

Review Revit module Heating and Cooling Loads

I think I found a few errors in the module Heating and Cooling Loads. I would like to get to know if these things are real errors, I am mistaken or that they are on purpose. Second I would like Autodesk to add a few extra options to the module Heating and Cooling Loads and I am curious if that's possible on the short term.

The calculations I did are made with Revit 2016 but the same problems also occur with Revit 2018. The example project can be downloaded at the webpage.

Basically, I have the following questions:

1. Why is the Heat Loss to the Ground Floor not always calculated?
2. Why aren't the Categories from Heating Components and Building Construction matching?
3. Why can't the Infiltration be given up freely?
4. Why isn't the Heat Loss to Air added to the calculation?
5. Why isn't it possible to add the Warm-up fee to the calculation?

In this order in this document the questions will be more specified and possible solutions or suggestions will be given.

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1) Heat loss to ground floor not calculated

Problem:

The heat loss of the ground floor is not calculated when Building Construction is not overwritten.

Proof:

For the calculations with Revit see Attachment 1: *Heating Loads_example-part-1.rvt* Attachment 2: *Constructions.xml* is used for the definition of the constructions.

The results are compared with a calculation by hand in Attachment 3: *Heating Loads_example_part-2.xlsx*

It turns out that the heat loss to the Ground Floor is not calculated.

Why(?):

Possible reasons:

- Lowest floor is seen as a basement?
- ASHRAE?

Possible Solution:

Add an extra Space below the lowest Space and add a zone to this Space with the correct ground temperature and check 'heated' out in the properties of the Space

Conclusion:

This is not a nice solution because as a Mechanical Engineer you do not want to add building elements to your installation model to make it work. On the other hand, you could make appointments with the architect about this.

Question (to Autodesk):

Is it possible to add a feature to the module to assign a temperature to the ground plane?

2) Categories do not match

Problem:

The categories from 'Heating Components' do not match the categories at 'Building Construction':

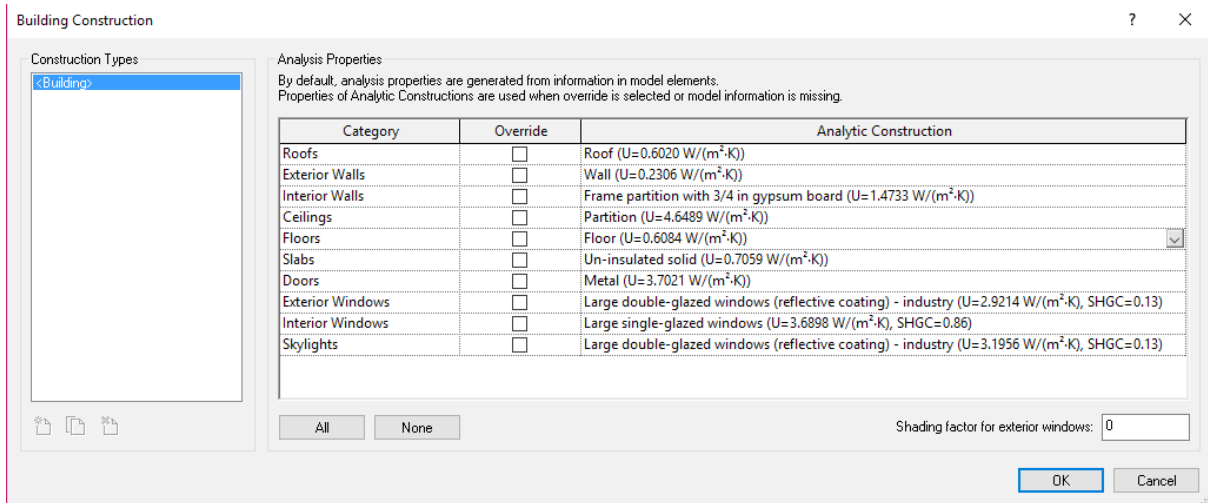


Figure 1: Building Categories at Building Construction

Heating Components	Total (W)	Percentage
Wall	686	22.03%
Window	0	0.00%
Door	0	0.00%
Roof	0	0.00%
Skylight	0	0.00%
Partition	2,429	77.97%
Infiltration	0	0.00%
Ventilation	0	0.00%
Lighting	0	0.00%
Power	0	0.00%
People	0	0.00%
Total	3,115	100%

Figure 2: Building Categories at Heating Components

Question:

Why aren't the categories matching or are they like this?

3) Infiltration

Problem:

There are only four options for Building Infiltration Class (Mastering Autodesk Revit MEP, 2014):

- Loose - 0.076 cfm/sqft;
- Medium - 0.038 cfm/sqft;
- Tight - 0.019 cfm/sqft;
- None

In the Netherlands we have some regulations for the Infiltration Class, so I needed to convert the classes.

Known is:

- 1 cfm/sqft = 0.00508 m/s;
- 1 cfm = 1.6990111 m³/h;
- 1 sqft = 0.09290304 m².

This results in the following table:

Table 1: converted infiltration classes

	<i>cfm/sqfwall</i>	<i>m³/(s.m²wall)</i>
Loose	0,076	0,000386
Medium	0,038	0,000193
Tight	0,019	0,00009652

The ISSO 53, a publication from a well known institute in the Netherlands (ISSO), has made the following table to determine the Building Infiltration class at a determined pressure (10 Pascal). On the left the $q_{v,10}$ is shown and above the building height:

$q_{v,10kar}$ [dm ³ /(s·m ² gebruiksopp.)]	infiltratie maatgevend kantoor [m ³ /(s·m ² gevelopp.)]				
	gebouwhoogte (m)				≥ 30 m
	0 - 20 m				
	(3m)	(6m)	(12m)	(20m)	
Kleiner dan 0,20	0,00026	0,00034	0,00043	0,00051	0,00062
Van 0,20 tot 0,40	0,00039	0,0005	0,00063	0,00077	0,00092
Van 0,40 tot 0,60	0,00064	0,00082	0,00103	0,00126	0,00149
Van 0,60 tot 0,80	0,00088	0,00111	0,0014	0,00172	0,00200
Van 0,80 tot 1,00	0,00109	0,00138	0,00175	0,00213	0,00251
Groter dan 1,0	0,00118	0,00151	0,00189	0,00232	0,00273

Figure 3: ISSO 53, determination of Building Infiltration class at 10 Pascal

As can be seen the range from the table 0,00273 to 0,00026 m³/(s.m²wall) is totally different from the range from Revit 0,000386 to 0,00009652 m³/(s.m²wall).

Questions (to Autodesk):

1. Is it possible to add an option to give in a custom value at a certain pressure?
2. At which pressure is the Revit Building Infiltration Class given?

4) Heat loss to air not possible to calculate

Problem:

It is not possible to calculate the heat loss to ventilation ($\Delta T = \text{room temperature} - \text{air temperature}$) with Heating and Cooling Loads:

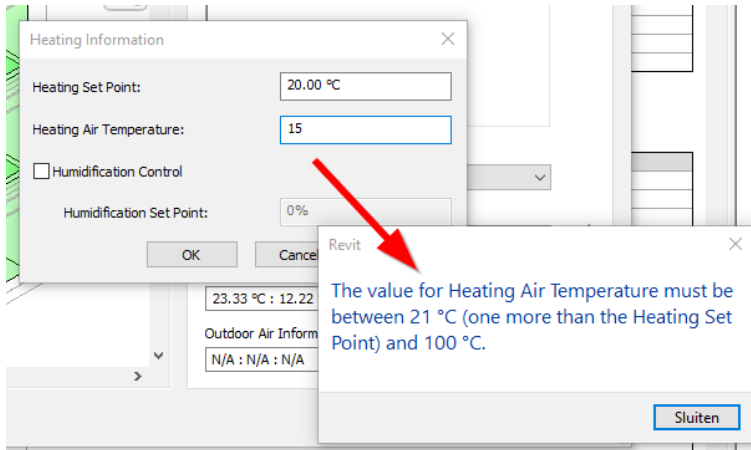


Figure 4: error when the Air Temperature is lower than Heating Set Point

When the air temperature for Cooling Load is given in this error (of course) does not occur.

Possible solution:

Calculate heat loss to ventilation in schedule and add it manually to total heat loss.

Question (to Autodesk):

Can this option (Heat Loss to Air) be added to the module Heating and Cooling Loads?

5) Warm-up fee

Problem:

It seems not possible to calculate the Warm-up fee for situations where extra heating power is needed to heat up a building in a certain time (for example from cold to comfortable after weekends).

Question (to Autodesk):

It would be great to calculate the warm-up fee in the module Heating and Cooling Loads. Is it somehow possible to add this feature (or is it already possible)?