U-Factor Simulation – Sectional Garage Door

The overall product U-factor is calculated based on area weighted average of various component's U-factor. The components used for area weighting a sectional garage door are:

- Top Rail
- Bottom Rail
- Stile
- Meeting Rail
- Panel Core

Figure 1 illustrates the above components on the front view of a garage door. The U-factor of each component is calculated using two dimensional heat transfer software THERM. The sectional garage doors with glazing components and with center stile are not covered in this document.

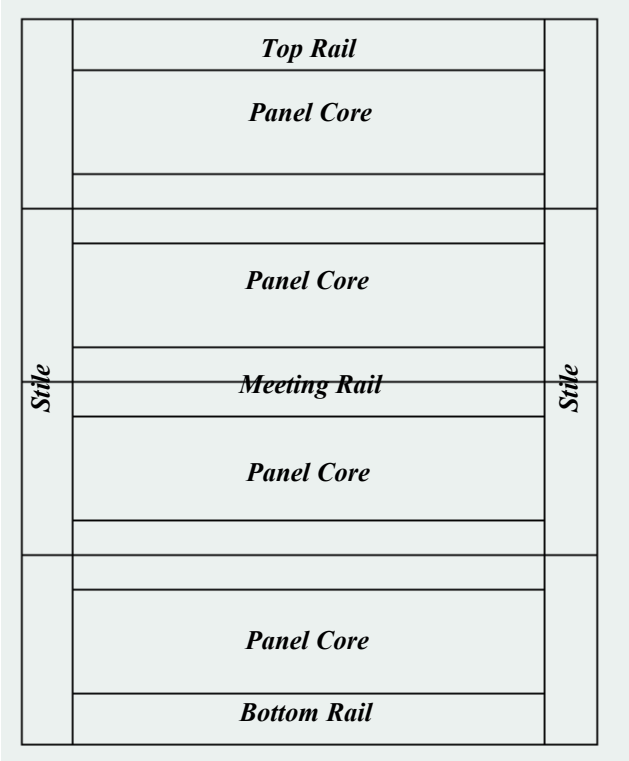

Figure 1: Sectional Garage Door Layout

The boundary condition details and other modeling assumptions used on the simulation models for door components are discussed in the following sections.

Top Rail Model:

A nominal 2x6 wood block is used in the Top Rail Model as shown in Figure 2. The torsion spring assembly, and any non-continuous hardware, shall not be included in this model. The boundary condition (BC) type and U-factor tags used in the model are described in Figure 2.

THERM File Properties:
Cross-section Type: Head
Gravity Arrow: Down

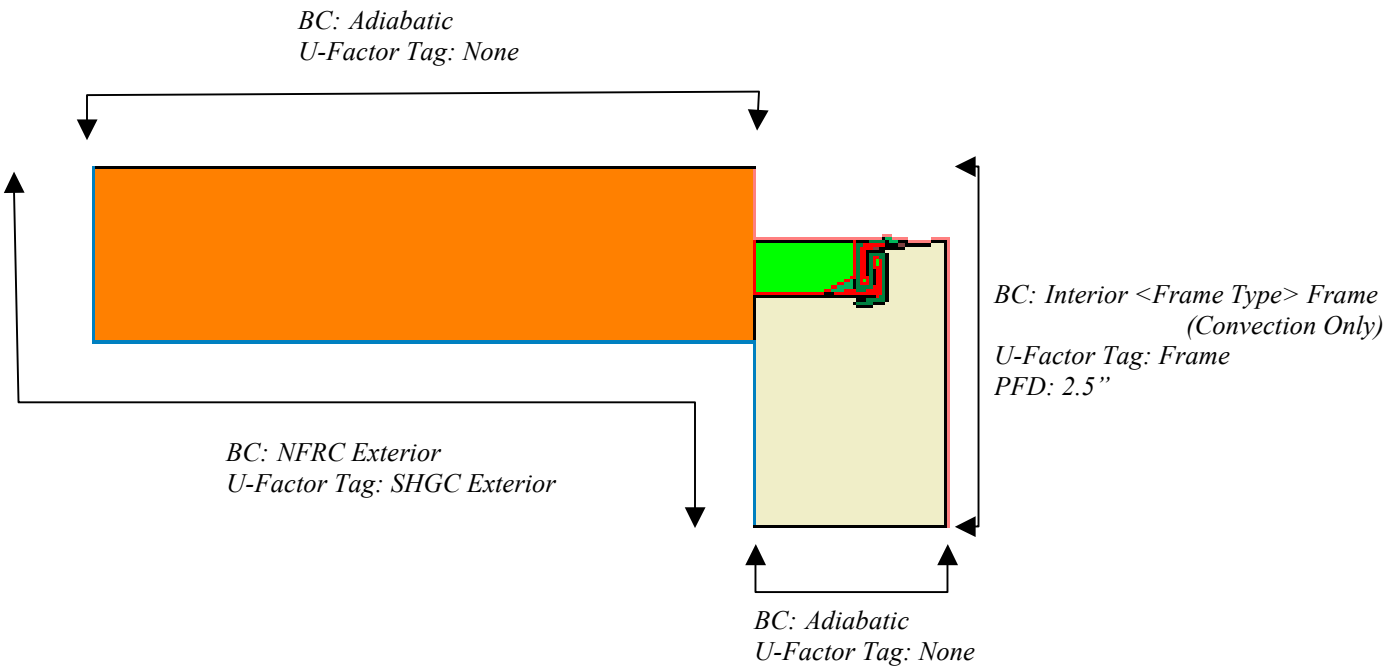

Figure 2: Top Rail Model

Bottom Rail Model:

A nominal 2 x 8 wood block is used in the bottom rail model of the garage door. Refer Figure 3 for boundary condition and U-factor tag details.

THERM File Properties:
Cross-section Type: Sill
Gravity Arrow: Down

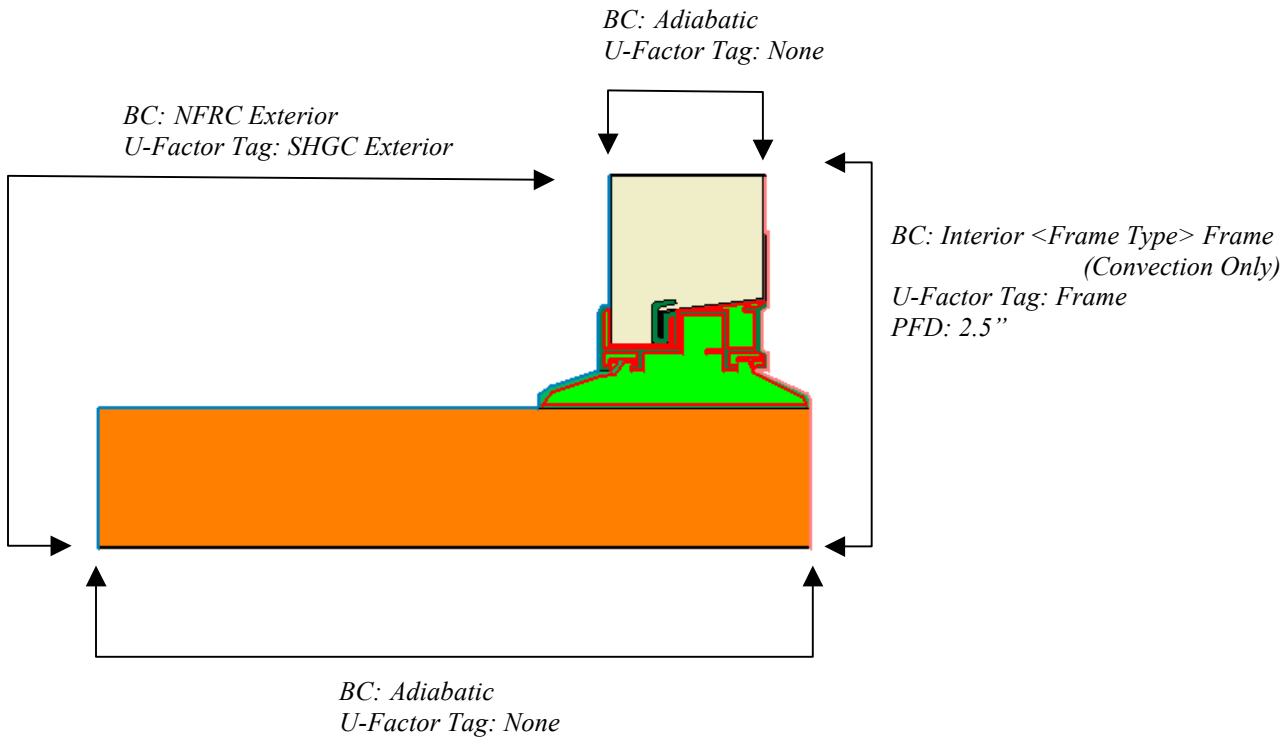

Figure 3: Bottom Rail Model

Stile Model:

A nominal 2x6 wood block is used in the Stile Model. The projected frame dimension shall incorporate a 1” uniform section of the garage door panel. Any non-continuous hardware, such as rollers, shall not be included in the model. The boundary condition type and the U-factor tag used on Stile model are shown in figure 4.

THERM File Properties:

Cross-section Type: Jamb
Gravity Arrow: Into the Screen

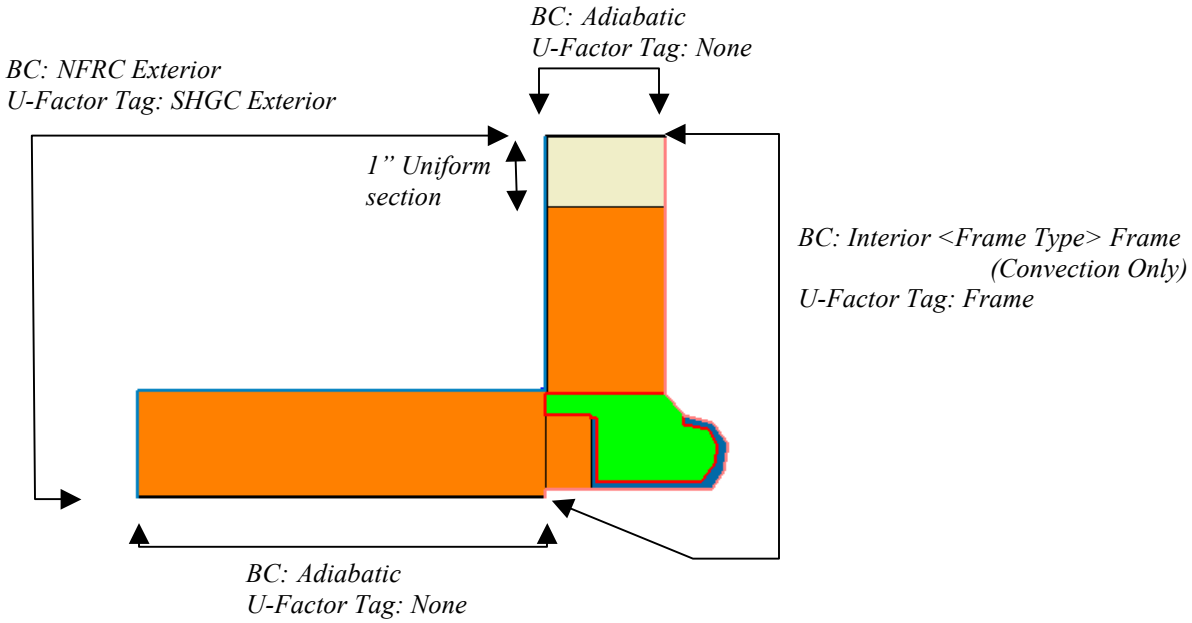

Figure 4: Stile Model

Meeting Rail/Panel Core THERM Model:

The Meeting Rail Model is combined with the Panel Core Model, as shown in Figure 5. The meeting rail model shall include 2.5" section of the each joining panel. The projected dimension of the panel core section shall be equal to ([Height of the Panel]-5")/2.

THERM File Properties:

Cross-section Type: Horizontal Meeting Rail
Gravity Arrow: Down

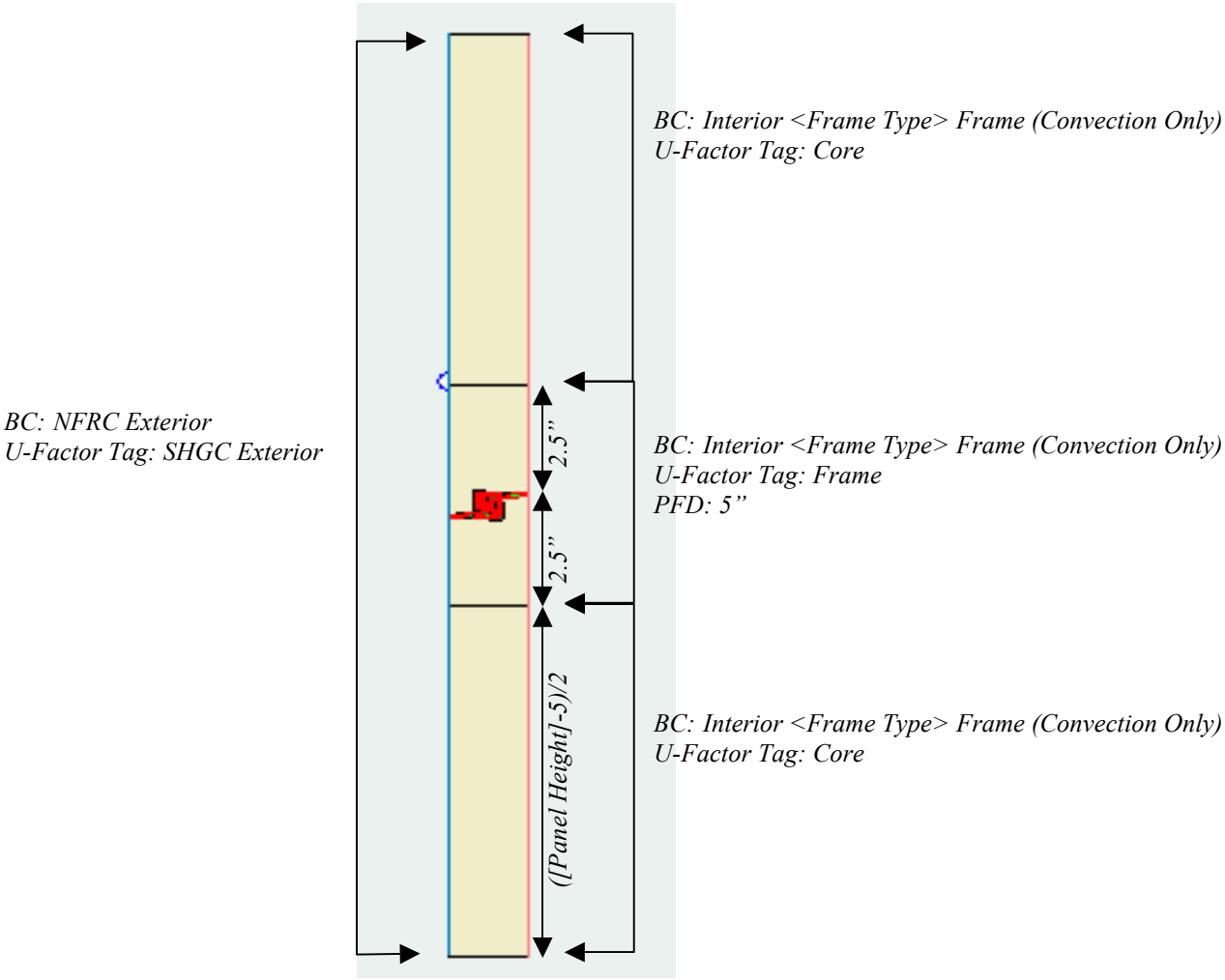

Figure 5: Meeting Rail and Panel Core Model

Overall Product U-factor:

The following equation is used to calculate overall U-factor of a sectional garage door.

$$U\text{-}factor = \frac{(U_{TR} * A_{TR}) + (U_{BR} * A_{BR}) + (U_{ST} * A_{ST}) + (U_{MT} * A_{MT}) + (U_{CR} * A_{CR})}{A_{Total}} \qquad \text{(Equation 1)}$$

Where:

U_{TR} – *Top Rail U-factor*
A_{TR} – *Top Rail Area*
U_{BR} – *Bottom Rail U-factor*
A_{BR} – *Bottom Rail Area*
U_{ST} – *Stile U-factor*
A_{ST} – *Stile Area*

U_{MT} – *Meeting Rail U-factor*
A_{MT} – *Meeting Rail Area*
U_{CR} – *Panel Core U-factor*
A_{CR} – *Panel Core Area*
A_{Total} – *Total Projected Area of the Door*