

# Report on WINDOW 6 / THERM 6 NFRC “Pilot” Training Venetian Blinds

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On May 4, 2009, LBNL hosted a “pilot” webinar training session for NFRC simulators about using WINDOW 6 and THERM 6 to model venetian blinds and fritted glass.

The purpose of the webinar was to test the newly written section of the NFRC THERM / WINDOW simulation manual describing the modeling procedures for venetian blinds and fritted glass, as well as to test the programs for their usability. We encouraged feedback from the participants so that we could improve both the simulation manual and the programs. The webinar was voluntary, and we appreciate the many people who took the time to participate in it.

Fourteen people participated in the voluntary webinar:

- Joe Hayden
- Paul Smith
- Sherri Wendt
- Sheila Gore
- Catherine Best
- Peter Lyons
- Marles McDonald
- Mike Thoman
- Scott Hanlon
- Mike Palin
- Mahabir Bhandari
- Charlie Curcija
- Bipin Shah
- Dennis Andersen

The other request by LBNL of the participants was to turn in a homework problem so that we could determine if there were modeling issues which were unclear or causing simulators problems.

LBNL provided a website which contained the homework problem, the program versions used in the training, the draft simulation manual, and a movie of the webinar for reference. The URL is:

<http://windows.lbl.gov/software/NFRC/w6t6training/training.htm>

## Homework Results

Four participants submitted homework solutions. There were several issues with each of the homework problems, which included:

1. Using the wrong glass layer in the glazing system for the Low-E layer
2. Not keeping the overall thickness of the glazing system after inserting the venetian blind -- see # 1 under “Nice to have” below
3. Not having the correct model set (to ISO 15099) in Preferences – see # 1 under “Necessary” below
4. Didn’t change thickness of slat from 1.0 mm to 0.25 mm, or make a new instance of the slat with the correct thickness
5. Possibly used the wrong version of WINDOW (wrong database version)
6. Wrong window type used (should have been fixed picture)
7. Some users taped the small area above the butyl rubber seals, some didn’t – this was not explicit in the instructions, and in a real modeling situation, the simulator would model what was tested, so this is not really an issue that needs to be addressed here.
8. Not selecting the Frame type (sill, head, jamb) when inserting the glazing system, so therefore Dtop, Dbot, Dright, Dleft did not get imported from WINDOW into the THERM file.
9. Didn’t include the top rail dimensions in the sight line calculation when importing the glazing system, so the edge dimension was less than 2.5”
10. Different people had different approaches to the issue of how to define the cavity in the Venetian blind rails for the closed blind case – the way this model was defined, the simulation manual didn’t cover this case. See #2 under “Modeling Issues to be Clarified”.
11. In THERM, some users pulled the Venetian blind layer into the top and bottom rails, as shown in the Simulation Manual, and some didn’t. The problem definition didn’t specify whether the blind layer went into the rails, so this is not an issue that needs to be addressed here, because the simulator would model the blind as it is constructed. However, a note should be put in the simulation manual for that example that not all blinds are constructed this way. See #3 in the “Issues for Simulation Manual” section.

## **Issues for Future Versions**

There are two categories of issues that came up during the training. They are:

- Necessary to deal with for the certified versions of the programs
- Nice to have but not necessary for the certified versions of the programs

### **Necessary for certified version:**

1. Make sure the default settings for the various Preference settings are correct in the installation version of the program.

### **Nice to have but not necessary:**

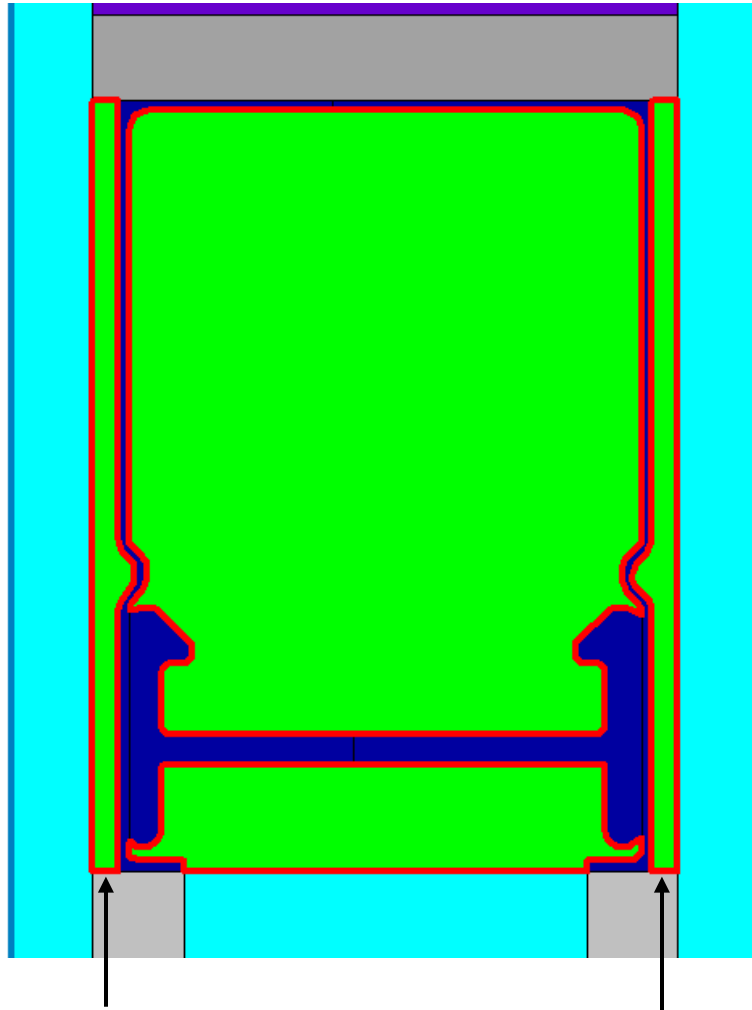
The following list of issues will not necessarily get dealt with for the certified version, but which we will add to our feature list to try to include in future versions, although that will depend on funding levels, available programming resources, and other priorities.

1. WINDOW should provide help to users in terms of keeping the overall glazing system thickness the same with and without the venetian blind. This also leads into # 2 below.
2. WINDOW should provide guidance to users or automation in terms of calculating the gap width between the glass layers and each side of the venetian blind, when a venetian blind is added to a glazing system. If the program knows to keep the overall thickness constant, and if the venetian blind is centered in the glazing system, the program can automatically calculate the gaps between the venetian blind and the glass layers.
3. If the Frame Type in the “Insert Glazing System” dialog box is different than the Type set in the File/Properties dialog box, program should alert the user to this and ask them if they want to change it when they are inserting the glazing system.

## Modeling Issues to be clarified

1. Establish a rule about when cavities associated with the Venetian blind are linked to the glazing system cavities, and when they are set to frame cavities. LBNL proposed a 2.5 mm rule:

If the “throat” between a cavity and a glazing system cavity is  $\geq 2.5$  mm, link it to the glazing system cavity. Otherwise, define it as a frame cavity.

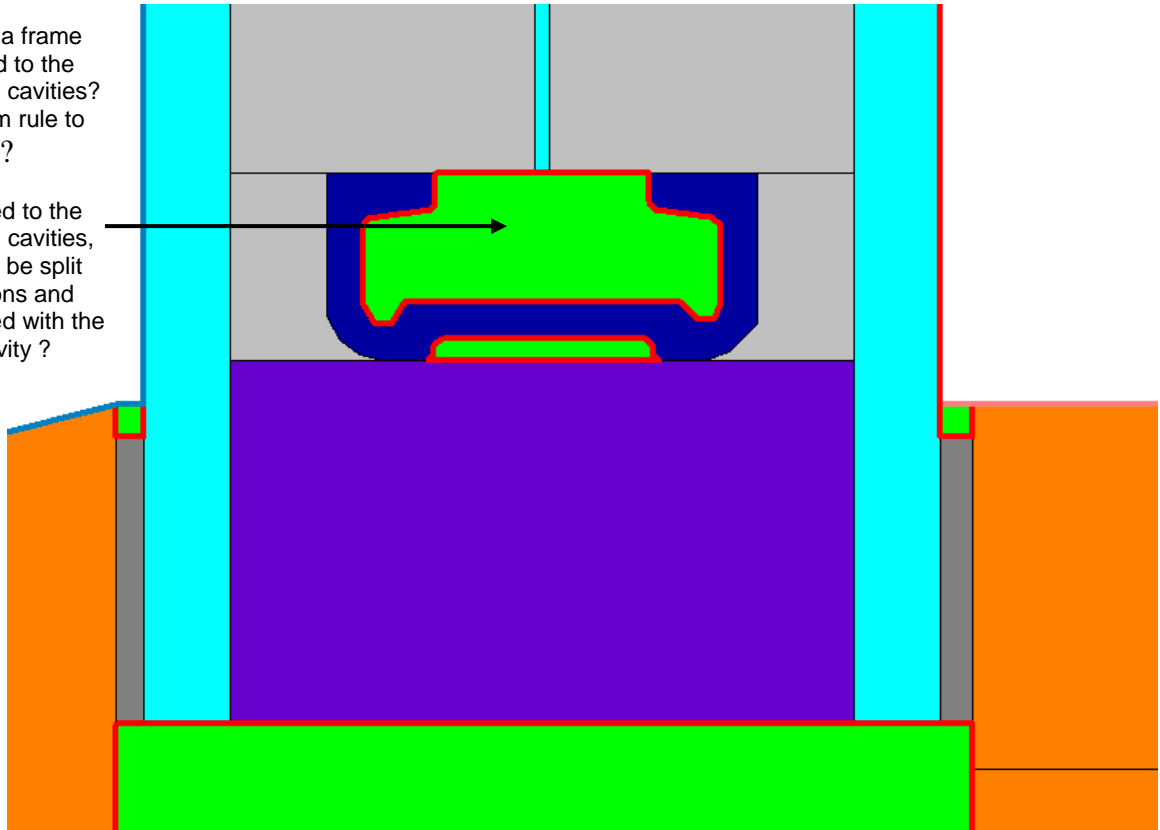


This is an example where the cavities on either side of the top rail would be defined as frame cavities because the “throat” where that cavity meets the glazing system cavity is  $< 2.5$  mm.

2. What to do with the cavity in the closed Venetian blind head and sill examples, where the blind does not go into the head rail or bottom rail – should the cavity be a frame cavity or linked to the glazing system cavities and if so, which ones (or both, ie, dividing up the rail cavity).

Should this be a frame cavity, or linked to the glazing system cavities? Use the 2.5 mm rule to determine this ?

And if it is linked to the glazing system cavities, does it need to be split into two polygons and each associated with the appropriate cavity ?



3. Question of whether the gap around the edge of the Venetian blind, which lets a small amount of light through the system, will affect the answers. Right now WINDOW does not take this into account when doing the calculations. This may come out in the Validation study that Willie DuPont is doing for NFRC.
4. What about the case where there is no air gap or a very small air gap between the blind and the glass? LBNL to test how small the gap can be and still be simulated by WINDOW and THERM.

## Issues for Simulation Manual

1. Make sure manual says to leave the Effective Hole Area = 0.05 (the program default) in the Shading Layer Library definition of Venetian blinds.
2. In the example where the Venetian blind layer is pulled into the cavity in the top and bottom Venetian blind rails, there should be a note that not all Venetian blinds are constructed this way, and that the model should reflect the actual construction of the blind hardware. There should probably be a series of small images of the configuration possibilities and how to define the cavity in the top and bottom rails for open and close blinds depending on how the product is constructed. (See modeling issues # 1 and #2 above)
3. Explain the math required for calculating the gaps between the Venetian Blind and the glass layers when creating the glazing system in WINDOW
4. Explain Dtop, Dbot, Dleft and Dright which images, showing how convection can happen above and below the Venetian blind hardware, depending on these dimensions.
5. Add example for a double glazed unit with a spacer
6. On page 22, add a note saying to turn on the editing of the IG in THERM in order to edit the glazing system.
7. Explain that the site line to bottom of glass calculation needs to include the Venetian blind hardware when inserting the glazing system – this section of the glazing system will get set to Frame and there still needs to be 2.5” after that for the edge of glass.
8. On page 23, show the detailed cross section of the sill and jamb with the boundary conditions; show that Dbot = 0 for the sill (make sure this is really true)
9. Add Pella to the Acknowledgements for allowing us to use their models as examples.
10. Add explanation that THERM and WINDOW will not do CR calc for Venetian blinds
11. On page 9-16, the Venetian blind definition is in inches, should be in mm.
12. Resolution of some of the screen shots (page 9-44) is weird when viewing in Acrobat.