Adding NVHR+ Units to a model

(NVHR900+)

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**.

Table of Contents

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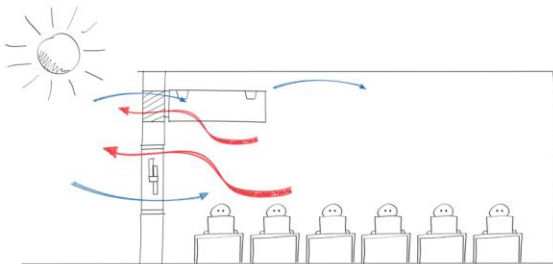
Instead we operate in 'mixing mode' where we bring air at high-level and mix it with the warm room air to create a tempered air stream which is comfortable for occupants. However, as IES VE does not take into account the thermal comfort in the context of cold draughts, this major advantage does not need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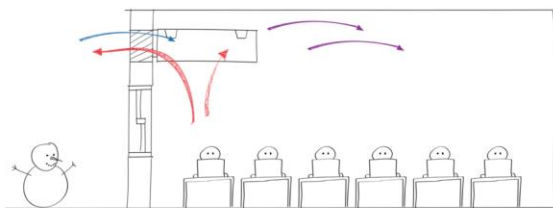
Air Flow Strategies

Summer Boost
- Damper opens fully
- Air delivered to rear of the space
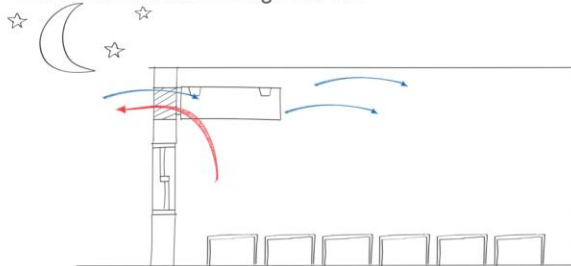- Natural exhaust through the unit
- Night cooling

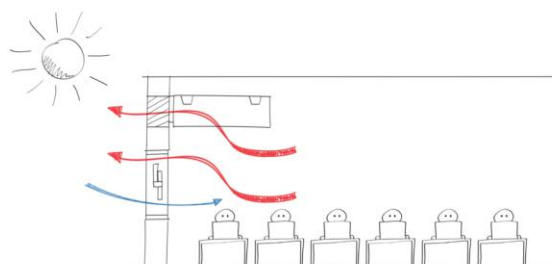### Night Cool Mode
- Damper opens fully
- Fans run at full capacity during coolest part of the night
- Natural exhaust through the unit

Winter Mixing
- Draught mitigation strategy
- Mixes warm room air with fresh external air
- Natural exhaust through the unit

Natural Mode
- Damper opens
- Single sided ventilation
- Works with other openings in the space

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.

In addition to the features outlined above for the standard NVHR units, the NVHR+ units also include an integrated LTHW heating coil to provide demand-controlled space heating.

The two main operating modes of the unit are described in the diagram to the left and the systems have been successfully used as the sole source of heating for a number of schools over the past few years.

Frost Protection and Morning Pre-Heating
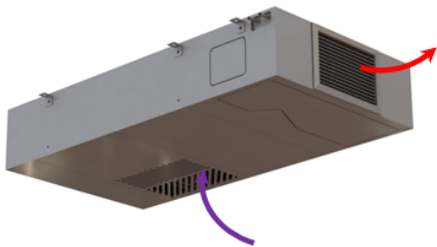
During periods of low temperatures where the room temperature is less than 12.0°C the Breathing Buildings system will run the recirculation fan at 100% and open the heating valve in order to raise the room temperature.

Prior to the room being occupied where the room temperature is less than 18.0°C the Breathing Buildings system will run the recirculation fan at 100% and open the heating valve in order to raise the room temperature above 18.0°C.

Occupied Heating
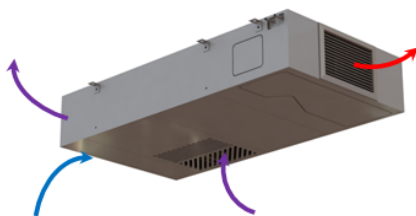
When the room is occupied and the room temperature is less than the target temperature the Breathing Buildings system will run the fresh and recirculation fan at 100% with the damper and heating valve open when venting on CO_2. When not venting on CO_2 the damper will remain closed, the heating valve will open recirculation fan will run at 70% in order to raise the room temperature above the room target temperature.

This document explains how to model the heating supplied by the NVHR+ unit in IES VE.

Adding the NVHR to your Model

Adding the ventilation characteristics of the NVHR+ units are exactly the same as adding the standard NVHR units, so please follow the guidance laid out in the "Creating and applying profiles for the NVHR Units" document. *Note: At the time of writing, the heating coil is only available as an addition to the NVHR900 unit, not the NVHR1100 unit.*

Modelling the NVHR+ Heating Coil in Apache

1. Go into the Building Template Manager
2. In the 'System' tab, change the "Heating plant radiant fraction" to 0.00 and the "Simulation heating unit capacity" to 6.28kW for a pair of units in a single space*

3. In the 'Space Conditions' tab, update the 'Operation profile' to be on continuously during the heating season. Then change the 'Setpoint (°C)' dropdown to 'Two-value' and set the Main setpoint to the desired internal temperature and the Setback value to 12°C. The operation profile should then be set to the occupied hours for the building, with an additional hour allowed in the morning for preheating of the space (when unoccupied, the setpoint will be 12°C and when occupied the 'Main setpoint' will be used). Setting the heating up this way models the frost-protection strategy of the unit, which keeps the room temperature from dropping below 12°C even when unoccupied, as well as modelling the standard temperature set point for the room when occupied. The operation profile outlines when heating power is available, whereas the setpoint profile details what the desired internal temperature is at a given time.

* This figure is the maximum heat output in a normal winter mixing mode for an 80/60°C flow/return LTHW system. The unit has an increased capacity in morning preheat mode of 8.48kW for a pair of units, however as IES will only allow a single unit heating capacity to be entered, the 6.28kW value has been chosen to be conservative. If using different flow/return temperatures, please contact Breathing Buildings for accurate heat outputs.