Daikin Air-conditioning Automatic Support System for Technical Calculations

For Windows

DACCS-PC Series

Heat Load Calculation Software

DACCS-HKGSG

Ver. 1.00



- **Before using this software**

This program has been developed by modifying the heat load calculation software designed for the use in Japan. The program automatically sets values such as the overall heat transfer coefficient of outer wall assembly, and the number of persons and personnel calorification according to the usage of building. These values are determined based on typical usage in Japan. Therefore, check these automatic input data, and make necessary changes, if necessary.

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Agreement

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1. Introduction

1.1 Outline

The DACCS-HKGSG program uses a steady-state load calculation method to compute heat load over a 24-hour period (1 day) on a summer day and a winter day. It also applies effective temperature differences in consideration of the effect of heat accumulated in the walls, since the heat load received from strong sunlight in summer through outer walls and roofs is substantial.

The program contains 24-hour weather condition data of major cities for summer and winter (TAC 5%). The standard design data include weather data of 140 countries, and it is based on climate data of the British Meteorological Office and Japan Meteorological Agency.

1.2 Features

The DACCS-HKGSG program offers the following features and functions.

- Reliable, detailed heat load calculation

Uses a simplified calculation method for easy input operations, yet provides detailed and accurate estimation of heat loads.

- Easy operation

Allows the use of keyboard and mouse.

- Extensive input and output items

Offers extended functions for system heat load table and input of multiple wall material types.

Displays and prints graphs for effective visualization of calculation results.

- Include world wide weather data base

Compatible with Windows 98, 2000, Me, and XP.

Note: The DACCS-HKGSG can not be used with Windows 3.1., Windows 95 or Windows NT

2. Software setup

A program called SETUP.EXE in the CD-ROM is used to install all files on a hard disk that are necessary for using the DACCS-HKGSG.

Before setting up the program, check the hardware and software of your computer system.

2.1 Confirmation of required system configuration

To use the DACCS-HKGSG, the following hardware and software are necessary.

- Personal computer CPU486DX2 or higher
- OS: English-version Windows 98, 2000, Me, and XP

(Note that the DACCS-HKGSG cannot be used with Windows 3.1.,Windows 95 or windows NT)

- Hard disk capacity

More than 7 MB of available memory area

HKGSG + Shared area with DACCS + Area required installation (work area)

(Approx. 3 MB) + (Approx. 2 MB) + (Approx. 2 MB)

- CD-ROM drive(s) (required for program installation)
- Display device compatible with Microsoft Windows (recommended resolution: 800 x 600dots)

Note: In the case of 640 x 480dots resolution, display area extends beyond the screen on display device. (Display device of 640 x 480dots resolution can be used.)

- Printer compatible with Windows for hardcopy production (Output: A4 size, horizontal orientation)

2.2 Starting setup program

[Installation from CD-ROM]

1) Insert DACCS CD-ROM in CD-ROM drive.
2) Open CD and double click on **Setup**
3) Follow instruction displayed on screen

2.3 Before using software

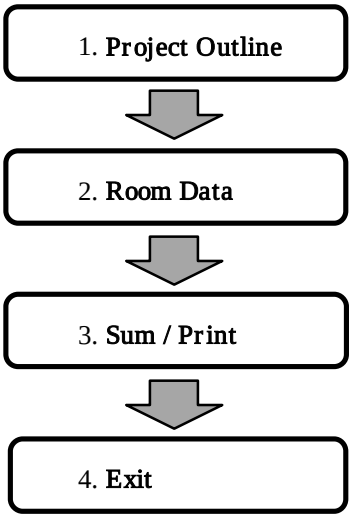
The DACCS-HKGSG software is an application program that operates on English-version Windows 98, Me, 2000, and XP.
Therefore, basic knowledge of the Windows operating system is necessary to use the DACCS-HKGSG software.
This manual does not include detailed explanation of the basic operations of Windows, such as how to open a menu and how to give a name to file using a dialog box.
For details of Windows, refer to the Windows manual or use the online help function.

3. Operation flow

The DACCS-HKGSG was designed to allow accurate load calculation easily and quickly by anyone.
Users can perform load calculation easily, quickly and accurately(※1) by inputting data in sequence using functions from "1. Project Outline Input" to "4. Exit" on the main menu of the HKGSG.

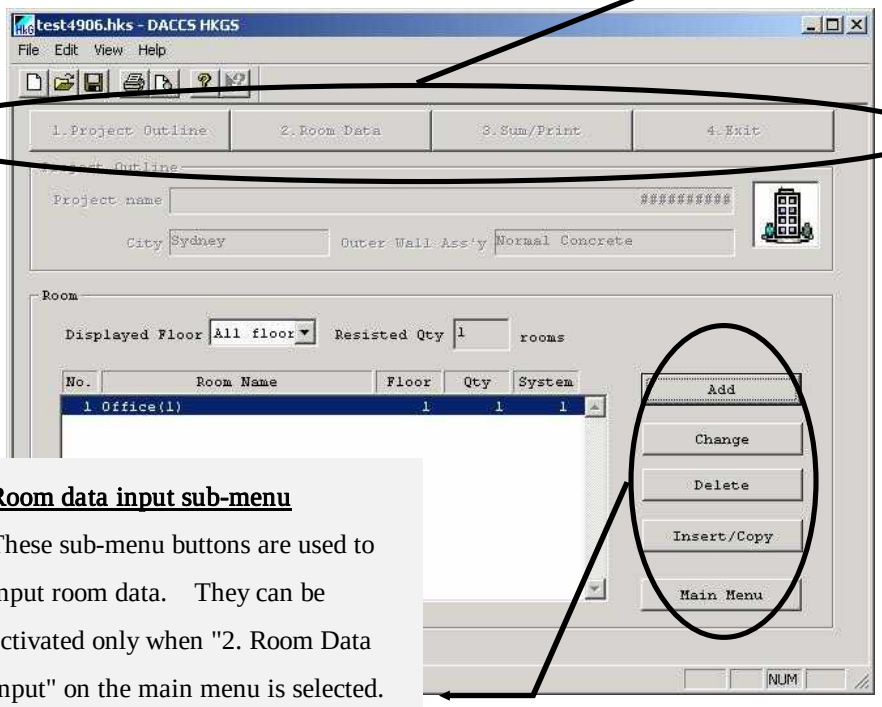
Note: Computers always provide accurate calculation results. However, if input data is not appropriate, the calculation result will not be reliable.

[Computer input flowchart] (Flow of load sum table production)





[Main screen of simplified heat load calculation program]



- **Main menu**
  Operate functions 1 to 4 in sequence to produce a heat load sum table.

The software supports the use of both keyboard and mouse. (Some operations can be executed only by the mouse, since the program includes unique button operations.)

Room data input sub-menu
These sub-menu buttons are used to input room data. They can be activated only when "2. Room Data Input" on the main menu is selected.

---- The following describes main menu functions. ----

1. Project Outline

This screen is used to input project name, country/city names, address and outer wall assembly data. This screen also allows change of design data (default heat transfer coefficient and weather data).

2. Room Data

<Room specifications>

Input data such as room name, floor no., number of rooms, usage of room, ventilation system, with or without ceiling board, floor area, ceiling height, non-conditioned ceiling area, non-conditioned floor area, calorific volume from equipment, outer wall length, window area on outer wall and non-conditioned inner wall length.

<Change of standard data>

- **Heat transfer coefficient** — Value can be changed according to outer wall assembly type.
- **Design temperature and humidity** — Values of design room temperature and humidity in summer and winter can be changed.
- **Schedule** — Schedule data such as operating time zone (time zone for heat load calculation), lighting, number of persons, calorification from equipments can be changed.
- **Others** — Fresh air intake, no. of infiltration ventilation, load safety factor, window glass type, blind type, humidifying method, lighting, number of persons, underground wall, attic height and other data can be changed.
- **Material II** — Heat transfer coefficients that are different from those of normal outer walls, inner walls, windows and blinds can be input. (Maximum of two types including ordinary materials)
- **Data for extend** — Personnel calorific volume per person, next room condition and other data can be changed.

Note: Data for extend consists of condition data, and it does not have to be changed in most cases.

3. Sum / Print

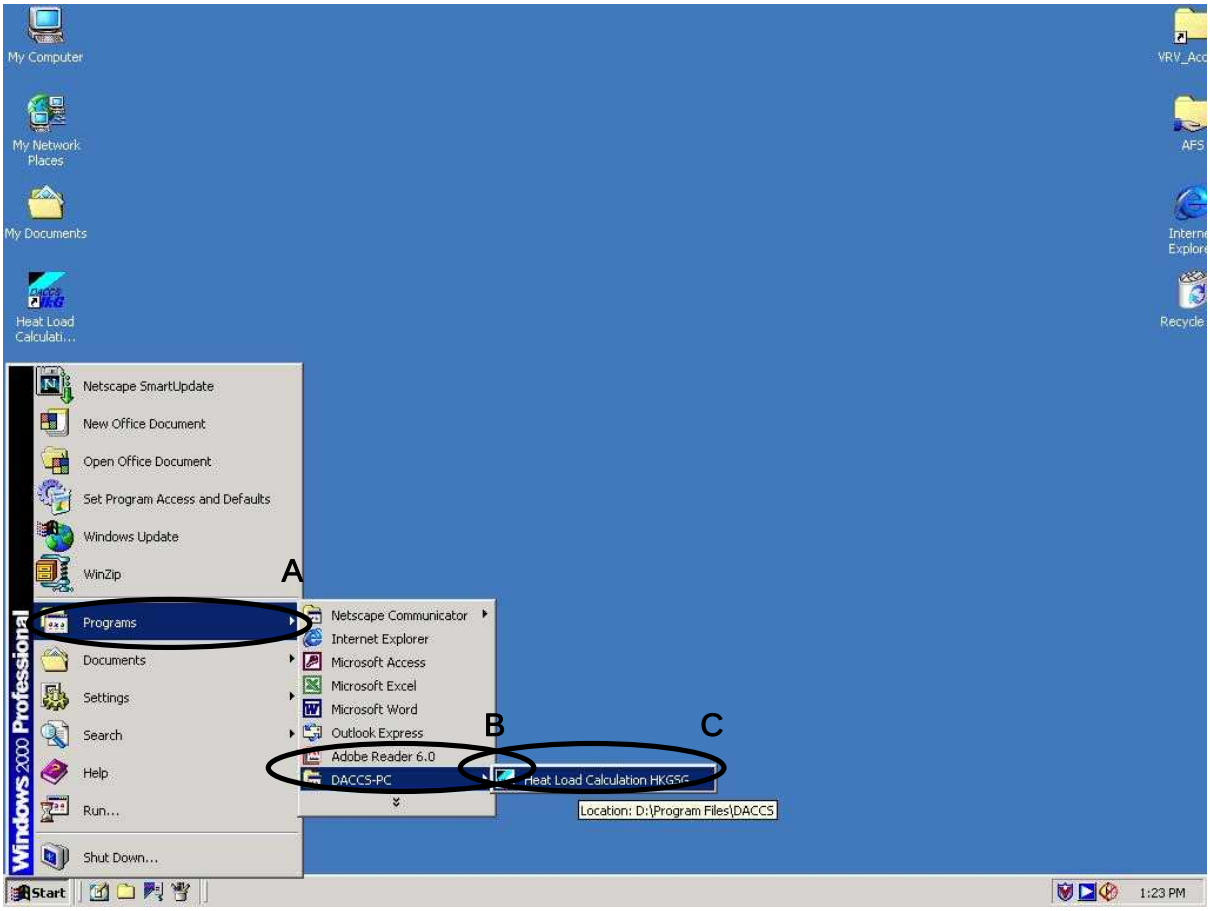
This function is used to perform calculations and print calculation results. (Hardcopy: heat load table, system heat load table, system table, input room data, graph, room heat load table and peak heat load detail table.)

4. Exit

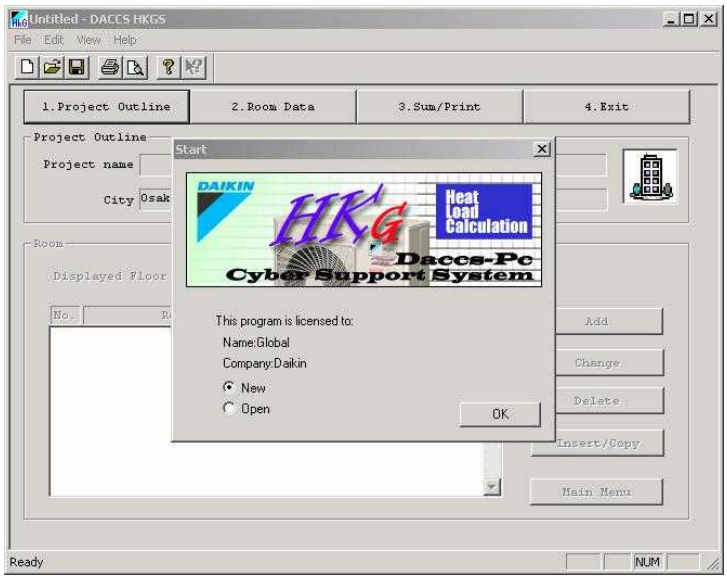
This function is used to exit the program. If data is not saved, the screen displays a message asking whether to save data or not.

4. Starting software

As soon as program setup is completed, a "DACCS-PC" folder (B) is created in "Program" folder (A) at the start menu. Program short-cut menu (C) is also created inside the "DACCS-PC" folder. The application program can be started by clicking on this short-cut menu.



5.1 Starting HKGSG



Choose whether to input new data or to load data from a stored file.

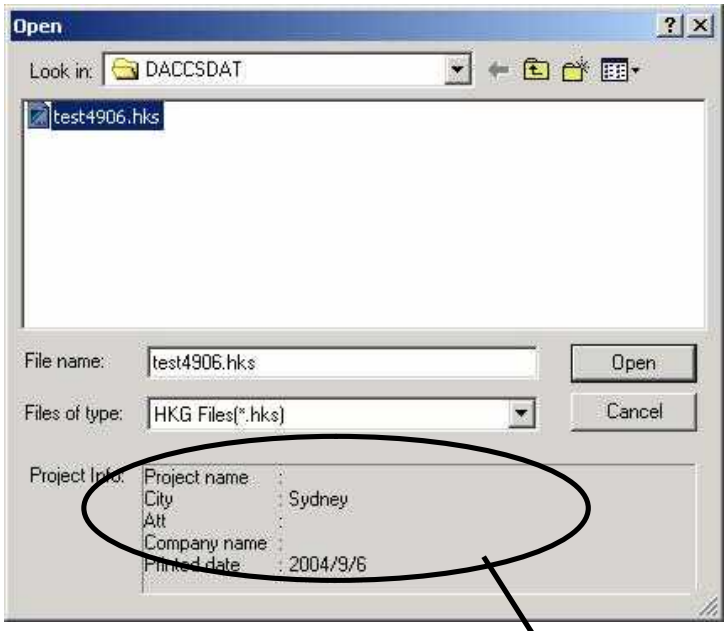
Select from the following two options.

() New

() Open

(When data is input for the first time, select "New" and proceed to steps described in "II. Data Input" (page 8).)

Opening stored file (opening file for data update and change)



Select a data file to open.

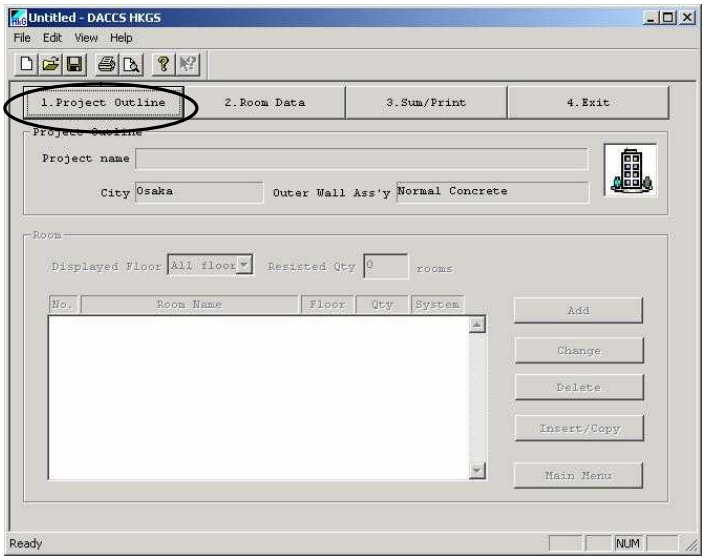
(Drive and folder of file location can be changed in the same way as for other Windows application programs.)

Extension for load calculation files: .hks

Displays project information of selected file.

5.2 Data input

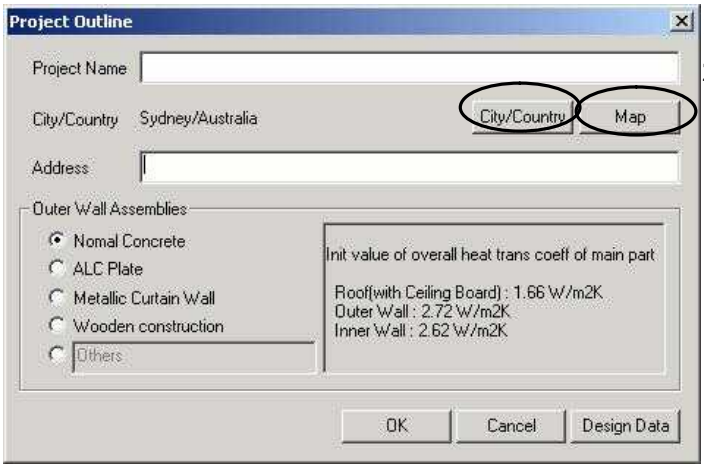
5.2.1 Input project outline



Click on 1. Project Outline on the main menu using the mouse.

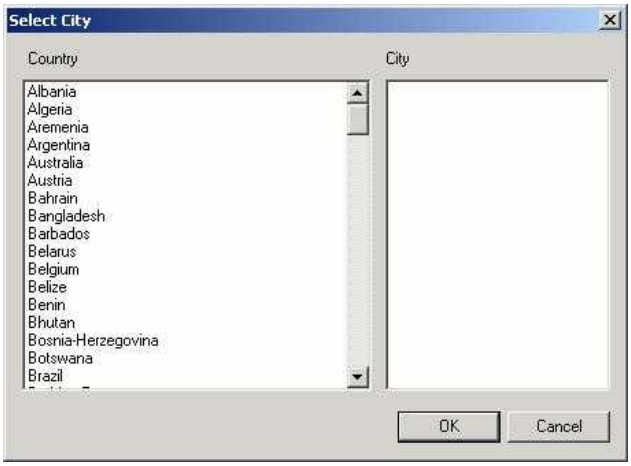
This screen allows the input of project name, city, address and outer wall assemblies. It also allows change of design data.

When the cursor ( ) is positioned on a main menu , it can be moved to another button by using arrow keys and a button function can be activated by pressing the Enter key.



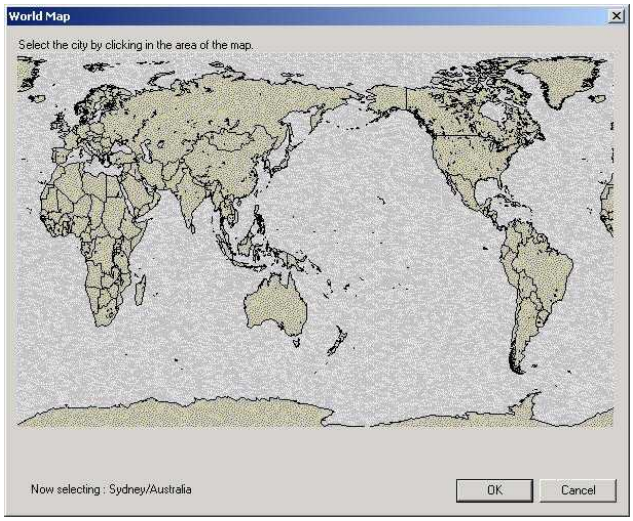
1. **Project Name** (60 characters)
2. Click on either **City/Country** or **Map** button to select a city.

[City Selection Support Tool]



When the City/Country button is clicked using the mouse, the City Selection Support Tool screen appears. Select a country and a city in that order.

[World Map Support Tool]



When the Map button is clicked using the mouse, a world map appears. Click on a city location.

The program uses effective temperature differences to take into consideration the effect of sunlight and outside air temperature to the outer wall and roof and the time lag in heat transmission resulting from the heat storing capacity of the wall.
Different values of effective temperature difference are designated in Wall Type I, II, III, IV and S based on wall material and thickness.
See the Appendix.

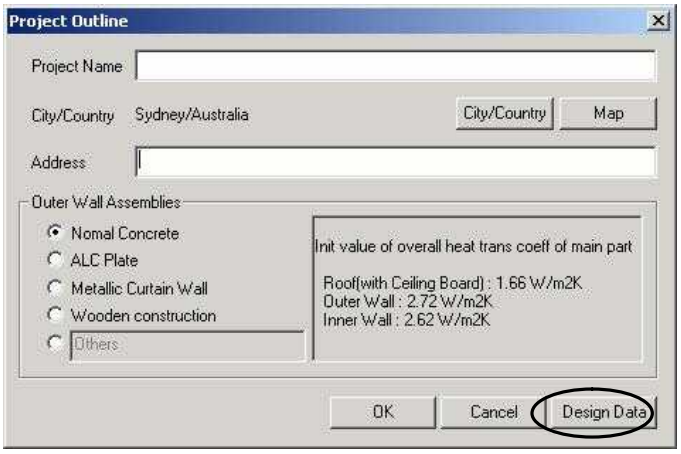
. **Address** ……..(30 characters)
. **Outer Wall Assemblies: Select an outer wall assembly type using the mouse or arrow keys.**

Note: The heat transfer coefficients of the outer wall, inner wall, roof and floor as well as the wall type for effective temperature difference are automatically set.

Project name and address are printed on the cover of heat load table. (This data does not affect the calculation.)

5.2.2 Design data change

(Follow the procedure only when changing the default weather data and heat transfer coefficients.)

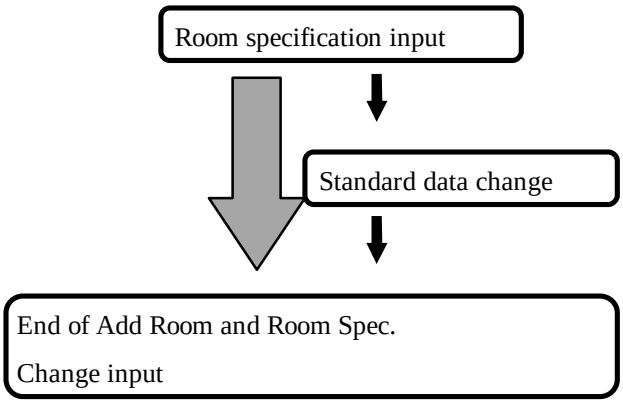


[Design data change]
Default values (initial values) of weather data and heat transfer coefficients can be changed. Revised data is applicable only to that particular project.

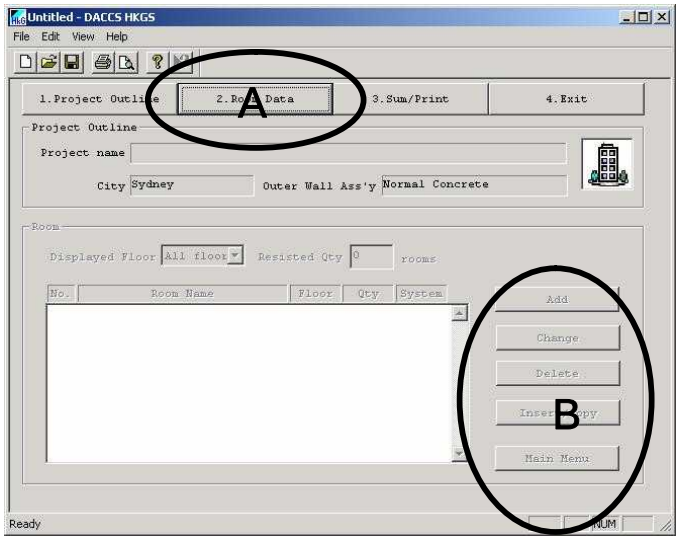
For **the design data change** procedure, refer to **"7. Design data and standard data change." (page 34)**

5.2.3 Room data input

[Flow of room data input]



In the HKGSG, selection of "Usage of room" automatically sets typical data in the standard data. However, this typical data may not apply in some projects. If the initial conditions listed in the Appendixes do not apply, change the conditions by using Change Std Data button.

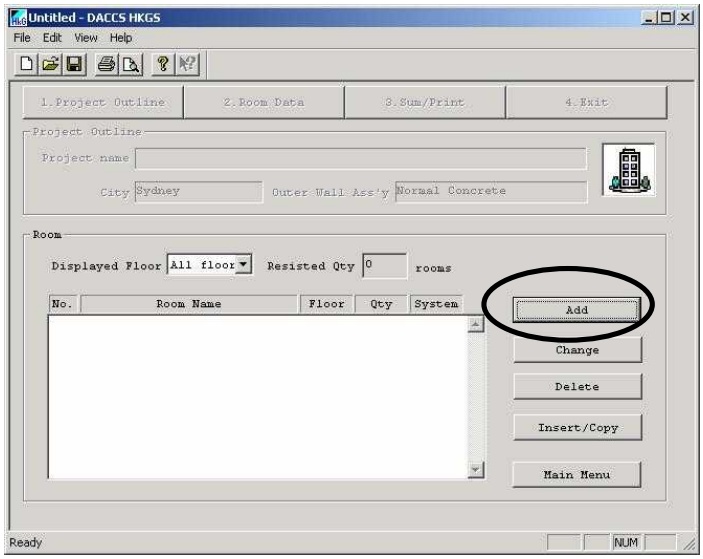


[Moving to room data input sub-menu]

Click section A (2. Room Data button). This activates section B (room data input sub-menu). These sub-menu functions are used for the input of room data.

Note: When the sub-menu (section B) is active, the main menu functions (section A) become inactive. To use a main menu function, click the **Main Menu** button.

5.2.4 Add room (adding room data)



Click the **Add** button.

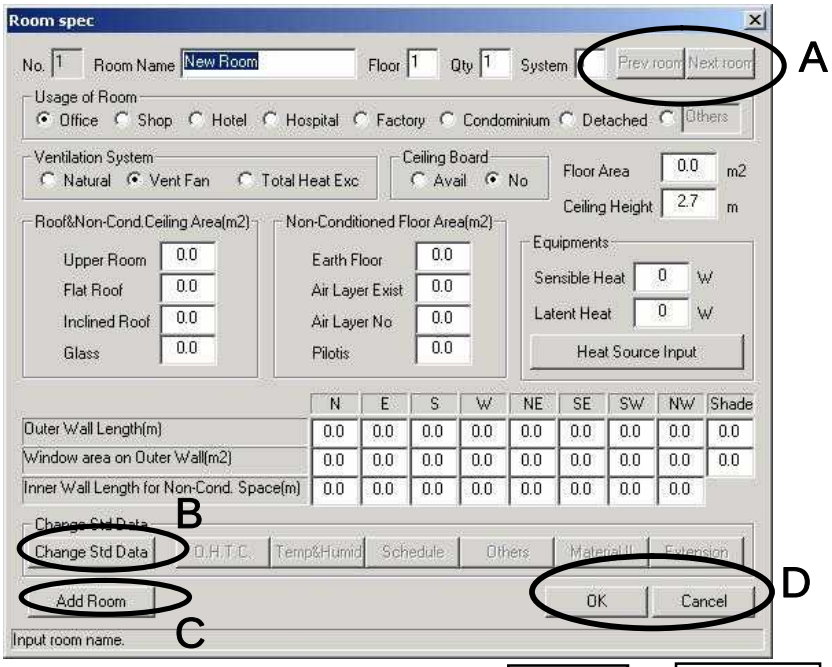
(The cursor can be moved by the mouse or arrow keys.)

Add: This button opens the room data input screen. Use this screen to input room data for the first time and to add room data.

When Add button is inactive

Check to make sure that [room data input sub-menu] is active.
If not, follow the procedure described in the above [Moving to room data input sub-menu] section.

[Room Data Input Screen]



A Displayed room can be changed to Prev room or Next room.

B Clicking Change Std Data allows the change of heat transfer coefficient, room temperature and humidity, schedule, others, material II and data for extend.

C Inputting data for the new room.

D Select OK to enter input data and exit from "Room Spec" screen.

Select Cancel to delete input data and exit from the "Room Spec" screen.

This screen allows the input of **room name, floor no., number of rooms, system, usage of room, ventilation system, with or without ceiling board, floor area, and ceiling height**.

---- The following describes the details of input items. ----

. Room Name Room name is printed on hardcopy. (up to 20 characters)

. Floor Input a floor number (-5 to 99) **Note**: Use a negative (-) value for underground floors.

[Caution in inputting floor no.]

Note: The program takes into consideration the cooling effect of atmospheric heat radiation in calculating heat loads in winter (heating operation). The radiant cooling effect is taken into account between 18:00 and 7:00 for the calculation of the heat loads of roofs and roof windows. However, if the floor no. is 4th or higher, the cooling effect is taken into account between 18:00 and 7:00 for the calculation of the heat loads of glass windows and outer walls.

Heating load = azimuth factor × increasing factor of ceiling height × temperature difference × heat transfer coefficient × area

(8:00 to 17:00) Temperature difference = indoor temperature - outside temperature

(18:00 to 7:00) Temperature difference = indoor temperature - outside temperature + Δ t a (radiant cooling effect)

4th to 9th floors	Δ t a = 2
10th floor and above	Δ t a = 3
Roof windows and roofs	Δ t a = 6 (regardless of floor no.)

. Qty If there are same-type rooms(*1), input the number of those rooms. (1 to 99)
(Heat loads of all same-type rooms are added in the heat load table.)

Note: "Same-type rooms" refer to rooms in the building having the same structure, size, purpose and next room conditions (such as rooms in hotels and classrooms in schools).

. System Input the system no. (1 to 999)

Note: System no. is used for the production of a system heat load table. (If heat load is not calculated for individual systems, input "1.")

. Usage of Room Select a room usage type. The mouse or arrow keys can be used to make a selection. If "Others" is selected, any name can be input. (10 characters). Other settings are the same as those for offices.

> The "Usage of room" data optimizes the following standard data items.
> No. of persons, personnel calorific volume per person, no. of infiltration ventilation, schedule, coefficient of internal temperature difference, lighting and blind type
> (For details, see the Appendixes.)

. Ventilation system Select a ventilation system. The mouse or arrow keys can be used to make a selection.

> Depending on the ventilation system, the infiltration and outdoor air heat load calculation method changes.
>
> Natural ventilation: Only infiltration heat load is taken into consideration.
> Ventilation Fan: Infiltration heat load and outside air heat load are taken into consideration.
> Total heat exchanger: Infiltration heat load and outside air heat load minus total heat exchanger heat load are taken into consideration.
> Infiltration heat load: Heat load of drafts entering room from doors and spaces in windows and outer walls.
> Outside air heat load: Heat of outside air forcibly introduced into room by mechanical ventilation systems.

. Ceiling Board Select "Available" if there is a ceiling board, or "No ceiling" if there is no ceiling board. The mouse or arrow keys can be used to make a selection.

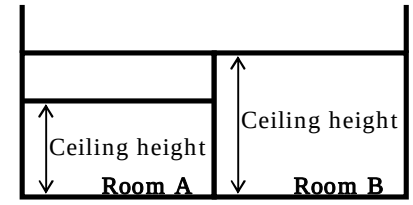
(See the diagram below.)

> **Heat transfer coefficients of roof and ceiling change depending on whether there is a ceiling board or not.**
>
> **(For details, see the Appendixes.)**

. Floor area Input the floor area of room. (0 to 9999.9) (Used to calculate the heat load per square meter of the room.)

. Ceiling Height Input the distance between floor surface to ceiling board if the room has a ceiling board, or input the floor height if the room has no ceiling board. (0 to 99.9)

[Diagram of ceiling board and ceiling height]



With ceiling board Without ceiling board.

Ceiling height is used to calculate the outer wall area.

Without ceiling board: -----**Outer wall length × ceiling height - window area**

With ceiling board: ----------**Outer wall length × (ceiling height + attic height) – window area**

Note: Attic height can be set using "Others" of the "Change Std Data" function. (Initial value: 0.6 m)

In the case of high ceiling

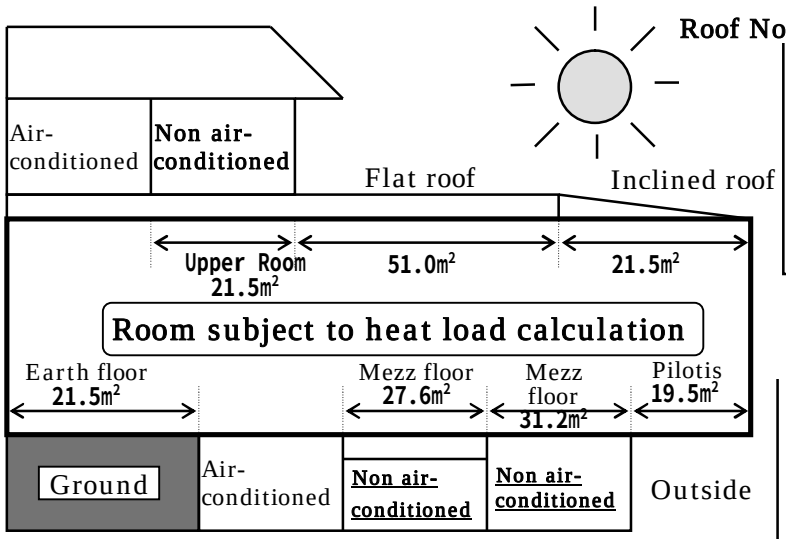
If the ceiling height is 5 m or more, the heating loads for outer wall, roof and glass are multiplied by the increasing factor of ceiling height.

. Roof Non-Conditioned Ceiling Area Input the area of space where air conditioner is not used in the room above or the areas of roof and roof window in direct contact with outside air. (0 to 9999.9 m^2)

. Non-Conditioned Floor Area Input the area of space where air conditioner is not used in the room below, the area of space where the floor below is exposed to outside air (pilotis), or the area of earth floor. (0 to 9999.9 m^2)

In the case of an underground wall (when a negative (-) sign is attached in front of outer wall length), total "earth floor" area is calculated as an "underground earth" floor area. (Due to different heat transfer coefficient and temperature difference value, the heat load of earth floor changes.)

[Example of roof, non-conditioned roof and floor area input]



Roof Non-Conditioned Ceiling

Upper Room	21.5
Flat Roof	51.0
Inclined Roof	21.5
Glass	0.0

Non-conditioned floor area

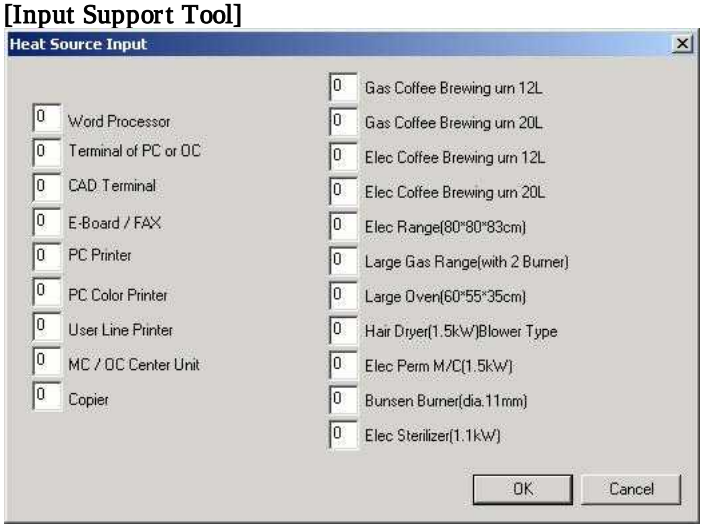
Earth Floor	21.5
Air Layer Exist	27.6
Air Layer No	31.2
Pilotis	19.5

Do not input the air-conditioned area since no heat transfer is considered to occur with that area.

Note: Heat load of inclined roof is calculated by multiplying heat transfer efficient of flat roof by 1.1.

. Calorific volume from Equipments Input the sensible heat and latent heat of calorific volume from equipment. (-99999 to 300000 kcal/h)

[Input Support Tool]



When the **Heat Source Input** button is clicked, the Input Support Tool window opens.
Input the number of units in applicable boxes. When the "OK" button is pressed, the input data is calculated and displayed as sensible heat and latent heat loads.

. Outer Wall Length Input the length of wall that faces outside on the other side or is buried in the ground. (-999 to 999.9 m)

[Input of outer wall]

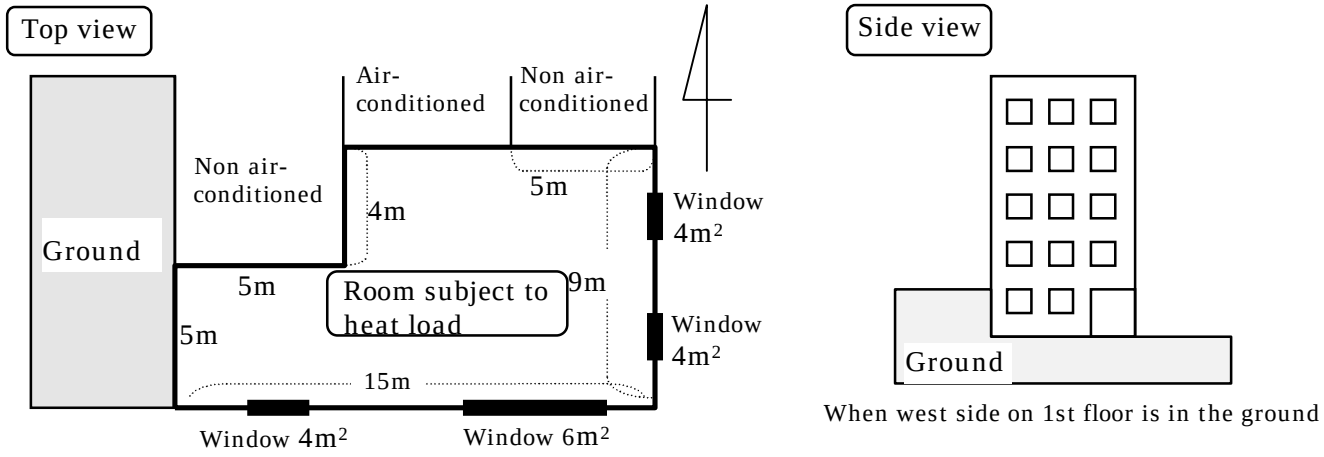
. Input the length of outer wall in meters.
. If the outer wall is an underground wall (such as basement floor), add a negative (-) sign to the direction data.
. If the outer wall is in the shade of an adjacent building, input the total outer wall length in the Shade section regardless of the direction.

. Window area on Outer Wall Input the area of windows in contact with outside air. (0 to 999.9 m^2)

Caution in inputting window area on outer wall
Be sure to input outer wall length and ceiling height before inputting window area.
Reason: Outer wall area is calculated by the following formula.
Outer wall area = outer wall length × ceiling height - window area
Because of the use of the above formula, outer wall length must be input even if the entire outer wall is covered with windows.

. Inner wall length for Non-Conditioned Space Input the length of inner wall that faces non-conditioned area on the other side. (0 to 999.9 m)

[Example of outer wall, window, inner wall input]



When west side on 1st floor is in the ground

	N	E	S	W	NW	SE	SW	NW	Shade
Outer Wall Length (m)	0.0	9.0	15.0	-5.0	0.0	0.0	0.0	0.0	0.0
Window area on Outer Wall (m^2)	0.0	8.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Inner wall length for Non-Cond Space (m)	10.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	

Input length for outer and inner wall.
Input area for windows.

Note1: If the outer wall facing west is an underground wall, add a negative (-) sign to the data.

Note2: Do not input the air-conditioned area since no heat transfer is considered to occur

Change Std Data button

Clicking this button allows the change of heat transfer coefficient, design temperature and humidity, schedule, others, material II and data for extend. (See the following section for details.)

In the HKGSG, selection of "Usage of room" automatically sets typical data in the standard data. However, this typical data may not apply in some projects. If the initial conditions listed in the Appendixes do not apply, change the conditions by using the "Change Std Data" button.

Add Room button

Click this button when inputting data for the next room.

O K button

Click this button to enter the input data and exit from the Room Spec screen.

Note

Values of room specifications and standard data are carried over when the **Add** button is used. (Values input for the previous room are carried over to the next room when the **Add** button is used. Initial values can also be used).

< Room Spec screen >

Data of floor no., system, usage of room, ventilation system, with or without ceiling board and ceiling height input for the previous room are carried over. Other items set to initial settings.

< Heat transfer coefficients in standard data >

Since the initial value is set by design data change, the value for the previous room is not carried over. The initial value is set for added rooms.

< Design temperature and humidity in standard data >

The values for the previous room are not carried over.

< Schedule in standard data >

The value for the previous room is carried over. (When the usage of room is changed, the initial value for the selected usage of room is set.)

< Others in standard data >

[Method of fresh air intake]

The value for the previous room is carried over. (When the usage of room or the ventilation system is changed, the initial value is set.)

[Infiltration, lighting, internal heat gain in heating, window type, blind type, humidifying method]

The values for the previous room are carried over. (When the usage of rooming is changed, the initial values for the selected usage of room are set.)

[Safety factor]

The value for the previous room is carried over.

[Total number of persons]

The value for the previous room is not carried over. (The initial value is set for each room.)

[Attic height]

The value for the previous room is carried over. (When the usage of room or the ceiling board (with/without) is changed, the initial value is set. When there is no ceiling board, input cannot be made.)

[Underground wall]

The value for the previous room is carried over.

< Material II in standard data >

The values for the previous rooms are not carried over.

< Data for extend in standard data >

[Personnel calorific volume per person, next room condition]

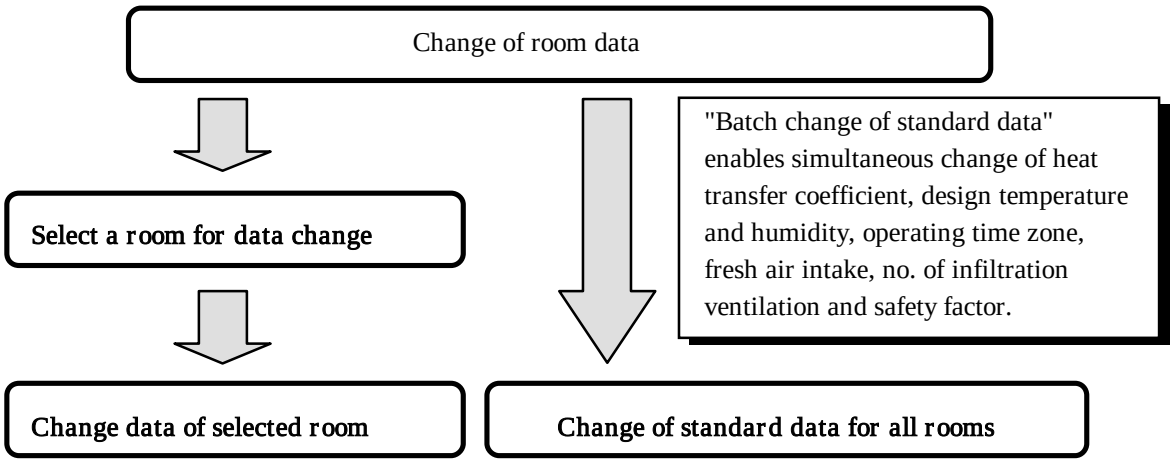
The values for the previous room are not carried over. (The initial values are set for each room according to the usage of rooming.)

[Glass surface ratio]

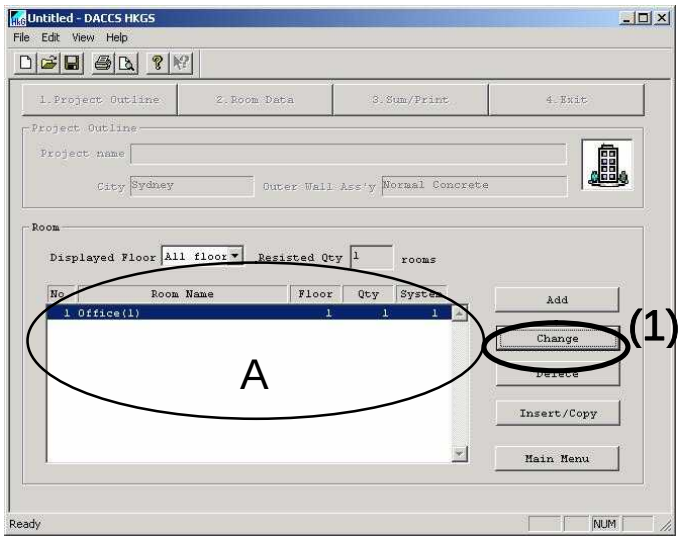
The value for the previous room is carried over.

Note: When room data is inserted, the standard data of an inserted room is based on the data for the previous room. If a room is inserted at the top, initial values are set.

5.2.5 Change Room (change of room data)



[Change data of selected room]



[Room selection]

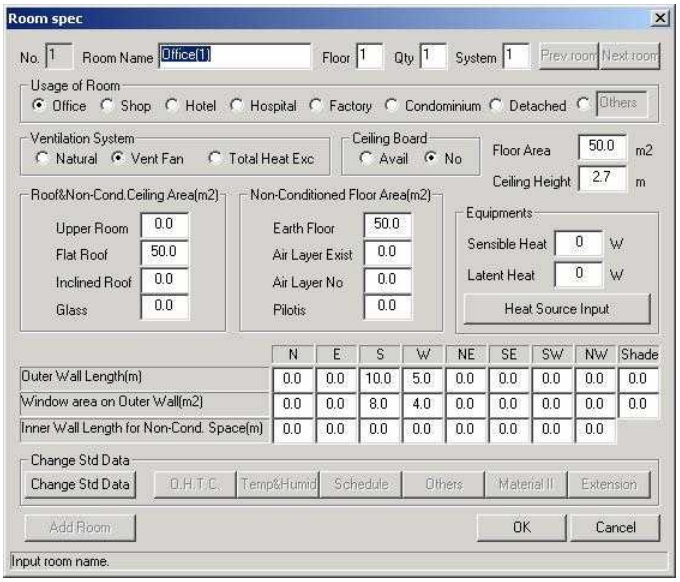
Use button (1) to select a room for data change (selected room is highlighted with thick band on section **A**).
Selection can be also made by double-clicking on a room using the mouse.

When [Change] button is inactive

Check to make sure that the room data input sub-menu is active.
If not, follow the procedure described in [Moving to room data input sub-menu] (page 13) under the "Room data input" section.

[Change system selection]

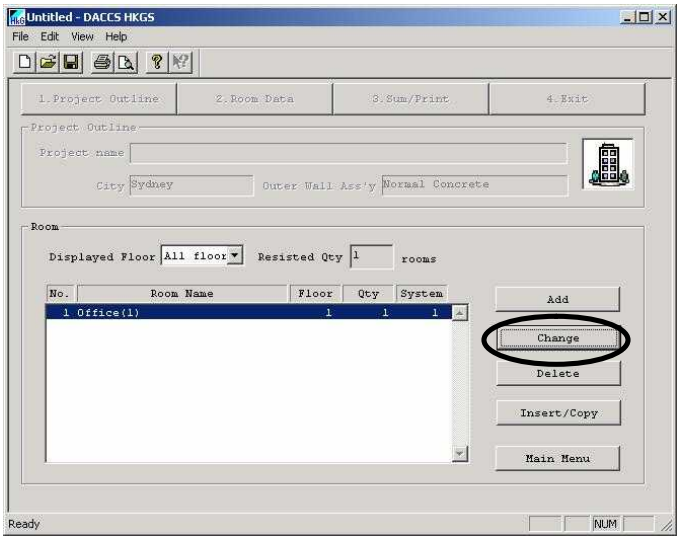




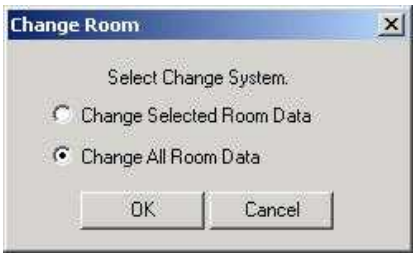
To change data of a specific room, select **"Change Selected Room Data"** ,and click **OK.**

The screen displays the room specifications of the selected room. Make necessary changes and click "OK" to change the room data.

[Change of standard data for all rooms]

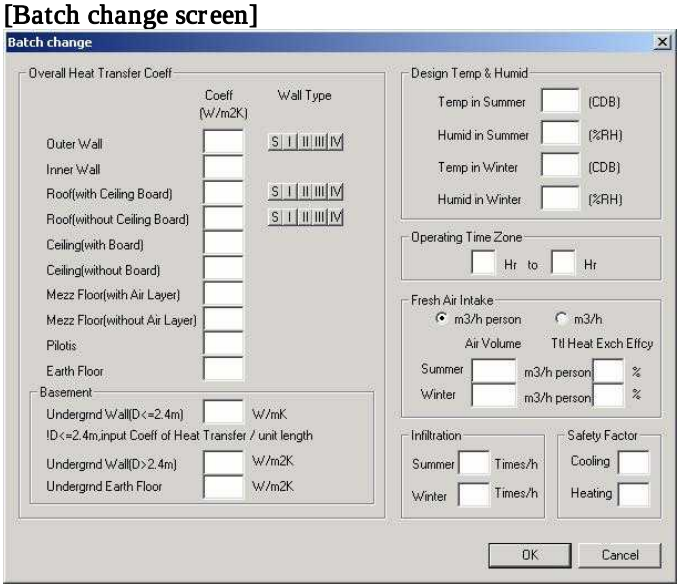


Without selecting a room, click on Change .



To change data for all rooms, select "Change All Room Data", then click OK

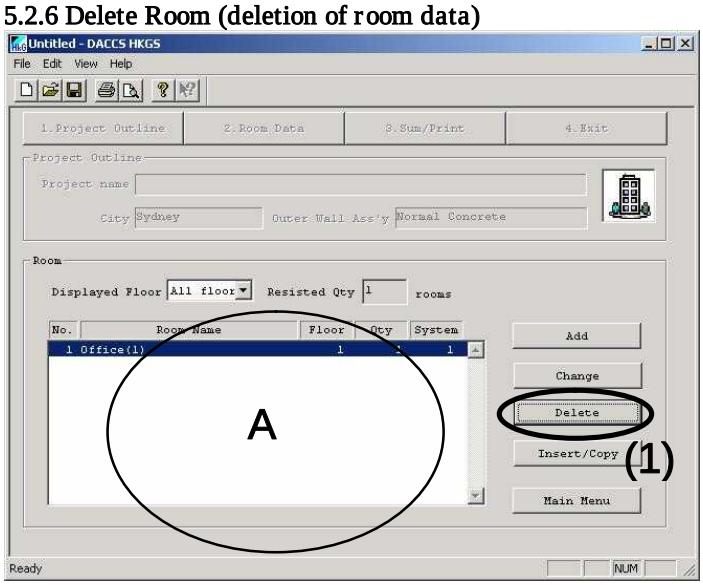
[Batch change screen]



Data such as heat transfer coefficient, design temperature and humidity, operating time zone, fresh air intake, no. of infiltration ventilation and safety factor can be changed at the same time. Input numerical data at the locations of data to be changed (Data of blank items do not change.)

Since a batch change results in the change of data for all registered rooms, be careful in using this function.
Changed data cannot be returned to original settings.

5.2.6 Delete Room (deletion of room data)



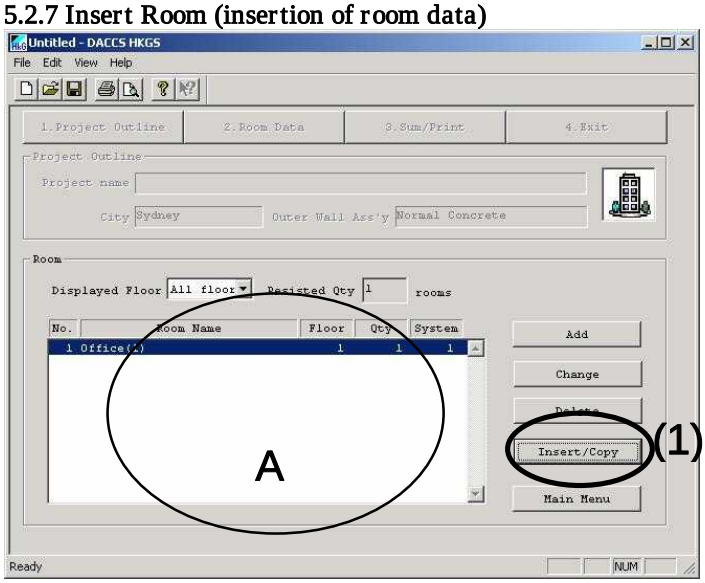
[Selection of room for data deletion]

Select a room on section A (selected room is highlighted), then click button (2) Delete or the DEL key on the keyboard.

When Delete buttons are inactive

Check to make sure that the room data input sub-menu is active.
If not, follow the procedure described in [Moving to room data input sub-menu] (page 13) under the "Room data input" section.

5.2.7 Insert Room (insertion of room data)

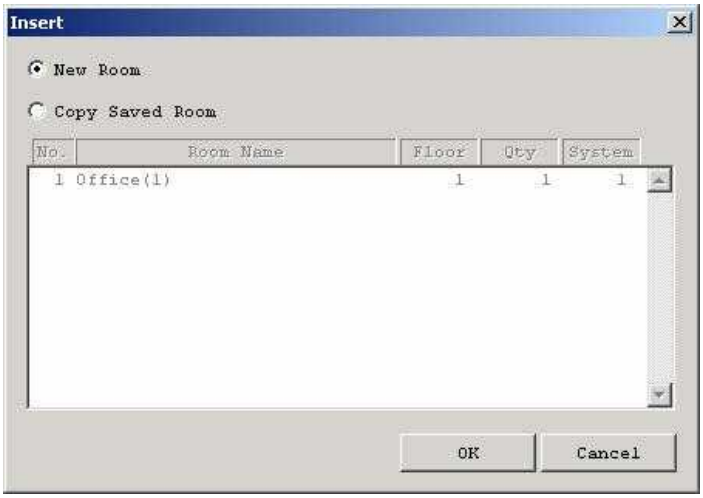


[Room data insertion]

Select a room on section A (selected room is highlighted), then click button (2)

Insert /Copy

A new room is inserted immediately before the selected room indication. A window shown below appears on the screen. Click on OK to insert.
Data for the inserted room can be input by following the procedure for room data input.
If "Copy Saved Room" is selected, data from stored room data can be copied and pasted.



When Insert buttons are inactive

Check to make sure that the room data input sub-menu is active.
If not, follow the procedure described in [Moving to room data input sub-menu] (page 13) under the "Room data input" section.

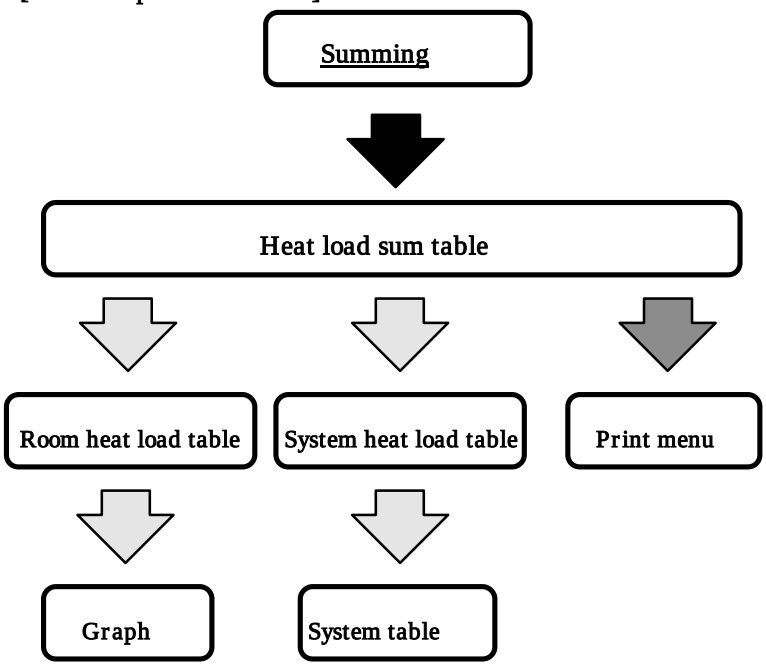
6. Sum and print

The HKGSG offers a variety of calculation result output formats to meet diverse needs of users, and provides information in the most suitable arrangement.

Types of sum and print

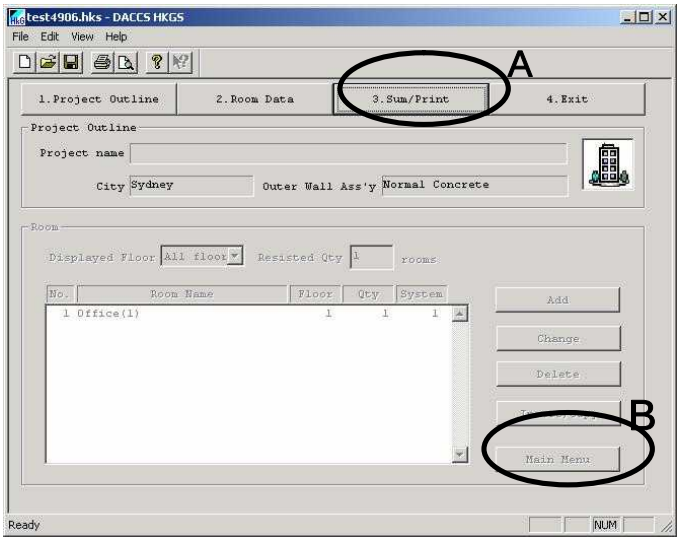
1) Cover ---------- Title, company name, attention:, date and remarks can be input.
2) Room input data---------- Table of data and conditions of individual rooms.
3) System table---------- Chart of system no. and corresponding room names.
4) Heat load sum table---------- Chart of heat loads of registered rooms in summer and winter, and peak load of building.
5) Room heat load table--------- Detailed time-based charts of heat loads in summer and winter.
6) System heat load table-------- Chart of heat loads of individual systems entered in room data input.
7) Peak load detail table-------- Results of calculation of peak loads in summer and winter by outer wall assembly and direction. (Peak load detail table function can be used only in printing or Print Preview.)
8) Heat load graph ---------- Time-based heat load curve for easy understanding

[Sum and print flowchart]



When the HKGSG completes data calculation, a heat load table is displayed.
Heat load table has **Table of Room**, **Table of System** and **Print** buttons. Make a selection.

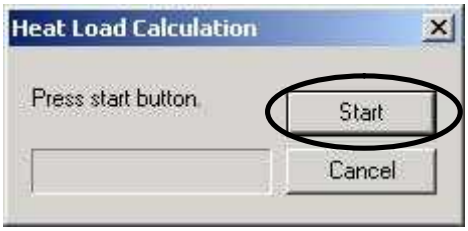
[Switching to print and sum screen]



Click **3. Sum / Print** button (**A**).

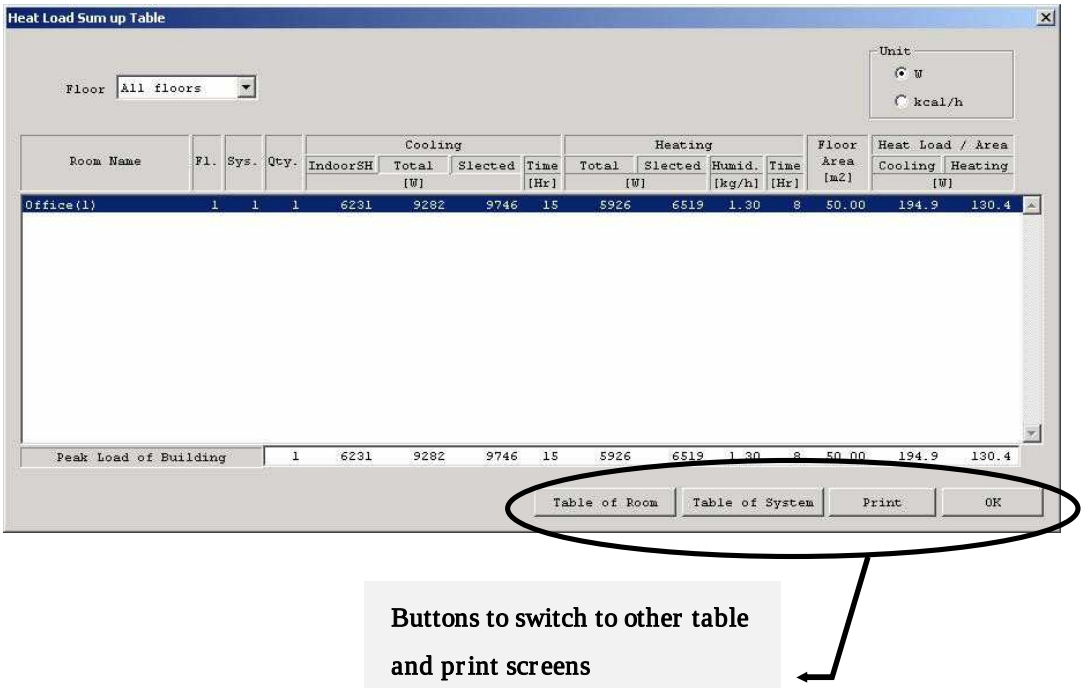
When the room data input sub-menu is active**[immediately after room data input]**or when the [3. Sum / Print] button is inactive, press button **B** to activate the main menu (function buttons located at upper screen section), then click the [3. Sum / Print] button.

[Sum start]



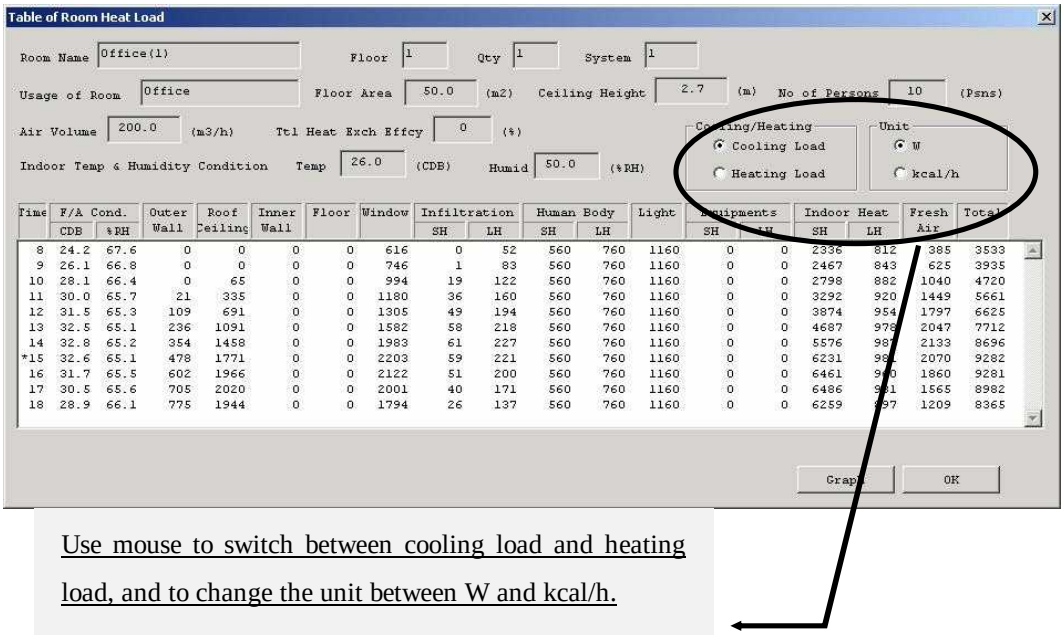
When the [3. Sum / Print] button is clicked, the message shown on the left appears. Click Start.
(If calculation is complete, the message does not appear.)

[Sum and Print screen (heat load table)]



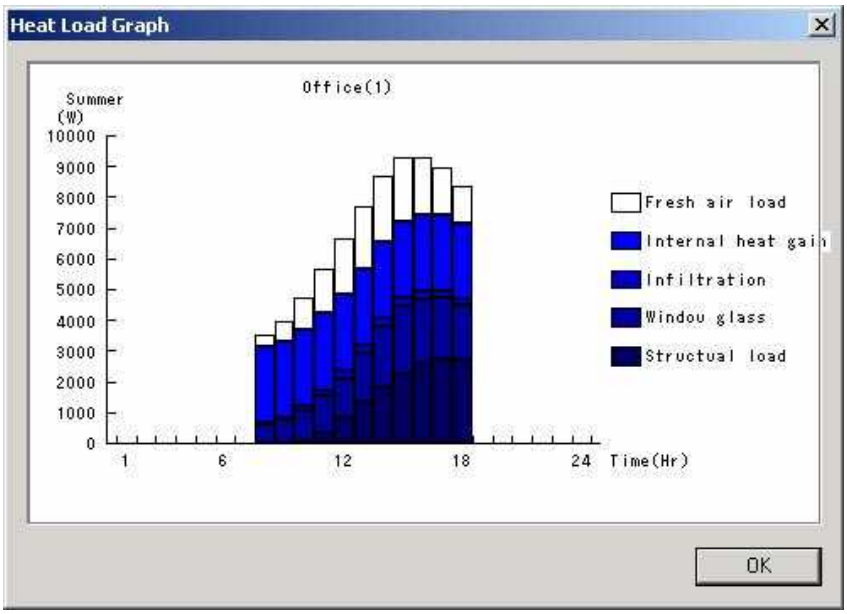
Buttons to switch to other table and print screens

[Room Load Table]

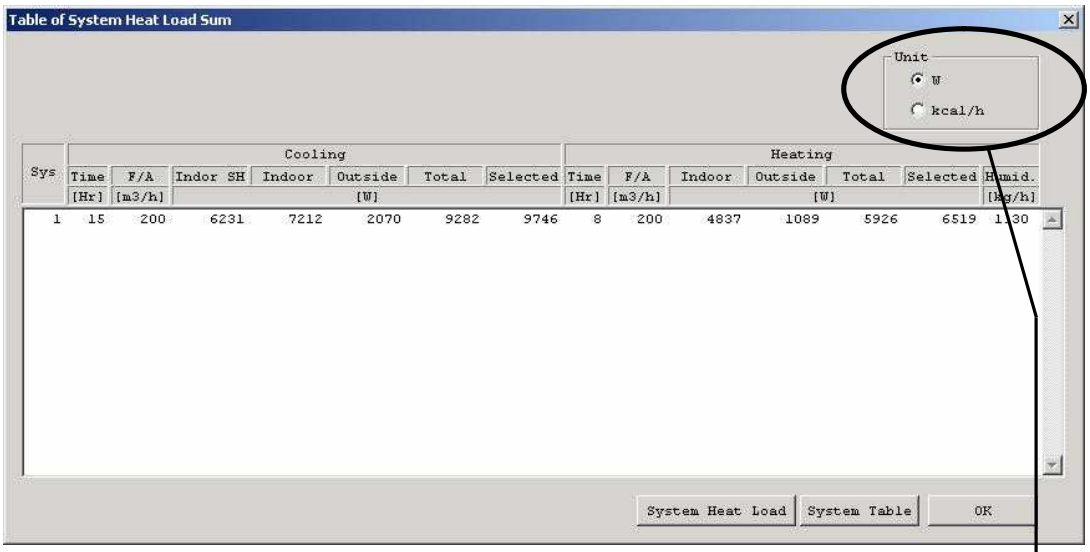


Use mouse to switch between cooling load and heating load, and to change the unit between W and kcal/h.

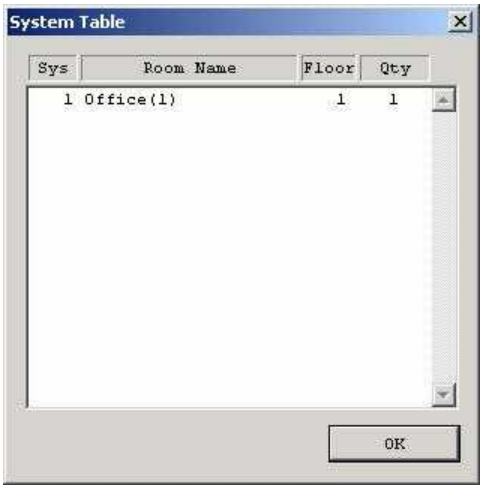
[Heat load graph]



[System heat load table]

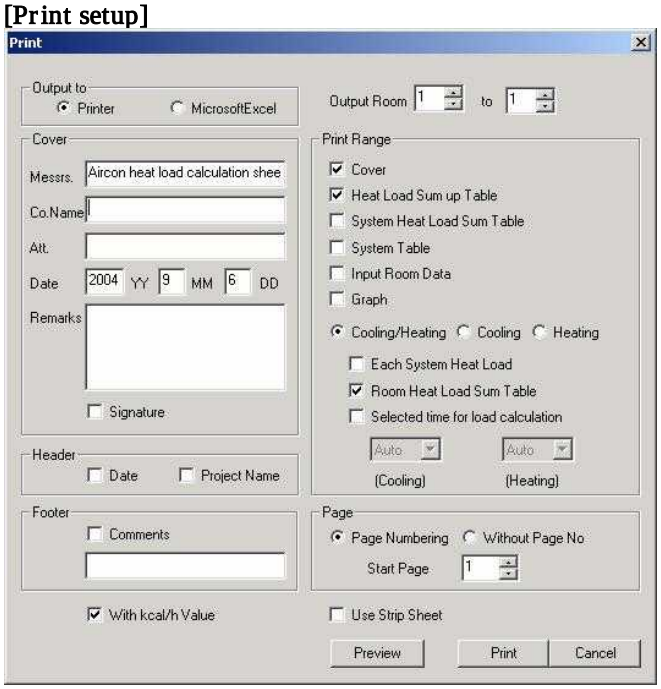


[System table]



Unit can be switched between W and kcal/h.

[Print setup]



The cover has a remarks section (up to 130 characters) and other pages have a footer (up to 26 characters), so information such as design number and estimate number can be indicated.

Clicking the **Preview** button shows a print image on screen for confirmation.

[Print setup]

This window is used to make various print settings.

It enables **the setting of the cover, header, footer, output rooms, print range, and page numbering**.

. Cover Messrs., company name, attn:, date and remarks.(A message of up to 130 characters can be input.) SignatureIf this box is checked, signature is printed on the cover.

. Header Date and project name can be printed at the upper right corner of each page (excluding cover). Make a selection of item(s) to print.

. Footer Comment (up to 26 characters can be printed at the lower right corner of each page (excluding cover).

. Output room Select the starting number and ending number of room to output.

. Print range Check the boxes of items to print.

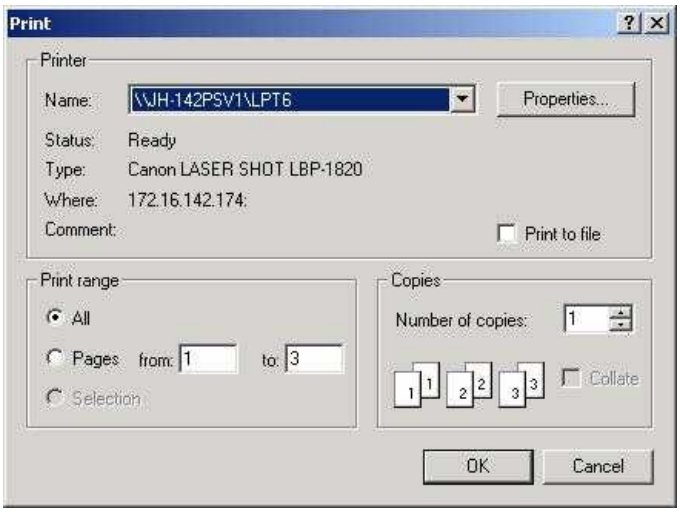
. Page Select whether to print page number or not. The page number to print on the first printed page can be also input when data is not printed from the beginning.

. Use strip sheet Check the box when stack form is used (output in vertical orientation).

. With kcal/h value Heat load tables include values in the kcal/h unit in addition to W values.

In the case of print output in vertical orientation

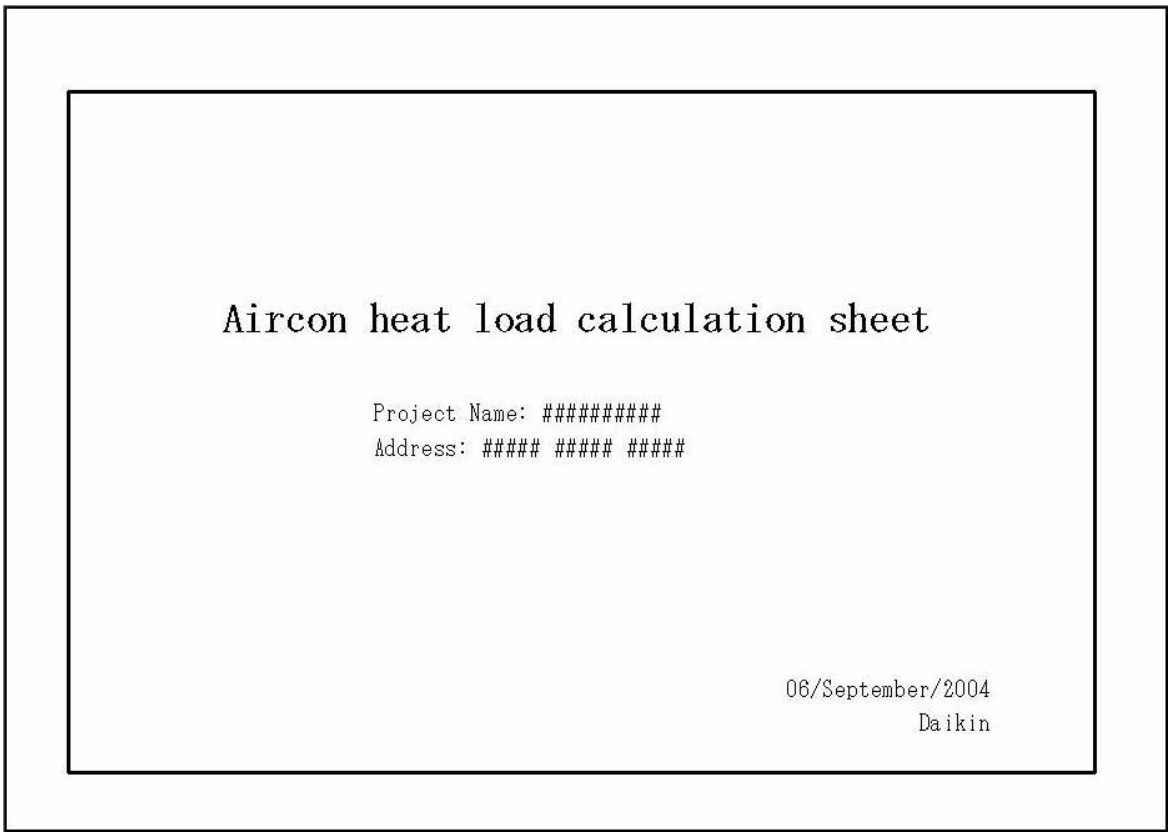
Use of strip sheet: Heat load calculation results are usually output horizontally on paper. However, in some printers (serial printers that use stack form), tables may not be printed in proper orientation. When this happens, check the "Use Strip Sheet" box in the print setup window.



This window is used to make print settings. To make detailed settings for a printer, such as size enlargement and reduction, use the Property option in the Printer section. When the OK button is clicked, printing starts.

The HKGSG's standard output (print) is set to A4 size, horizontal orientation.

[Cover]

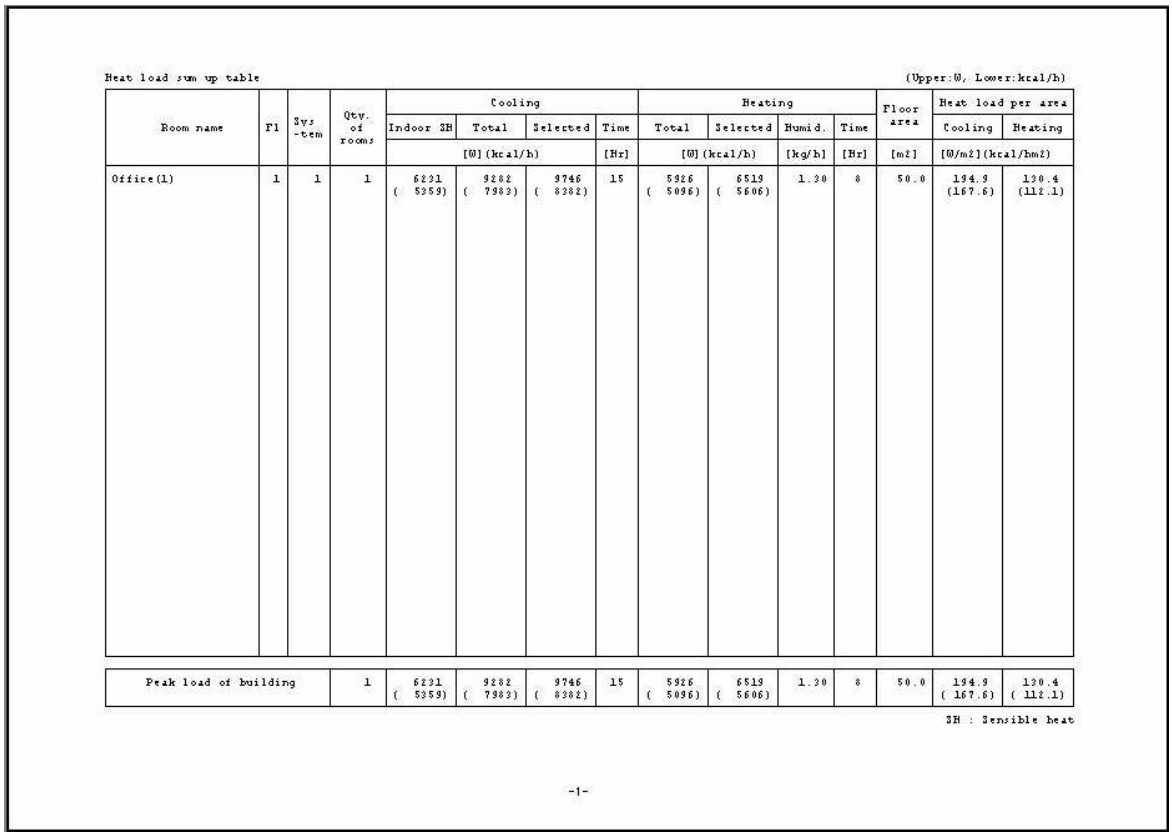


Aircon heat load calculation sheet

Project Name: ##########
Address: ##### ##### #####

06/September/2004
Daikin

[Heat load sum table]



Heat load sum up table (Upper:W, Lower:kcal/h)

Room name	Fl	Sys-tem	Qty. of rooms	Cooling				Heating				Floor area	Heat load per area	
				Indoor SH	Total	Selected	Time	Total	Selected	Humid.	Time		Cooling	Heating
				[W](kcal/h)			[Hr]	[W](kcal/h)		[kg/h]	[Hr]	[m²]	[W/m²](kcal/hm²)	
Office(1)	1	1	1	6231 (5359)	9282 (7983)	9746 (8382)	15	5926 (5096)	6519 (5606)	1.30	8	50.0	194.9 (167.6)	130.4 (112.1)
Peak load of building			1	6231 (5359)	9282 (7983)	9746 (8382)	15	5926 (5096)	6519 (5606)	1.30	8	50.0	194.9 (167.6)	130.4 (112.1)

SH : Sensible heat

-1-

[System heat load sum table]

Table of system heat load (Upper:W, Lower:kcal/h)

Sys-tem	Cooling							Heating						
	Time	F/A vol	Indoor SH	Indoor	Outside	Total	Selected	Time	F/A vol	Indoor	Outside	Total	Selected	Humid.
	[Hr]	[m3/h]	[W] (kcal/h)					[Hr]	[m3/h]	[W] (kcal/h)				[kg/h]
1	15	200	6231 (5359)	7212 (6202)	2070 (1780)	9282 (7983)	9746 (8382)	8	200	4827 (4150)	1089 (937)	5926 (5096)	6519 (5606)	1.30

F/A : Fresh air
SH : Sensible heat

-2-

[System table]

System table

System	Room name	Floor	Rooms
1	Office(1)	1	1

System	Room name	Floor	Rooms

-3-

[System heat load (cooling)]

Table of System heat load

System
1

[Cooling Load] [W] (kcal/h)

Time	F/A cond.		Outer Wall	Roof & Ceiling	Inner Wall	Floor	Window	Infiltration		Human body		Light -ing	Equipments		Indoor heat		Fresh air	Total heat load
	CDB	%RH						SH	LH	SH	LH		SH	LH	SH	LH		
1	22.0	68.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
2	21.7	68.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
3	21.6	68.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
4	21.4	68.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
5	21.3	68.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
6	21.7	68.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
7	22.7	67.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
8	24.2	67.5	0	0	0	0	616	0	52	560	760	1160	0	0	2296	812	285	3523 (3038)
9	26.1	66.8	0	0	0	0	746	1	83	560	760	1160	0	0	2467	842	625	3935 (3264)
10	28.1	66.4	0	65	0	0	994	19	122	560	760	1160	0	0	2798	882	1040	4720 (4059)
11	30.0	65.7	21	335	0	0	1180	36	160	560	760	1160	0	0	3292	920	1449	5661 (4868)
12	31.5	65.2	109	691	0	0	1305	49	194	560	760	1160	0	0	3874	954	1797	6625 (5698)
13	32.5	65.1	236	1091	0	0	1582	58	218	560	760	1160	0	0	4687	978	2047	7712 (6632)
14	32.8	65.2	354	1458	0	0	1983	61	227	560	760	1160	0	0	5576	987	2133	8636 (7479)
*15	32.6	65.1	476	1771	0	0	2203	59	221	560	760	1160	0	0	6231	981	2070	9282 (7983)
16	31.7	65.5	602	1966	0	0	2122	51	200	560	760	1160	0	0	6461	960	1860	9281 (7982)
17	30.5	65.6	705	2020	0	0	2001	40	171	560	760	1160	0	0	6486	931	1565	8982 (7725)
18	28.9	66.1	775	1944	0	0	1794	26	127	560	760	1160	0	0	6259	897	1209	8265 (7194)
19	27.1	66.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
20	25.5	67.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
21	24.2	67.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
22	23.5	67.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
23	22.8	67.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
24	22.4	67.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)

-4-

[System heat load (heating)]

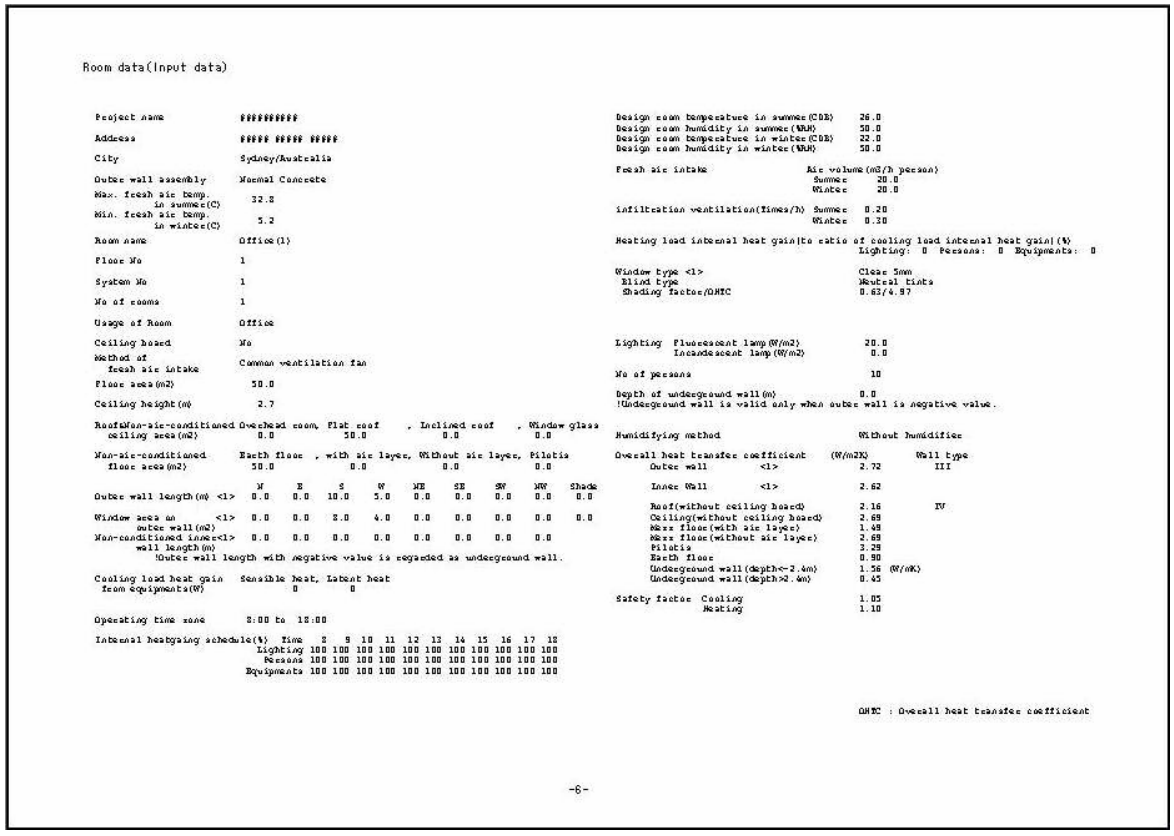
[Heating Load] [W] (kcal/h)

Time	F/A cond.		Outer Wall	Roof & Ceiling	Inner Wall	Floor	Window	Infiltration		Human body		Light -ing	Equipments		Indoor heat		Fresh air	Total heat load
	CDB	%RH						SH	LH	SH	LH		SH	LH	SH	LH		
1	6.7	72.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
2	6.4	72.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
3	6.1	72.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
4	5.8	75.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
5	5.6	74.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
6	5.4	75.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
7	5.2	76.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
* 8	5.5	75.2	1407	1782	0	222	1083	243	149	0	0	0	0	0	4837	149	1089	5926 (5096)
9	6.4	72.3	1220	1685	0	222	1023	229	145	0	0	0	0	0	4589	145	1030	5618 (4832)
10	7.7	70.8	1219	1544	0	222	938	210	134	0	0	0	0	0	4222	134	944	5177 (4452)
11	9.2	66.7	1092	1382	0	222	840	188	127	0	0	0	0	0	3824	127	845	4669 (4015)
12	10.5	63.6	981	1242	0	222	754	169	119	0	0	0	0	0	3468	119	759	4227 (3635)
13	11.4	61.1	904	1145	0	222	696	156	116	0	0	0	0	0	3222	116	700	3923 (3374)
14	11.8	59.5	870	1102	0	222	669	150	116	0	0	0	0	0	3112	116	673	3786 (3256)
15	11.6	60.2	887	1123	0	222	682	153	116	0	0	0	0	0	3167	116	686	3853 (3314)
16	11.2	61.5	912	1156	0	222	702	157	116	0	0	0	0	0	3249	116	706	3955 (3401)
17	10.8	62.4	955	1210	0	222	735	165	119	0	0	0	0	0	3387	119	739	4126 (3548)
18	10.1	64.1	1014	1393	0	222	780	175	123	0	0	0	0	0	4224	123	785	5009 (4308)
19	9.4	65.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
20	8.9	66.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
21	8.3	67.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
22	7.9	69.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
23	7.4	70.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)
24	7.0	71.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 (0)

Total indoor heat load is not contained latent heat.

-5-

[Input room data]



Room data(Input data)

Project name	##########	Design room temperature in summer(CDB)	26.0
Address	##### ##### #####	Design room humidity in summer(%RH)	50.0
City	Sydney/Australia	Design room temperature in winter(CDB)	22.0
Outer wall assembly	Normal Concrete	Design room humidity in winter(%RH)	50.0
Max. fresh air temp. in summer(C)	32.8	Fresh air intake	Air volume(m3/h person) Summer 20.0 Winter 20.0
Min. fresh air temp. in winter(C)	5.2	Infiltration ventilation(times/h)	Summer 0.20 Winter 0.30
Room name	Office(1)	Heating load internal heat gain	to ratio of cooling load internal heat gain (%) Lighting: 0 Persons: 0 Equipments: 0
Floor No	1		
System No	1	Window type <1>	Clear 5mm
No of rooms	1	Blind type	Neutral tints
Usage of Room	Office	Shading factor/OHTC	0.63/4.97
Ceiling board	No	Lighting Fluorescent lamp(W/m2)	20.0
Method of fresh air intake	Common ventilation fan	Incandescent lamp(W/m2)	0.0
Floor area(m2)	50.0	No of persons	10
Ceiling height(m)	2.7	Depth of underground wall(m)	0.0
Roof&Non-air-conditioned ceiling area(m2)	Overhead room, Flat roof 0.0, Inclined roof 50.0, Window glass 0.0	!Underground wall is valid only when outer wall is negative value.	
Non-air-conditioned floor area(m2)	Earth floor 50.0, with air layer, 0.0, Without air layer, 0.0, Pilotis 0.0	Humidifying method	Without humidifier

	N	E	S	W	NE	SE	SW	NW	Shade
Outer wall length(m) <1>	0.0	0.0	10.0	5.0	0.0	0.0	0.0	0.0	0.0
Window area on outer wall(m2) <1>	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	0.0
Non-conditioned inner wall length(m) <1>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

!Outer wall length with negative value is regarded as underground wall.

Cooling load heat gain from equipments(W): Sensible heat 0, Latent heat 0

Operating time zone: 8:00 to 18:00

Internal heatgaing schedule(%)

Time	8	9	10	11	12	13	14	15	16	17	18
Lighting	100	100	100	100	100	100	100	100	100	100	100
Persons	100	100	100	100	100	100	100	100	100	100	100
Equipments	100	100	100	100	100	100	100	100	100	100	100

Overall heat transfer coefficient

		(W/m2K)	Wall type
Outer wall	<1>	2.72	III
Inner Wall	<1>	2.62	
Roof(without ceiling board)		2.16	IV
Ceiling(without ceiling board)		2.69	
Mezz floor(with air layer)		1.48	
Mezz floor(without air layer)		2.69	
Pilotis		3.29	
Earth floor		0.90	
Underground wall(depth<=2.4m)		1.56	(W/mK)
Underground wall(depth>2.4m)		0.45	

Safety factor: Cooling 1.05, Heating 1.10

OHTC : Overall heat transfer coefficient

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[Room heat load table]

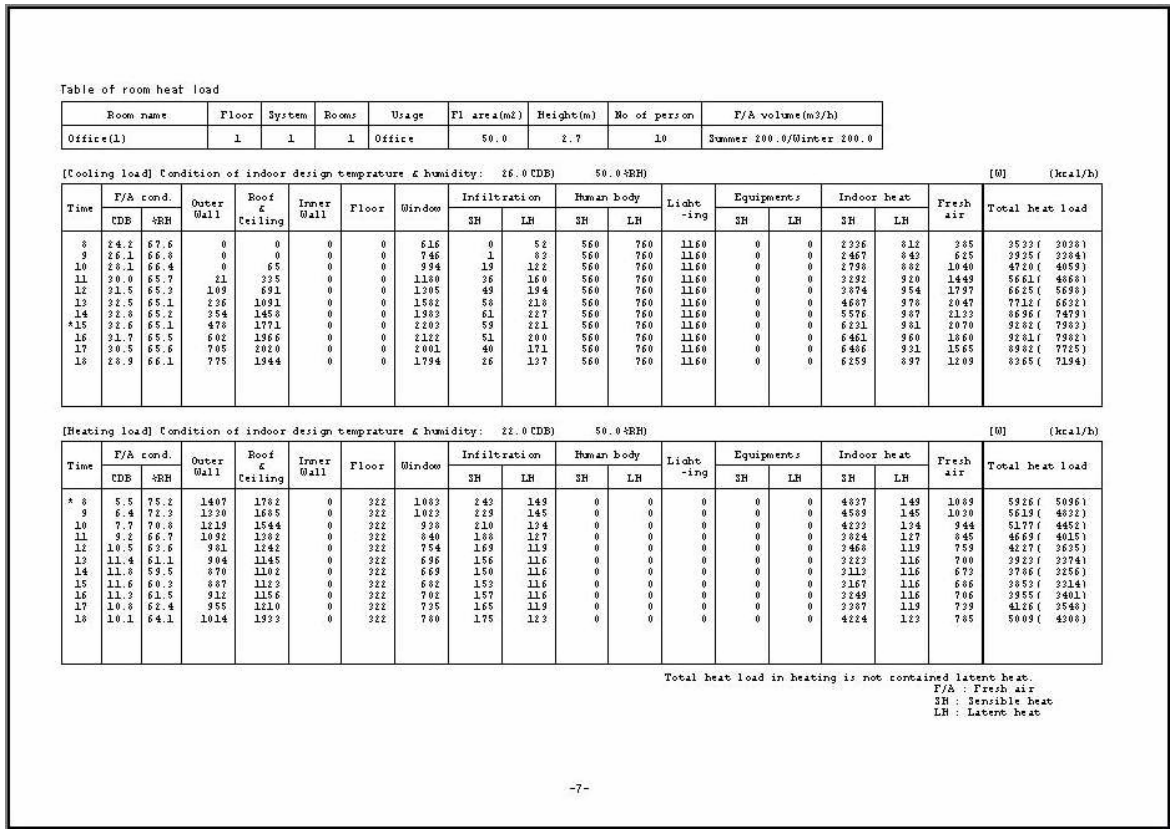

Table of room heat load

Room name	Floor	System	Rooms	Usage	Fl area(m2)	Height(m)	No of person	F/A volume(m3/h)
Office(1)	1	1	1	Office	50.0	2.7	10	Summer 200.0/Winter 200.0

[Cooling load] Condition of indoor design temprature & humidity: 26.0 CDB 50.0 %RH [W] (kcal/h)

Time	F/A cond. CDB	F/A cond. %RH	Outer Wall	Roof & Ceiling	Inner Wall	Floor	Window	Infiltration SH	Infiltration LH	Human body SH	Human body LH	Light -ing	Equipments SH	Equipments LH	Indoor heat SH	Indoor heat LH	Fresh air	Total heat load
8	24.2	67.6	0	0	0	0	616	0	52	560	760	1160	0	0	2336	812	285	3533 (3038)
9	26.1	66.8	0	0	0	0	746	1	83	560	760	1160	0	0	2467	842	625	3925 (3284)
10	28.1	66.4	0	65	0	0	994	19	122	560	760	1160	0	0	2738	882	1040	4720 (4059)
11	30.0	65.7	21	325	0	0	1180	36	150	560	760	1160	0	0	2932	920	1449	5661 (4868)
12	31.5	65.2	109	691	0	0	1305	49	194	560	760	1160	0	0	3074	954	1797	6625 (5698)
13	32.5	65.1	236	1091	0	0	1582	58	218	560	760	1160	0	0	4587	978	2047	7712 (6632)
14	32.8	65.2	354	1458	0	0	1983	61	227	560	760	1160	0	0	5576	987	2133	8696 (7479)
*15	32.6	65.1	478	1771	0	0	2203	59	221	560	760	1160	0	0	6231	981	2070	9282 (7983)
16	31.7	65.5	602	1966	0	0	2122	51	200	560	760	1160	0	0	6461	960	1860	9281 (7982)
17	30.5	65.6	705	2020	0	0	2001	40	171	560	760	1160	0	0	6486	931	1565	8982 (7725)
18	28.9	66.1	775	1944	0	0	1794	26	127	560	760	1160	0	0	6259	897	1209	8365 (7194)

[Heating load] Condition of indoor design temprature & humidity: 22.0 CDB 50.0 %RH [W] (kcal/h)

Time	F/A cond. CDB	F/A cond. %RH	Outer Wall	Roof & Ceiling	Inner Wall	Floor	Window	Infiltration SH	Infiltration LH	Human body SH	Human body LH	Light -ing	Equipments SH	Equipments LH	Indoor heat SH	Indoor heat LH	Fresh air	Total heat load
* 8	5.5	75.2	1407	1782	0	322	1083	243	149	0	0	0	0	0	4827	149	1089	5926 (5096)
9	6.4	72.2	1320	1685	0	322	1022	229	145	0	0	0	0	0	4589	145	1020	5619 (4832)
10	7.7	70.5	1219	1544	0	322	938	210	134	0	0	0	0	0	4223	134	944	5177 (4452)
11	9.2	68.7	1092	1382	0	322	840	188	127	0	0	0	0	0	3824	127	845	4669 (4015)
12	10.5	67.6	981	1242	0	322	754	169	119	0	0	0	0	0	3468	119	759	4227 (3635)
13	11.4	67.1	904	1145	0	322	696	156	116	0	0	0	0	0	3223	116	700	3923 (3374)
14	11.8	66.5	870	1102	0	322	669	150	116	0	0	0	0	0	3113	116	673	3786 (3256)
15	11.6	66.2	867	1123	0	322	682	153	116	0	0	0	0	0	3167	116	686	3853 (3314)
16	11.2	67.5	912	1156	0	322	702	157	116	0	0	0	0	0	3249	116	706	3955 (3401)
17	10.8	67.4	955	1210	0	322	735	165	119	0	0	0	0	0	3387	119	739	4126 (3548)
18	10.1	64.1	1014	1333	0	322	780	175	123	0	0	0	0	0	4224	123	785	5009 (4308)

Total heat load in heating is not contained latent heat.
F/A : Fresh air
SH : Sensible heat
LH : Latent heat

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[Peak load detail table (cooling)]

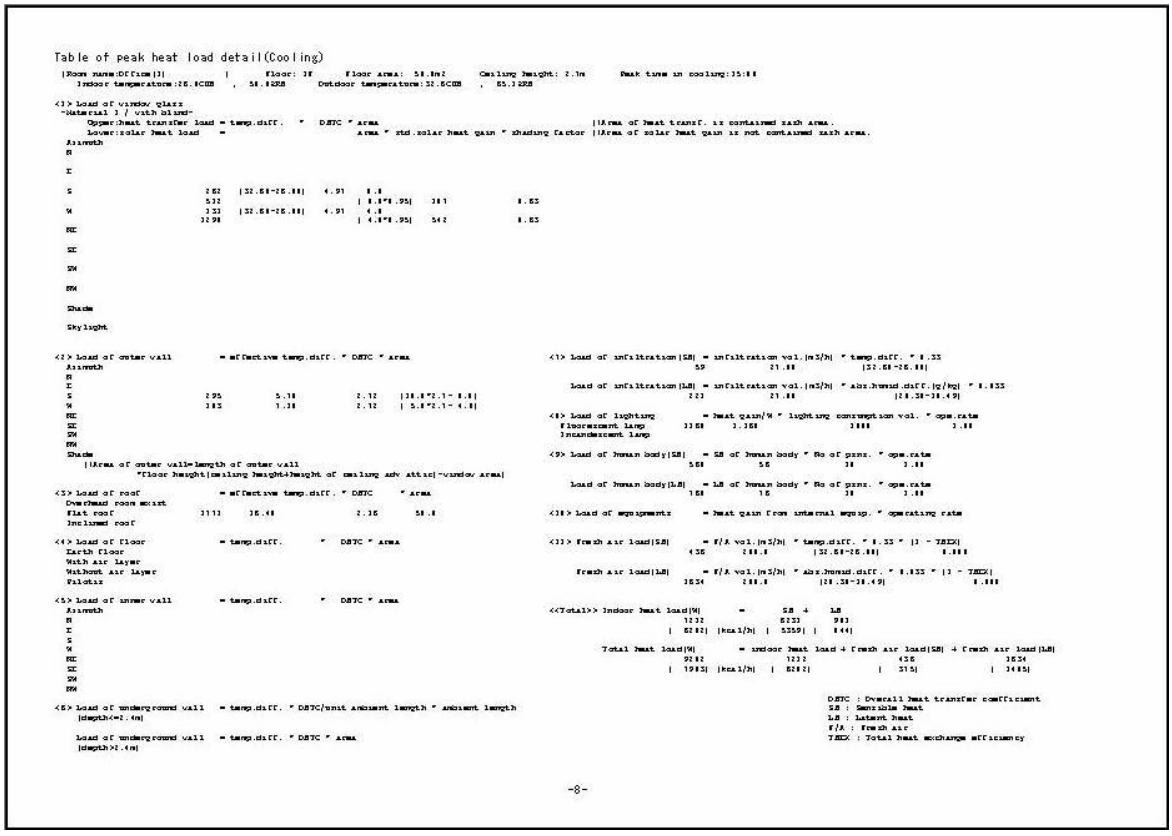

Table of peak heat load detail(Cooling)

|Room name:Office(3)| | Floor: 3F | Floor area: 58.8m2 | Ceiling height: 2.7m | Peak time in cooling:15:00

Indoor temperature:26.0CDB , 58.0RH | Outdoor temperature:32.6CDB , 65.1RH

<3> Load of window glass
"Material 3 / with blind"
Upper:heat transfer load = temp.diff. * DETC * area | |Area of heat transf. is contained each area.
Lower:solar heat load = area * std.solar heat gain * shading factor | |Area of solar heat gain is not contained each area.

S	2.62	(32.6-26.0)	4.91	8.8	
	5.32			8.8*0.95	38.1	8.63
W	2.53	(32.6-26.0)	4.91	4.4	
	32.98			4.4*0.95	54.2	8.63

<2> Load of outer wall = effective temp.diff. * DETC * area

S	2.95	5.38	2.12	(38.8*2.1- 8.8)
W	3.83	1.38	2.12	(5.8*2.1- 4.4)

Shade
|(Area of outer wall-length of outer wall *floor height|ceiling height-height of ceiling adv.attic|-window area|

<3> Load of roof = effective temp.diff. * DETC * area

Flat roof	3.13	26.48	2.26	58.8

<4> Load of floor = temp.diff. * DETC * area

Earth floor
With air layer
Without air layer
Pilotis

<5> Load of inner wall = temp.diff. * DETC * area

<6> Load of underground wall = temp.diff. * DETC/unit ambient length * ambient length
(depth<=2.4m)

Load of underground wall = temp.diff. * DETC * area
(depth>2.4m)

<1> Load of infiltration|SB| = infiltration vol.|m3/h| * temp.diff. * 0.33

	59	21.88	(32.6-26.0)

Load of infiltration|LB| = infiltration vol.|m3/h| * abs.humid.diff.|g/kg| * 0.833

	223	21.88	(28.38-38.49)

<8> Load of lighting = heat gain/W * lighting consumption vol. * ope.rate

Fluorescent lamp	33.68	1.38	38.8
Incandescent lamp			

<9> Load of human body|SB| = SB of human body * No of pers. * ope.rate

	5.68	5.6	38	1.88

Load of human body|LB| = LB of human body * No of pers. * ope.rate

	1.68	1.6	38	1.88

<10> Load of equipments = heat gain from internal equip. * operating rate

<11> Fresh air load|SB| = F/A vol.|m3/h| * temp.diff. * 0.33 * (1 - ZEEX)|

	4.36	288.8	(32.6-26.0)|	8.888

Fresh air load|LB| = F/A vol.|m3/h| * abs.humid.diff. * 0.833 * (1 - ZEEX)|

	36.34	288.8	(28.38-38.49)|	8.888

<<Total>> Indoor heat load|W| = SB + LB

	1232	8233	983
	8282 |kcal/h|	5359|	844

Total heat load|W| = indoor heat load + fresh air load|SB| + fresh air load|LB|

	9282	1232	436	3634
	19815 |kcal/h|	8282|	3715|	3485

DETC : Overall heat transfer coefficient
SB : Sensible heat
LB : Latent heat
F/A : Fresh air
ZEEX : Total heat exchange efficiency

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[Peak load detail table (heating)]

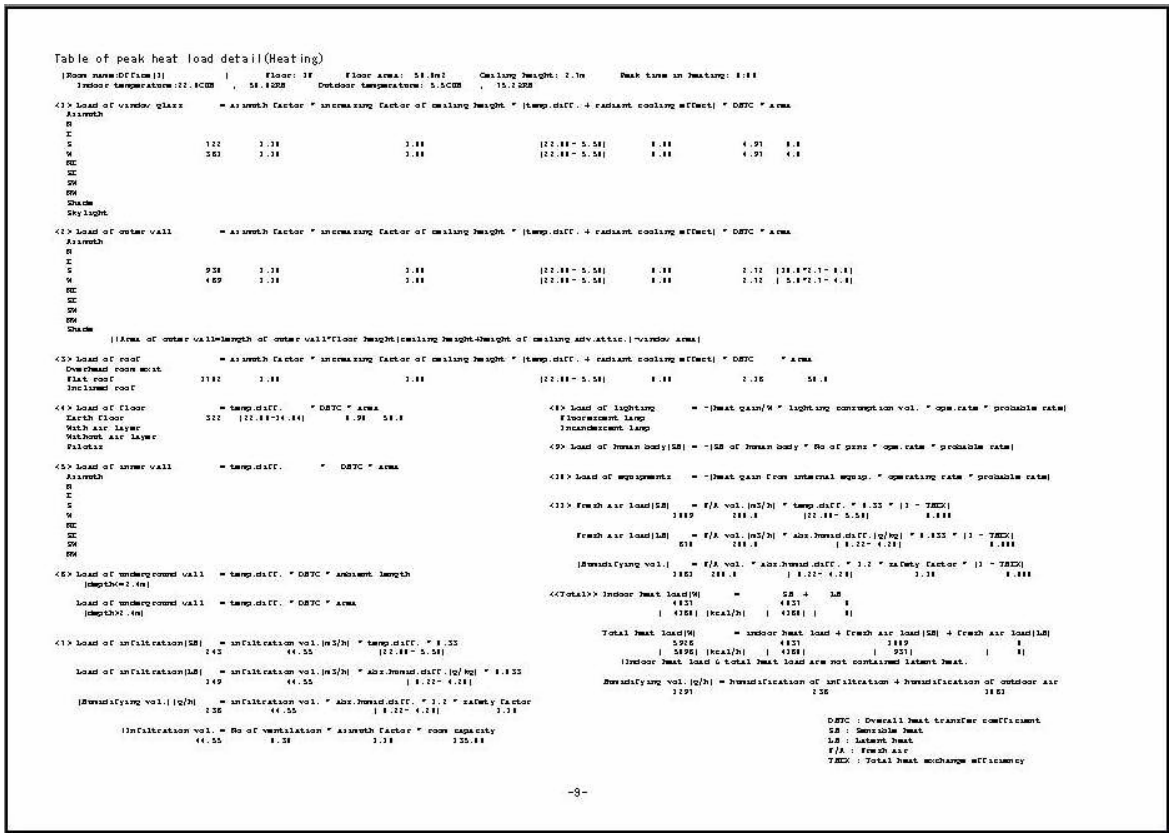

Table of peak heat load detail(Heating)

|Room name:Office(3)| | Floor: 3F | Floor area: 58.8m2 | Ceiling height: 2.7m | Peak time in heating: 8:00

Indoor temperature:22.8CDB , 58.8RH | Outdoor temperature: 5.5CDB , 15.2RH

<3> Load of window glass = azimuth factor * increasing factor of ceiling height * |temp.diff. + radiant cooling effect| * DETC * area

S	1.22	1.38	1.88	|22.88 - 5.58|	8.88	4.91	8.8
W	5.83	1.38	1.88	|22.88 - 5.58|	8.88	4.91	4.8

Shade
Skylight

<2> Load of outer wall = azimuth factor * increasing factor of ceiling height * |temp.diff. + radiant cooling effect| * DETC * area

S	9.38	1.38	1.88	|22.88 - 5.58|	8.88	2.12	(38.8*2.1- 8.8)
W	4.69	1.38	1.88	|22.88 - 5.58|	8.88	2.12	(5.8*2.1- 4.4)

Shade
|(Area of outer wall-length of outer wall*floor height|ceiling height-height of ceiling adv.attic.|-window area|

<3> Load of roof = azimuth factor * increasing factor of ceiling height * |temp.diff. + radiant cooling effect| * DETC * area

Flat roof	3.82	1.88	1.88	|22.88 - 5.58|	8.88	2.26	58.8

<4> Load of floor = temp.diff. * DETC * area

Earth floor	5.22	|22.88-34.84|	8.98	58.8

With air layer
Without air layer
Pilotis

<5> Load of inner wall = temp.diff. * DETC * area

<6> Load of underground wall = temp.diff. * DETC * ambient length
(depth<=2.4m)

Load of underground wall = temp.diff. * DETC * area
(depth>2.4m)

<1> Load of infiltration|SB| = infiltration vol.|m3/h| * temp.diff. * 0.33

	2.43	44.55	|22.88 - 5.58|

Load of infiltration|LB| = infiltration vol.|m3/h| * abs.humid.diff.|g/kg| * 0.833

	3.49	44.55		8.22- 4.28|

|Humidifying vol.|g/h| = infiltration vol. * abs.humid.diff. * 1.2 * safety factor

	2.36	44.55		8.22- 4.28|	3.38

|Infiltration vol. = No of ventilation * azimuth factor * room capacity

	44.55	8.38	3.38	335.88

<8> Load of lighting = -|heat gain/W * lighting consumption vol. * ope.rate * probable rate|
Fluorescent lamp
Incandescent lamp

<9> Load of human body|SB| = -|SB of human body * No of pers. * ope.rate * probable rate|

<10> Load of equipments = -|heat gain from internal equip. * operating rate * probable rate|

<11> Fresh air load|SB| = F/A vol.|m3/h| * temp.diff. * 0.33 * (1 - ZEEX)|

	3.89	288.8	|22.88- 5.58|	8.888

Fresh air load|LB| = F/A vol.|m3/h| * abs.humid.diff.|g/kg| * 0.833 * (1 - ZEEX)|

	6.18	288.8		8.22- 4.28|	8.888

|Humidifying vol.| = F/A vol. * abs.humid.diff. * 1.2 * safety factor * (1 - ZEEX)|

	3.63	288.8		8.22- 4.28|	3.38	8.888

<<Total>> Indoor heat load|W| = SB + LB

	4851	4851	8
	4358| |kcal/h|	4358|	8

Total heat load|W| = indoor heat load + fresh air load|SB| + fresh air load|LB|

	5926	4851	1089	8
	5096| |kcal/h|	4358|	951|	8

|Indoor heat load & total heat load are not contained latent heat.

Humidifying vol.|g/h| = humidification of infiltration + humidification of outdoor air

	12.91	2.36	10.63

DETC : Overall heat transfer coefficient
SB : Sensible heat
LB : Latent heat
F/A : Fresh air
ZEEX : Total heat exchange efficiency

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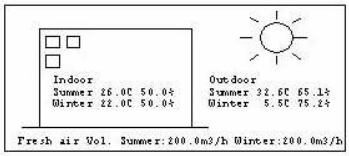
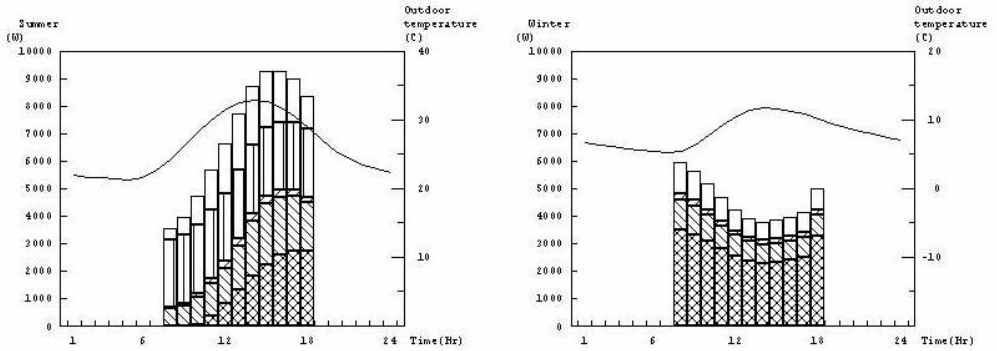
[Graphs]

Heat load graph

Room name	Floor	System	Rooms	Usage	Fl area(m2)	Height(m)	No of person
Office(1)	1	1	1	Office	50.0	2.7	10





[Detail]

(W)	Time	Outer wall	Roof & Ceiling	Inner wall	Floor	Window	Infiltration		Human body		Light -ing	Equipments		Fresh air	Total heat load	Selected heat load
							SH	LH	SH	LH		SH	LH			
Summer	15	478	1771	0	0	2203	59	221	560	760	1160	0	0	2070	9282	9746
Winter	8	1407	1782	0	322	1083	242	149	0	0	0	0	0	1089	5926	6519

Note) Total indoor heat load & selected heat load are not contained latent heat.
SH : Sensible heat
LH : Latent heat

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7. Design data and standard data change

7.1 Standard Data Change

In the HKGSG, selection of the usage of room automatically sets typical values in the standard data of rooms. However, those values may not apply in some projects.
If the initial conditions listed in the Appendixes do not apply to the conditions of a particular project, use "Change Std. Data" to make changes.

The standard data items include the following.

O.H.T.C. ---------- Allows change of heat transfer coefficient according to the outer wall assemblies.

Temp& Humid ---------- Allows change of room temperature and humidity for summer and winter.

Schedule ---------- Allows change of schedules such as operating time zone (time period of heat load calculation) and lighting, number of persons and calorification from equipments.

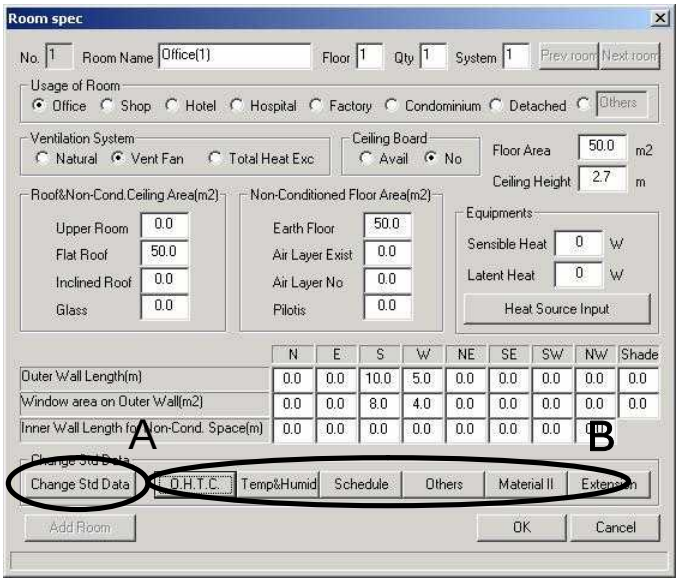
Others ---------- Allows change of fresh air intake, no. of infiltration ventilation, safety factor, window glass type, blind type, humidifying method, lighting, number of persons, underground wall and attic height.

Material II ---------- Allows setting of different heat transfer coefficient values that are different from those of normal outer walls, inner walls, windows and blinds. (Maximum of two types including normal materials)

Extension ---------- Allows change of values in exothermic volume of human body per person and next room conditions.

*** Extension does not usually have to be changed.**

[Standard data change]



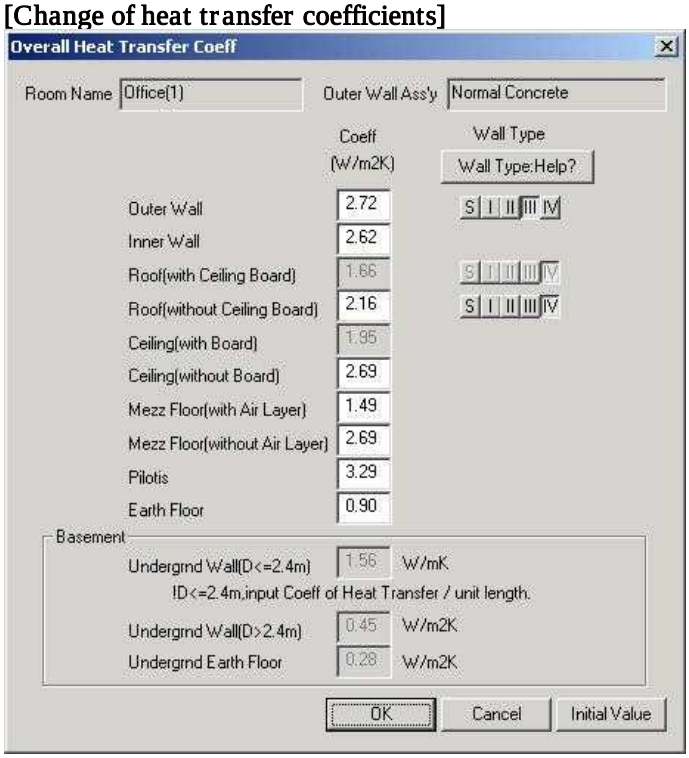
Use the "Room Spec" input screen to change the standard data of rooms. Select the room for which the standard data is to be changed. (Regarding the method of selecting the "Room Spec" screen, refer to "[5] Data input method.")

When the **Change Std. Data** button at section A is clicked, buttons at section B become active.

Use these buttons to select items to change.

Each room can be set with its own standard

[Change of heat transfer coefficients]



When the **O.H.T.C.** button is clicked, the screen shown at the left is displayed. Change data as needed.

Overall Heat Transfer Coefficient

Rate of outside air heat transmitted into room. The value of heat transfer coefficient K of a wall is obtained based on the material thickness, heat conductivity coefficient of material and heat conductivity coefficients of internal and external surfaces.

Wall Type

Effective temperature difference varies according to the wall type.

* Heat transfer coefficients for underground items can be changed only for underground floors and underground walls (when the outer wall length is a negative value).

* For roof and ceiling, input locations are different depending on whether or not the room has a ceiling board.

The wall type does not automatically change when the heat transfer coefficient is changed. Select an appropriate wall type according to the assembly type by referring to the wall type table (Appendix).

Heat load calculation uses the following formula to obtain the basic heat load values for individual building structure types.

Heat load = heat transfer coefficient
× effective temperature different
× area

(Other factors may also be used in some cases.)

When the value of the heat transfer coefficient is small (high heat insulating performance), the heat load becomes smaller.

[Formula for heat transfer coefficient calculation]

$$K = \frac{1}{\frac{1}{\alpha o} + \frac{\tau 1}{\lambda 1} + \frac{\tau 2}{\lambda 2} + \cdots + \frac{\tau n}{\lambda n} + \frac{1}{\alpha i}}$$

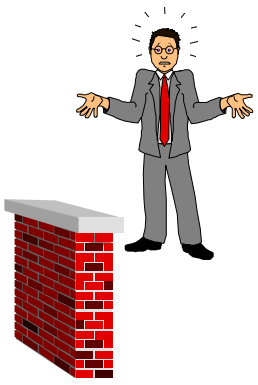
K :Heat transfer coefficient ($W/m^2 \cdot K$)

αo :Heat conductivity coefficient of external surface ($W/m^2 \cdot K$)

αi :Heat conductivity coefficient of internal surface ($W/m^2 \cdot K$)

λi :Heat conductivity coefficient of i-layer material ($W/m \cdot K$)

τi :Thickness of i-layer material (m)

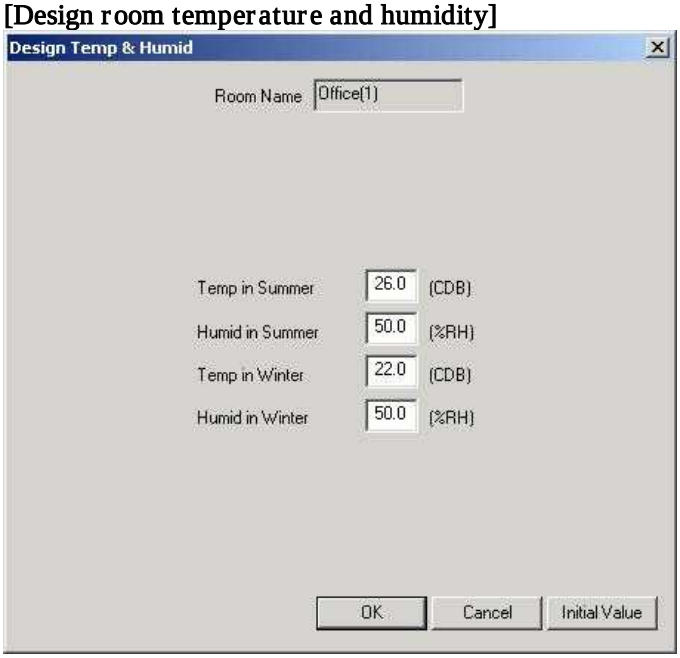


The HKGSG uses effective temperature difference for outer walls and roofs. In effective temperature difference values, the solar heat loads and outside air and the delay in heat transmission caused by the heat storing capacity of walls are taken into consideration.

[Explanation of wall types]

Depending on the heat storing capacity and heat conducting timedelay, the effective temperature difference varies from wall to wall. Walls are categorized according to the wall material type and thickness, and each wall type is given a specific value for its effective temperature difference. Walls are generally classified into I, II, III and IV, as indicated in the wall type table (Appendix). In the HKGSG, Type S is also added. This wall type is set with no effective temperature difference value, and used for materials that do not store heat, such as slate roofs.

[Design room temperature and humidity]

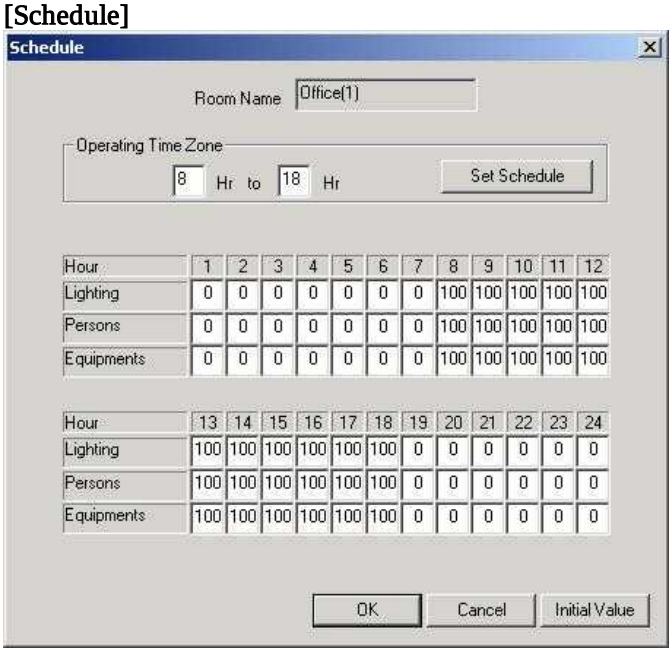


When **Temp & Humid** button is clicked, the screen shown at the left is displayed. Change data as needed.

Change of the temperature value alters the outside air temperature difference and the effective temperature difference determined according to the wall heat storing capacity, both of which are used in heat load calculation. (It changes the heat load value of the outer wall assemblies. The larger the temperature difference is, the higher the heat load becomes.)

Change of the humidity value alters the latent heat values of the infiltration load and outside air load as well as the amount of humidification in heating operation.

[Schedule]



When the **Schedule** button is clicked, the screen shown at the left is displayed. Change data as needed. Numerical values indicate operating rates.

When the data of the operating time zone is changed, click the **Schedule** button.
When this button is clicked, the operating time periods listed below change.

Operating Time Zone

Heat load calculation is conducted for a period of time specified by the operating time zone.
Calculation results do not include heat loads generated outside of the operating time zone.
The initial values of operating time zone are different depending on the usage of room.
(Examples of initial operating time zone settings)
Examples

8	Hr –	18	Hr
20	Hr –	5	Hr (Time zone can extend over midnight in HKGSG)

Lighting, no. of persons, operating rate of equipment with calorification from internal equipment (initial value: 100%)

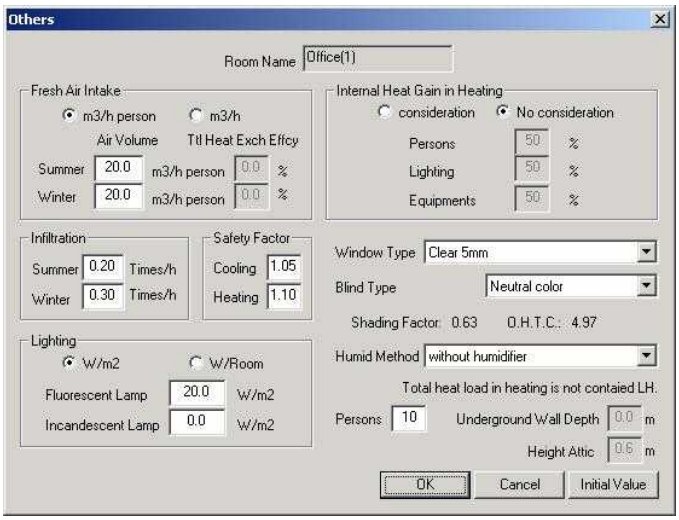
Percentage used in heat load calculation can be set for each hour of the day (24 hours). (0% to 100%)

Note1: Values set for hours outside the air conditioner operating time zone are not used in heat load calculation.

(Example) These settings can be used in the following cases.
Equipment is always shut down at 4:00, so the calorification from internal equipment is 0% after 4:00.
Outside light is bright from 9:00 to 16:00, so 70% is used for the lighting setting during that time.

Note 2: Heat load calculation is performed to provide a safety margin (maximum load values) in its results. Therefore, change the settings only when it is confirmed that the load reduction (setting change) occurs without a fail

[Others]



When the **Others** button is clicked, the screen shown at the left is displayed.
Change data as needed.

Conditions in "Others" include those that are greatly affected by the usage of room and other settings (floor no., floor area, ceiling height). If the usage of room and other settings are changed after settings in "Others" are changed, a message appears and asks if initial values are used for condition settings. Therefore, be careful when changing settings in "Others."

[Room specification items][Other condition data items that automatically change]

Usage of room ----------	Number of persons, infiltration, lighting, blind type
Floor no. (underground, above ground)	Underground wall height
Floor area ----------	Number of persons
Ceiling height ----------	Underground wall depth (in the case of underground floor)

[Fresh Air Intake]

*** Fresh air intake volume can be input only when "Natural ventilation" or "Total heat exchanger" is selected in the ventilation system setting on the "Room Spec" screen.**

(1) Air Volume

Allows selection of "Amount of fresh air/ person" or "Set air volume."
(Initial value: Amount of fresh air/ person 20.0 m^3/h-person)

Amount of fresh air/person

Set the amount of fresh air intake per person in room (m^3/h-person)
(Fresh air intake volume = amount of fresh air intake per person × number of persons)

Set Air Volume

Set the amount of fresh air intake into room per hour (m^3/h)

(2) Total Heat Exchange Efficiency

(input possible only when "Total heat exchange" is selected in ventilation system setting on "Room Spec" screen)
Input the total heat exchanger efficiency (%). (Initial value: 60% for both summer and winter)

Estimation of fresh air intake volume

Generally, the number of persons in a room cannot be determined or varies from time to time. The number of persons per area also differs in each room in the same zone. Therefore, values shown in the following table are used for fresh air intake volume per 1m^2 floor area in the program.
If an exhaust ventilation system is provided in a room (such as lavatory and kitchen) and installed machines produce exhausts such as in a factory, the above calculation results are compared with the amount of exhaust air, and the largest value is used as the volume of fresh air intake.

Volume of fresh air intake required per floor area unit (m^3/m^2h) (Reference values applicable in Japan)

(m^3/m^2h)	Office	Restaurant, department store	Conference room	Theater	Residence, hotel guest room	Lobby, entrance, hall
Recommended value	5	10	15	25	3	3
Minimum value	3	6	10	25	2	2

[Infiltration]

Infiltration refers to the amount of outside air that enters a room through doors, gaps around window frames and gaps in outer walls. Air usually enters a room because of the temperature and pressure differences between inside and outside, and wind pressure. (Infiltration refers to the volume of outside air that enters a room naturally.)

In the HKGSG, the input of this item indicates the number of times the room air is replaced per hour based on a ventilation cycle method.
The initial value is different depending on the usage of room.

No. of infiltration ventilation (times/h)
(Reference values applicable in Japan)

Outer wall assemblies	No. of ventilation (times/h)	
	In heating operation	In cooling operation
Concrete structure (large scale)	0 to 0.2	0
Concrete structure (small scale)	0.2 to 0.6	0.1 to 0.2
Western-style wooden structure	0.3 to 0.6	0.1 to 0.3
Japanese-style wooden structure	0.5 to 1.0	0.2 to 0.6

There is no problem in using the ventilation cycle method for small rooms. For large rooms, however, the ventilation cycle method tends to produce overestimated values due to large room capacity. Therefore, be careful of selecting input values for large rooms.

Example

0.2 time in summer → Entire air in room is replaced every 5 hours.

* Infiltration volume per hour (m^3/h) = no. of ventilation (times/h) × floor area (m^2) × ceiling height

[Safety factor]

This setting is used to calculate the select heat load of air conditioner.

Select heat load (required capacity) = total heat load × safety factor

Initial value: 1.05 (in summer), 1.10 (in winter)

[Lighting]

This input determines the heat load resulting from lighting. Input the power ratings (W) of fluorescent lamps and incandescent lamps.
(Initial value is different according to the usage of room. Refer to the Appendix.)

* Since lighting load is usually a positive factor in heating operation, the value is not added in calculating heating load.

Lighting load (W) = Calorification per 1 W × power rating (W) of lighting

* Calorification per 1 W is 1 W for incandescent lamps and 1.16 W for fluorescent lamps (including ballast)

[Calorification from internal equipment in heating operation]

During heating operation, calorification from people, lighting and equipment offset external heat loss. Therefore, in conventional manual calculation, it is not taken into consideration in many cases. However, an excessive safety margin can result in overrating of air conditioner capacity. This not only causes uneconomical operation of air conditioners but also lowers the operating efficiency in normal condition. In the HKGSG, it is possible to take into consideration a percentage of internal calorification in heating operation in the calculation of heat load in cooling operation. This setting can be made for each room. (Initial setting: Have no consideration)

Example

The following shows cases in which internal calorification may be taken into consideration in heating.

(1) When extended air conditioner warming up time is acceptable
(2) When steady internal calorification volume is expected
(3) When calorification volume is excessively large

*** Note that heat load becomes small when internal heat gain is taken into consideration in heating.**

[Window type] and [Blind type]

The window type and blind type can be changed. When the window/blind type is changed, the heat transfer coefficient and shading factor used in calculating heat load from glass area also change.
Initial value for window glass: normal glass 5 mm,
Initial value for blind: value set according to usage of room.

[Window type, others]



When "Others" is selected in the window type selection, the settings can be changed as needed.

Window Type ---------- Input the name of window.

Shading Factor ---------- Input the shading factor of window.

Overall Heat Transfer Coefficient -- Input the Overall heat transfer coefficient of window.

Glass Type ---------- Select an appropriate type since the standard solar calorification varies depending on the glass type.

[Humidifying method]

The humidifying method setting allows selection of whether latent heat load is added to total heating load (sensible heat load).

Humidifying method	Latent heat added
Without humidifier	No
Evaporative humidifier	Yes
Pan type humidifier	No
Ultrasonic humidifier	Yes
Steam spray	No
Water spray	Yes
Pressurization spray	Yes

* Regardless of whether or not a humidifying system is used, the amount of humidification is indicated on output tables.

[Number of persons]

Input the number of persons in the room. The value of area per person is set according to the usage of room, and the number of persons setting changes when floor area is input.

Area per person (m^2/person) (Reference values applicable in Japan)

		Typical area	Design value
Office	Office room	5 to 8	5
	Conference room	2 to 5	2
Department store, retail shop	Normal	1 to 4	2.5
	Crowded place	0.5 to 2	0.7
	Fewer people	4 to 8	5
Restaurant		1 to 2	1.7
Theater	Audience section	0.4 to 0.7	0.5
School	Classroom	1.3 to 1.6	1.4
Museum	Exhibition room	2 to 4	2.5
Library	General	1.8 to 3	2
Coffee shop		1.5 to 4	2
Beauty parlor, barber shop		2 to 4	2.5

* Exothermic load of human body is usually calculated as a safety margin. Therefore, it is not added to heating load.

In the audience sections of movie theaters and other theaters, exothermic of human body accounts for majority of heat load. Therefore, obtain an accurate estimation of the number of persons for this input. It should be noted that the number of people in a movie theater sometimes far exceeds the number of seats.

[Underground wall] * Only when applicable

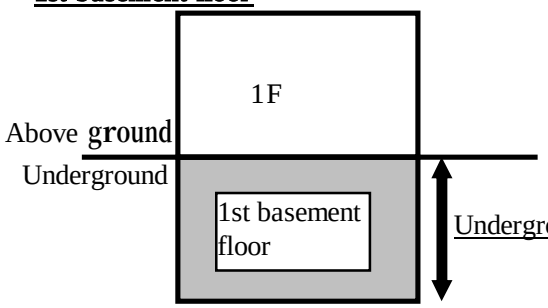
Since the external heat load of an underground wall (including semi-underground wall) is different from that of an above-ground wall, the HKGSG calculates the heat load for an underground wall based on a special calculation method. The HKGSG recognizes a wall as an underground wall when the outer wall length has a negative (-) sign.

The HKGSG uses different calculation methods for a shallow underground wall and a deep underground wall.

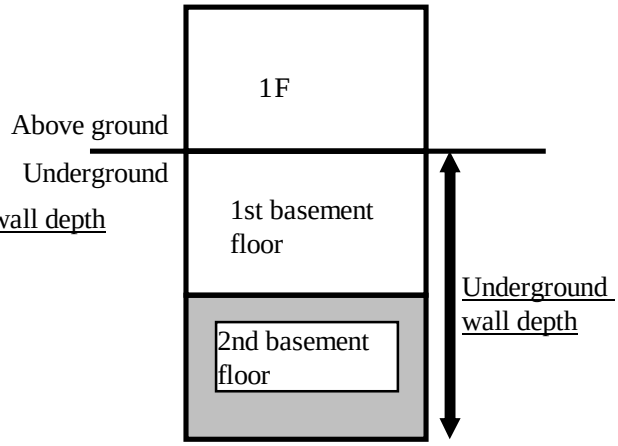
Initial value: Shallow underground wall (2.4 m or less) → Floor height [ceiling height + attic height] × underground floor no.

[Example of underground wall input] * Depth from ground surface is input as underground wall depth.

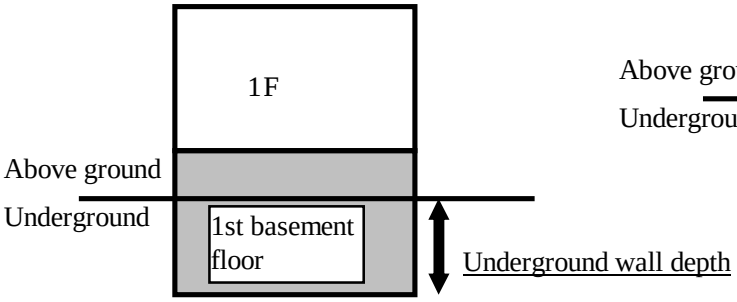
1st basement floor



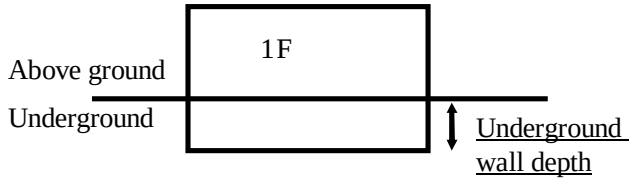
2nd basement floor



1st basement floor with wall partially above



1st floor with wall partially below ground surface



When outer wall length has negative (-) sign
Earth floor
=> Underground earth floor

[HKGSG's definition of underground walls] * Program automatically performs calculation, and there is no need to pay special attention to the following explanation during data input.

(1) Shallow underground walls (less than 2.4 m from ground surface)
Sections that are not deeper than 2.4 m are greatly affected by outside air temperature. Therefore, the temperature difference with the outside air temperature is used in calculating heat load.

Underground wall heat load= Kp X τ p X (Tr – To)

Kp: Heat transfer coefficient per unit periphery (W/mK)

τ p: Ambient length (m)

Tr: Room temperature (DegC) To: Outside air temperature (DegC)

(2) Deep underground walls (more than 2.4 m from ground surface)
For sections that are 2.4 m or more in depth, the heat load received from underground heat (underground temperature) is obtained.

Underground wall heat load = Kb X Ab X (Tr – Tg)

Kb: Heat transfer coefficient of underground wall (W/m^2·K)

Ab: Underground wall area (m^2)

Tr: Room temperature (DegC) Tg: Underground temperature (DegC)

[Underground temperature] Underground temperature at depth of x (m)

Heating $Tx = \frac{Ts + To}{2} - \frac{Ts - To}{2} X e^{-0.4x}$

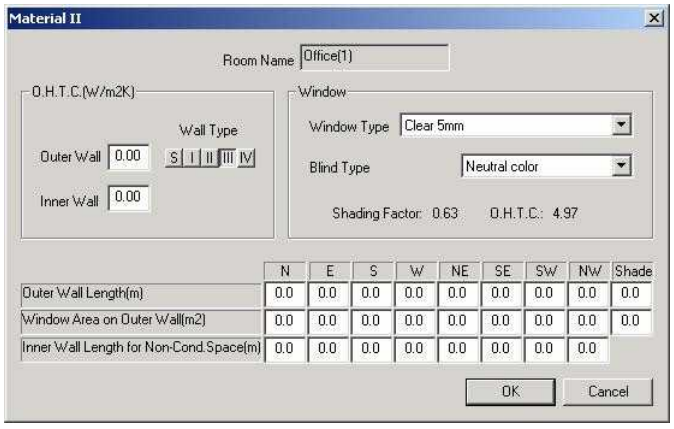
Cooling $Tx = \frac{Ts + To}{2} + \frac{Ts - To}{2} X e^{-0.4x}$

Tx: Underground temperature at depth of x (m) Ts: Highest outside air temperature in summer
To: Lowest outside air temperature in winter
* Underground temperature is also used for underground earth floors.

[Attic height] * Only when ceiling board is provided

Input a value only when the room has a ceiling board.(Initial value: 0.6 m)
The HKGSG adds attic heat load to outer wall heat load.
(Outer wall area = floor height [ceiling height + attic height] X outer wall length)

[Material II]



When the **Material II** button is clicked, the screen shown at the left is displayed. Change data as needed.

Since simplified heat load calculation is the development concept of the HKGSG, the maximum number of material types for input is limited to two. If more than two material types need to be used, it is necessary to approximate heat transfer coefficient values using area ratios.

In the HKGSG, a maximum of two heat transfer coefficients and glass types can be set for each structure (outer wall, inner wall, window) can be set in addition to dimension and heat transfer coefficient inputs on the "Room Spec" screen.
To input those values, enter heat transfer coefficients (outer wall, inner wall) and window type using the "Material II" screen in the same way as for the dimension input on the "Room Spec" screen.

*Select necessary items from heat transfer coefficient, window type and dimension for data input.

[Example of use]

. The wall on the north side is different in structure from other walls, and different heat transfer coefficient and wall type must be used.

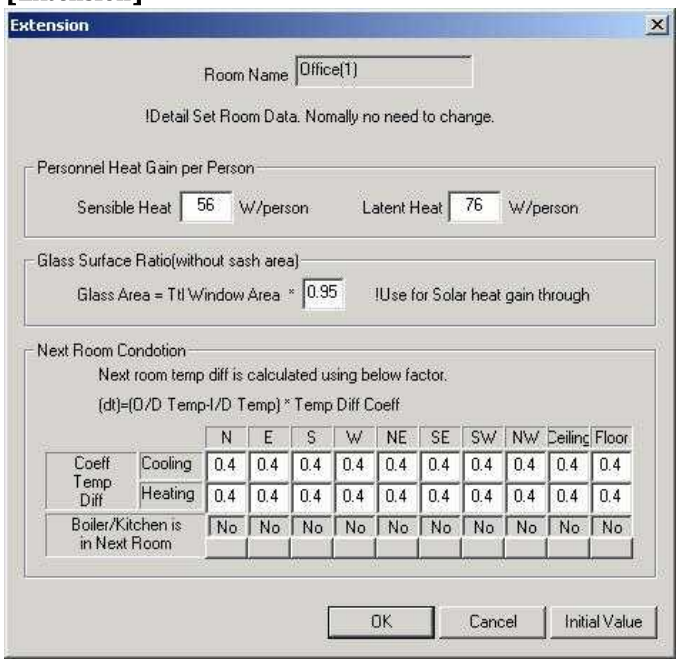
. A different heat transfer efficient must be used for an entrance.

. Two window types must be used.

[Caution in window area input for Material II]
For window area of Material II, input a value that is smaller than a value of (outer wall length X floor height) in Material II. The program uses the following formula, and does not accept a negative value for outer wall area II.

Outer wall area II = (outer wall length of Material II X floor height) - window area II

[Extension]



When the **Extension** button is clicked, the screen shown at the left is displayed. Change data as needed.

The [Extension] screen enables detailed settings for each room. Note that "Data for extension" settings do not usually have to be changed.

[Personal Heat Gain per person]

Exothermic volume of human body is set according to the usage of room. If the set value does not apply, make a change. (Initial value: See the Appendix.)

[Glass Surface Ratio]

For heat load in summer, the HKGSG takes into consideration the glass surface ratio (without sash area) in calculating solar heat load through glass windows. Normal window area input includes the area including the sash. Therefore, the glass area value obtained by using the glass surface ratio is used for solar heat load calculation. If the preset value is not appropriate for a particular case, change the data as needed.

(Initial value: 0.95)

Summer
Transfer heat load => Use of window area (with sash area)
Solar heat load => Use of glass area

Winter
Transfer heat load => Use of window area (with sash area)

[Next Room Condition]

The HKGSG uses the temperature difference with next room in calculating heat load from the inner wall of a non-conditioned room.

Heat load from inner wall = temperature difference with next room
× heat transfer coefficient
× inner wall area of non-conditioned room

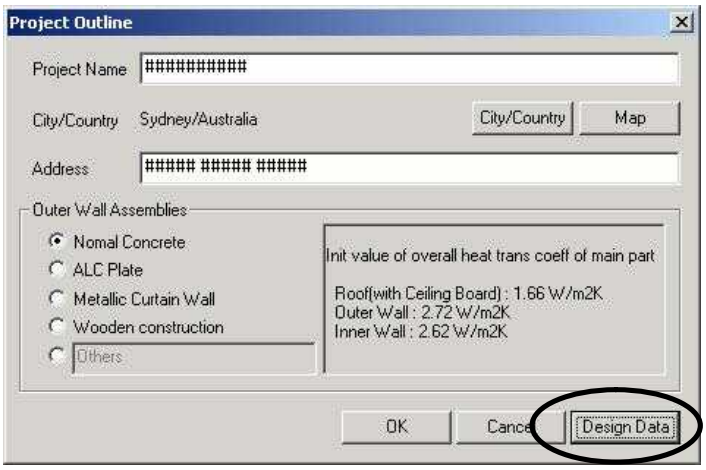
The following formula is used to calculate the temperature difference with next room. The temperature difference coefficient used in the formula changes in accordance with the outside air temperature.

Temperature difference with next room = (outside air temperature - room temperature)
× temperature difference coefficient

When the next room is a special usage room such as boiler room and kitchen, click the " Boiler/Kitchen is in Next Room " button. This sets "20DegC" as the standard temperature difference with next room.

(Initial value of the temperature difference with next room is automatically set according to the usage of room.)

7.2 Design Data Change (for change of default weather data and heat coefficient)



Click Design Data

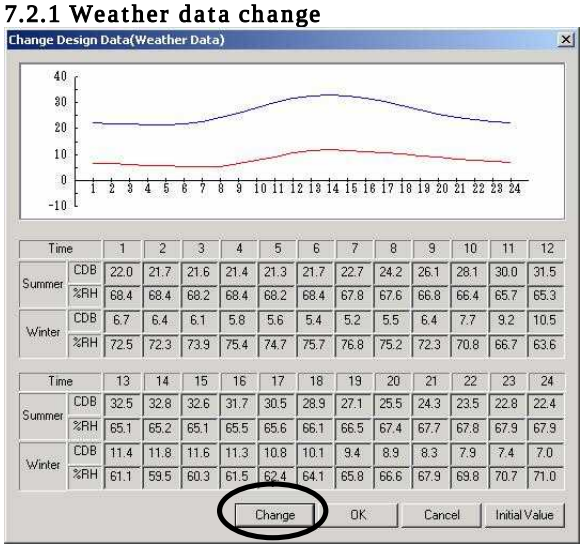
This screen allows the change of default weather data and heat transfer coefficient.



Select the data to change.

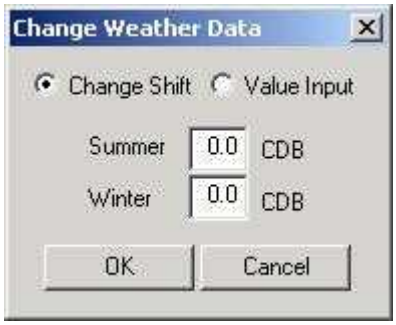
Then click the OK button.

7.2.1 Weather data change



The screen displays a graph and numerical data for visual confirmation. To make a change, click Change .

To return revised data to the initial values, click Initial value button.

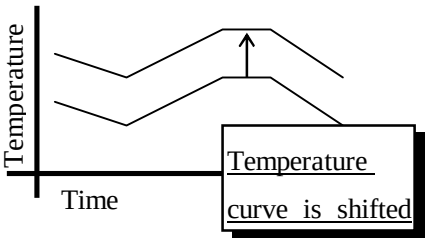


When Change is selected, the screen shown at the left is displayed. Select the method of change, and click the OK button.

. **Change Shift** --- Entire temperature curve is shifted according to the value input for summer and winter. (Input a difference value.)

. **Value Input** --- Input numerical data directly.

[Supplementary information]

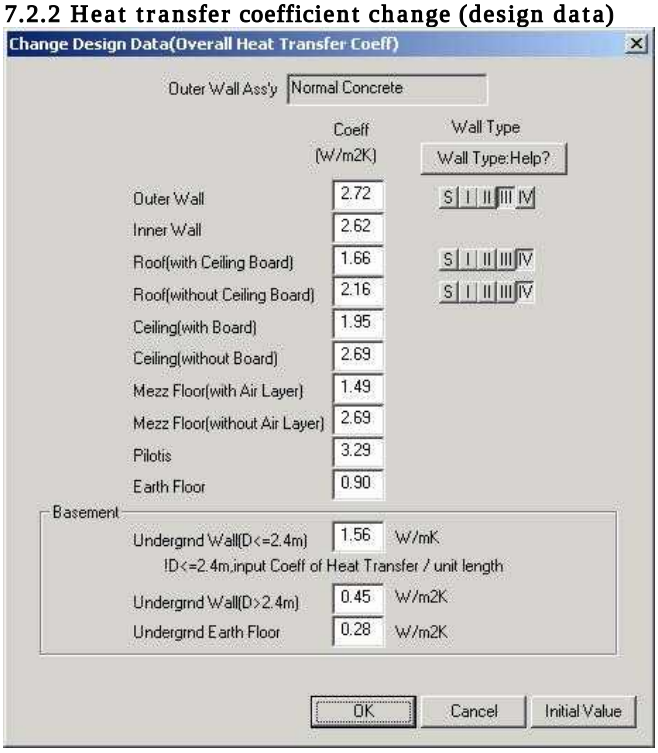


Use of humidity data in change shift operation

Relative humidity (%) is converted to absolute humidity for use in calculating heat load.

When weather data is changed by the change shift function, the program automatically obtains standard relative humidity (%) and absolute humidity data which is used in calculating outside air temperature after the change is made. Therefore, the relative humidity display remains the same after the change shift function is used, but the absolute humidity data used in calculation is changed.

7.2.2 Heat transfer coefficient change (design data)



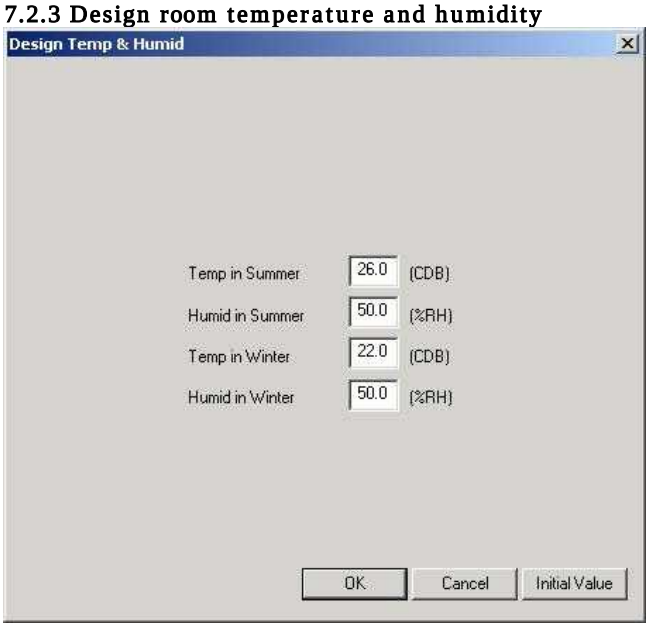
This screen allows the change of the initial values of heat transfer coefficients used for the project.

When the values are changed on this screen, revised values become the initial values of the heat transfer coefficients in the standard data change of each room.

When the OK button is clicked, the input values become the initial values next time.

Wall Type - - - - - See the Appendix.

7.2.3 Design room temperature and humidity



This screen allows the change of the initial values of the design room temperature and humidity data for each room.

When the values are changed on this screen, revised values become the initial values of the design room temperature and humidity in the standard data change of each room.

When the OK button is clicked, the input values become the initial values next time.

[Setting of initial values for usage of room]

In the HKGSG, typical values are set in the standard data based on the selected usage of room.

The following table shows the initial values.

	Area per person	Exothermic volume of human body	Infiltration volume	Schedule	Coefficient of temperature difference with next room	Lighting	Outside air Intake	Window type	Blind
	m^2/pers.	Kcal/h pers.	times/h	o'clock		W/m^2	m^3/h person		
8]:Office	5	132 SH 56 LH 76	Cooling 0.2 Heating 0.3	8 to 18	Cooling 0.4 Heating 0.4	20	20	Clear 5 mm	Neutral tint
Store	2.5	145 SH 59 LH 86	Cooling 0.3 Heating 0.45	10 to 22	Cooling 0.4 Heating 0.4	30	20	Clear 5 mm	Neutral tint
Hotel	5	145 SH 59 LH 86	Cooling 0.2 Heating 0.3	4 to 24	Cooling 0.4 Heating 0.4	30	20	Clear 5 mm	Neutral tint
Hospital	5	145 SH 59 LH 86	Cooling 0.3 Heating 0.45	4 to 24	Cooling 0.4 Heating 0.4	20	20	Clear 5 mm	Neutral tint
Factory	10	264 SH 84 LH 180	Cooling 0.2 Heating 0.3	8 to 18	Cooling 0.4 Heating 0.4	20	20	Clear 5 mm	Neutral tint
Condominium	5	132 SH 56 LH 76	Cooling 0.2 Heating 0.3	6 to 24	Cooling 0.3 Heating 0.3	20	20	Clear 5 mm	Neutral tint
House	5	132 SH 56 LH 76	Cooling 0.5 Heating 0.75	6 to 24	Cooling 0.9 Heating 0.6	20	20	Clear 5 mm	Neutral tint
Others	5	132 SH 56 LH 76	Cooling 0.2 Heating 0.3	8 to 18	Cooling 0.4 Heating 0.4	20	20	Clear 5mm	Neutral tint

[Overall Heat Transfer Coefficient 1]

The program contains specific heat transfer coefficient data for the roof, ceiling, earth floor, pilotis, outer wall, underground wall and inner wall for each building structure type. The heat transfer coefficient of a wall is determined by the material type and thickness, as shown in [Heat transfer coefficient 2] table.
The heat transfer coefficients of materials are based on the following.

Heat conductivity coefficient of external surface = 23 (W/m^2K)
Heat conductivity coefficient of internal surface = 9 (W/m^2K)
Thermal resistance of enclosed air layer = 0.15 (m^2K/W)
Thermal resistance of open air layer = 0.07 (m^2K/W)

	Normal concrete	ALC plate	Metallic curtain wall	Wooden construction
Outer wall	2.72 (III)	1.33 (II)	1.55 (II)	1.23 (I)
Inner wall	2.62	2.30	2.30	2.81
Roof (with ceiling board)	1.66 (IV)	1.66 (IV)	1.66 (IV)	1.03 (II)
Roof (without ceiling board)	2.16 (IV)	2.16 (IV)	2.16 (IV)	1.03 (II)
Ceiling (with ceiling board)	1.95	1.95	1.95	1.73
Ceiling (without ceiling board)	2.69	2.69	2.69	1.73
Mezz floor (with air layer)	1.49	1.49	1.49	1.73
Mezz floor (without air layer)	2.69	2.69	2.69	1.73
Pilotis	3.29	3.29	3.29	3.29
Earth floor	0.90	0.90	0.90	0.90
Underground wall (depth: less than 2.4 m)	Per unit ambient length 1.56	Per unit ambient length 1.56	Per unit ambient length 1.56	Per unit ambient length 1.56
Underground wall (depth: 2.4 m or more)	0.45	0.45	0.45	0.45
Underground earth floor	0.28	0.28	0.28	0.28

Unit [W/m^2K]
Underground wall of less than 2.4m in depth [W/mK]

*** Roman numerals in parentheses ( ) indicate wall types.**

(Note)
The heat transfer coefficient values indicated above are initial values set in the software at the time of shipment.
When values are changed and registered by the "Change design data/heat transfer coefficient" function, revised values become initial values in the next use.

[Overall Heat Transfer Coefficient 2]

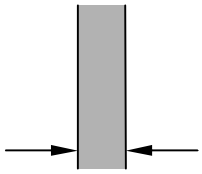
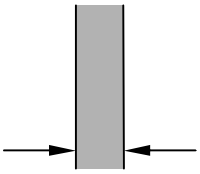
	Normal concrete Material and thickness / Heat conductivity coefficient	ALC plate Material and thickness / Heat conductivity coefficient	Metalic curtain wall Material and thickness / Heat conductivity coefficient	Wooden construction Material and thickness / Heat conductivity coefficient
Outer wall	Synthetic resin 10mm 0.190 Normal concrete 200mm 1.4 Mortar 20mm 1.5 Plaster 3m 0.79 2.72 (III)	ALC 100mm 0.17 Mortar 20mm 1.5 1.33 (II)	Aluminum 1.5mm 210.0 Sprayed-on asbestos 20mm 0.051 Air layer - - Gypsum board 5mm 0.17 1.55 (II)	Mortar 15mm 1.5 Plywood 10mm 0.19 Glass wool 25mm 0.042 Plaster 3mm 0.79 1.23 (I)
Inner wall	Plaster 25mm 0.79 Normal concrete 150mm 1.4 Mortar 19mm 1.5 Plaster 6mm 0.79 2.62	Gypsum board 12mm 0.17 Air layer - - Gypsum board 12mm 0.17 2.30		Plywood 6mm 0.19 Air layer - Plywood 6mm 0.19 2.81
Roof (with ceiling board)		No ceiling board+ Air layer - - Gypsum board 12mm 0.17 1.66 (IV)		Roofing tile 22mm 1. 0 Moisture proof paper 10mm 0.21 Plywood 9mm 0.19 Glass wool 25mm 0.042 Air layer - Plywood 6mm 0.19 1.03 (II)
Roof (without ceiling board)		Mortar 20mm 1.5 Lightweight concrete 65mm 0.78 Asphalt 10mm 0.11 Normal concrete 150mm 1.4 Mortar 15mm 1.5 Plaster 3mm 0.79 2.16 (IV)		
Ceiling (with ceiling board)		No ceiling board+ Air layer - - Gypsum board 12mm 0.17 1.95		Flooring 13mm 0.198 Sub-slab board 18mm 0.14 Air layer - Hardtex 12mm 0.133 1.73
Ceiling (without ceiling board)		Synthetic resin 5mm 0.190 Mortar 5mm 1.5 Normal concrete 150mm 1.4 Mortar 15mm 1.5 Plaster 3mm 0.79 2.69		
Mezz floor (with air layer)		Synthetic resin 5mm 0.19 Mortar 5mm 1.5 Normal concrete 150mm 1.4 Air layer - - Gypsum board 9mm 0.17 Asbestos sound-absorbing board 12mm 0.064 1.49		Flooring 13mm 0.198 Sub-slab board 18mm 0.14 Air layer - Hardtex 12mm 0.133 1.73
Mezz floor (without air layer)		Synthetic resin 5mm 0.19 Mortar 5mm 1.5 Normal concrete 150mm 1.4 Mortar 15mm 1.5 Plaster 3mm 0.79 2.69		

Table is continued next page

* Roman numerals in parentheses ( ) indicate wall types.

Pilotis		Synthetic resin	5mm	0.19
		Mortar	5mm	1.5
		Normal concrete	150mm	1.4
		Mortar	15mm	1.5
		Plaster	3mm	0.79
		3.29		
Earth floor		Mortar	20mm	1.5
		Normal concrete	150mm	1.4
		Rubble	150mm	1.4
		Concrete sub-slab	150mm	1.4
		Soil	1000mm	1.5
		0.90		
Underground wall (depth: less than 2.4 m)	1.56 (Value per unit ambient length)			
Underground wall (depth: 2.4 m or more)	0.45			
Underground earth floor	0.28			

* Roman numerals in parentheses ( ) indicate wall types.

Without heat insulation Normal concrete Single-layer wall  d [mm] Without heat insulation Aerated concrete plate Single-layer wall  d [mm]	Wall type	Normal concrete	Aerated concrete
	I	d=0 to 5(*) to30	d=0 to30
	II	d=30 to 100(*) to140	d=30 to 130
	III	d=140 to190(*) to 230	d=130 to 210
	IV	d=230 to 320(*) or more	d=210(*) or more

Inner heat insulation (outer heat insulation) Normal concrete Multi-layer wall Outside Inside (Outside) (Inside) Normal concrete d (mm) Styrene foam board l (mm) Gypsum board or equivalent 12 mm (Applicable for outer heat insulation)		l=25	l=50	l=100
	I	-	-	-
	II	d= 0 to 100 (0 to 70)	d= 0 to 90 (0 to 60)	d= 0 to 80 (0 to 50)
	III	d=100 to 190 (70 to 140)	d=90 to 180 (60 to 140)	d=80 to 170 (50 to 130)
	IV	d = 190 or more (140or more)	d=180 or more (140or more)	d=170 or more (130or more)

Inner heat insulation (outer heat insulation) Normal concrete Multi-layer wall Outside Inside (Outside) (Inside) Normal concrete d (mm) Styrene foam board l (mm) Air layer: semi-enclosed, gypsum 9 mm, rock wool sound-absorbing board 12 mm		l=25	l=50	l=100
	I	-	-	-
	II	d= 0 to 100	d= 0 to 90 (0 to 20)	d= 0 to 80 (0 to 20)
	III	d=100 to 200	d=90 to 190 (20 to 100)	d=80 to 180 (20 to 80)
	IV	d=200or more	d=190or more (100or more)	d=180or more (80or more)

With heat insulation Metallic board Multi-layer wall Steel board 1.5 mm Sprayed-on rock wool l (mm) With heat insulation Metallic board Multi-layer wall Aluminum board 3.0 mm Air layer: Semi-helmetic Sprayed-on rock wool l (mm) Gypsum board 12 mm		Left (steel board)	Left (aluminum board)
	I	d=0 to 30	d=0 to 20
	II	d=30 to 60	d=20 to 50
	III	d=60 to 90	d=50 to 80
	IV	d=90 or more	d=80 or more

For dimensions with an asterisk (*), obtained effective temperature difference values are used as the representative values of those materials.

The HKGSG includes wall type S. For this wall type, no effective temperature difference is set. This wall type is used for materials that have no heat storing capacity, such as slate roofs.

[Shading factors and heat transfer coefficients of different glass types]

Glass type	Shading factor (SC)			Heat transfer coefficient (K) W/m^2K	
	Without blind	Blind Bright color	Blind Neutral tint	Glass	Glass Blind
Clear glass 3 mm	1.00	0.54	0.66	6.47	5.06
Clear glass 5 mm	0.97	0.54	0.63	6.35	4.97
Clear glass 6 mm	0.96	0.53	0.63	6.29	4.95
Clear glass 8 mm	0.93	0.52	0.62	6.19	4.88
Clear glass 10 mm	0.90	0.50	0.60	6.06	4.80
Clear glass 12 mm	0.89	0.50	0.59	5.97	4.77
Heat absorbing glass 3 mm	0.93	0.52	0.61	6.47	5.06
Heat absorbing glass 5 mm	0.86	0.49	0.56	6.35	4.97
Heat absorbing glass 6 mm	0.83	0.48	0.55	6.29	4.95
Heat absorbing glass 8 mm	0.77	0.46	0.52	6.19	4.88
Heat absorbing glass 10 mm	0.72	0.43	0.48	6.06	4.80
Heat absorbing glass 12 mm	0.68	0.41	0.45	5.97	4.77
Clear reflective coated glass 8 mm	0.74	0.48	0.55	6.19	4.88
Tinted reflective coated glass 8 mm	0.65	0.44	0.49	6.19	4.88
Reflecting tinted glass 3mm	0.62	0.41	0.46	5.57	4.40
Heat absorbing heat & reflective coated glass 8 mm	0.58	0.38	0.42	6.19	4.88
Clear glass 3 mm + Clear glass 3 mm	0.89	0.54	0.63	3.50	3.05
Clear glass 5 mm + Clear glass 5 mm	0.85	0.52	0.60	3.43	2.99
Clear glass 6 mm + Clear glass 6 mm	0.83	0.52	0.59	3.40	2.97
Clear glass 8 mm + Clear glass 8 mm	0.79	0.50	0.57	3.34	2.92
Heat absorbing glass 3 mm + Clear glass 3 mm	0.81	0.48	0.56	3.50	3.05
Heat absorbing glass 5 mm + Clear glass 5 mm	0.72	0.45	0.51	3.43	2.99
Heat absorbing glass 6 mm + Clear glass 6 mm	0.69	0.43	0.49	3.40	2.97
Heat absorbing glass 8 mm + Clear glass 8 mm	0.62	0.39	0.44	3.34	2.92
Tinted reflective coated glass 6 mm + Clear glass 6 mm	0.56	0.40	0.44	3.40	2.97

*Air layer is 6 mm for all multi-layer glass types.

In the HKGSG, when "Others" is selected for the window glass type, the shading factor and heat transfer coefficient can be set to any value.

Heat load calculation software

DACCS-HKGSG

Operation Manual

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