

Using Revit Models for Energy Analysis

On building projects using a BIM, standalone energy analysis software is often used to develop and analyze energy models based on information contained in the BIM. However, the complex nature of BIMs can cause it to be mistranslated when imported into a Building Energy Model (BEM) via gbXML or IFC. In order to fully take advantage of the Revit model in the energy modeling process, it must be properly prepared for analysis. The following tips can be utilized in order to help reduce common errors typically associated with importing models created in Revit into standalone energy analysis software.

Tips for Designers

- Define Energy Settings from the Project Information dialog in Revit. Items to set include:
 - Building Type
 - Location
 - Export Category
 - Export Complexity
- Spaces
 - Define all upper and lower boundaries of spaces. Verify all walls and floors are room bounding.
 - If ceilings are modeled, determine whether or not the void space between the ceiling and floor structure above needs to be included in the energy model. If so, plenum area must be included in a Revit room.
 - Set Volume Computations to “Areas and Volumes”.
 - Model multi-level spaces as separate rooms per level.
- Columns
 - Set columns in the model to “non-room bounding”. This will prevent a “room-in-a-room” situation that energy analysis software will not import correctly.
- Shading Devices
 - To enable a shading device to export from Revit it must be assigned as either a Roof Family or Mullion Family.
 - Shading devices that belong to a ‘floor’ family or in-place ‘system’ family will not translate.
 - Alternatively use the massing tool to build shading devices and apply walls/roof/floor surfaces by face.
- Walls
 - Set walls that protrude into a space, but that do not divide the space to “non-room bounding”.
 - Place walls based on their centerlines
 - For exterior walls, use walls that go from ground level to the roof as opposed to stacked walls
- Curtainwalls
 - Do not embed curtain walls into other opaque wall elements; use a dedicated curtain wall family.
 - Where possible create full height curtain walls, or minimize the number of curtain wall sections.
 - Do not stack curtain walls. Create a grid and adjust panels to the correct window/wall coverage
 - For opaque sections in curtain walls use panels with a max 3% transparency.
 - For glazed doors, leave as a glazed panel.
 - For opaque doors, use a Revit door template.
- Windows
 - Use generic windows. Apply project-specific glazing and frame properties once imported into the energy simulation software.
 - Windows with overlapping frames may be clipped when exported
- Doors
 - Use generic doors. Apply project-specific door and frame properties once imported into the energy simulation software.

- Elevator doors do not export and are not a significant contributor to building performance analysis.
- Glass doors do not export as glass; apply project-specific glazed door properties once imported into the energy simulation software.
- Glass doors in curtain wall systems will export as an opaque panel, apply the correct properties to glass doors once imported into the energy simulation software.
- Skylights
 - Verify a Revit skylight template has been used. Apply project-specific glazing and frame types once imported into the energy simulation software.
- Modeling conditions to avoid:
 - Rooms inside of rooms
 - Room boundary lines overlapping walls and other room boundary lines. This may cause errors in the exported file.
- Use templates and the correct families for each component whenever possible. Most energy analysis software will classify elements based on UniFormat Assembly Codes and Descriptions (Walls, Floors, Ceilings, Roof) defined in Revit. Revit automatically assigns the correct UniFormat Assembly Codes and Description values at the Type level to the of Out-of-the-Box families.
- When the Revit model is thought to be ready for export, take the following steps to check for proper room creation and correct adjacencies:
 - In Visibility Graphics, turn on Rooms – In-Fill and Reference. Visually check the model (in plan view and in section view) to ensure all rooms are enclosed.
 - Create a room schedule and ensure that there are no rooms that say “Redundant Room” or “Not Enclosed”

Tasks that can be performed by either Designer or Energy Modeler

- Copy the Design Model and create a simplified Energy Model for analysis:
 - Substitute window families for curtain walls
 - Substitute simple generic families for walls
 - Delete elements not required for energy analysis, such as railings and furnishings
- Export to gbXML from Revit. Export at the lowest level of complexity necessary for the energy analysis, with “Simple” being the recommended level. Choosing “Complex w/ Mullions and Shading Surfaces” is not recommended.