

## Test Case 06 – Envelope Information

### Test Description:

Building envelope contains critical information for performance analysis, including the assembly order, the thermal resistance of each layer, and the reflectance of the outmost layer. When exporting a BIM model to gbXML, such information should be preserved and correctly mapped. This test case will exam the capability of a BIM software in exporting the envelope information.

### Spaces / Rooms:

There is just one spaces in this test model. It is located at the first floor, named as “level\_1\_space\_1”.

### Special Considerations:

1. The model is 10’ x 10’ (outer line).
2. The thickness of wall assembly is 1’1-7/8”. Table 1, 2 and 3 illustrate the layer by layer assemblies as well as the thermal properties for each layer.
3. Exterior wall is a typical brick wall, and its structure is 2x6 wood stud.
4. Roof is a typical metal roof, and its structure is 2x10 roof rafter.
5. Floor is a slab on grade floor.
6. All the walls face to an orientation shall be named as: “[orientation]\_wall\_[custom index]”
7. All the other surfaces shall be named as their function, such as “interior\_wall\_[custom index]”
8. The custom index is an index to differentiate the same type surfaces. The tester can decide how to label the custom index.

**Table 1.** Wall assembly details

Function	Material Name	Thickness (inches)	R (ft <sup>2</sup> -F-hr/Btu)	Conductivity (BTU/h.ft.F)	Density (lb/ft <sup>3</sup> )	Specific Heat (Btu/lb-F)
Exterior Side						
Finish	Brick	4”	-	6.2	120	0.23
Exterior insulation	Rigid insulation	2”	-	0.21	2.7	0.29
WRB	Building paper	-	-	-	-	-
Substrate	Plywood	1/2”	-	0.83	33.7	0.29
Structure	Fiber glass	6”	-	0.24	8.7	0.23
Finish	Gypsum board	5/8”	-	1.1	49.9	0.26
Interior Side						

**Table 2.** Roof assembly details

Function	Material Name	Thickness (inches)	R (ft <sup>2</sup> -F-hr/Btu)	Conductivity (BTU/h.ft.F)	Density (lb/ft <sup>3</sup> )	Specific Heat (Btu/lb-F)
Exterior Side						
Finish	Metal surface	0.03”	-	314	488.4	0.12
WRB	Building paper	-	-	-	-	-
Substrate	Plywood	1/2”	-	0.83	33.7	0.29
Structure	Fiber glass	10”	-	0.24	8.7	0.23

Finish	Gypsum board	5/8"	-	1.1	49.9	0.26
Interior Side						

**Table 3.** Floor assembly details

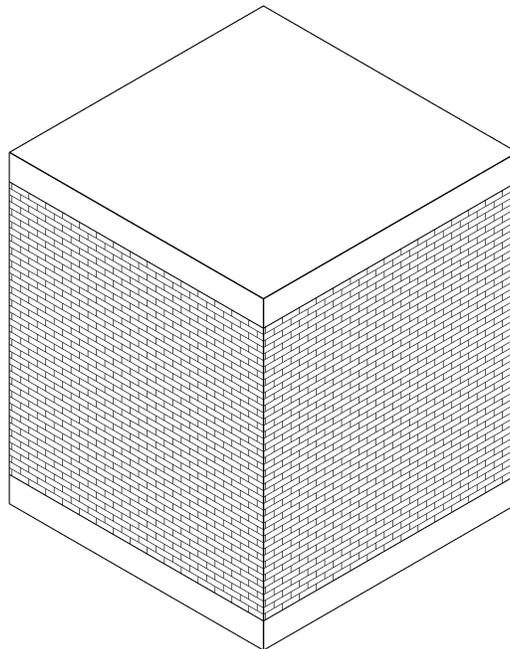
Function	Material Name	Thickness (inches)	R (ft <sup>2</sup> -F-hr/Btu)	Conductivity (BTU/h.ft.F)	Density (lb/ft <sup>3</sup> )	Specific Heat (Btu/lb-F)
Exterior Side						
Exterior	Slab on Grade	4"	-	3.7	80	0.2
Air	Air gap	2"	0.18	-	-	-
Finish	Hardwood floor	7/9"	0.12	-	-	-
Interior Side						

*Description of Test Case:*

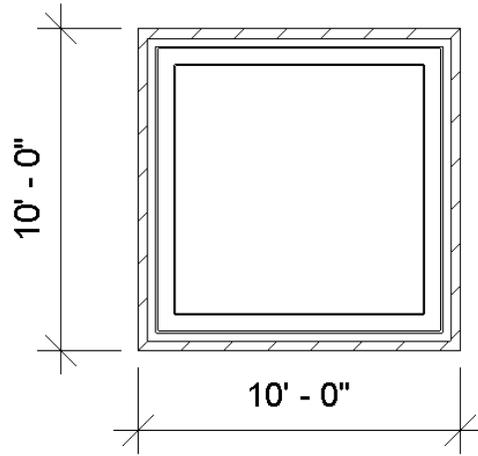
**Figure 1** shows a 3-dimensional isometric view of this test model. Walls locate between the slab floor and the roof and is made up of multiple layers.

**Figure 2** shows the dimension of the model (excluding the roof and floor thickness).

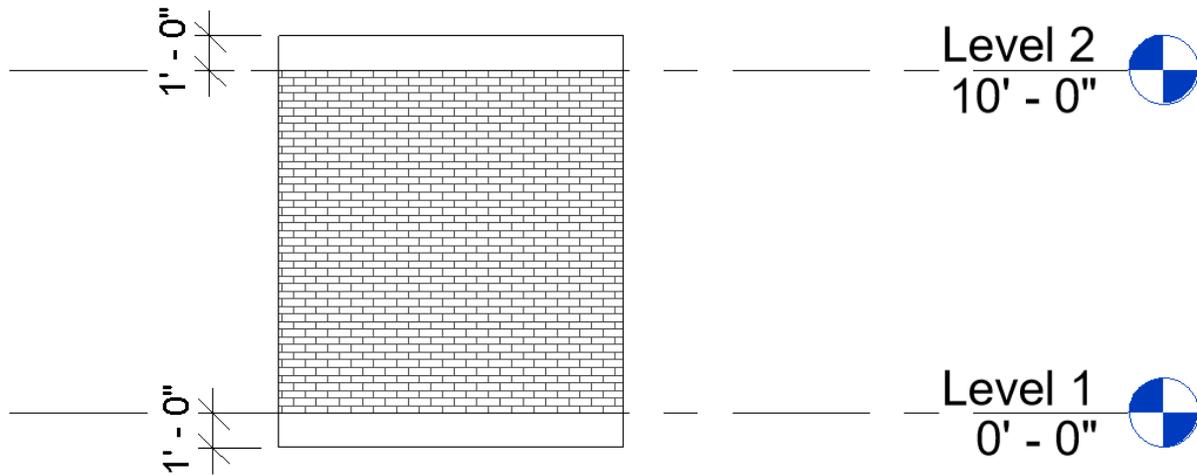
The test expects that the constructions and its layers can be successfully exported into gbXML. The test expects that the layers with thickness can be exported successfully with correct name and thermal properties.



**Figure 1.** Isometric View



**Figure 2.** Floor plan



**Figure 3.** Section Views

Common Outcomes and Test Results:

In the exported gbXML file, the construction tag and material tag should appear just under the gbXML tag. However, in most cases, only geometry information can be exported, as shown in **Figure 3**. The material information and construction names which are supposed to be stored in construction tags are often not shown in the exported gbXML files, as shown **Figure 4**.

```

<Surface surfaceType="ExteriorWall" exposedToSun="true" id="aim0066">
  <AdjacentSpaceId spaceIdRef="aim0024" />
  <RectangularGeometry id="aim0067">
    <Azimuth>0</Azimuth>
    <CartesianPoint>
      <Coordinate>-41.26024</Coordinate>
      <Coordinate>10.79123</Coordinate>
      <Coordinate>0</Coordinate>
    </CartesianPoint>
    <Tilt>90</Tilt>
    <Width>8.84375</Width>
    <Height>10</Height>
  </RectangularGeometry>
  <PlanarGeometry>
    <PolyLoop>
      <CartesianPoint>
        <Coordinate>-50.10399</Coordinate>
        <Coordinate>10.79123</Coordinate>
        <Coordinate>0</Coordinate>
      </CartesianPoint>
      <CartesianPoint>
        <Coordinate>-50.10399</Coordinate>
        <Coordinate>10.79123</Coordinate>
        <Coordinate>10</Coordinate>
      </CartesianPoint>
      <CartesianPoint>
        <Coordinate>-41.26024</Coordinate>
        <Coordinate>10.79123</Coordinate>
        <Coordinate>10</Coordinate>
      </CartesianPoint>
      <CartesianPoint>
        <Coordinate>-41.26024</Coordinate>
        <Coordinate>10.79123</Coordinate>
        <Coordinate>0</Coordinate>
      </CartesianPoint>
    </PolyLoop>
  </PlanarGeometry>
  <CADObjectId>Basic·Wall·Exterior···Brick·and·CMU·on·MTL··Stud·[352792]</CADObjectId>
  <Name>N-1-E-W-1</Name>
</Surface>

```

**Figure 3. Geometry Information in gbXML**

```

05_Construction Names.xml x
1 <?xml version="1.0" encoding="UTF-16"?>
2 <gbXML useSIUnitsForResults="false" temperatureUnit="F" lengthUnit="Feet"
  areaUnit="SquareFeet" volumeUnit="CubicFeet" version="0.37" xmlns="
  http://www.gbxml.org/schema">
3   <Campus id="aim0002">
651   </Campus>
652   <DocumentHistory>
667   </DocumentHistory>
668 </gbXML>

```

**Figure 4. Tags in incomplete gbXML**