Assigning profiles to a Breathing Buildings NVHR Unit (NVHR900 & NVHR1100)

This document provides a comprehensive step-by-step guide to assigning operating profiles for an NVHR unit to an existing IES VE model. Should you have any questions please contact **Joe Clawley or Matthew Waterson** at joe.clawley@breathingbuildings.com / matthew.waterson@breathingbuildings.com, or call the office on **01223 450 060**.

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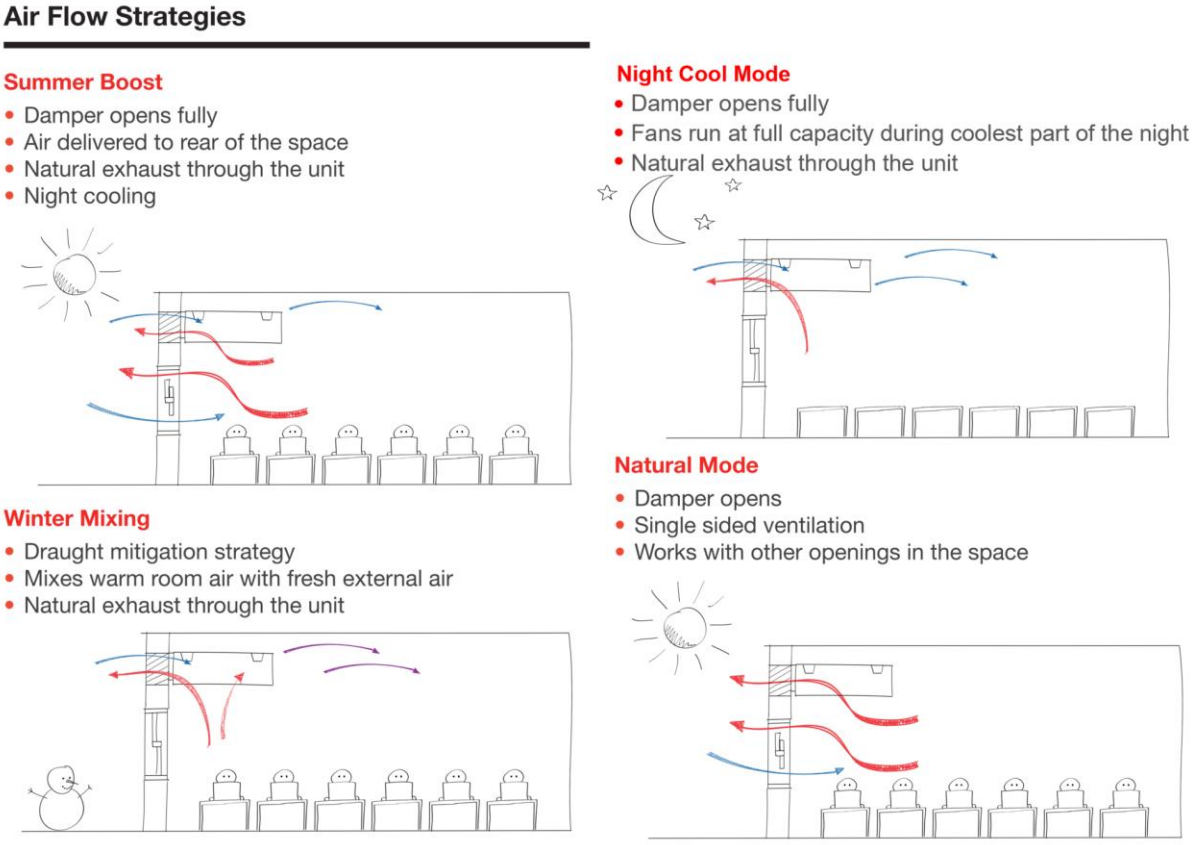
Modelling natural/hybrid ventilation in IES VE

One of the big advantages of the Breathing Buildings systems over other natural/hybrid ventilation systems is that in the winter, we do not bring in air via opening windows, as this requires a potentially large amount of preheating energy. This would of course make for a less energy efficient and environmentally friendly solution to keeping temperatures and CO2 levels comfortable.

Instead we operate in 'mixing mode' where we bring air at high-level and mix it with the warm room air to create a tempered air stream which is comfortable for occupants. However, as IES VE does not take into account the thermal comfort in the context of cold draughts, this major advantage does not need to be modelled.

IES VE models a room with a 'bulk air temperature', which means the requirement to preheat the incoming air (and associated energy consumption) of other conventional natural ventilation systems is not included in the IES model. It is however worth noting that in a real-world situation **our** systems would have you covered to comply with the new BB101 regulations.



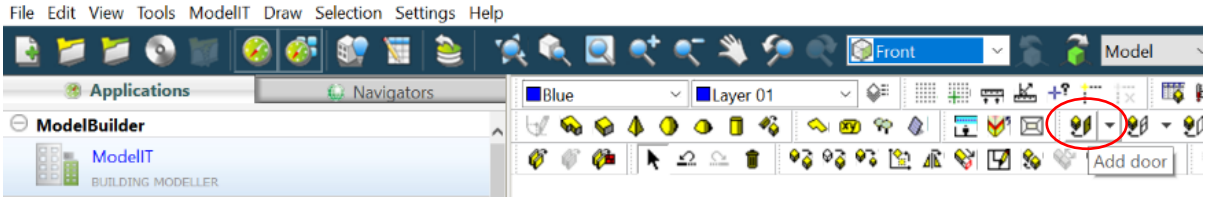
The NVHR system is not a heat exchanger, and therefore cannot be modelled as a mechanical system with heat recovery. The system saves energy by bringing air into the space and mixing it with the room air to reduce cold draughts.

This document explains in detail how to set up an NVHR unit in IES VE. The NVHR1100 has been used as an example in this document, but the same principles apply to the NVHR900.

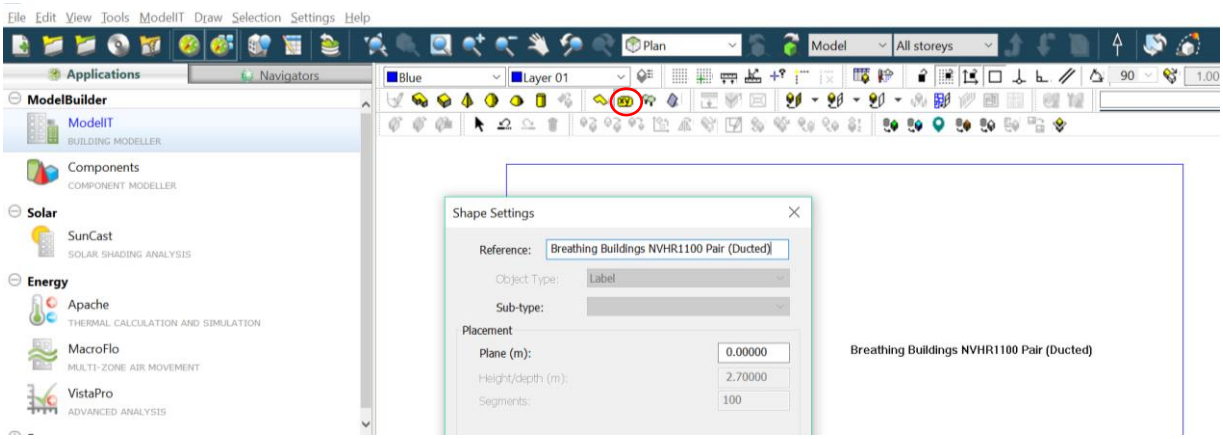
Adding the NVHR to your Model

Start by creating the model of your room or building within the VE. Once you have your building set up, with the necessary construction properties applied, you are ready to add an NVHR system.

Because the unit only requires access to the façade via a louvre, no external geometry file need be imported, unlike adding the E-stack units which require the roof terminal geometry to be added to the model. The louvre can be added by creating a door of the correct dimensions (NVHR900: 900mm(W) x 300mm(H) | NVHR1100: 1078mm(W)x329mm(H)) in ModelIT. This door will later be assigned an opening profile.



If there are other louvres added to rooms without NVHR units and you wish to make it clear which rooms have NVHR profiles applied and which do not, labels could be added in ModelIT.

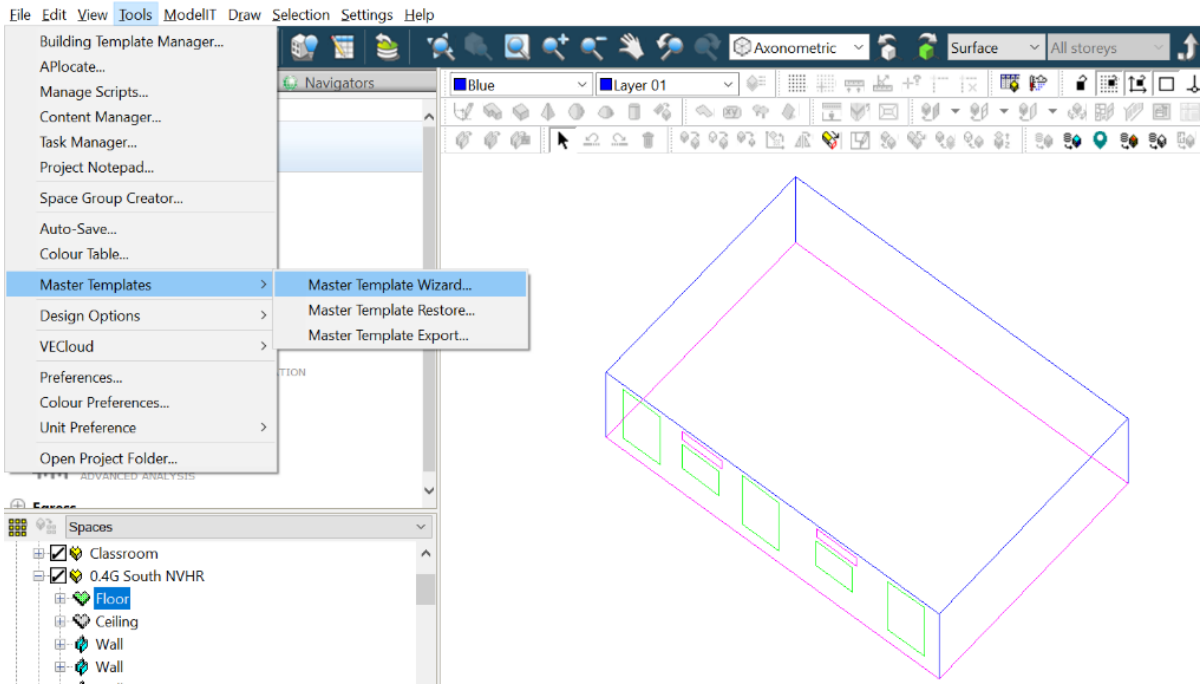


Modelling functionality of the NVHR in IES VE

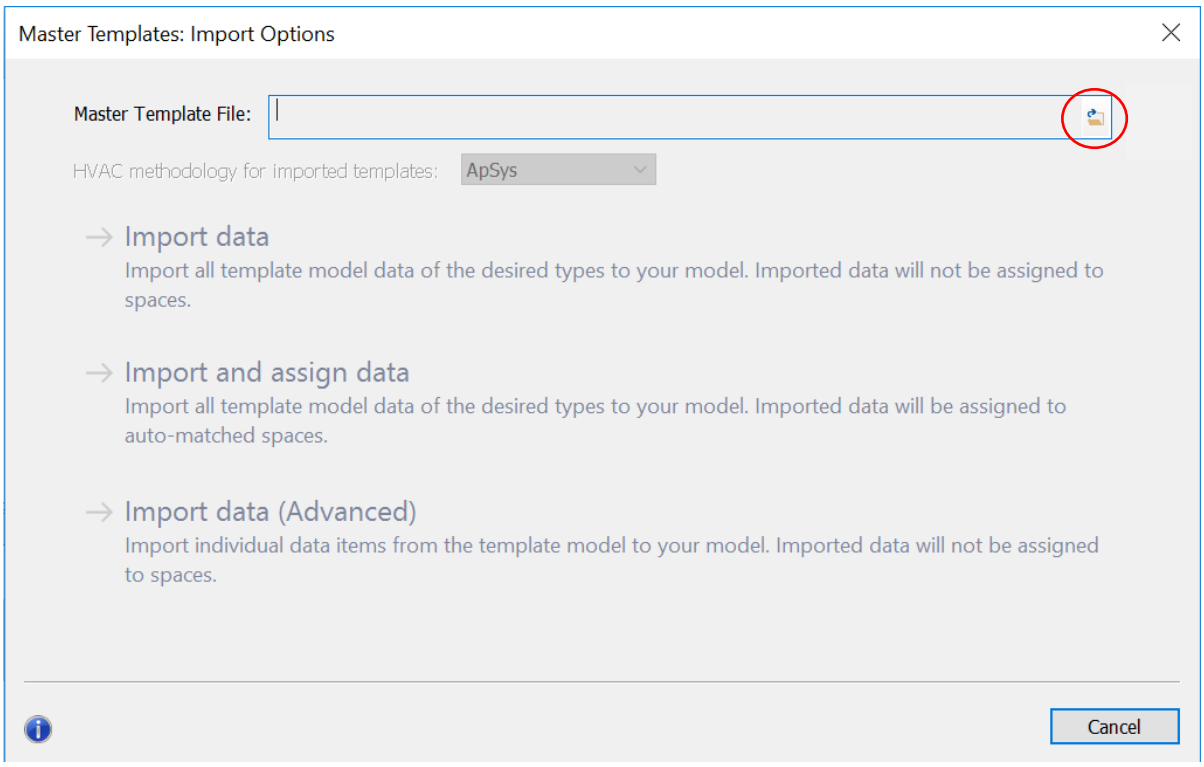
The functional control of an NVHR system takes into account: modulating damper control, window opening, fan operation, temperature sensing, CO2 sensing, and timed functions. The complexity of this system can be difficult to model in any dynamic simulation software. We have therefore created all the profiles necessary and included them in the cabinet file folder.

Importing NVHR profiles into your project

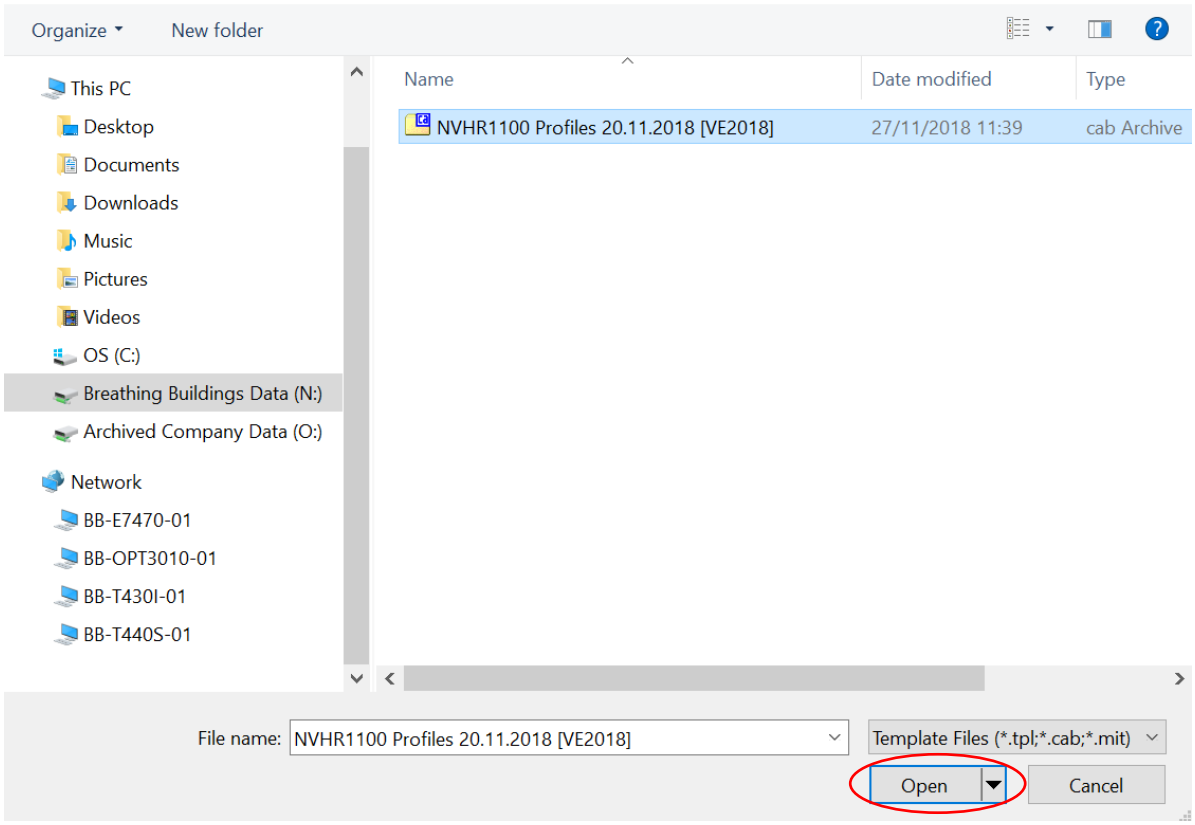
Once the rooms are set up and the NVHR louvres (represented by doors in IES) are added, the profiles, air exchanges and MacroFlo openings should be imported into the model using the '*Master Template Wizard'* found in the *'Tools'* menu.



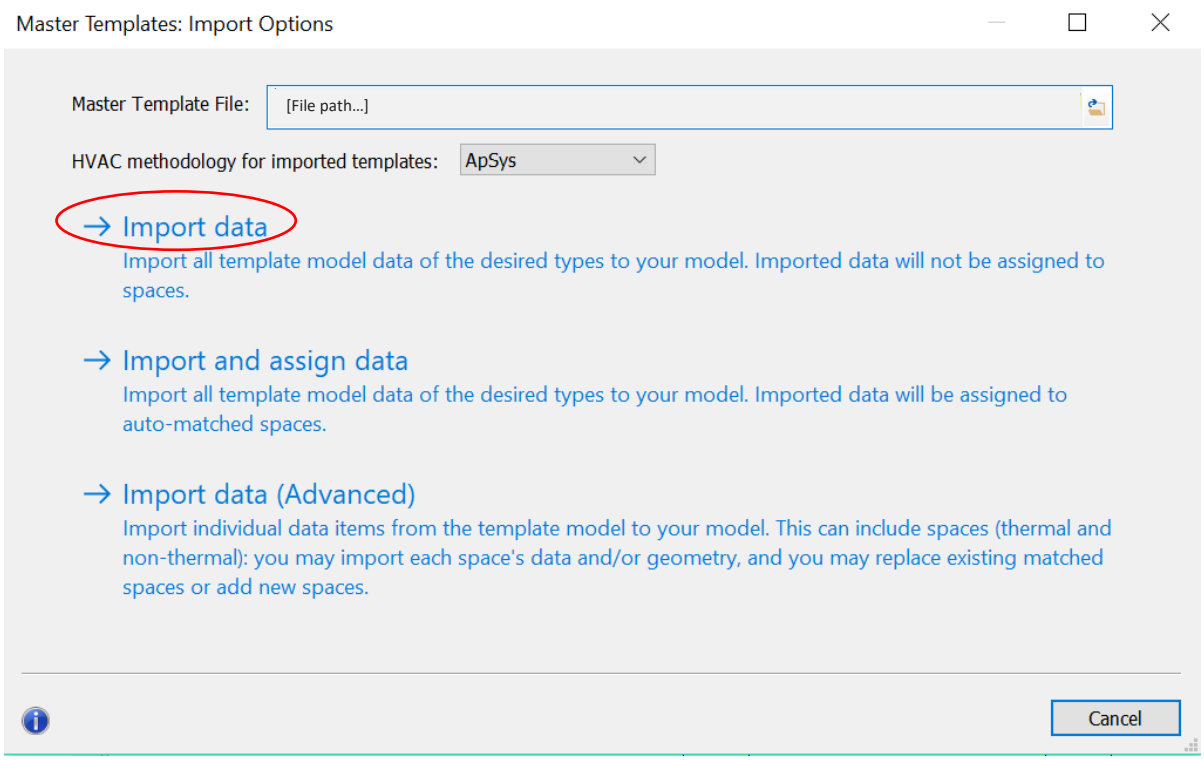
Click the 'find folder' button:



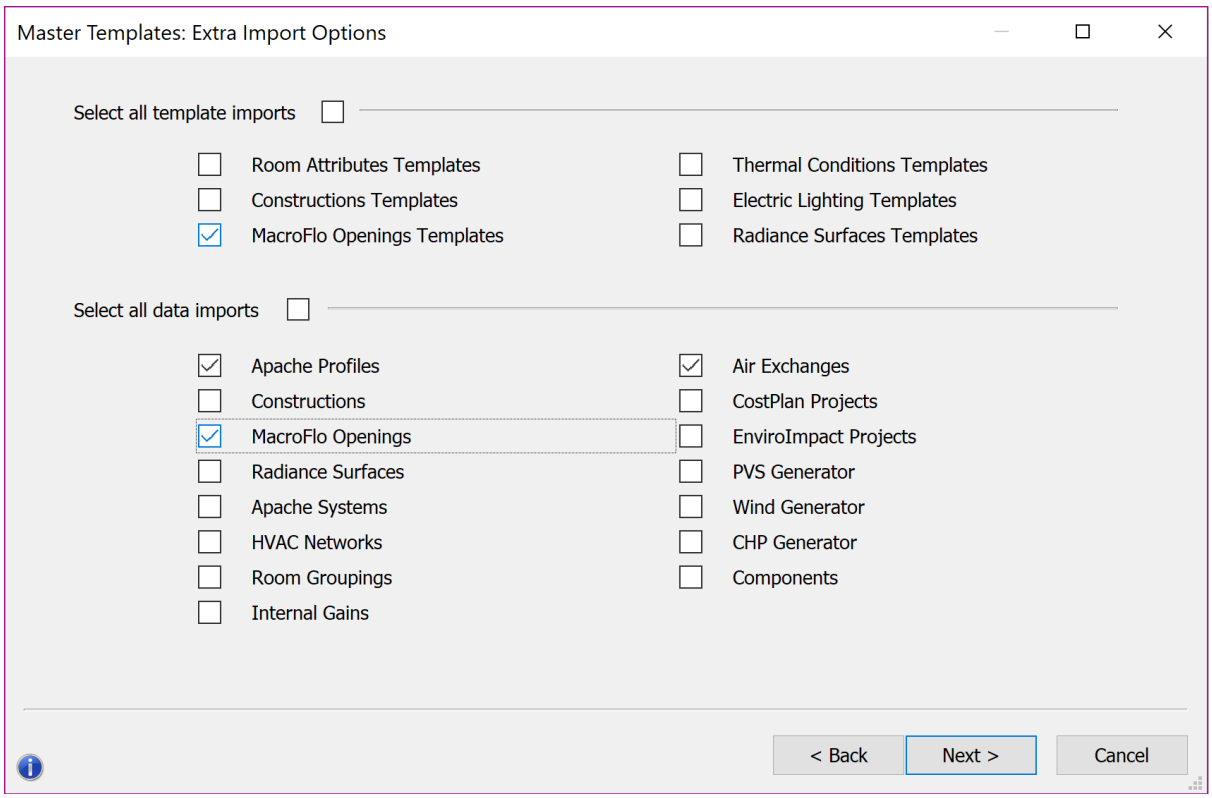
Find the relevant unit folder, in this case the ***NVHR1100*** folder in the location it was saved after being downloaded from our website, and select the .cab file entitled '***NVHR1100 Profiles'***:



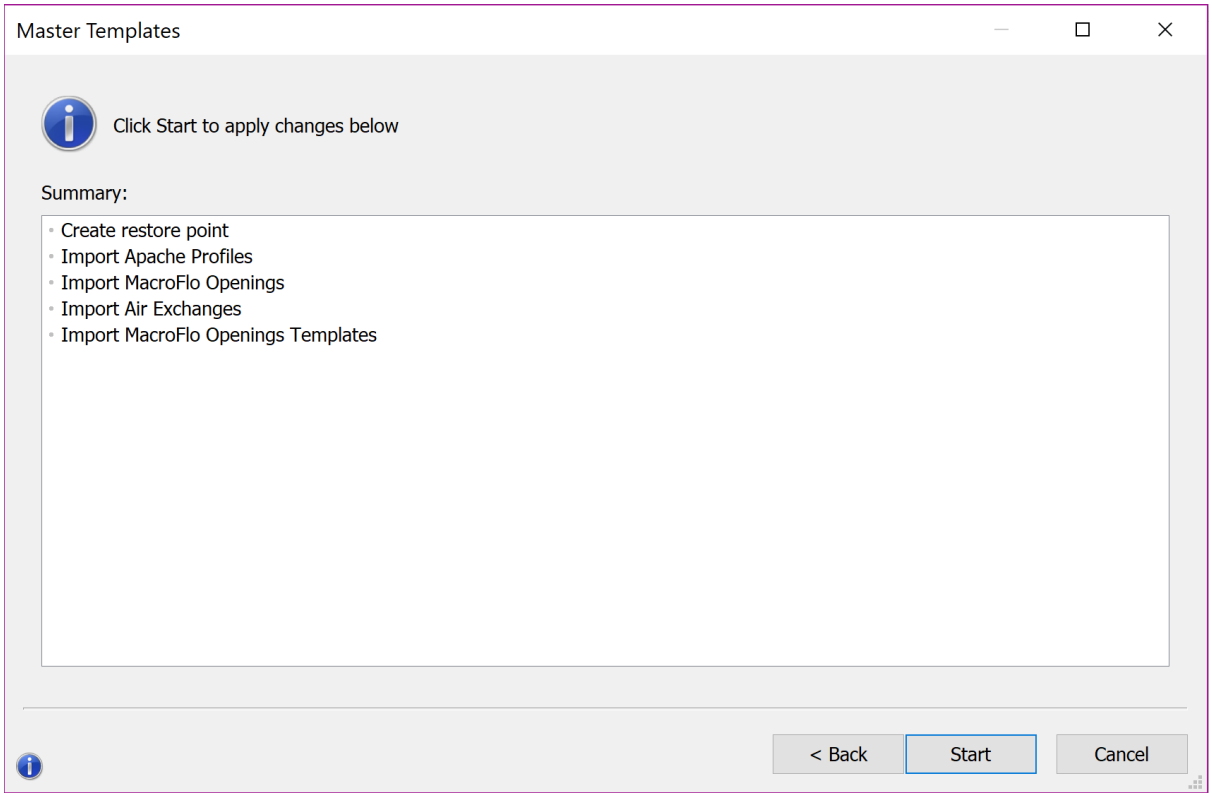
Click the 'Import data' button:



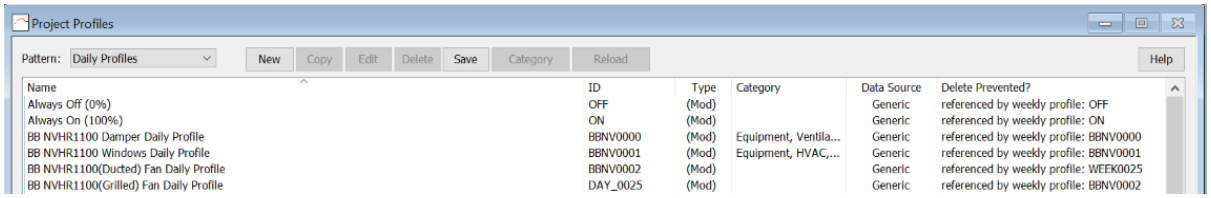
Select the 'MacroFlo Openings Templates', 'Apache Profiles', 'Air Exchanges' and 'MacroFlo Openings' options as shown below:



Click ‘next’, and then ‘Start’:



Your IES VE file will now contain the Breathing Buildings NVHR profiles required to control the unit. The profiles have been prefixed, in this case with ‘BB NVHR1100’ for the NVHR1100 unit, to make them easy to identify and group within the Profiles Database:



The profiles included are daily and weekly profiles culminating in:

Damper Profile – Damper control of the NVHR units in your project

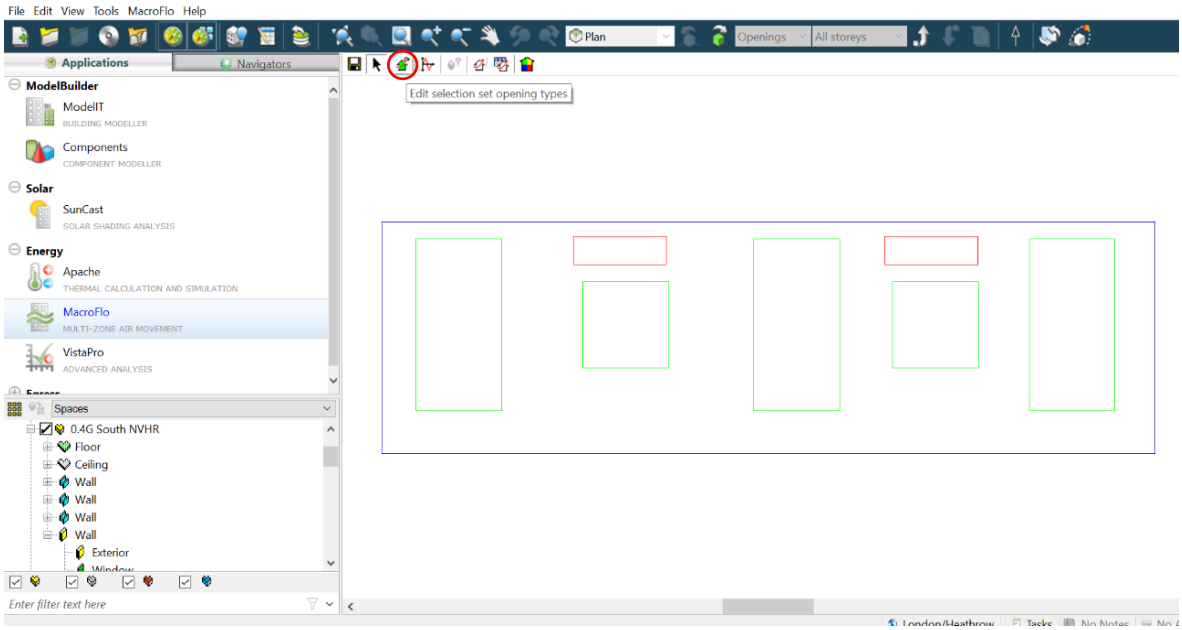
Fan Profile (this accounts for all fan operations) – Auxiliary ventilation control

Windows Profile – Window opening profiles (assumed to be useable 9:00-16:00 but these hours can be easily edited to suit the occupied hours of your building)

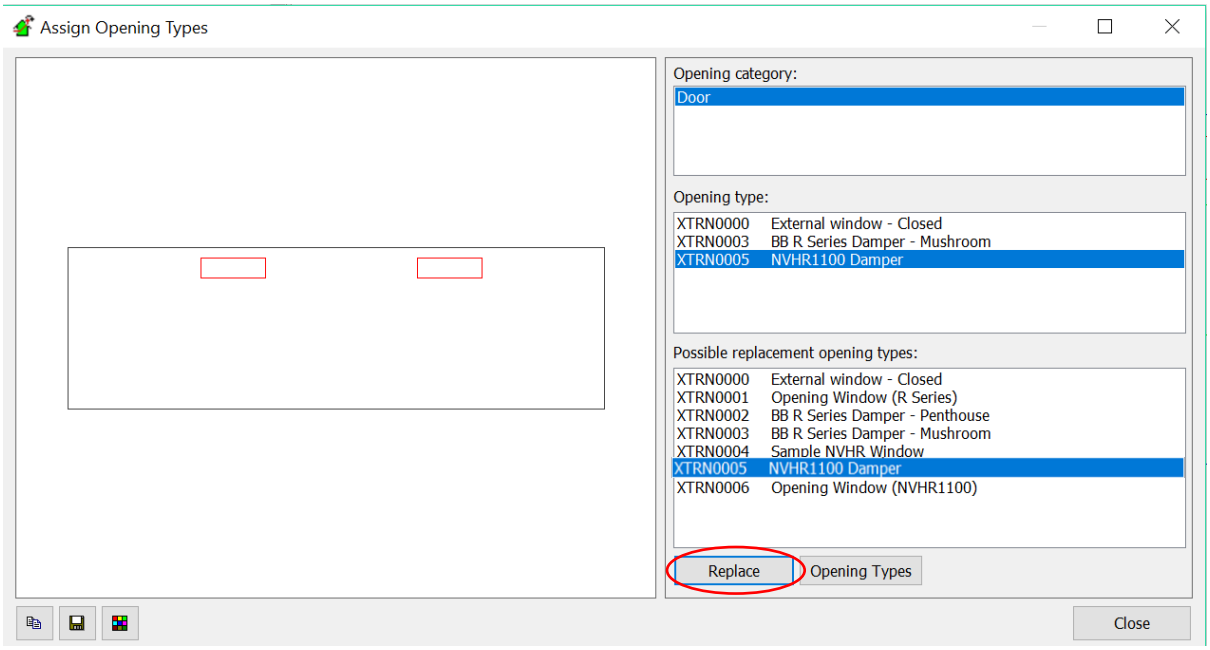
School Term weekly Profile – Typical classroom occupancy 9:00-16:00 with lunch break 12:00-13:00

BB NVHR Damper Profile setup

Through the MacroFlo tab select the louvres/doors of the NVHR units and click the '*Edit selection set opening types'* button as shown below:



Select the *'NVHR1100 Damper'* opening type and click replace.

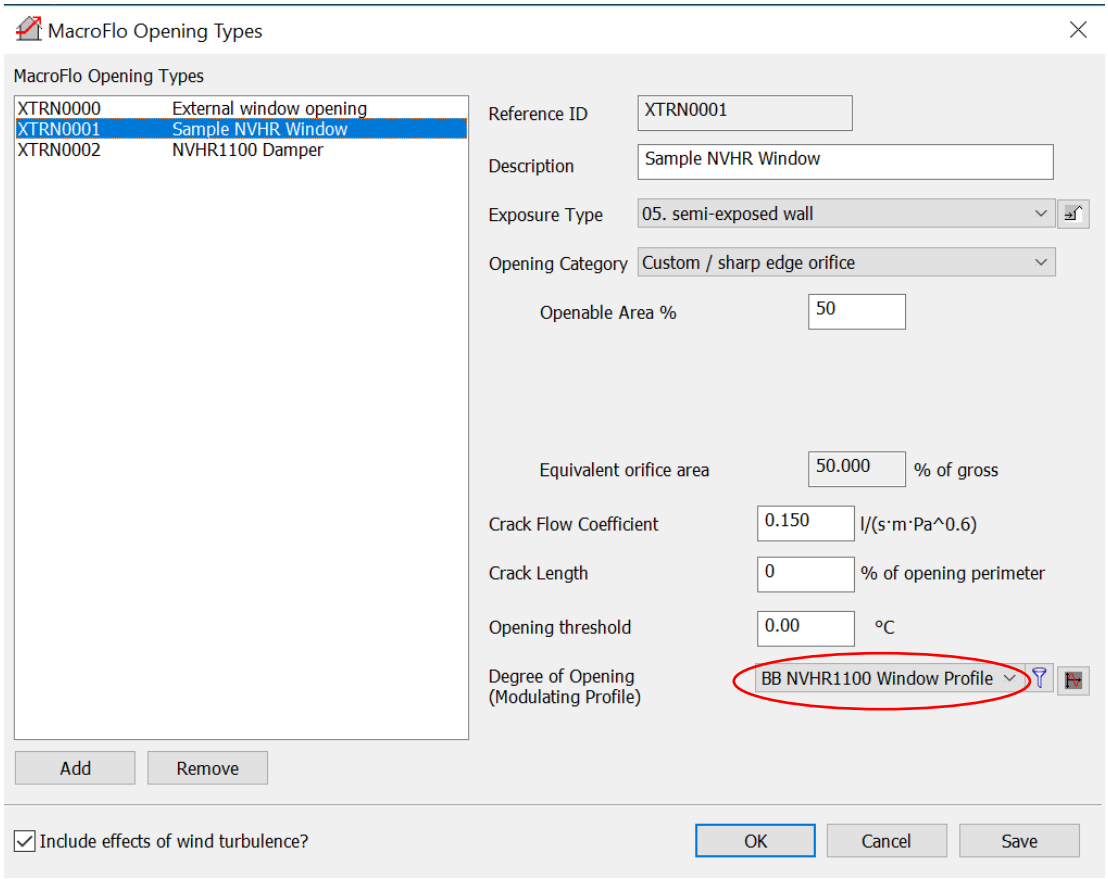


You now have the Macroflo opening profiles set up correctly. This will enable the NVHR damper to open and close automatically, depending on internal and external conditions, replicating the real-life operation of our NVHR systems.

BB NVHR Windows Profile setup

The NVHR systems are designed to perform optimally when working in conjunction with openable windows. In a real building, the opening and closing of these windows would be done by the room occupants. When simulating the building, however, we need to set the window opening profiles in line with the internal and external conditions.

The profiles you need are all included in the .cab file you downloaded and imported into your IES model. You simply need to assign them to the windows in your building by selecting the *'BB NVHR1100 Window Profile'* in the *'Degree of Opening'* area of *'MacroFlo Opening Types'* as detailed below. Please ensure the hours for when windows can be used are altered accordingly in the highlighted window profile below (currently assumed to be 9am to 4pm).

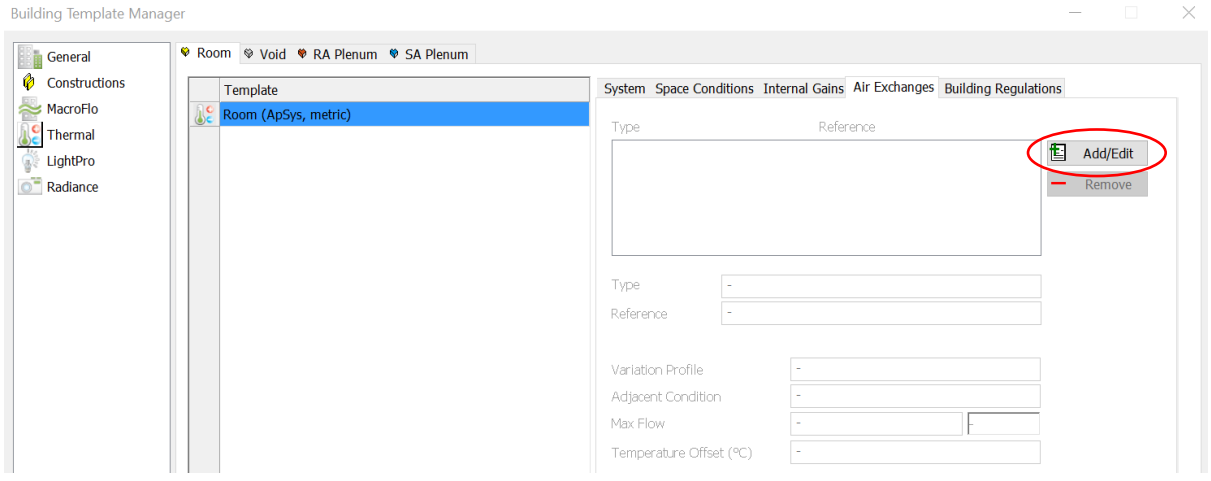


Click '*Save*' and '*OK*'

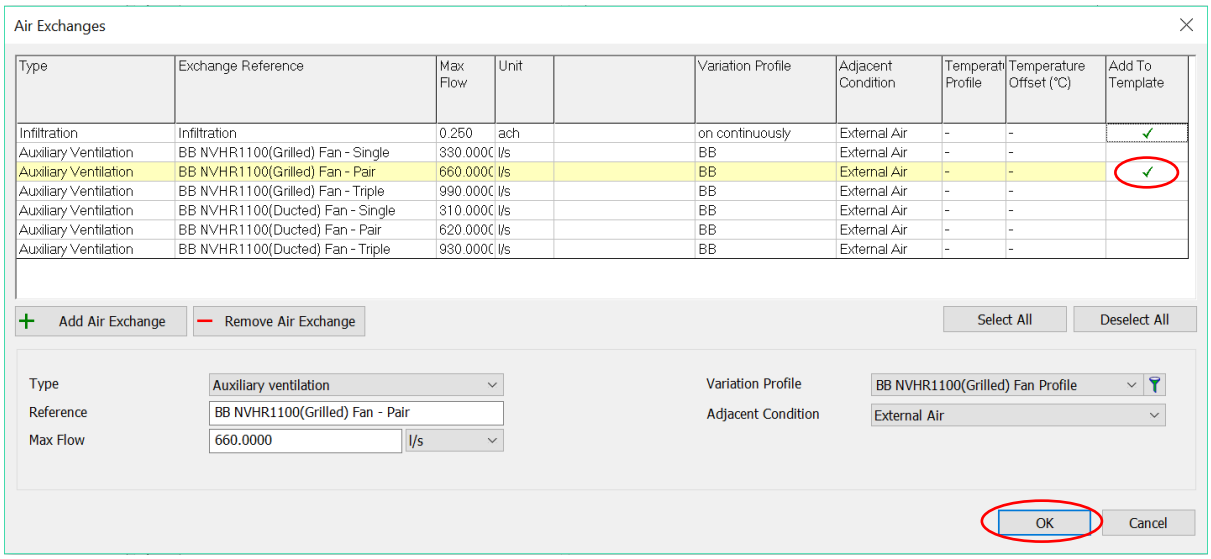
BB NVHR Auxiliary Ventilation Profile setup

Breathing Buildings' NVHR systems are hybrid natural ventilation systems, which include low-powered fans, to enable mixing ventilation in colder weather (Breathing Buildings' energy saving method for mitigating cold draughts in winter whilst ensuring occupancy comfort) and boost ventilation in summer.

The fans in the unit are modelled in IES as auxiliary ventilation within the room, added through the '*building templates manager*' '*Air Exchanges*' tab as shown below:

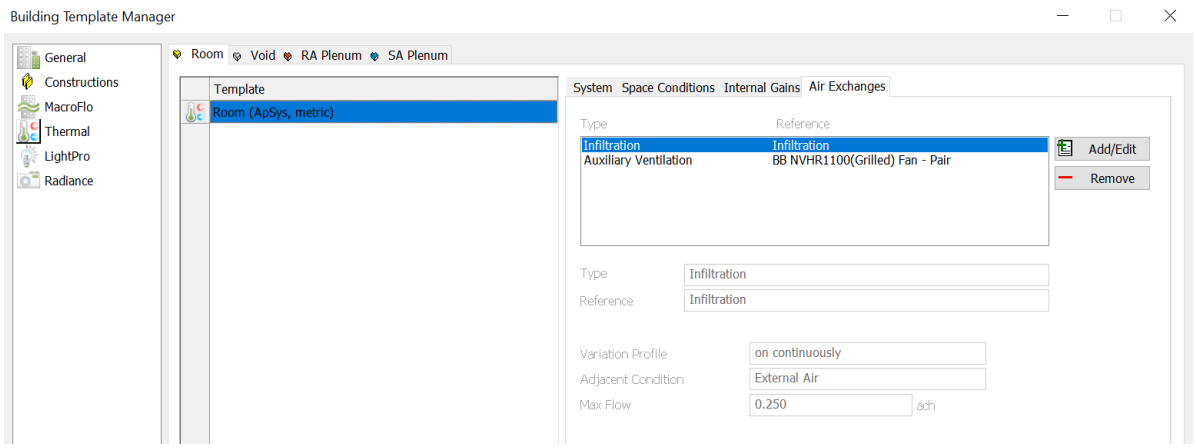


Click the '*Add/Edit*' button and add the appropriate 'NVHR Fan' profile to the template. Fan Profiles for NVHR singles, pairs and triples will have been imported into your model using the master template wizard. If more than three units are required for a given space, a new air exchange can be created with the maximum flowrate for the single unit being multiplied by the number of units required, or alternatively multiple air exchanges can be added (e.g. 4 units in a space could be modelled as two pairs). *Note: these profiles are applied on a room level rather than per NVHR unit/door applied to the room.*



By allowing for the infiltration you can avoid CO2 being trapped in the room during unoccupied hours, this is a more realistic model of the building and we recommend 0.25 ach as is the default for IES VE.

All air exchanges have now been set up (the example below is for a typical classroom):



Click '*save*' and '*OK*'.

Heating and Cooling defaults within the building

IES VE will automatically set your room up to have continuous heating set at 19 degrees, and cooling set at 23 degrees continuously throughout the year. This is not realistic, so change these in the '*Space Conditions*' tab of the building template manager.

Note that the units will operate in night cool mode in the height of summer, if the heating profile is still on during these months and is set to a temperature higher than 16°C then this will interfere with the effectiveness of the night cool.