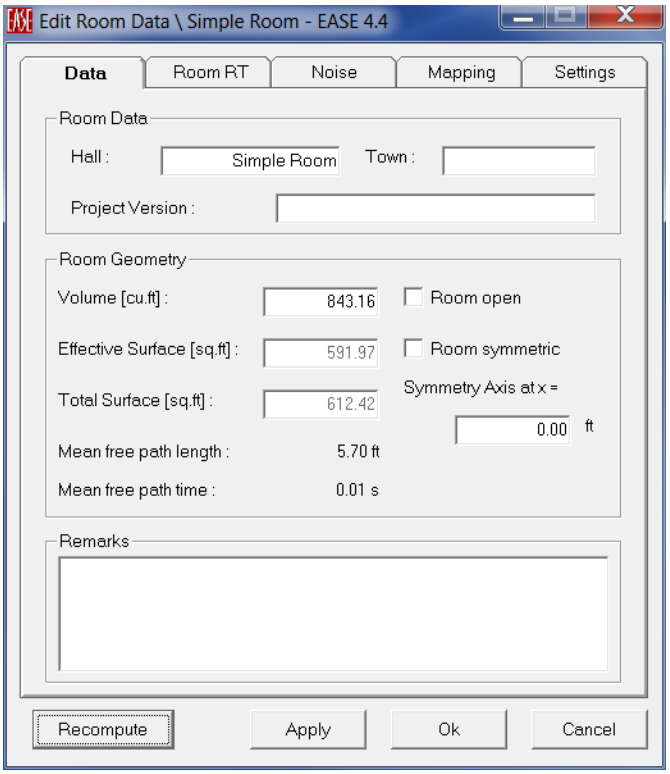
We still have a problem with the box: its bottom *Face* is covering part of the floor area and that needs to be properly accounted for. Similarly to what we did on the window attached to the wall above, we will set the box's bottom *Face* as **Coat** of the floor.

Open **Face Properties** for F1 and **Coat** it to F14:



Notice that since the backside of the box's bottom *Face* is inside the enclosure and will not be an active part of the room we want this *Face* to be a single-fold *Face*. Therefore, we do not mark the **Two fold** check box. This way, only its front side is active and in use to subtract the floor area.

If you check the **Room Data** once more, the **Effective Surface** should also have been reduced this time:



The *Simple Room* project should now be completely fixed.