



IES Modelling Procedure for the COOL-PHASE® low energy cooling and ventilation system Performance Component

This document sets out Monodraught’s procedure for modelling COOL-PHASE systems within IES, utilising the Performance Component.

Powered by



Revision: N/A

Date: 20th September 2013



CONTENTS

CONTENTS	2
1. Introduction.....	3
2. Monodraught COOL-PHASE® Performance Components	4
2.1. COOL-PHASE Component options.....	4
3. Monodraught COOL-PHASE® Components modelling Procedure.....	6
3.1. Component modelling procedure.....	6
3.2. Importing COOL-PHASE.....	7
3.3. Accessing COOL-PHASE Performance Components in CompLib	9
3.4. Assign rooms to appropriate COOL-PHASE Group.....	10
3.5. COOL-PHASE ApacheHVAC system file	11
4. Simulation procedure	12
4.1. Room Load and System Load Calculations.....	12
4.2. Apache Simulation	13
5. Additional COOL-PHASE Phase Component Information	14
5.1. One COOL-PHASE component to multiple rooms.....	14
5.2. Multiple COOL-PHASE systems within one room.....	15
6. Further COOL-PHASE Phase information.....	16



1. Introduction

This document has been compiled to provide a user guide for modelling Monodraught COOL-PHASE® low energy cooling and ventilation systems using the new Performance Components feature, which is available as part of the IES-VE Pro 2013 Feature pack 1 release. The user guide will feature a step-by-step breakdown of the processes involved with simulating in the VE using Monodraught COOL-PHASE Performance Components, whereby the placement of the system component, within a given zone, can allow the user to simulate the resultant conditions with no additional steps required.

The guide has subsequently been broken down into two key sections – firstly, what COOL-PHASE performance components are available to use within the new feature, and secondly, guidance on how to integrate Monodraught's COOL-PHASE® low energy cooling and ventilation systems into a building using the new COOL-PHASE Navigators menu.



2. Monodraught COOL-PHASE® Performance Components

2.1. COOL-PHASE Component options

Performance Components are an evolution of the original geometric components constructed within the ComLib Component Modeller module. A typical component has no physical properties associated with it other than its geometric form, which subsequently limits its use within the different modules available to the user in the VE-Pro suite. With the use of Performance Components, however, users will now have access to a library of pre-defined component replicas of Monodraught's COOL-PHASE systems.

There are three main options available for Monodraught's COOL-PHASE performance components available to the user in this feature, to suit the type of installation that would be required.

Facia: For installations where no ceiling void is present or an existing void has less than 400mm clearance. The system will be located within the room and be on display to the occupants. For this installation a floor to ceiling height of 2.6m or greater is recommended. The systems are supplied with built-in grille diffusers to provide an even distribution of air within the room and fitted with covering fascia panels to give the system a smooth, contemporary aesthetic.



Suspended Ceiling: For installations above a ceiling, where the system will not be visible. This system application requires a minimum void clearance of 400mm for installation, although it can be installed flush to the slab or suspended from larger voids. The system is supplied with 3-way diffusers, sized to suit a 600mm x 600mm suspended ceiling grid to provide air circulation within the room.





Exposed Void: For installations to either double height spaces with an exposed structure or open plenum applications. Although the installation will be similar to the fascia system, it is supplied with two 90° downturns and 3-way diffusers, to provide a circulation of air down within the room. The system will generally be supplied in a matte black finish to allow it to sit unnoticed at high level.



For all three of Monodraught's COOL-PHASE systems, there are currently three different system sizes available, to suit the required level of *Thermal Energy Storage* required.

The three system sizes available are: 6kW, 8kW and 10kW.

For further information about Monodraught's COOL-PHASE system, please visit our website: www.cool-phase.net , or download our brochure at: http://www.cool-phase.net/cool_phase_brochure.pdf



3. Monodraught COOL-PHASE® Components modelling Procedure

The following details a step-by-step guide to modelling with the COOL-PHASE Performance Components in IES, from navigating the new Performance Component catalogue, through to the import process for placement of the components within a building model and assigning the appropriate ApacheHVAC profiles.

3.1. Component modelling procedure

The Monodraught COOL-PHASE Performance Components are accessible through two methods. The first is through the IES Component Library, similar to the method of importing Monodraught WINDCATCHER® systems, which appears on the main toolbar of VE-Pro suite (see Figure 1).

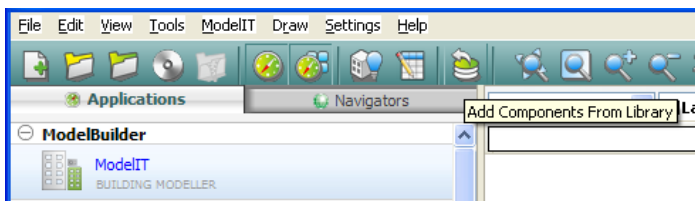


Figure 1 – ‘Add Components From Library’ icon

The second is through the ‘Navigators’ feature of VE-Pro suite (see Figure 2). This is the preferred method, as it provides a step-by-step, streamlined method for applying COOL-PHASE systems to your building, as well as detailing any necessary notes for future reference (see Figure 3).

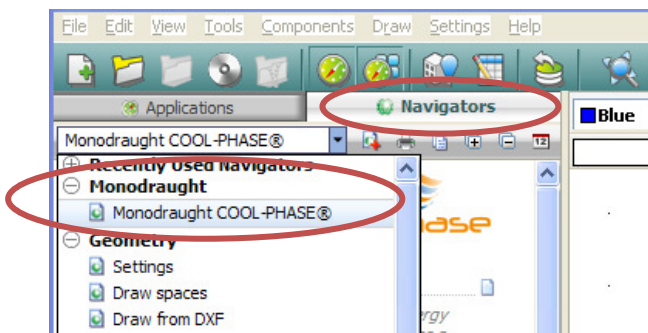


Figure 2 – ‘Navigators’ toolbar

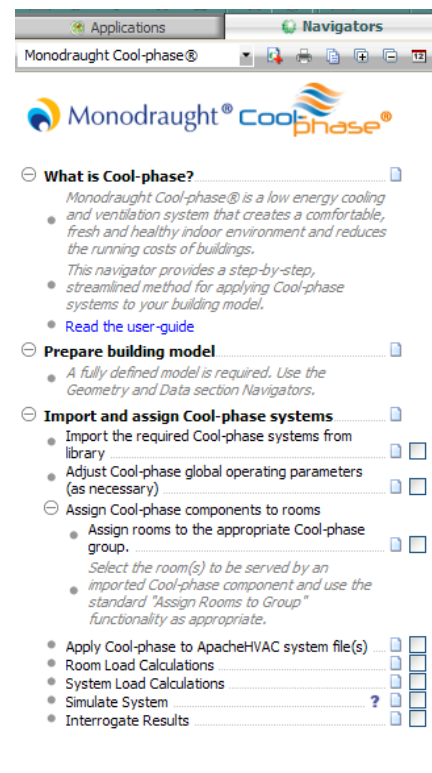


Figure 3 –COOL-PHASE Navigator menu

This step-by-step process also provides a series of ‘quick links’ for the appropriate step, to open the relevant module of IES associated with modelling Monodraught’s COOL-PHASE system. These ‘quick links’ are easily identifiable, as the text will change colour to blue when the cursor is positioned over it.



3.2. Importing COOL-PHASE

Once the required building has been constructed within IES, with all relevant geometry, constructions, thermal templates and solar shading assigned, the COOL-PHASE systems should then be imported into the model.

Within the COOL-PHASE Navigators menu, under ‘Import and assign COOL-PHASE systems’, click on ‘Import the required COOL-PHASE systems from library’ (see Figure 4).

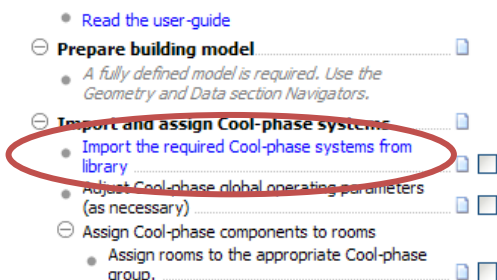


Figure 4 – COOL-PHASE Component Library link

When clicked, a new window, ‘Add Components From Library’, will automatically open, where the Monodraught Performance Components are displayed in a catalogue format. If the Monodraught COOL-PHASE® catalogue does not appear immediately, it can be accessed from the top-left dropdown box of the window (see Figure 5).

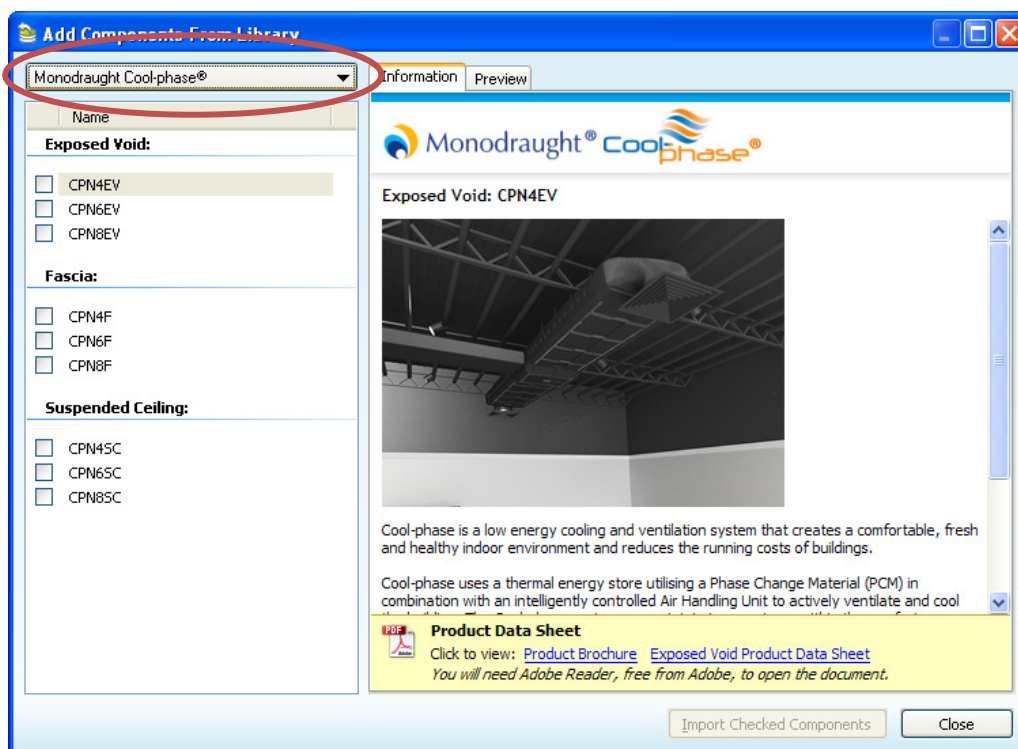


Figure 5 – COOL-PHASE Component Library

The ‘Add Components From Library’ catalogue lists each system type and the available sizes of each system, as detailed within Section 2.1 of this modelling procedure. The user can simply click on a system type and size, then the information tab on the right hand side of the window will display an image and description of that product (see Figure 5). Each system also has an external html link to the respective product data sheet on the Monodraught website, which will provide the user with any further technical information regarding that particular system which may be required.



If the user wishes to preview the system, the 'Preview' tab will display a basic geometric line model of the Performance Component available to view in Axonometric, Plan, Front, Back, Left and Right views (see Figure 6).

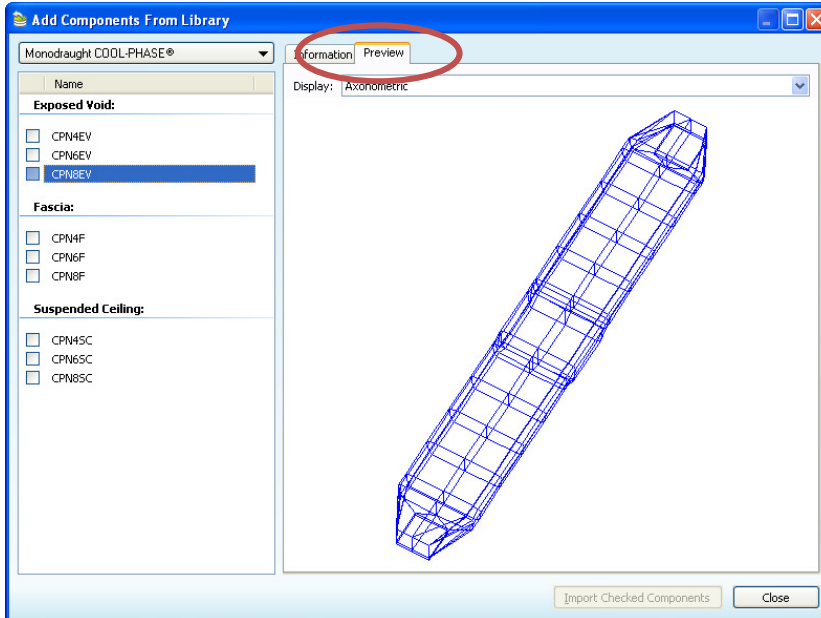


Figure 6 – COOL-PHASE Component Library preview tab

To import a COOL-PHASE Performance Component, simply select the system type and by using the tick boxes next to each system size, then click 'Import Checked Components' (see Figure 7) at the bottom right hand side of the window. The catalogue will also allow the user to import multiple components at once by selecting the tick boxes for multiple systems.

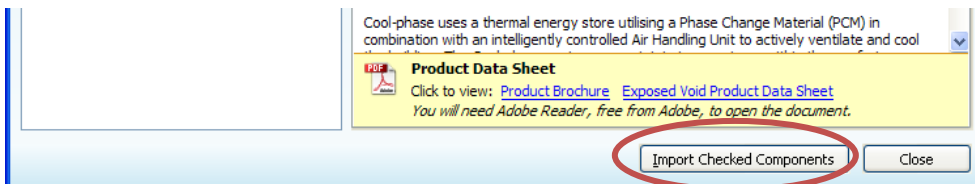


Figure 7 – COOL-PHASE Component Library Import checked components icon

The Performance Components that are imported are automatically located within the CompLib module, should the user wish to further view a component prior to integrating it with the geometry of a building model.

As each step of the 'COOL-PHASE Navigators menu' process is completed, the user is able tick-off this step within right hand box, as well as clicking on the 'paper icon' to type any notes about this step for future reference (see Figure 8).

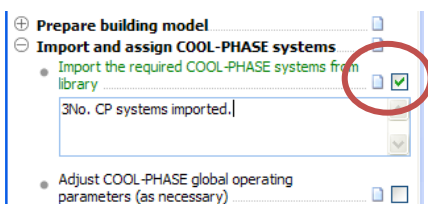


Figure 8 – COOL-PHASE Navigators check-list



3.3. Accessing COOL-PHASE Performance Components in CompLib

When the user opens the CompLib module, a new component category called ‘*Monodraught Ltd*’ has been created under the ‘*Standard Components*’ tree heading in the components list on the left of the screen (see Figure 9).

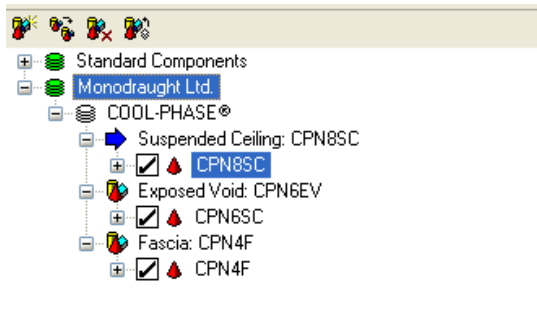


Figure 9 – Accessing Performance Components in CompLib

Expanding the ‘*Monodraught Ltd*’ tree displays each type of Monodraught system and the sizes of each that have been imported to the users IES file from the Components Library. Under each individual system heading, the drop downs are categorised into a zone that makes up each component, which is further categorised into the corresponding geometric surfaces and openings that make up that zone, much the same as the tree structure found in ModelIT.

By right clicking on the component title, such as ‘*Suspended Ceiling: CPN8SC*’, and selecting ‘*Properties*’, a new window for the ‘*Component Properties*’ will appear (see Figure 10).

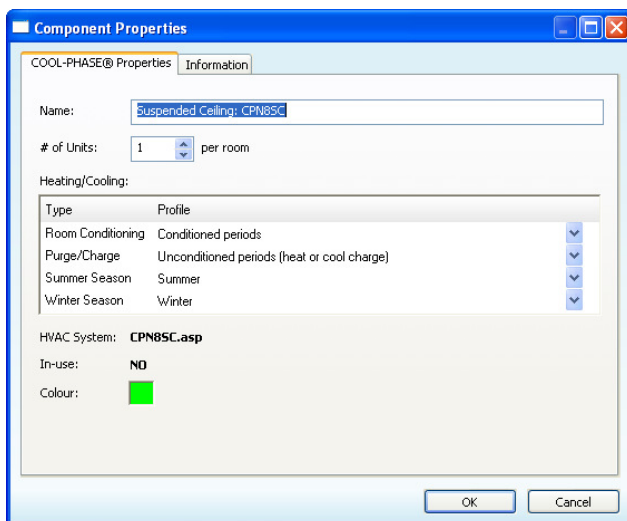


Figure 10 –Components Properties window

Within this window, the user may view the current properties associated with this particular component, including number of units, Heating/Cooling profiles, if the component is in use within the user’s model, as well technical information about the system.



3.4. Assign rooms to appropriate COOL-PHASE Group

Within the COOL-PHASE Navigators menu, under ‘Assign COOL-PHASE components to rooms’; select ‘Assign rooms to the appropriate COOL-PHASE group’. On the left hand side, below the ‘COOL-PHASE Navigators menu’, a list of Monodraught COOL-PHASE components will appear. If these do not appear immediately, it can be accessed from the dropdown list (see Figure 11).

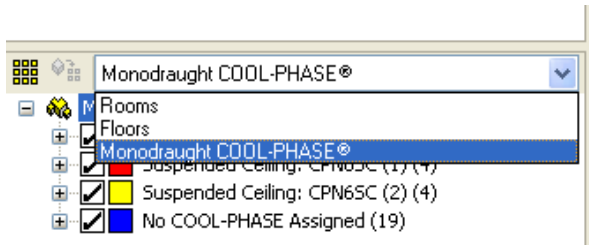


Figure 11 – List of Imported COOL-PHASE system components

Within model space, select the desired room which is to be served via the COOL-PHASE system. Adjacent to the drop down list, below the COOL-PHASE Navigators menu, click on the ‘assign selected rooms to room groups’ button (Figure 12).

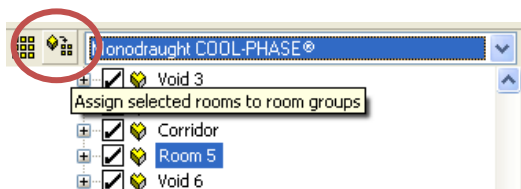


Figure 12 – Assign selected rooms button

A new window will open up, ‘Assign Room Group’ (see Figure 13). Ensure that for the top drop down list, Monodraught COOL-PHASE® is selected. For the lower drop down list, select the required COOL-PHASE system component which is to be assigned to the room, then press OK. Back in model space, the assigned room will now have a COOL-PHASE logo appear within it (see Figure 14). The circled number to the right of the logo indicates that one system has been assigned to the room.

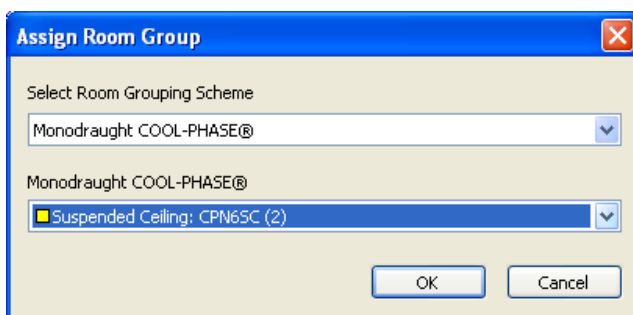


Figure 13 – Assign Room Group window

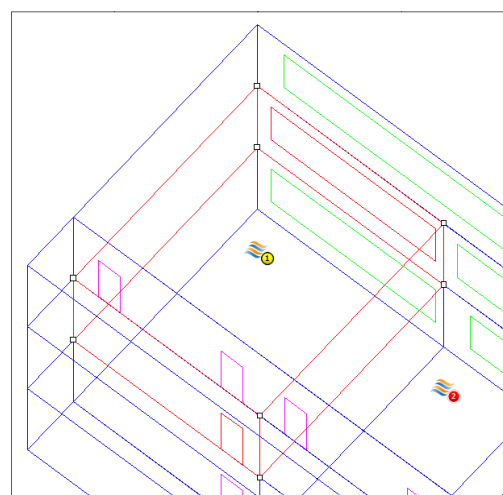


Figure 14 – Assigned COOL-PHASE room



3.5. COOL-PHASE ApacheHVAC system file

When the desired COOL-PHASE components have been assigned to the required rooms of the building, click on 'Apply COOL-PHASE to ApacheHVAC system file(s)' within the 'COOL-PHASE Navigators menu'. A new window will open up to apply a new COOL-PHASE HVAC system (see Figure 15). Under 'New HVAC system', type in the name of the new HVAC system and press OK.

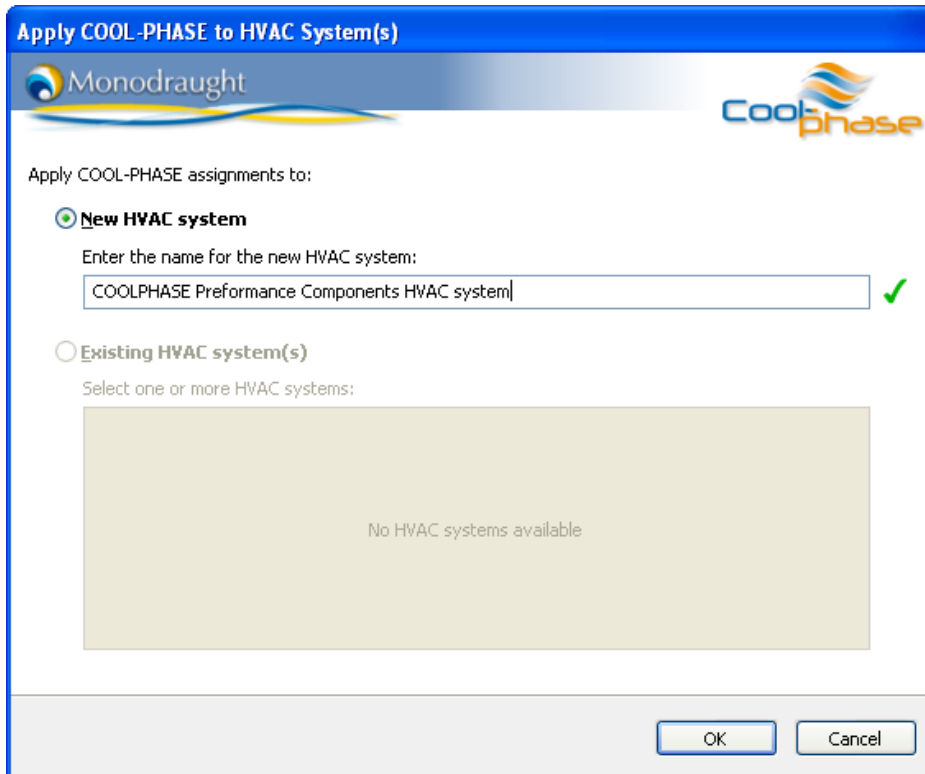


Figure 15 – Assign Room Group window

By clicking over to the 'Applications menu' of IES, opening the 'ApacheHVAC' module and opening the recently user created COOL-PHASE HVAC system, a schematic diagram of the COOL-PHASE HVAC system can be viewed (see Figure 16).

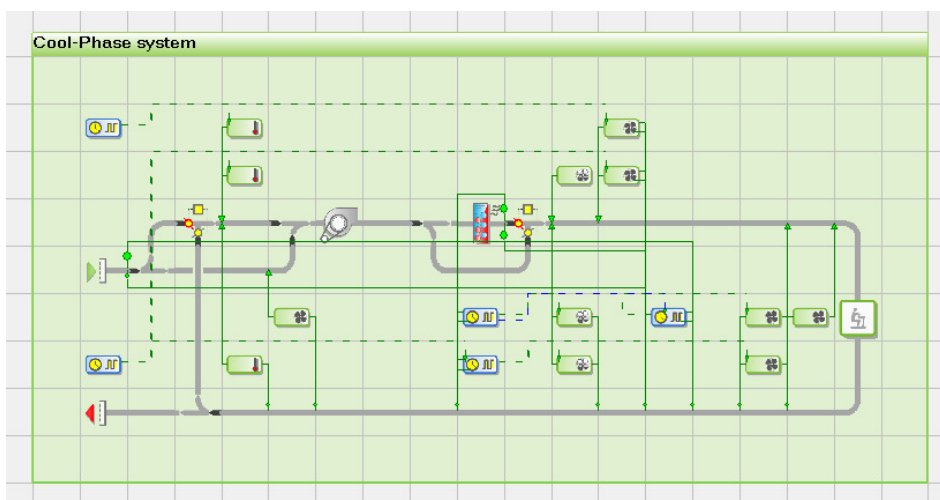


Figure 16 – COOL-PHASE HVAC system schematic diagram



4. Simulation procedure

The following continues the ‘COOL-PHASE Navigators menu’ step-by-step guide to modelling with the COOL-PHASE Performance Components in IES, working through Load calculations of the rooms and systems, before running the dynamic thermal simulation calculations of the building.

4.1. Room Load and System Load Calculations

When the COOL-PHASE HVAC system has been created, back in the ‘COOL-PHASE Navigators menu’, select ‘Room Load Calculations’ (see Figure 17), which opens the ASHRAE Loads window. Within this new window, type in the desired results file name at the top, then select the required COOL-PHASE HVAC system file within the ‘Simulation (Heat Balance Method) settings’ dropdown (see Figure 18), if this has not appeared automatically. Select or de-select any remaining outputs for the calculation, then press the Calculate button.

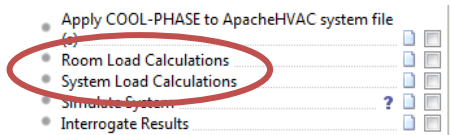


Figure 17 – ASHRAE Loads calculation window

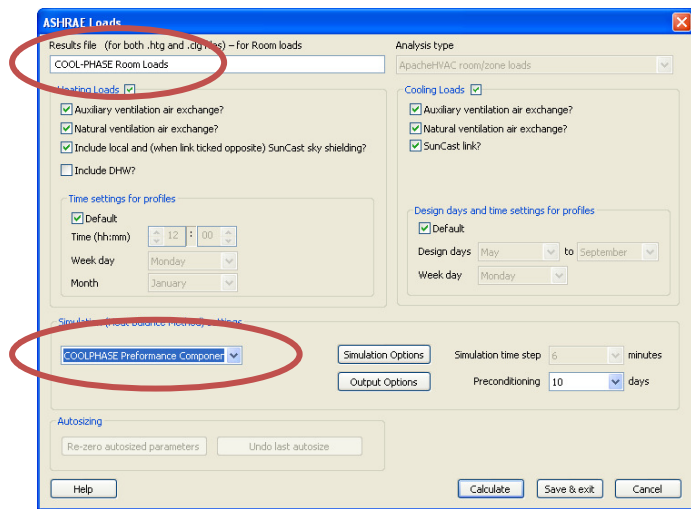


Figure 18 – ASHRAE Loads calculation window

Once completed, the same process should be undertaken for the ‘System Load Calculation’ from the COOL-PHASE Navigator menu to calculate the ASHRAE Loads for the system. As previously, type in the desired results file name at the top, then select the required HVAC system file within the ‘Simulation (Heat Balance Method) settings’ (see Figure 19).

Ensure that the option to ‘Update ApacheHVAC system sizes?’ is selected to ensure that radiator and boiler sizes are updated. Select or de-select any remaining outputs for the calculation, then press the ‘Calculate’ button. Loads for the COOL-PHASE systems will not be updated.

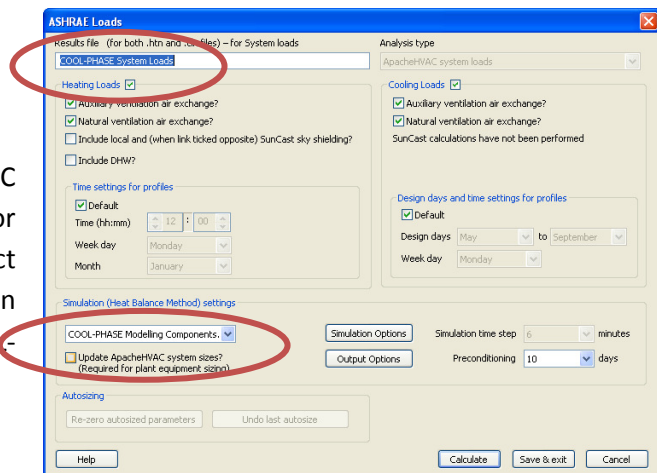


Figure 19 – ASHRAE Loads calculation window



4.2. Apache Simulation

Following the completion of the load calculations, select ‘*Simulate System*’ within the COOL-PHASE Navigator menu to open up the Apache Simulation window. As well as selecting the desired modelling periods and output results, within the ‘*ApacheHVAC Link?*’ drop down list, select the COOL-PHASE HVAC system file, then press the Simulate button.

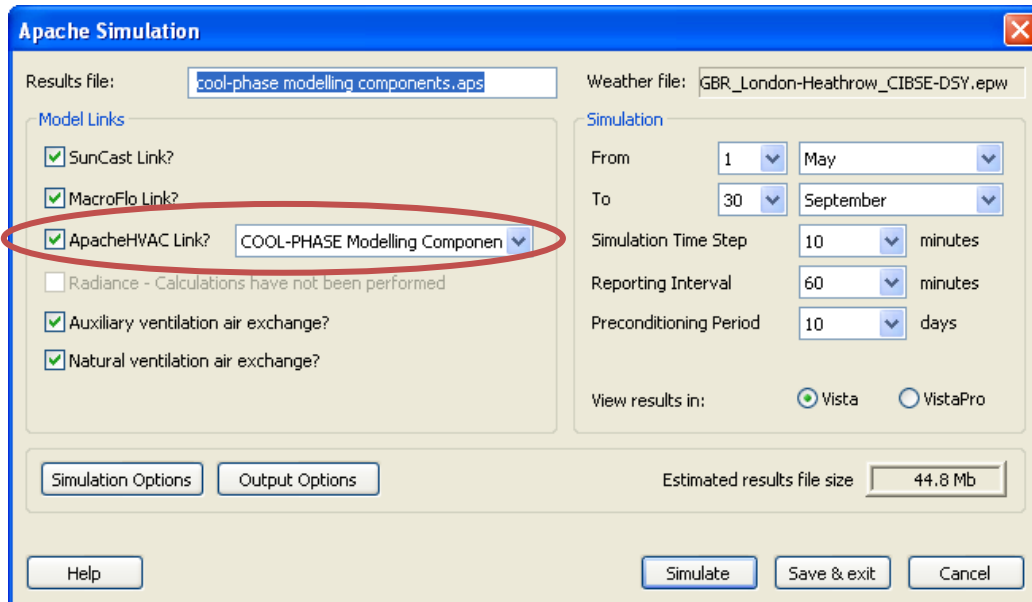


Figure 18 – Apache Simulation window



5. Additional COOL-PHASE Phase Component Information

The following provides some further information about utilising the COOL-PHASE Components to allow a user to modify their thermal model prior or following analysis of the dynamic thermal simulation results, including multiplying the quantity of systems within a particular room, or utilising a single COOL-PHASE component to multiple rooms.

5.1. One COOL-PHASE component to multiple rooms

For buildings with multiple rooms, which have similar geometry, thermal templates and usages, such as school classrooms, rather than importing the same COOL-PHASE component multiple times, it is possible to assign one imported COOL-PHASE component to more than one room.

Use the same process, as Section '3.4 Assign rooms to appropriate COOL-PHASE Group', detailed earlier in the modelling procedure. Within the list of 'No COOL-PHASE Assigned', select the desired rooms to be served by a particular COOL-PHASE Component (see Figure 19) and click on the 'assign selected rooms to room groups' button.

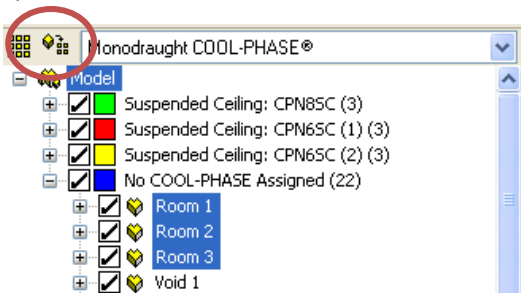


Figure 19 – Un-assigned room selection

Within the new window, select the required COOL-PHASE system component, which is to be assigned to the rooms, then press OK. Now, within the list of Monodraught COOL-PHASE components, each COOL-PHASE component will be assigned a list of assigned rooms (see Figure 20).

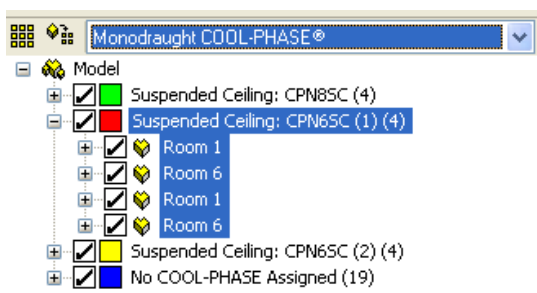


Figure 20 – Rooms assigned to each COOL-PHASE component



5.2. Multiple COOL-PHASE systems within one room

If, after analysing the room results, it has been determined that a single COOL-PHASE system doesn't meet the desired overheating or fresh air requirements to a particular room, a simple method can be utilised to increase the quantity of systems. In the 'COOL-PHASE Navigators menu', select 'Assign rooms to the appropriate COOL-PHASE group' to show the assigned COOL-PHASE components. Right click on the desired COOL-PHASE component and select 'Properties' (see Figure 21).

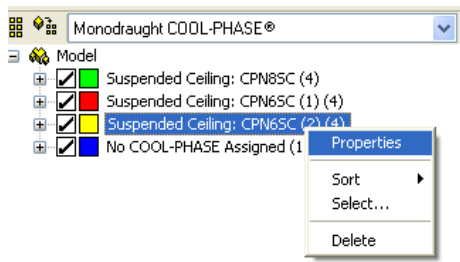


Figure 21 – Component Properties window

A new window for the 'Component Properties' will appear. To adjust the quantity of required systems, use the up & down arrows, or type in the desired quantity of systems, within the '# of units per room' field (see Figure 22), then press OK. Back in model space, next to the COOL-PHASE logo within the assigned room, the circled number will have changed to the quantity of systems entered in the Component Properties Window (see Figure 23).

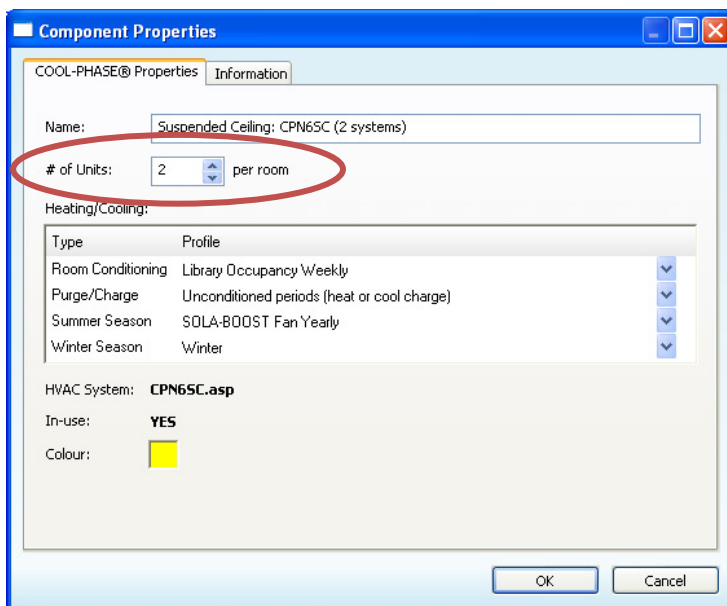


Figure 22 – Component Properties window

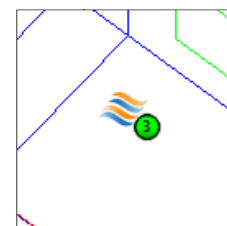


Figure 23 – Quantity of assigned COOL-PHASE systems

It should be noted, that if multiple rooms have been assigned to one COOL-PHASE Component, however analysis of the results indicated that one of the rooms requires a different quantity of COOL-PHASE systems, a separate COOL-PHASE component will need to be imported. By adjusting the quantity of desired systems using the 'Component Properties' window (see Figure 22), the quantity of systems will be change to each room assigned that particular component.



6. Further COOL-PHASE Phase information

For further information about Monodraught's COOL-PHASE system, please visit our website:

www.cool-phase.net

or download our brochure at:

http://www.cool-phase.net/cool_phase_brochure.pdf