

U-Factor Simulation - Rolling Steel 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 Rolling garage door are:

- Top Rail
- Bottom Rail
- Stile
- 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.

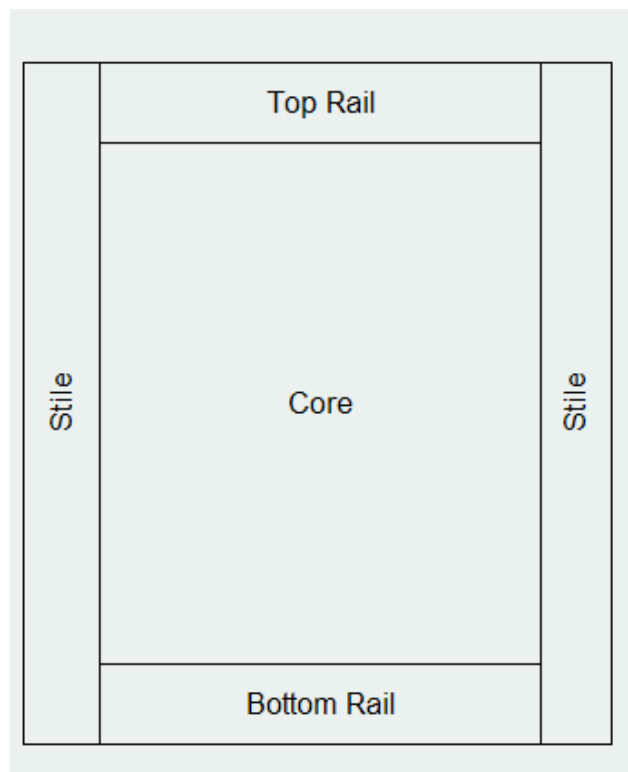


Figure 1: Rolling Steel Door Layout

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 top rail model shall include two complete slats and one half slats. 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

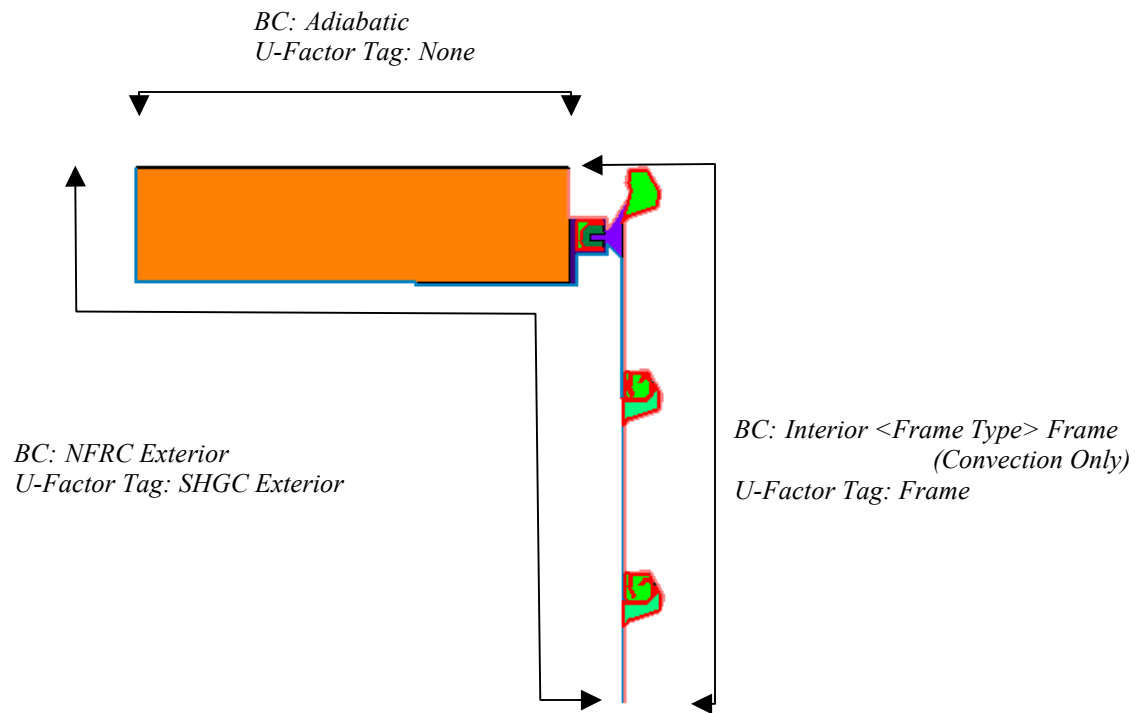


Figure 2: Top Rail THERM Model

Bottom Rail Model:

A nominal 2 x 8 wood block is used in the bottom rail model of the garage door. The Bottom Rail Model shall include one complete slat and one half slats. Refer Figure 3 for boundary condition and U-factor tag details.

THERM File Properties:

Cross-section Type: Sill

Gravity Arrow: Down

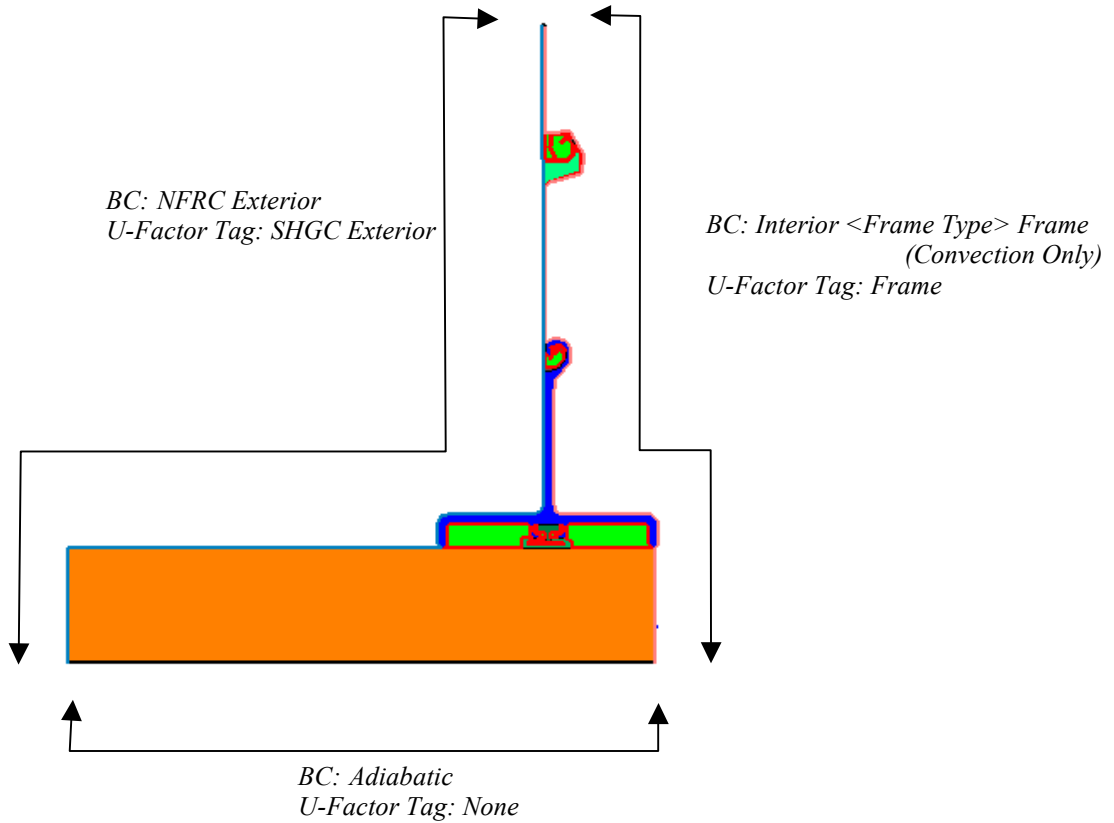


Figure 3: Bottom Rail THERM Model

Stile Model:

A nominal 2x6 wood block is used in the Stile Model. The projected frame dimension shall incorporate a 2.5" exposed section of the slat as shown in figure 4. 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

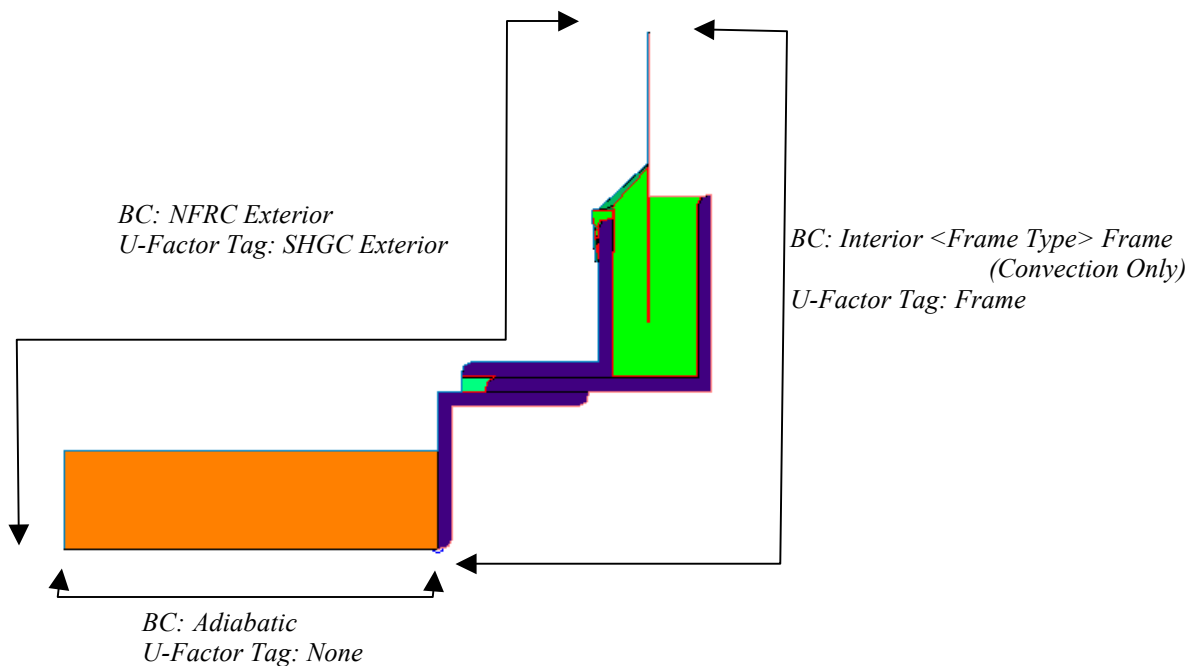


Figure 4: Stile THERM Model

Core Model:

The Core Model shall include two full slats and two half slats at each ends. The details of the section where slats join shall be obtained from the manufacturer. The boundary conditions on core model are specified in Figure 5.

THERM File Properties:

Cross-section Type: Horizontal Meeting Rail

Gravity Arrow: Down

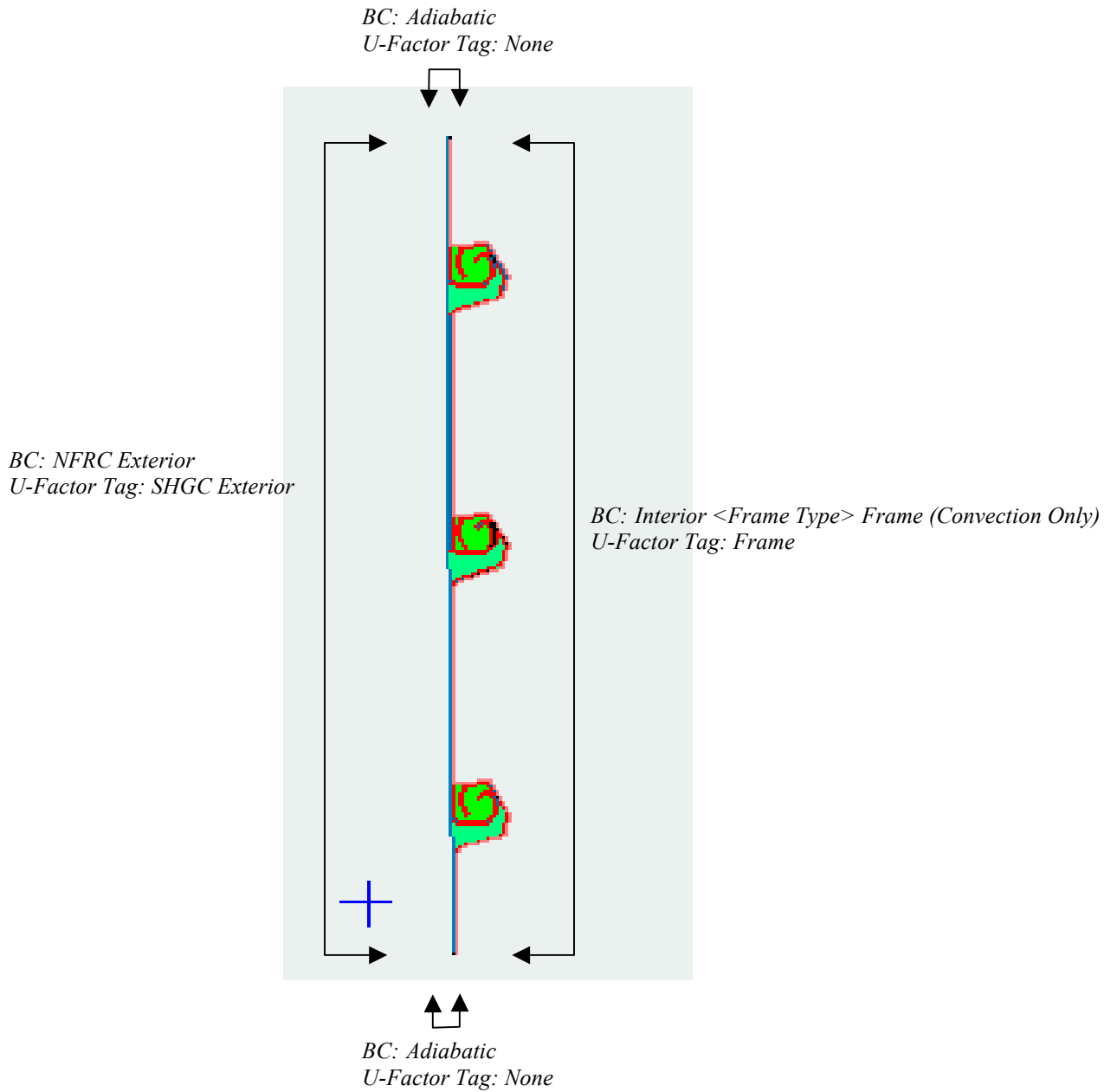


Figure 5: Core THERM Model

Overall Product U-factor:

The following equation shall be used to calculate overall U-factor of a rolling steel door.

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

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_{CR} – Core U-factor*
- A_{CR} – Core Area*
- A_{Total} – Total Projected Area of the Door*