

## Test Case 19 – HVAC System and Schedule (Optional)

Test Description: HVAC is an essential building system in every new and retrofit building construction. It is also a critical component for evaluating a building’s energy performance as well as indoor air quality. To enhance data interoperability, it is suggested that not only geometric but also HVAC data be successfully exported from a BIM to gbXML. This test case focuses on whether a BIM authoring tool, when the described data is available, is capable of exporting HVAC data to gbXML. The HVAC system is a simple gas-based furnace adapted from the description in the standard ASHRAE 90.1 Appendix C.

### Spaces / Rooms:

There is one space in this test model named as “level\_1\_space\_1”.

### Special Considerations:

1. The model is 10’ x 10’ x 10’ (center line)
2. HVAC shall have the following characteristics
  - a. A constant-volume fan control with fan efficiency of 0.7
  - b. An electrically-provided cooling with constant COP equal to 3.0
  - c. A gas furnace with constant thermal efficiency equal to 0.8
  - d. Zone design OA is 5.3 CFM/person and 0.059 CFM/sq.ft.
  - e. Design heating temperature is 70°F and design cooling temperature is 74°F
3. The order of the equipment should be on/off or constant volume fan, direct expansion cooling coil, gas furnace. The specification for each of the components are listed in Table 1, Table 2, Table 3. Operation schedule is detailed in Table 4.

### Space Volumes and Areas:

Name	Volume	Area
level_1_space_1	784 CF	87 SF

**Table 1.** Fan Properties

Property	Unit	Value
Motor in Air Stream	-	1
Air Stream Fraction	-	0.9

Delta P	Pa	75
Control	-	Cycling
Efficiency	-	0.7

**Table 2.** Cooling Coil Properties

Property	Unit	Value
Efficiency (COP)	-	3.0
Capacity	kBtu/h	85

**Table 3.** Heating Coil Properties

Property	Unit	Value
Efficiency	-	0.8
Energy Type	-	NaturalGas
Capacity	kBtu/h	102

**Table 4.** HVAC operation schedule (On/off schedule)

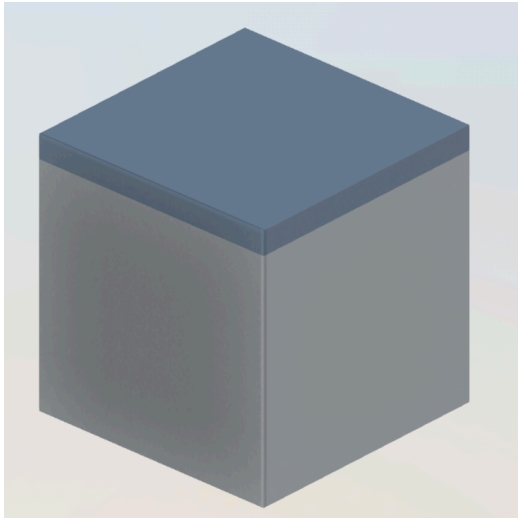
Schedule Type	Time period	Value
Year	All weeks	Week schedule type
Week	All days	Day schedule type
Day	1-5 AM	0
	6 AM – 10 PM	1
	11-12PM	0

Guideline for creating the BIM model:

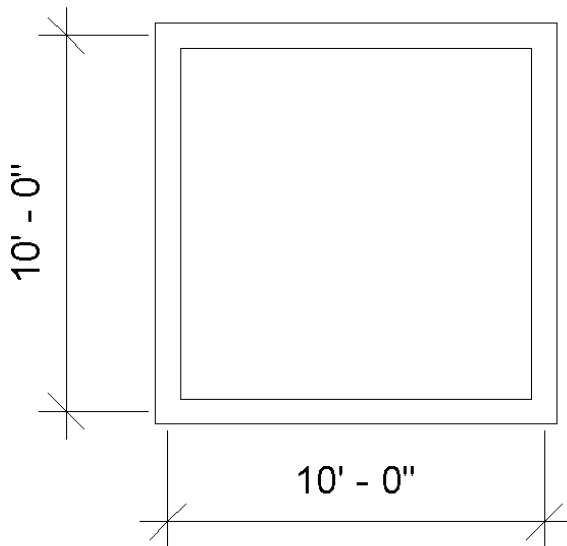
**Figure 1** shows a 3-dimensional isometric view of this test model.

**Figure 2** shows a typical floor plan to indicate dimensions and directions of the space, with wall thickness. The dashed line represents the profile of the shading of the roof.

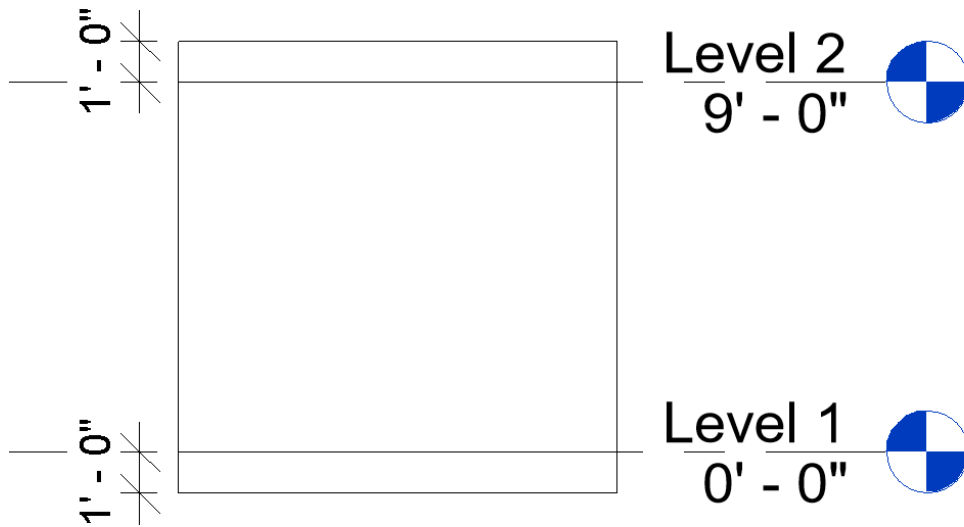
**Figure 3** shows a typical section view to indicate positions and dimensions of the slab floor, the height of the roof and the ceiling element.



**Figure 1.** Isometric View



**Figure 2.** Floor and Ceiling Plan View



**Figure 3.** Section View

Expected Outcomes:

In gbXML model, all the relevant fields can be identified and the values match Table 1, 2, 3 and 4.

Common Outcomes and Test Results:

One typical issue could be mis-ordered components. The order of the air loop equipment inside the air loop element is important in the gbXML because it defines the placement of equipment in the real installation inside an air handling unit.