AFRC

Australian Fenestration Rating Council

AFRC Technical Interpretations

AFRC – AUSTRALIAN FENESTRATION RATING COUNCIL

AFRC – Technical Interpretations E0A2

AFRC,
PO Box 783,
TURRAMURRA NSW 2074
Phone 02 9498 2768 • Fax 02 9498 3816
www.afrc.org.au

Published: 24th January, 2010
Last Updated: 24th January, 2010

Applicable to:
AFRC Protocols and Procedures Manual – v1.0 – 2003
NFRC Simulation Manual

Table of Contents

2007 Technical Interpretations

ATIR-2007-01 **1**
Hash requirement in IGDB for glazing

ATIR-2007-02 **1**
Interim IGDB data submission

ATIR-2007-04 **1**
Conversion of IP units to SI units

ATIR-2007-03 **1**
Thermally Improved Aluminium Frames

2008 Technical Interpretations

NIL

2009 Technical Interpretations

ATIR-2007-06 **1**
Simulation Method for Louvres

ATIR-2008-11 **1**
Thermophysical Properties of Santoprene™

2010 Technical Interpretations

ATIR-2008-12 **1**
Secondary Glazing

ATIR-2009-21 **1**
Perimeter Taping

ATIR-2007-09 **1**
Timber Reveals

ATIR-2007-01

ATIR-2007-*01* 01/08/2007

AFRC Technical Interpretation

Interpretation Requested:
The Pro's and Con's and feedback and clarification for the 'hash' requirement for IGDB data in the AFRC Protocols and Procedures Manual.

Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
01/03/07	17/04/07	26/04/07

Pertinent Document:	
AFRC Technical Protocols and Procedures Manual Version 1.0 – 30.03.07	
Referenced Sections:	***Referenced Pages:***
Chapter 3	Page 4

Interpretation :

The IGDB contains a field which identifies glass data that has been approved by the NFRC. Only NFRC approved glass (identified by a "#" sign) can be used for NFRC simulations. The AFRC has decided that the "#" sign is not necessary for AFRC simulations.

Any glass in the IGDB can gain NFRC approval by payment of a licence fee to the NFRC. There are no additional technical requirements over and above those required for inclusion in the IGDB. The "#" mark is a method of raising revenue for the NFRC, and as such does not provide any benefit to the NFRC.

There is no advantage to the AFRC to restrict the glass which can be used for simulations.

Technical Committee Revisions to Initial Interpretation:

ATIR-2007-02

ATIR-2007-02
01/08/2007

AFRC Technical Interpretation

Interpretation Requested:
What is the NFRC method and protocol for companies who can prove data submission to the IGDB but do not have the data in the IGDB until the next IGDB upload?

Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
01/03/07	26/04/07	30/04/07

Pertinent Document:	
NFRC 302-2004	
Referenced Sections:	***Referenced Pages:***

Interpretation :

NFRC 302 Clause 3.8.1 A states: "No glazing data may be used for NFRC window rating purposes until formally accepted by the NFRC. Acceptance is at the sole discretion of NFRC and is independent of the verification process. All NFRC approved data are encrypted and indicated with a "#" symbol in the WINDOW program."

The AFRC requirement is that whilst"#" is not required, the glazing properties shall be validated by being published in the IGDB. NFRC states that IGDB updates are released within 1 day to 2 weeks of the end of the peer review period. Fast tracking of peer review is also available.

Technical Committee Revisions to Initial Interpretation:

ATIR-2007-04

ATIR-2007-*04* 01/08/2007

AFRC Technical Interpretation

Interpretation Requested:
A method for converting IP unit files into SI unit for entry into the Australian system.

Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
16/03/07	26/04/07	30/04/07

Pertinent Document:	
NFRC IPSI Policy	
Referenced Sections:	***Referenced Pages:***
Point 5	

Interpretation :
NFRC policy for Metric/Inch-pound reporting states: "For rating purposes, using NFRC-approved simulation software tools, the rounding shall only be performed on the rating after the rating has been determined in metric units and the calculations, including conversions, are complete." It is therefore necessary to go back to the original simulation lab for conversion at the required precision.

Technical Committee Revisions to Initial Interpretation:

ATIR-2007-03

ATIR-2007-*03*
31/10/2007

AFRC Technical Interpretation

Interpretation Requested:
The interpretation requested is for a definition of "thermally improved aluminium" for AFRC use. This has arisen because of a conflicting, alternative definition that has been used in Australia for a decade by House Energy Rating software and schemes. The frame descriptors "aluminium improved" and "thermally improved aluminium" have been used historically to describe any frame with a U-value ≤ 8 $W/m^2.K$ and/or low-conductivity internal trim (e.g. timber reveals covering some exposed aluminium). Thus the definitions were part performance-based and part material-based. For technical reasons and to preserve consistency with NFRC practice wherever possible, this TI request was initiated to review the permissible definition and use of "thermally improved" in AFRC ratings.

Date Requested:	*Initial Interpretation Date:*	*Final TAC Approval Date:*
16/03/07	30/04/07	03/10/07

Pertinent Document:	
NFRC 100-2004; NFRC Simulation Manual, June 2006.	
Referenced Sections:	***Referenced Pages:***
NFRC 100-2004: Section 3 (Definitions); NFRC Simulation Manual, Sections 2.4.2 and 6.5.1	Pages 7 and 8; Pages 2-4 and 6-25

Interpretation :
The use of the "thermally improved aluminium" is no longer permissible as a frame descriptor for AFRC-rated fenestration products. To eliminate the confusion described above, the term "thermally improved" is only to be used as a descriptor for the purpose of allocating the interior frame boundary condition in THERM5. In this context it is defined in NFRC 100-2004 as:

Interpretation (cont.) :

"Thermally improved (TI) members: system members with a separation ≥ 1.60mm **and < 5.30mm separation** provided by a material [with thermal conductivity ≤ 0.5 W/m.K] or open air space between the interior and exterior surfaces. Such systems include members with exposed interior or exterior trim attached with clips and all skip-debridged systems."

The NFRC Simulation Manual, June 2006, defines the above separation as "splitting the frame components into interior and exterior pieces and use *[of]* a less conductive material to join them".

If the framing member does not conform to the above, but has an integral internal timber trim or reveal, and would have been formerly described as Thermally Improved, then it shall have its interior boundary condition assigned according to the predominant material, per the existing NFRC rules. That is, the method in Section 6.5.1 of the NFRC Simulation Manual shall be followed.

Technical Committee Revisions to Initial Interpretation:

ATIR-2007-06

ATIR-2007-*06*
06/02/2009

AFRC Technical Interpretation

Interpretation Requested:

Background

Louvre window systems are widely used in residential applications within Australia. They are commonly used in warmer climates as they can be fully opened to allow maximum ventilation. The closest alignment to a current NFRC product line would be the jal/jal window (jalousie).

A louvre window system consists of a surround frame with a number of operable blades. The number of blades is determined by the overall window height and individual blade heights. A vertical assembly of blades is also known as a gallery. The individual blades are attached to the jamb section via an operating mechanism and are held in place using a blade holder or clip. The material used for the operating mechanism and blade holder may vary as can the blade material. Common operating mechanisms and blade holders are made from a combination of metal and plastic, whilst the blades can be made from glass, aluminium and timber.

A number of challenges are faced when simulating U-value and SHGC for these products due to a number of factors:

- When the blades are in a closed position, each blade is typically a few degrees off vertical (up to 10 degrees)
- Blades overlap when the product is in the closed position
- Clip profiles are rarely uniform along their length.

Interpretation Request

A method for the simulation of louvre windows for U-value, SHGC, VT and CR.

Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
20/03/07	03/10/07, revised 25/11/08	23/01/09

Pertinent Document:	
NFRC 100, NFRC 200, Simulation Manual	
Referenced Sections:	***Referenced Pages:***

Interpretation :

A louvre system shall be simulated as per the current NFRC Simulation Manual with the following assumptions and additions.

For simulation purposes, the following assumptions are made:

- Blades are simulated in the fully closed position
- Blade overlap is ignored
- The blade is simulated in the vertical position (90° tilt)

The product size for a louvre system is 600mm wide by 1500mm high.

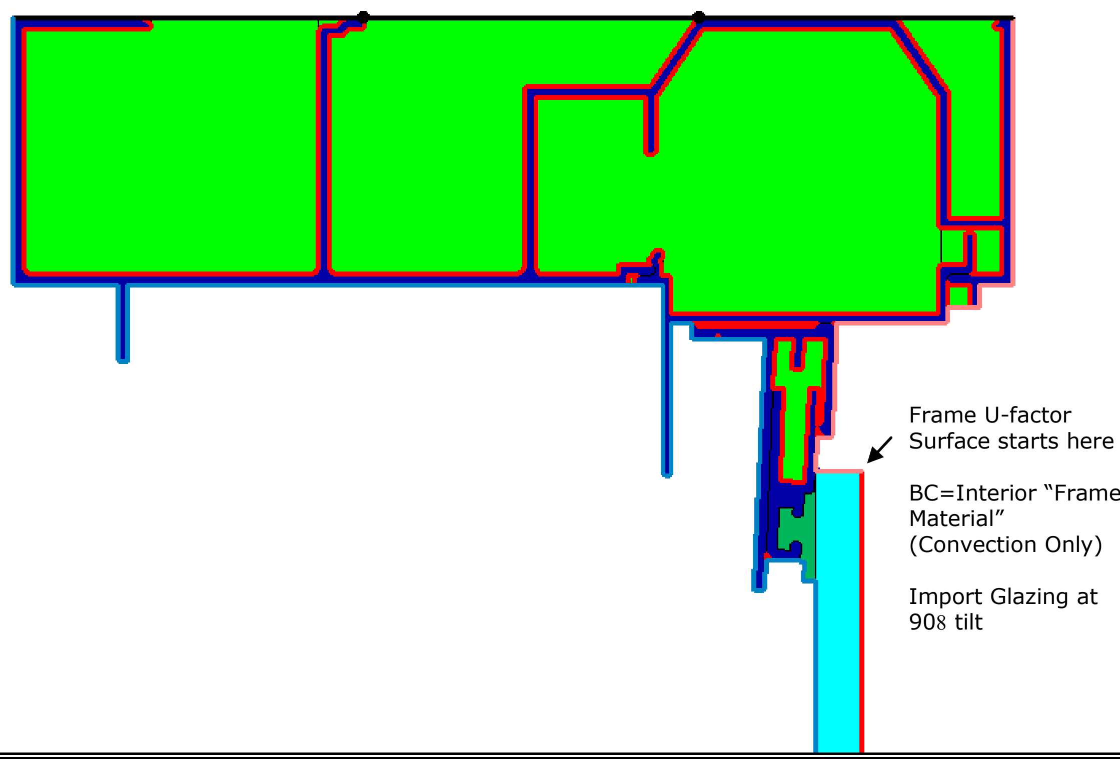
For louvre blade holders that do not have a uniform and consistent profile, the area shall be determined by area-weighting.

Notes:

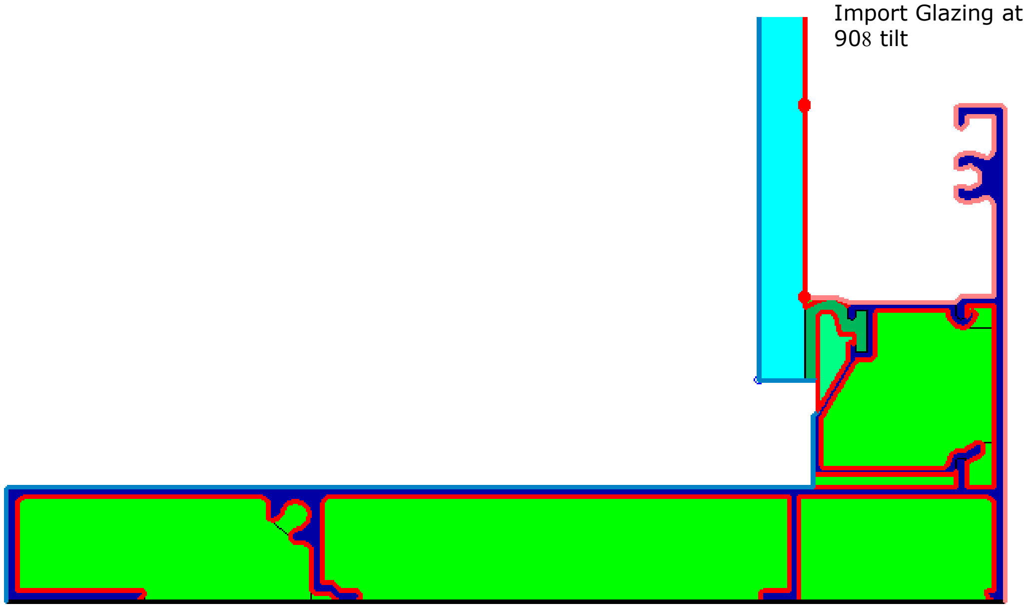
1. An example showing the simulation method for a louvre system is published on the AFRC website (www.afrc.org.au).

Frame Cross-Sections

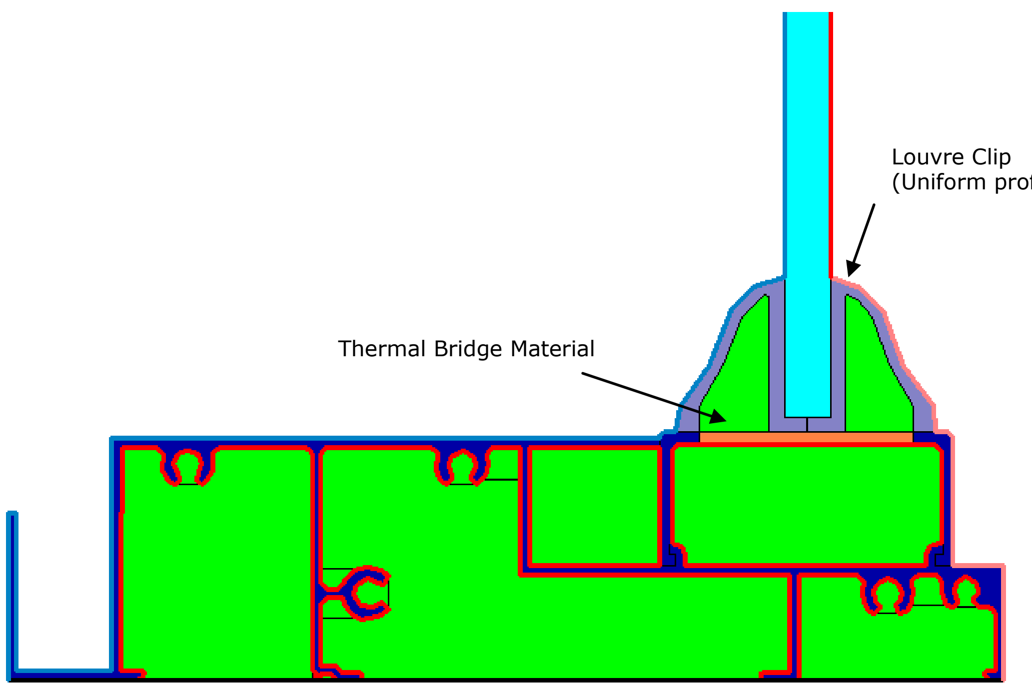
Louvre System Head



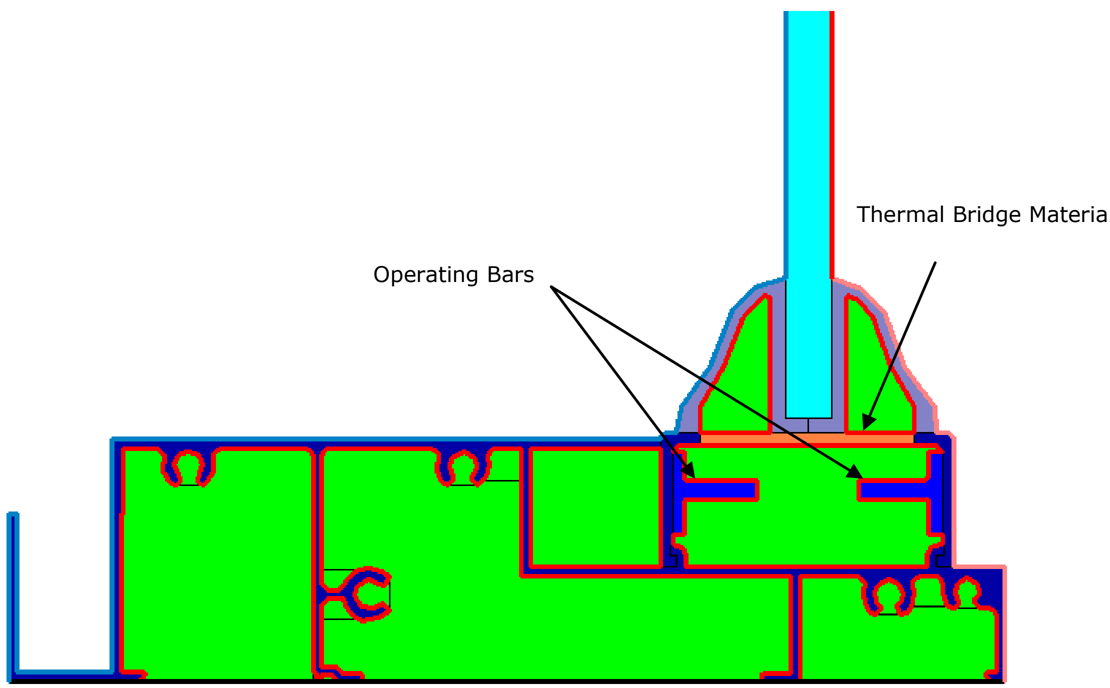
Louvre System Sill



Louvre System Jamb – Non-Operating Mechanism Side



Louvre System Jamb – Operating Mechanism Side



Technical Committee Revisions to Initial Interpretation:

ATIR-2008-11

ATIR-2008-*11* 06/02/2009

AFRC Technical Interpretation

Interpretation Requested:
Thermophysical properties for Santoprene™ elastomer.

Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
02/06/08	25/11/08	25/11/08

Pertinent Document:	
NFRC 101-2006; Email Correspondence: Re Santoprene question - 2nd response.txt; RE Santoprene question.htm	
Referenced Sections:	***Referenced Pages:***
Appendix B	pp. 17-21

Interpretation :

Background

Santoprene™ is an elastomer commonly used in window fabrication. It is EPDM/polypropylene mixture expected to have a similar conductivity to those constituent polymers, i.e. in the range 0.22 – 0.25 W/m.K. Santoprene™ is not currently listed in the material library of THERM 5.2 nor is it in the appendices of NFRC 101-2006.

Interpretation

Use the material properties of EPDM for Santoprene™

Technical Committee Revisions to Initial Interpretation:

ATIR-2008-12

ATIR-2008-*12* 00/00/2010

AFRC Technical Interpretation

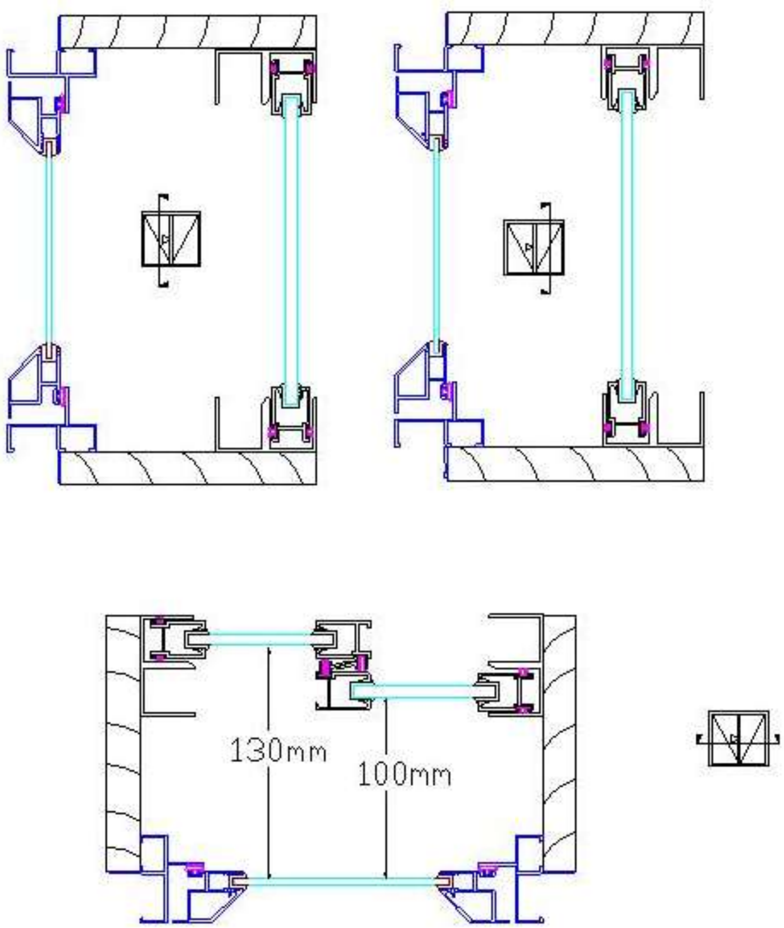
Interpretation Requested:

A method for the simulation for of a 2-Lite sliding window as a secondary glazing option for U-value, SHGC, VT and CR. The primary window is the external window and the secondary window is the internal window.

Background

<u>Sample Configuration</u>

This example is a 2-lite sliding window secondary glazed behind an external awning window.



Simulation Options:

1. Simulate the product as the secondary (internal) window (For this example, simulate as a sliding window with double awnings on the outside (1500mm by 1200mm – width by height))
2. Simulate the product as the primary (external) window with a divider to simulate any internal intermediate frame members. (For this example, simulate as an awning window and use a divider as the sliding window mullion (1500mm by 600mm – width by height))
3. Simulate the product as a dual custom vision at the primary window rating size. This allows for the option of internal/external intermediate frame members. (For this example, simulate at the awning window size (1500mm by 600mm – width by height))

Issues:

Option 1

Simulation as the secondary window creates an issue when the internal and external windows have different rating sizes. This would skew the results when comparing against existing ratings for the primary window type. (eg. Comparing a sliding window system with other awning windows.) This simulation procedure is also not representative of how the product would be hot box tested.

Option 2

Simulation as the primary window creates an issue when there are intermediate frame members on the internal frame (eg. Mullions, transoms) with differing air gaps between the operable and non-operable member. (eg. For a primary awning window, which is normally simulated as a single lite configuration, with a sliding window as the secondary glazing, the glass would be different distances apart from one side to the other.) To allow for an internal mullion to be simulated, a divider could be used. However, this means different glazing options can't be selected for each side of the internal sliding window (if needed). (I.e. a 2-lite configuration must be used)

Option 3

No issues apparent. Therefore this approach will be taken to simulate a secondary glazed window. The simulation procedures are presented in this interpretation and a full worked example is presented in the AFRC document atir200812eg.

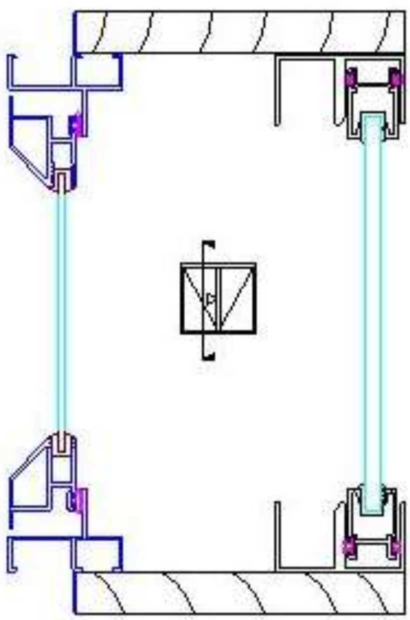
Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
22/08/2008	17/06/2010	16/07/2010

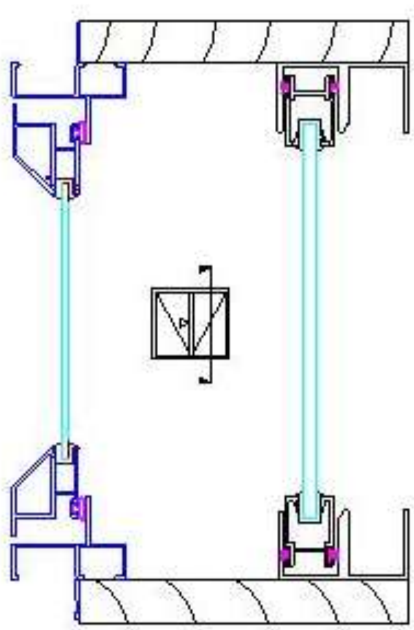
Pertinent Document:	
NFRC 100, NFRC 200, Simulation Manual	
Referenced Sections:	***Referenced Pages:***

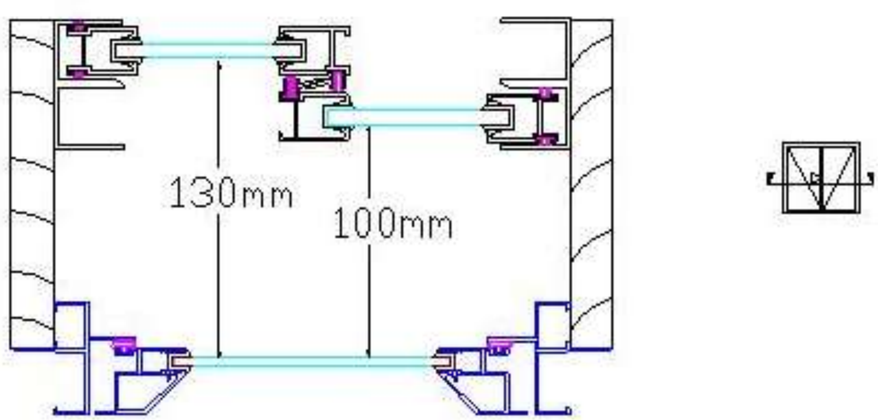
Interpretation :

Simulate the product as a dual custom vision set to the primary window size (external window). The external window is always to be considered as the primary window when setting the size.

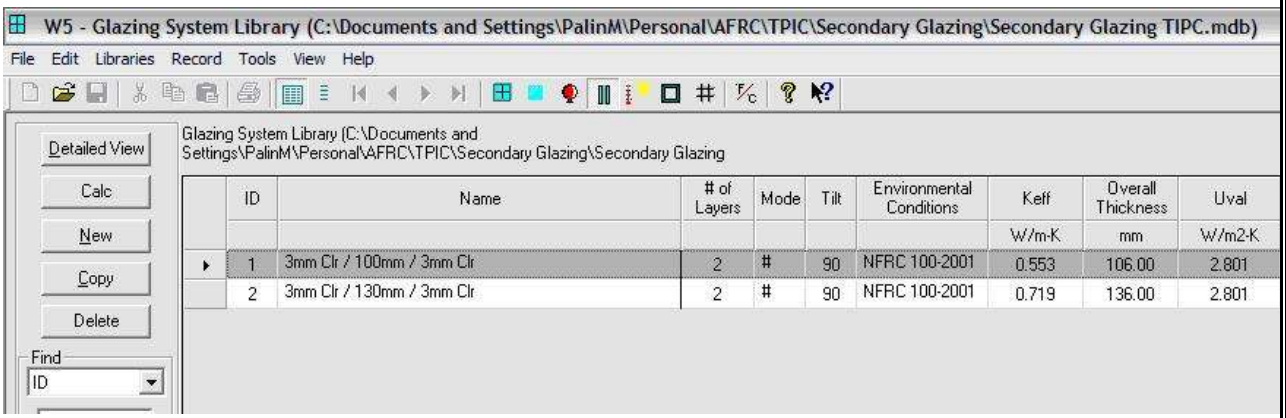
Sample Configuration





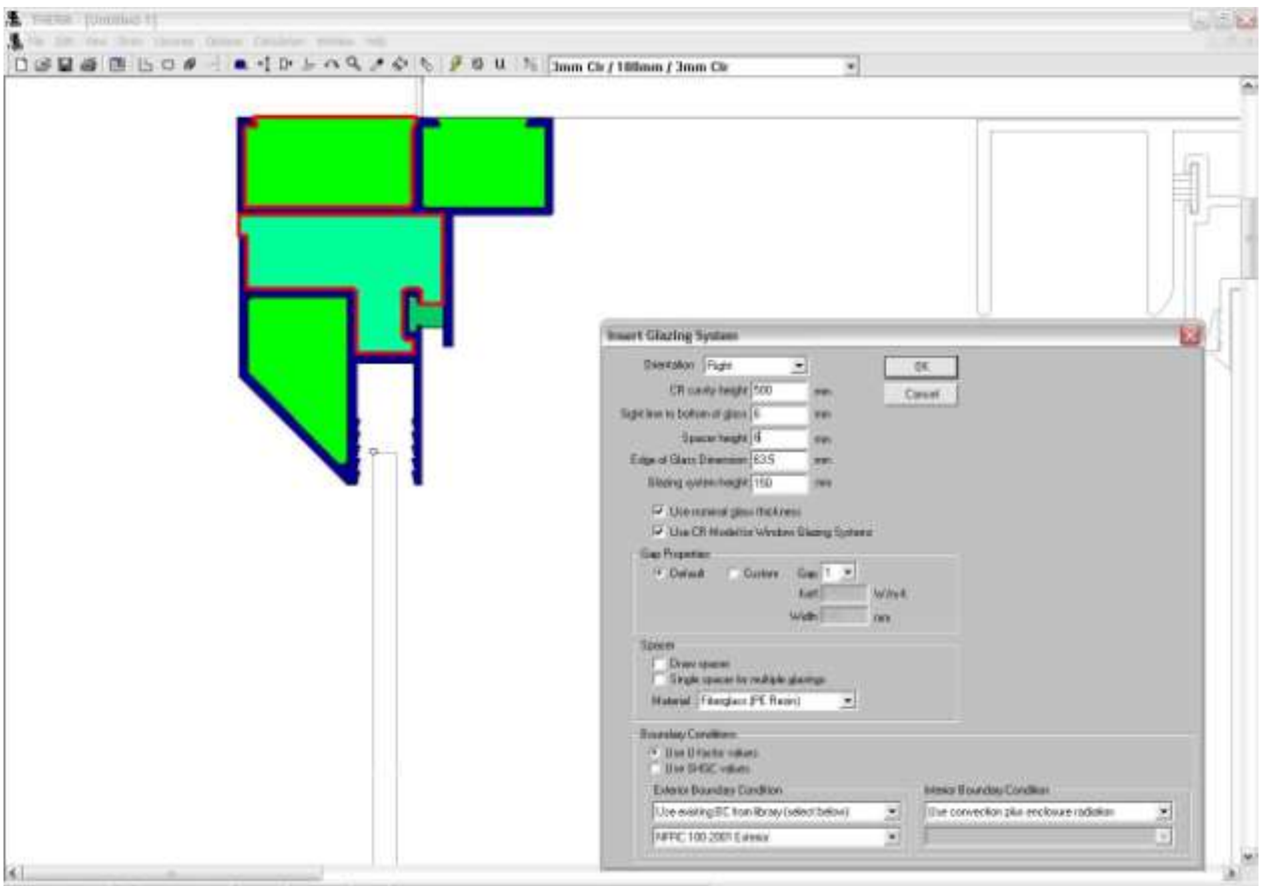


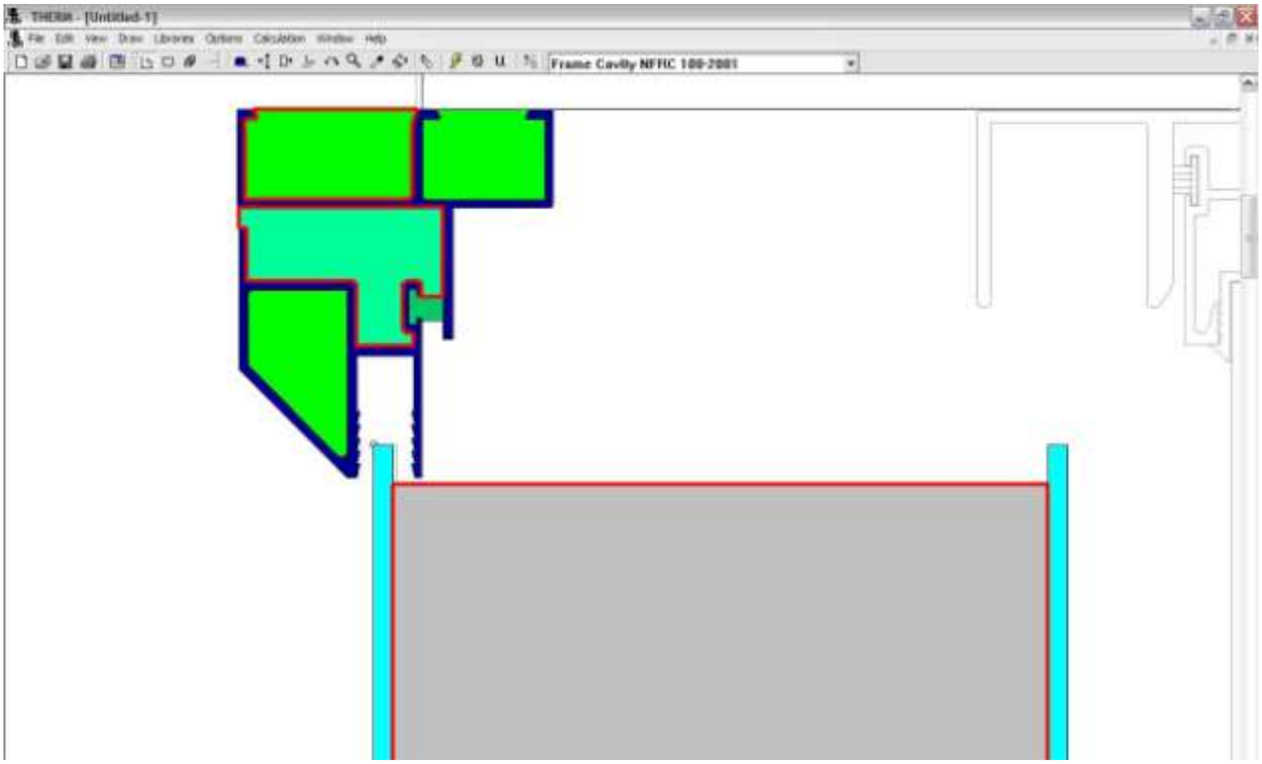
Step 1:
Model two glazing systems in Window 5.2 with different air gaps.



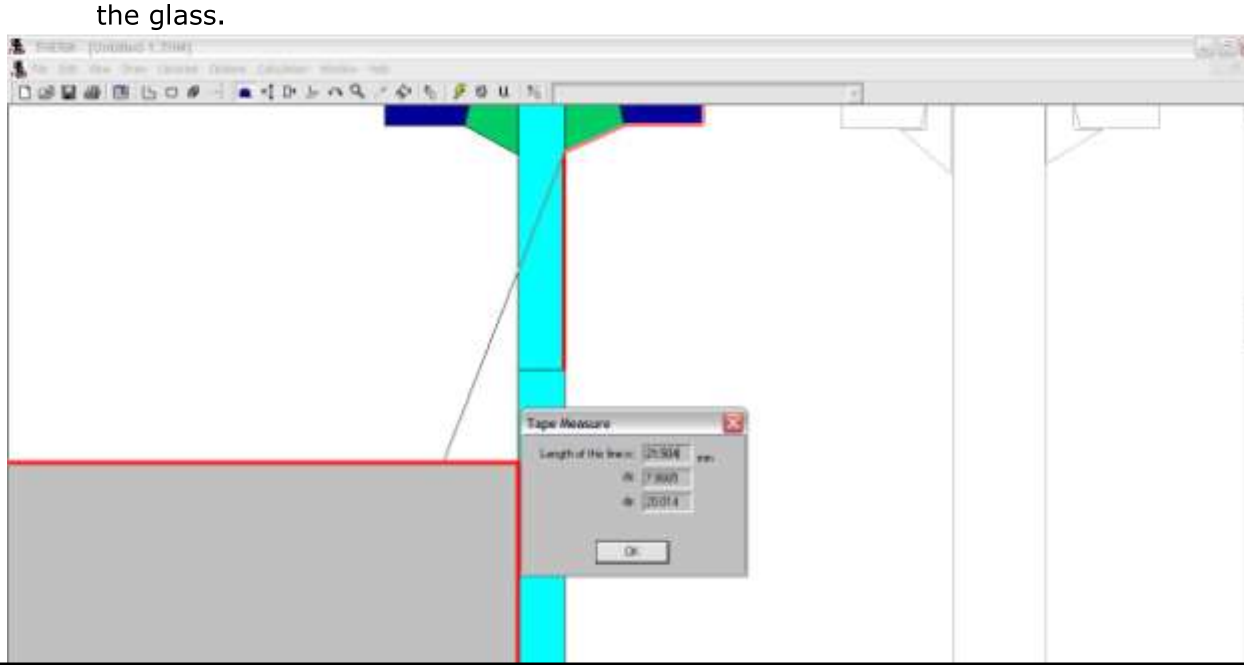
Step 2:

A. Model profiles in Therm5 as per standard NFRC procedures and insert the glazing system.

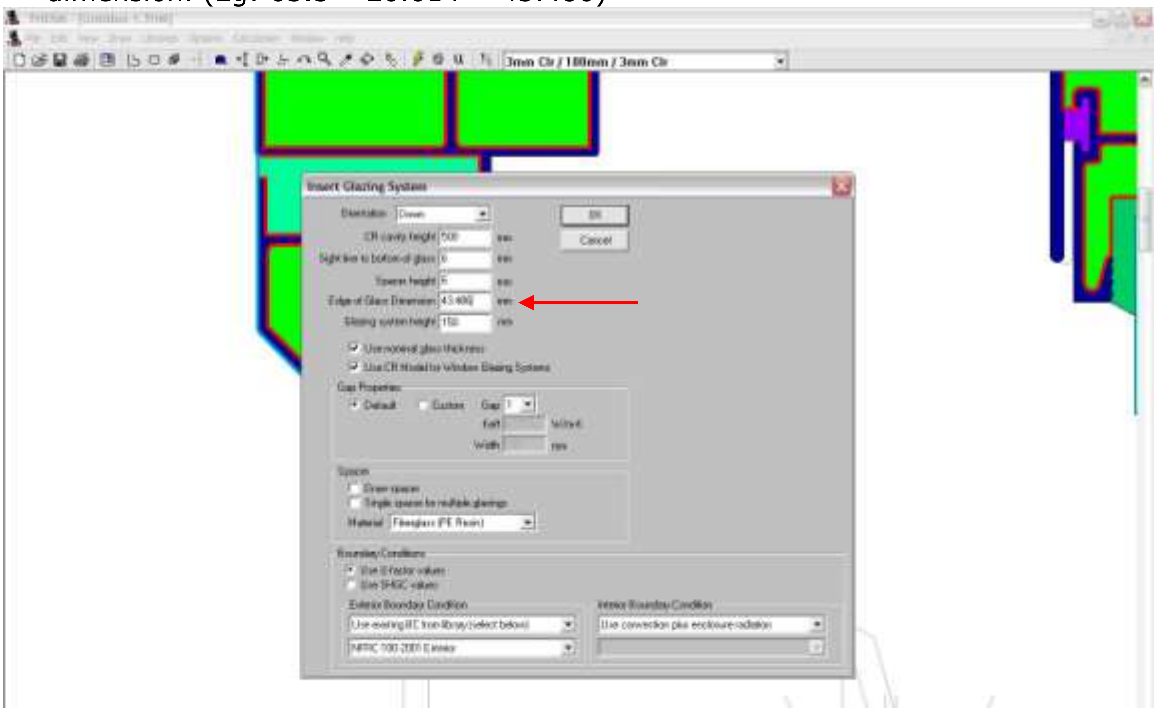




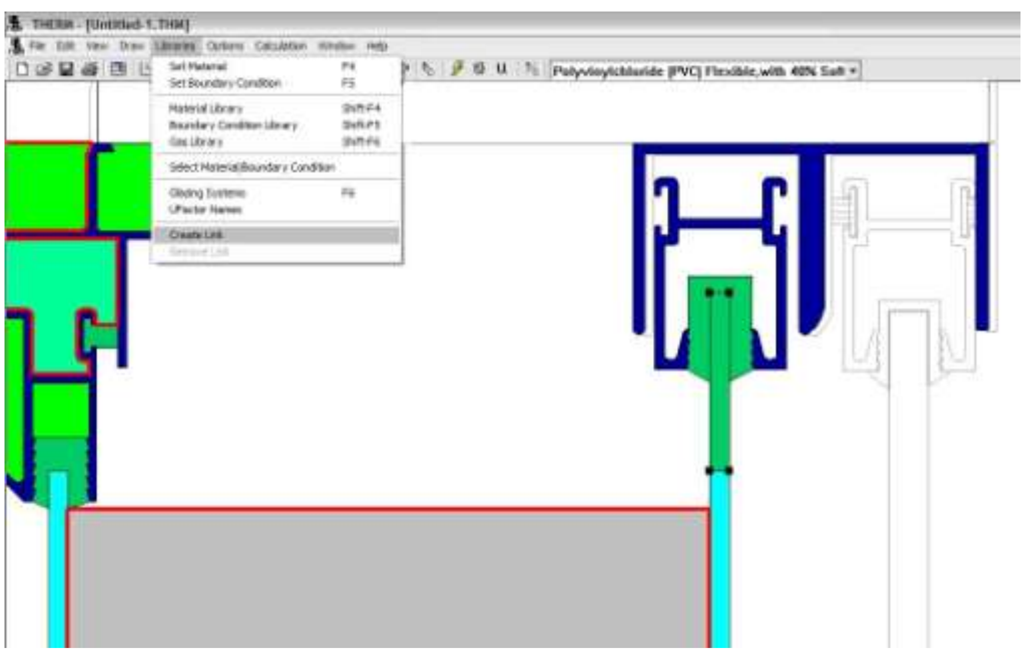
B. If the secondary window (internal window) had a lower PFD than the primary window (external window), draw a rectangle to represent where the glazing should sit and then take the vertical measurement from the internal sightline to the bottom of the air fill of the inserted glass. This is used to adjust the edge of glass when importing the glass.

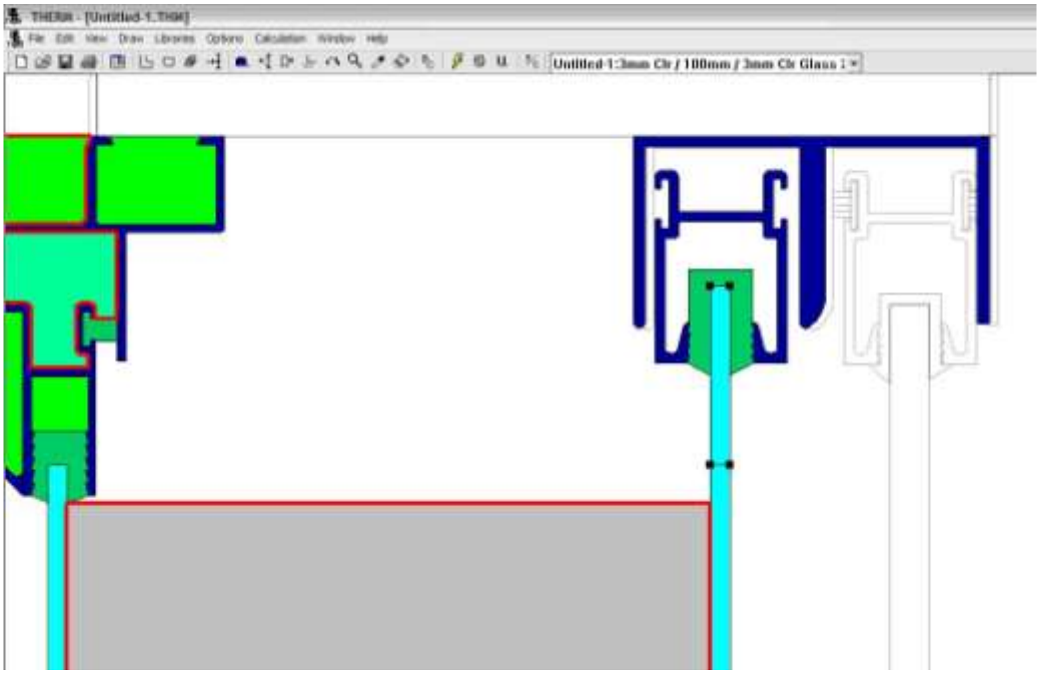


C. Delete the existing glass and re-import using the calculated edge of glass dimension to allow for the lower PFD. (i.e. Subtract the existing glass height from the edge of glass dimension. (Eg: 63.5 – 20.014 = 43.486)

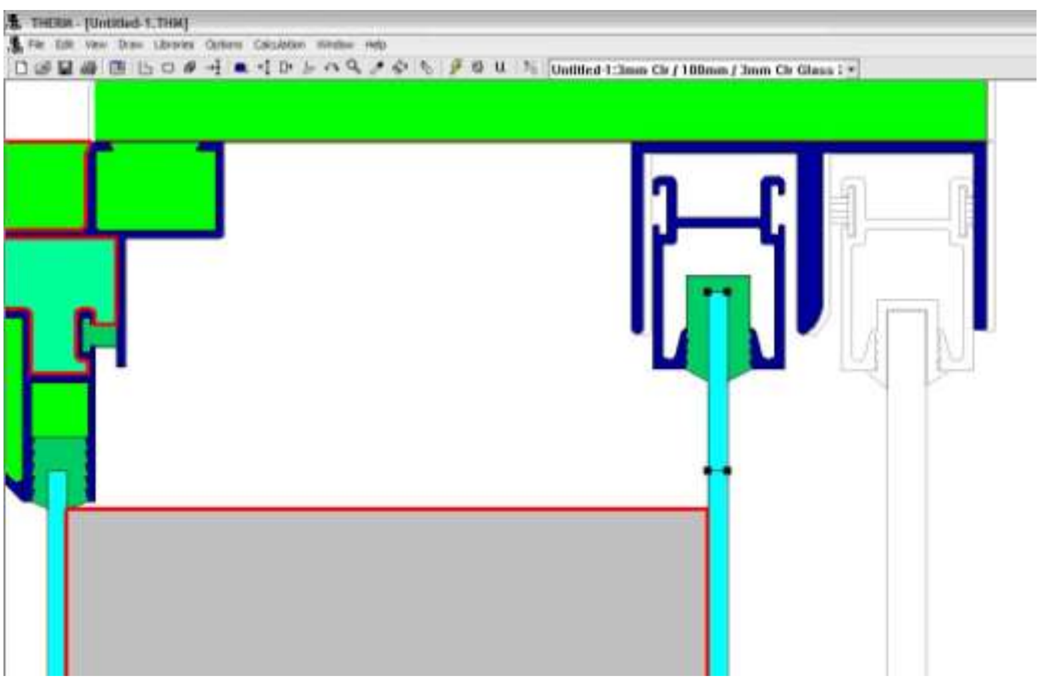


D. Create link between glass and the rectangle drawn in Step B. This will link the two materials and make it a cohesive piece of glass.

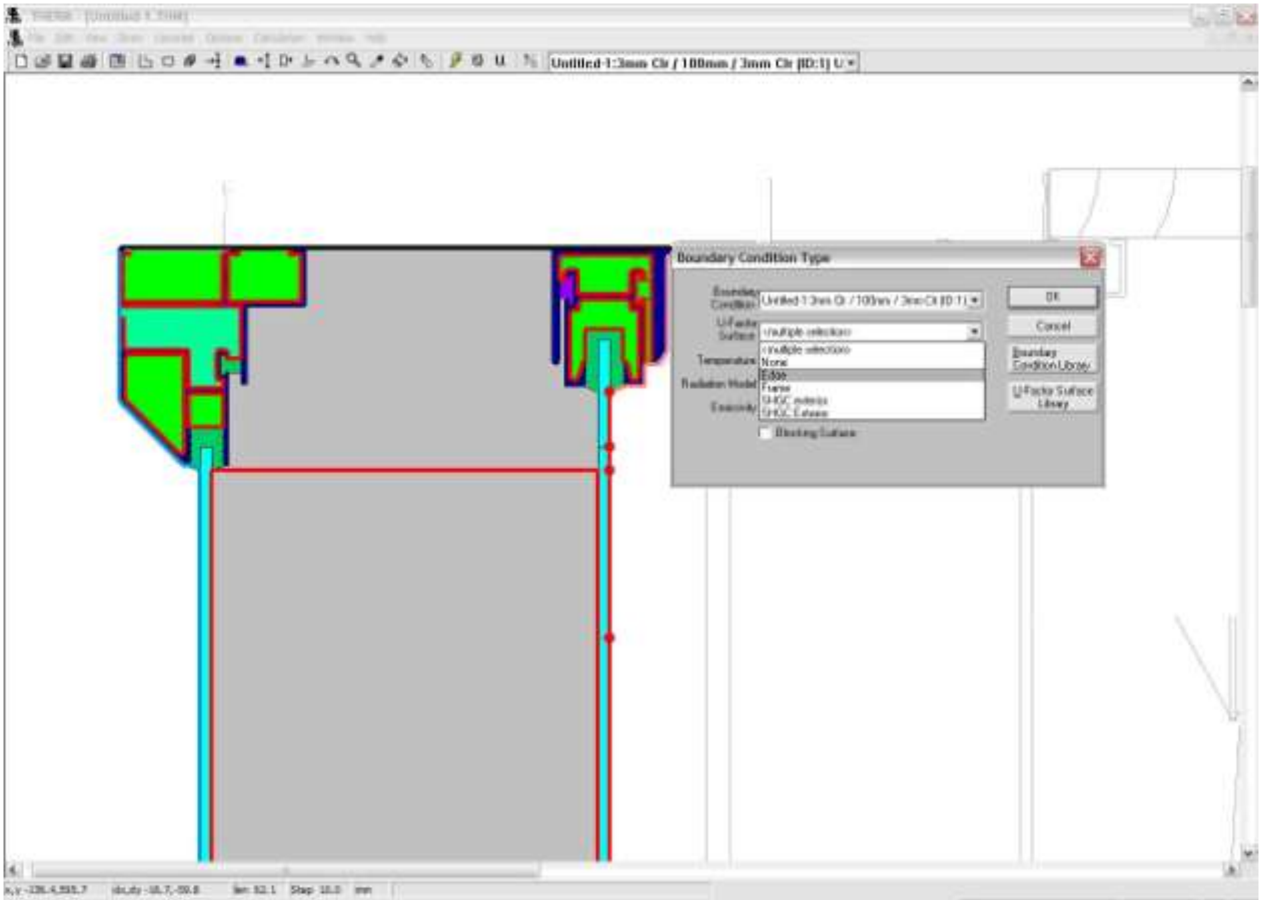




E. Fill the remaining cavity and create link between it and the glazing cavity.

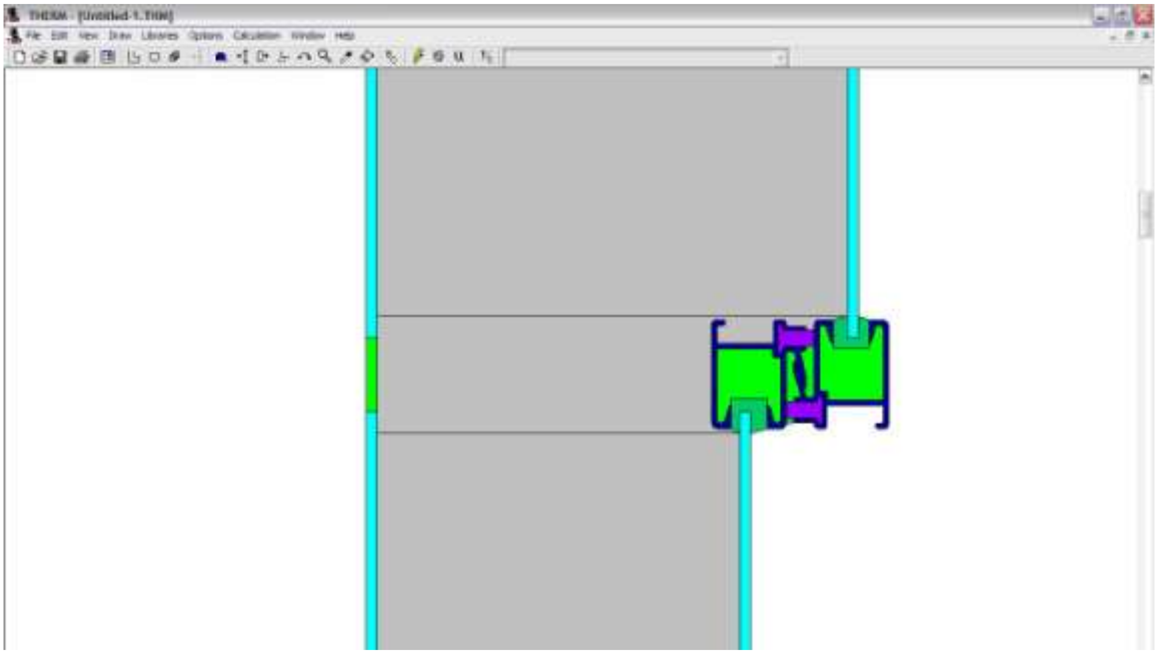


F. When assigning the boundary conditions, THERM will automatically assign a "frame" tag to the linked glass "rectangle" and bottom edge of the glass. Select the 3 tags as shown and change the U-factor Surface to "Edge". This will give a total edge length of 63.5mm as per NFRC procedures.

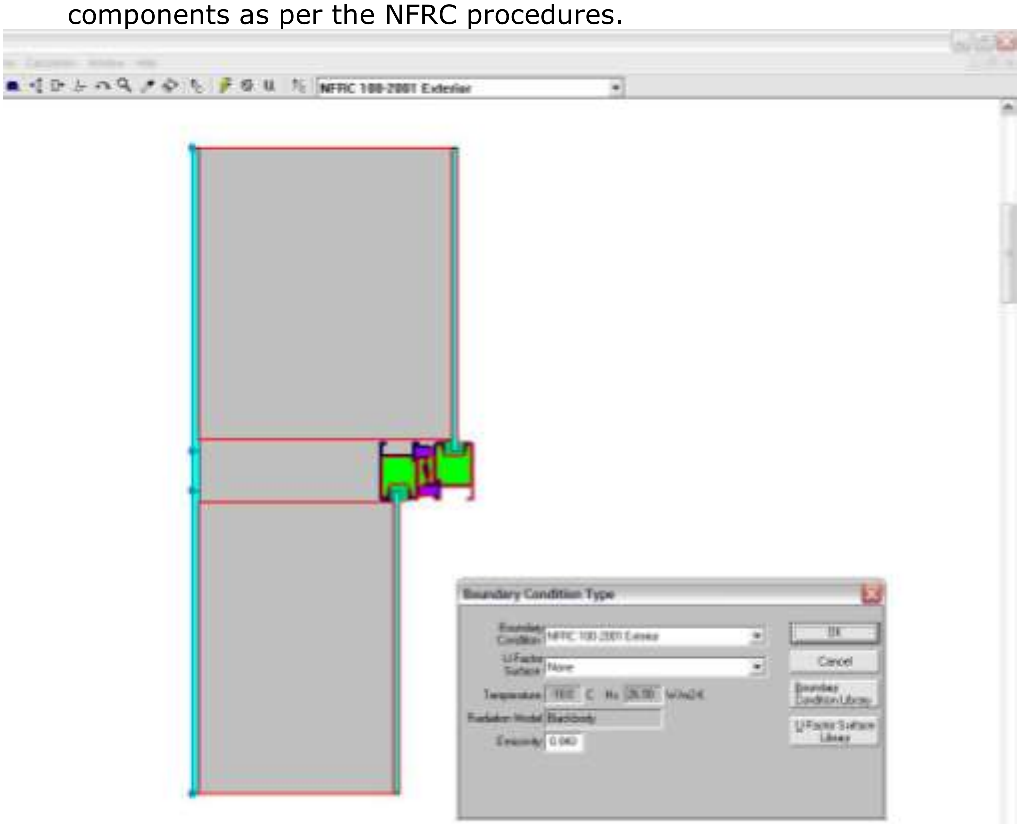


G. Complete this process for the remaining head, sill and jamb sections (i.e. all sections except any intermediate frame sections)

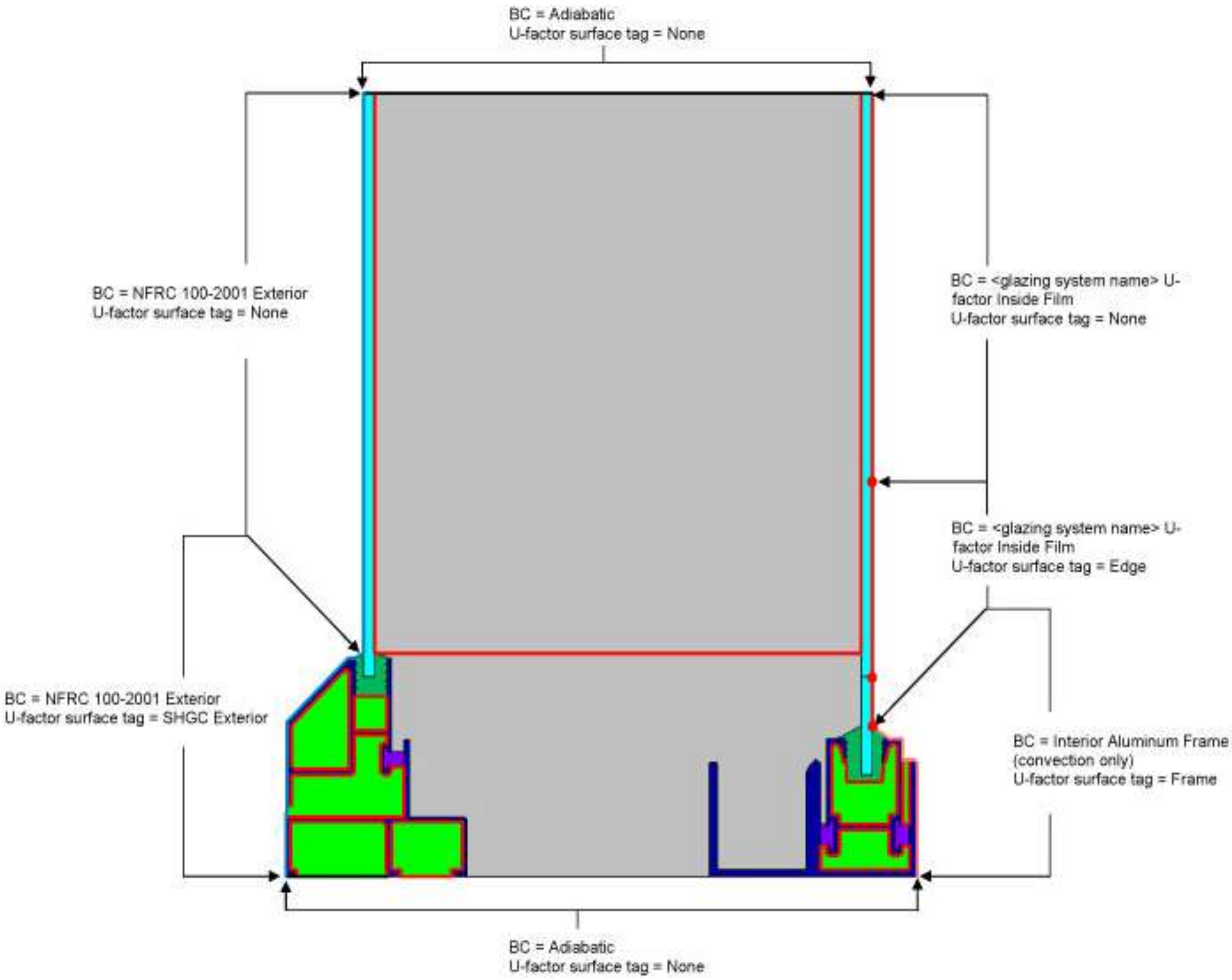
H. THERM modelling of the Intermediate frame section (Mullion/Transom)
   i. Draw the internal intermediate frame section as per NFRC simulation procedures and import the glass.
   ii. Draw a rectangle between the two external glass panes and "create link" with the other external glass panes.



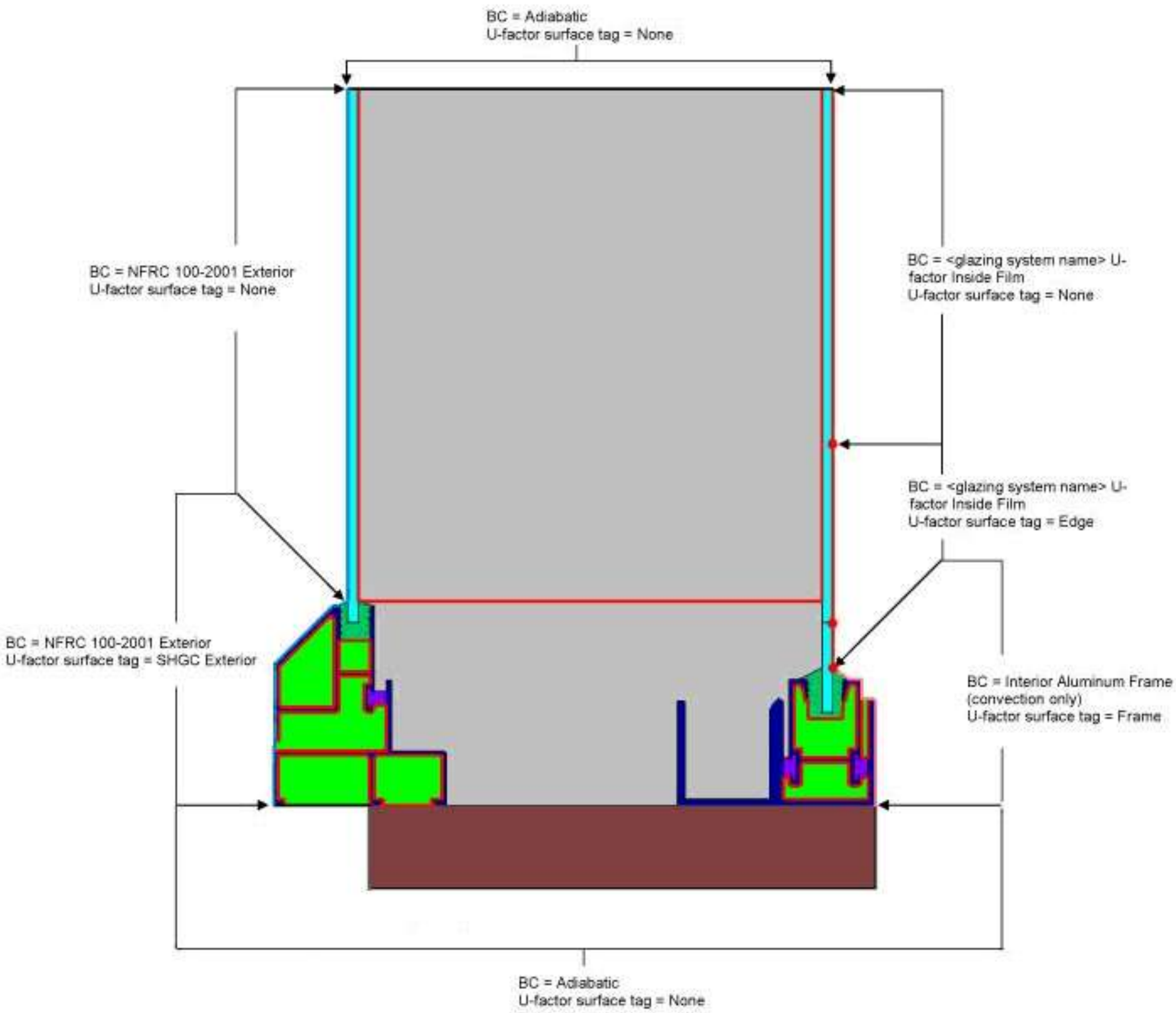
iii. Use the "None" U-factor Surface tag for all external glazing. Tag the internal components as per the NFRC procedures.



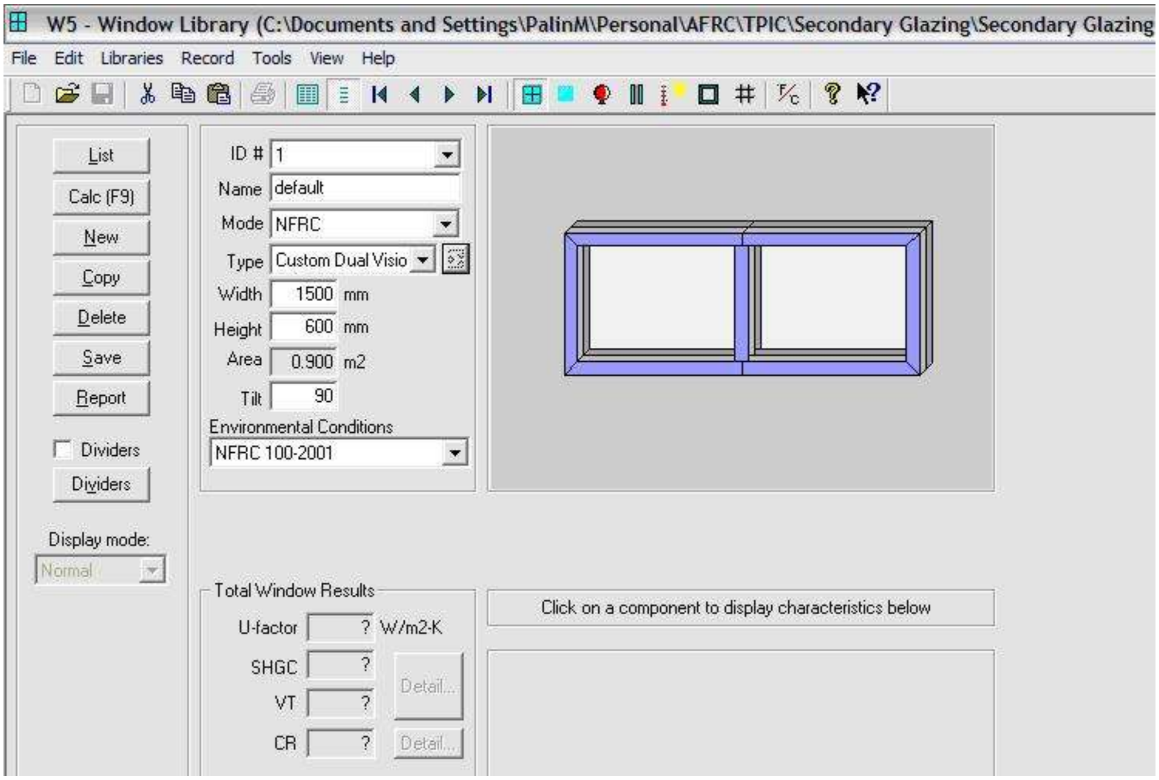
I. Assignment of boundary conditions and U-factor tags. See example below.



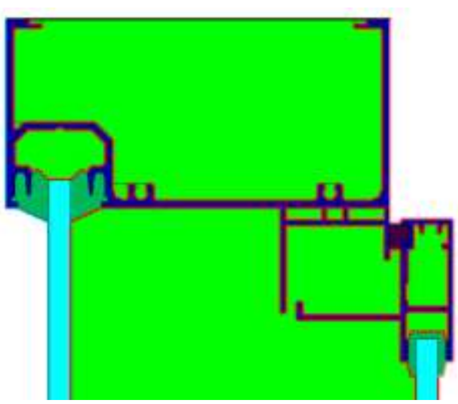
If a reveal is required model as adiabatic tags as below.



iv. Import all THERM files into Window5 and build as a Dual Custom Vision in the Window Library. Set to the size of the primary window (external window). In this example, the awning window is the primary window and the sliding window is the secondary window. Therefore, the Horizontal custom vision window is selected at the size 1500mm by 600mm (width by height).



The method presented in this interpretation can also be applied to a jockey sash configuration where the primary and secondary windows are joined by a framing member. (See Figure below)



Example of a jockey sash configuration

Technical Committee Revisions to Initial Interpretation:

ATIR-2009-21

ATIR-2009-*021*
00/00/2010

AFRC Technical Interpretation Request Form

Interpretation Requested:
How should perimeter frames be taped for simulation?

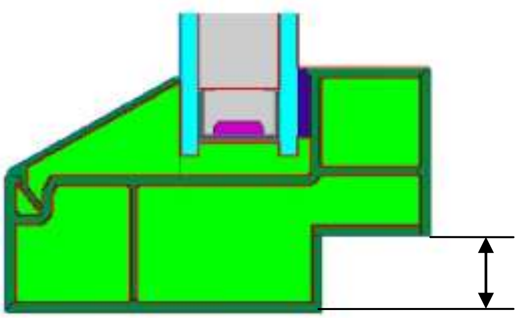
Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
24/02/09	24/02/09, revised 28/06/10	16/07/2010

Pertinent Document:	
NFRC 100, NFRC 200, Simulation Manual	
Referenced Sections:	***Referenced Pages:***

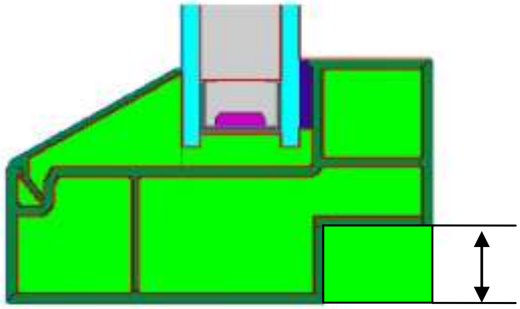
Interpretation :

For simulation purposes, a product should be modelled in the same way that it is physically tested. If the manner in which the window would be physically tested is unknown, apply the following interpretation to perimeter taping.

For a frame which has a “step in” at the perimeter, if the distance between the perimeter and the inner leg of the frame is less than or equal to 12.7mm tape from the frame corner perpendicularly to the perimeter.



≥ 12.7mm, leave open



Technical Committee Revisions to Initial Interpretation:

ATIR-2007-09

ATIR-2007-*09*
00/00/2009

AFRC Technical Interpretation

Interpretation Requested:
How are aluminium windows with timber reveals simulated?

Date Requested:	***Initial Interpretation Date:***	***Final TAC Approval Date:***
26/10/07	26/06/09	16/07/2010

Pertinent Document:	
NFRC 100 - 2004 NFRC 2001 and 2004 Technical Interpretations	
Referenced Sections:	***Referenced Pages:***
Section 4.2.5 (NFRC 100) TI-2005-08 (Technical Interpretations)	Page 18 (NFRC 100) Page 56 (Technical Interpretations)

Interpretation :

Aluminium windows are generally supplied in Australia with reveal linings pre fitted in the factory (See Figure 1).

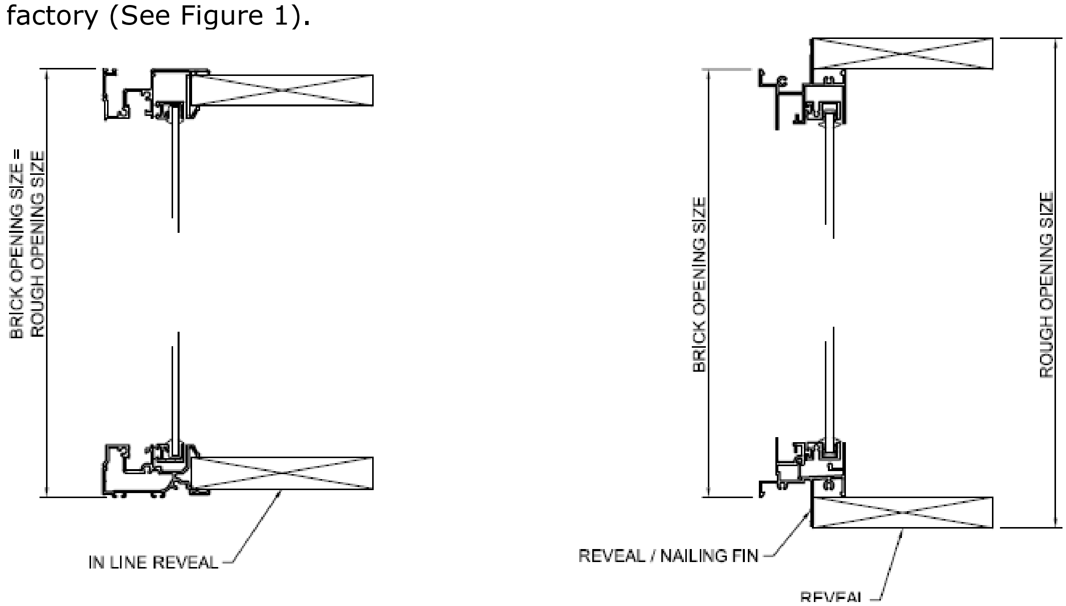


Figure 1: Window as Constructed with a timber reveal (nailing fins)

Reveal fins are described as nailing flanges by NFRC. NFRC 100-2010 4.2.5.A states that:

"*If a nail flange is not removable and is identified as such by the manufacturer, the product shall be simulated and tested with the nail flange covered with a nominal 1 in x 4 in fir trim. If a nail flange is removable, the product shall be simulated and tested without the nail flange*"

The method of simulating non removable nailing flanges is described in NFRC TIPC TI-2005-08. The attached drawing (see Figure 2) shows the NFRC methods of modelling a window with and without fins. There is negligible difference between the results obtained by the two modelling methods. If the window is simulated without the nailing fin, the reveal fin should be removed as per Figure 2 – NFRC Method 1. If the window is simulated with the nailing fin, the fir trim shall be position as per Figure 2 – NFRC Method 2.

If a permanent in-line reveal is present it shall be simulated with the reveal in place.

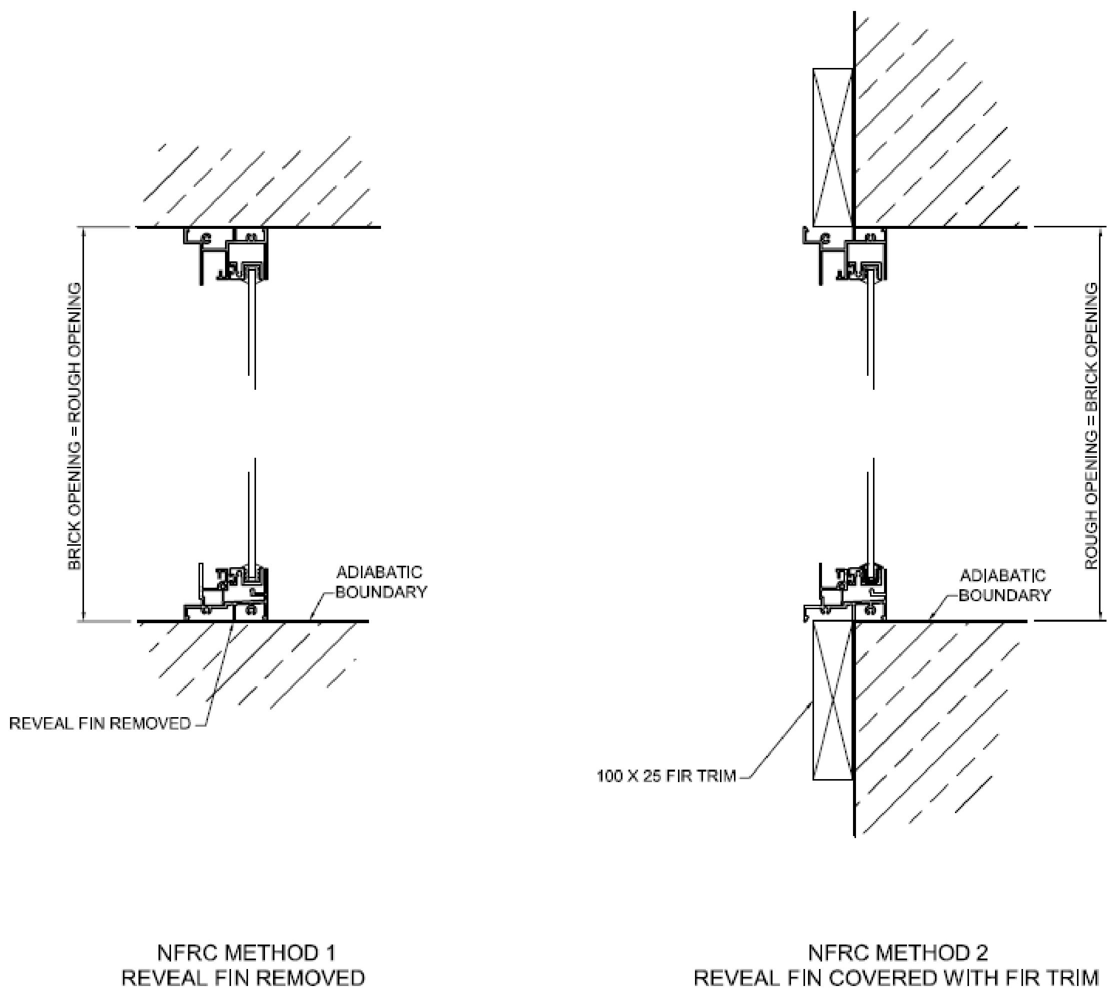


Figure 2: A comparison of the simulation configuration for aluminium frames with a timber reveal (nailing fins)

Additional Information:

If the window is modelled with the reveal attached (See Figure 1 -Window as Constructed), the results are skewed because the effective window size (brick opening size) is smaller than the modelling size (rough opening size). When the window size is removed from the equation and the amount of energy flowing through the window is considered, it can be shown that the reveal does not contribute to the energy performance of the window.

Technical Committee Revisions to Initial Interpretation:

Index

A

ATIR-2007-01, 1
ATIR-2007-02, 1
ATIR-2007-03, 1
ATIR-2007-04, 1
ATIR-2007-06, 1
ATIR-2007-09, 1
ATIR-2008-11, 1
ATIR-2008-12, 1
ATIR-2009-21, 1

C

Conversion of IP units to SI units, 1

H

Hash requirement in IGDB for glazing, 1

I

IGDB, 1
Interim IGDB Data Submission, 1
IP unit, 1

L

Louvre window systems, 1

P

Perimeter Frames, 1

S

Santoprene™, 1
SI unit, 1
Secondary Glazing,1

T

Thermally Improved Aluminium Frames, 1
Thermophysical properties, 1
Timber Reveals, 1

This page has intentionally been left blank.