



## **CIBSE Loads User Guide**

**IES Virtual Environment 6.5**

Apache

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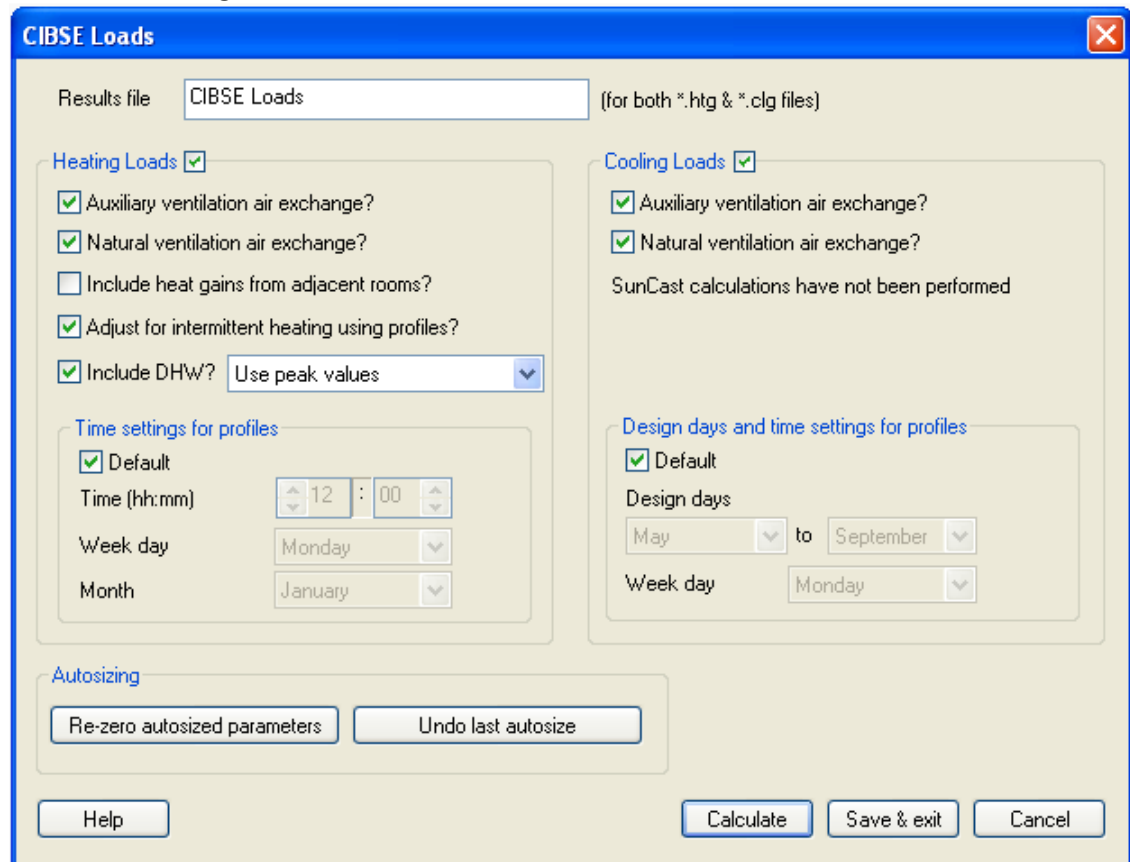
# 1 Introduction

CIBSE Loads (also known as ApacheCalc or CIBSE Heat Loss and Heat Gain) performs heating and cooling load calculations according to the procedures laid down in CIBSE Guide A (1995, 1999, 2001, 2006).

Results from CIBSE Loads are displayed by Vista.

For an account of calculation methods used in CIBSE Loads see 'CIBSE Heat Loss & Heat Gain Calculation Methods'.

CIBSE Loads dialog:



## 1.1 Results file (for both .htg and .clg files)

Here you can specify the name given to the two files where the results will be stored. The Heating Loads and Cooling Loads results are stored in files with extension .htg and .clg, respectively.

## 2 Heating Loads

Heating Loads implements CIBSE procedures for the calculation of room heating requirements and the sizing of heating plant.

Steady-state room heat losses are calculated in the absence of casual and solar heat gains. The calculation optionally includes conduction heat gains from adjacent rooms and the effects of mechanical and natural ventilation air exchanges.

Results are presented in Vista as tables or graphs of room or zone heat loss, broken down by heat loss mechanism. Losses can be expressed on a floor area or room volume basis. Room temperatures are also displayed. The data may be exported to other applications such as spreadsheets and word processors.

Results from Heating Loads also appear in Room Data and Apache Systems, where they can be used for equipment and air flow sizing.

For a description of the calculation methods used in Heating Loads see CIBSE Heat Loss & Heat Gain Calculation Methods.

### 2.1 Interface for Heat Loss Calculation

The screenshot shows a software interface for 'Heating Loads'. At the top, there is a checkbox labeled 'Heating Loads' which is checked. Below it are five more checkboxes: 'Auxiliary ventilation air exchange?' (checked), 'Natural ventilation air exchange?' (checked), 'Include heat gains from adjacent rooms?' (unchecked), 'Adjust for intermittent heating using profiles?' (checked), and 'Include DHW?' (checked). To the right of the 'Include DHW?' checkbox is a dropdown menu currently showing 'Use peak values'. Below these is a section titled 'Time settings for profiles' which contains a 'Default' checkbox (checked), a 'Time (hh:mm)' field set to '12:00', a 'Week day' dropdown set to 'Monday', and a 'Month' dropdown set to 'January'.

#### 2.1.1 Heating Loads

Tick this box to include a Heating Loads calculation when you click on Calculate.

#### 2.1.2 Auxiliary ventilation air exchange

Air exchanges specified in Room Data are divided into three categories: infiltration, auxiliary ventilation and natural ventilation. Any infiltration air exchanges are included unconditionally, but auxiliary and natural ventilation air exchanges may be switched on or off at calculation time.

Tick this box if you wish to include Room Data auxiliary ventilation air exchanges in the Heating Loads calculation.

Air exchanges are specified in Room Data in terms of a Maximum Value and a Variation Profile. In Heating Loads the Variation Profile requires interpretation because the calculation does not involve the time variable. The assumption is that the exchange rate takes the value at the time

indicated under 'Time settings for profiles' unless the profile is a formula profile (which is not supported by Heating Loads). In this case it takes the value zero.

### **2.1.3 Natural ventilation air exchange**

Tick this box if you wish to include Room Data natural ventilation air exchanges in the Heating Loads calculation.

Variation Profiles for natural ventilation are interpreted as for mechanical ventilation.

### **2.1.4 Include heat gains from adjacent rooms**

If you tick this box the calculation will include the effects of heat gains from neighbouring rooms, leading to reduced figures for net heat loss. The gains may be from conduction or air movement. A strict application of CIBSE recommendations requires this box to be un-ticked. However, by including heat gains from adjacent rooms a more realistic calculation of heat loss is obtained.

For rooms where the Heating Profile is off at the time indicated under 'Time settings for profiles', or a formula profile (which Heating Loads does not support), no heat is supplied and the room temperature free-floats. For such rooms, which typically represent buffer spaces such as roof voids, heat gains from neighbouring rooms are always included in order to provide correct boundary conditions for the heated rooms.

### **2.1.5 Adjust for intermittent heating using profiles?**

If you tick this box the calculated heating loads will be adjusted for intermittent heating according to the procedure described below. The adjustment applied to steady state heating loads for intermittent operation follows the treatment described in CIBSE Guide A, where it is calculated as a function of the fraction of the day for which the plant operates. This fraction is derived from the 'Time settings for profiles' described below.

### **2.1.6 Include DHW?**

If you tick this box the heating loads calculated for Apache Systems will include the Domestic Hot Water demand for each room.

Select 'Use peak values' to set DHW demand to the peak value in the room, or 'Use time settings below' to set it according to the demand at the indicated time of day and year.

### **2.1.7 Time settings for profiles**

The profile settings determine whether heating is available in each room, and, where appropriate, the adjustment for intermittent heating. If the heating profile is off at the specified hour, week day and month there is assumed to be no heating. In the case of annual profiles the profile is evaluated for the indicated weekday in the central week of the month. The thermal response characteristic of the room ('response factor') also plays a part in the calculation. In the CIBSE Loads interface the number of hours of operation is derived (if you tick the box 'Adjust for intermittent heating using profiles?') from the heating profile for a particular month and week day. You specify these in the box labelled 'Time settings for profiles'.

### **2.1.8 Calculate**

Click on this button to start the Heating and Cooling Load calculations.

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### 2.1.9 Save & exit

Click on this button to leave the CIBSE Loads dialog and save the data.

### 2.1.10 Cancel

Click on this button to leave the CIBSE Loads interface.

### 3 Cooling Loads

Cooling Loads calculates room cooling loads and free-floating temperatures using the CIBSE admittance procedure.

The calculation is carried out for one design day in each of a user-selected range of months, using weather data provided in APlocate. The calculation takes into account the timing and nature of each gain, applying the appropriate radiant fraction to all sources of heating and cooling. Inter-room dynamic conduction and ventilation heat transfer is accounted for. Glazing solar transmission properties are treated using an analysis based on the Fresnel equations. At the user's option the effects of ventilation air exchanges and external solar shading, as calculated by SunCast, may be incorporated.

Vista presents the Heat Gain results in tabular or graphical form in a variety of formats. Gains are broken down by heat transfer mechanism and by type (sensible or latent). Results may be displayed by room or totalled over the building, and peak loads are identified. Various measures of room temperature are displayed, together with room relative humidity. Data may be exported to other applications.

Results from Heating Loads also appear in Room Data and Apache Systems, where they can be used for equipment and air flow sizing.

For a description of the calculation methods used in Heat Gain see APcalc Methods.

#### 3.1 Interface for Cooling Loads Calculation

##### 3.1.1 Cooling Loads

Tick this box to include a Cooling Loads calculation when you click on Calculate.

##### 3.1.2 Auxiliary ventilation air exchange

Air exchanges specified in Room Data are divided into three categories: infiltration, auxiliary ventilation and natural ventilation. Any infiltration air exchanges are included unconditionally, but auxiliary and natural ventilation air exchanges may be switched on or off at calculation time.

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Tick this box if you wish to include Room Data auxiliary ventilation air exchanges in the Heat Loss calculation.

### 3.1.3 Natural ventilation air exchange

Tick this box if you wish to include Room Data natural ventilation air exchanges in the Cooling Loads calculation.

Variation Profiles for natural ventilation are interpreted as for mechanical ventilation.

### 3.1.4 SunCast Link?

Tick this box to include the effects of external solar shading, as calculated by SunCast, in the Cooling Loads calculation.

It is important to ensure that the shading data is kept up to date with any changes to the building geometry. The shading calculations should be repeated after any such changes.

### 3.1.5 Design Days

Select the months for which Heat Gain calculations are required.

### 3.1.6 Time settings for profiles

The Cooling Loads calculation is carried out for one design day per month. Indicate which day of the week is to be used to set the profiles used in Heat Gain for casual gains, ventilation rates and (if appropriate) temperature boundary conditions.

### 3.1.7 Calculate

Click on this button to start the Heating and Cooling Loads calculations.

### 3.1.8 Save & exit

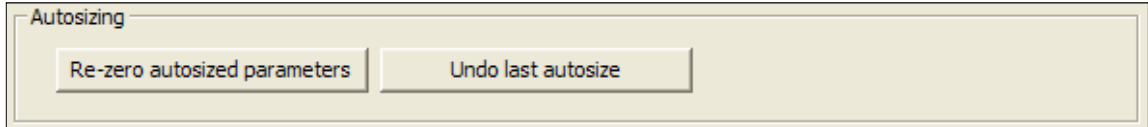
Click on this button to leave the CIBSE Loads dialog and save the data.

### 3.1.9 Cancel

Click on this button to leave the CIBSE Loads interface.

## 4 Autosizing settings

### 4.1 Interface for Autosizing settings



#### 4.1.1 Re-zero autosized parameters

Auto-sized parameters are the parameters located in the Room Data / Apache Systems dialog that are sized during ASHRAE Loads or CIBSE Loads calculations. Re-zero sets the values back to zero before a new calculation.

#### 4.1.2 Undo last autosize

Undo last autosize resets the autosized parameters to the previous calculated value.