APF (Annual Performance Factor) Calculation Program Manual

Installation manual
Instruction manual

TCC　Global Sales Division

Ver1.200
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Contents

1. Overview

This application software is used for the calculation of cooling and heating power consumption of air conditioners, whose calculation target is the DI/SDI under the specified building load line, specified outside temperature of a city and specified running period. Two ways of calculation are available according to user's purpose: in the “model based” way, you can select model names of indoor units for calculation; in the “parameter based” way, you can assign parameters such as compressor types, machine performance and power consumption for calculation.

1.1. Features

1.) The power consumption calculation method is based on the standard JRA 4048-2006: “Annual performance factor of package air conditioners by the Japan Refrigeration and Air Conditioning Industry Association”. The outline of the concept of the calculation method is shown on Annex.

2.) DI/SDI data for models: Contains specification data of 150 models and annual temperature data by hour of representative cities all over the world

3.) You can compare the power consumption of air conditioners individually by assigning a compressor type (constant speed, rotation speed, variable performance type A or B) and entering its performance and power consumption.

4.) The value of thermal load is adjustable.

5.) Calculatable power consumption in up to 9 combination patterns of model (or compressor), performance, and power (temperature, city and usage period are fixed) at the same time. You can output the calculation result. You can also output a report of the results in Excel file format.

6.) Calculation output

You can view the following calculation results for each model: total cooling load, total heating load, power consumption for cooling, power consumption for heating and power consumption of auxiliary heaters for heating. You can also view the following items in graphs: monthly power consumption, monthly bill, COP/EER, running costs, annual distribution of outside temperature of an assigned city, distribution of outside temperature during the cooling period and distribution of outside temperature during the heating period.

7.) Assignable parameters

Project summary (project name, installation date, test date, person in charge, etc.), city name, building type, cooling load at 35°C outside temperature, outside temperature to start cooling, cooling periods (two periods), cooling time and day, outside temperature to start heating, heating periods (two periods), heating time and day.

8.) Air conditioner specification assignment

Model-based calculation: select the models of the outdoor and indoor units (power consumption is calculated based on their preset specification values).

Parameter-based calculation: assign the following parameters for calculation: compressor type (constant speed, rotation speed, variable performance type A or B), single or multiple, rated cooling performance and its power consumption, half-power cooling performance and its power consumption, rated heating performance and its power consumption, half-power heating performance and its power consumption, heating performance at low temperature and its power consumption.

9.) The temperature data of cities is exportable to an Excel file. Excel files containing additional temperature data of new cities are importable to the city temperature data for calculation. Unnecessary cities and countries can be deleted from the list.

2. Precautions

The value of power consumption calculated by this software is a linear approximation using the coefficients evaluated from the performance and power consumption of the outside unit derived from some specification values and the outside temperature when running. Also, the contained outside temperature data when running is past data of a certain point within the selected city and may differ from the actual temperature of the installation place of the air conditioner. Therefore, the calculation result must be used only as a guide.
To this effect, this software shall be used under the license agreement below.

TOSHIBA CARRIER SOFTWARE LICENSE AGREEMENT

1. Terms and conditions for the use of the 'Annual Power Consumption support software'.
2. The 'Annual Power Consumption support software ' is a tool for estimating the annual operating electric cost for DI/SDI system. The results of the operating cost calculation produced by the software are the estimated cost, based on criteria that have been entered by the user. Note that the operating costs are only calculated for space heating.
3. Toshiba Carrier does not accept any responsibility for the results calculated by the software.

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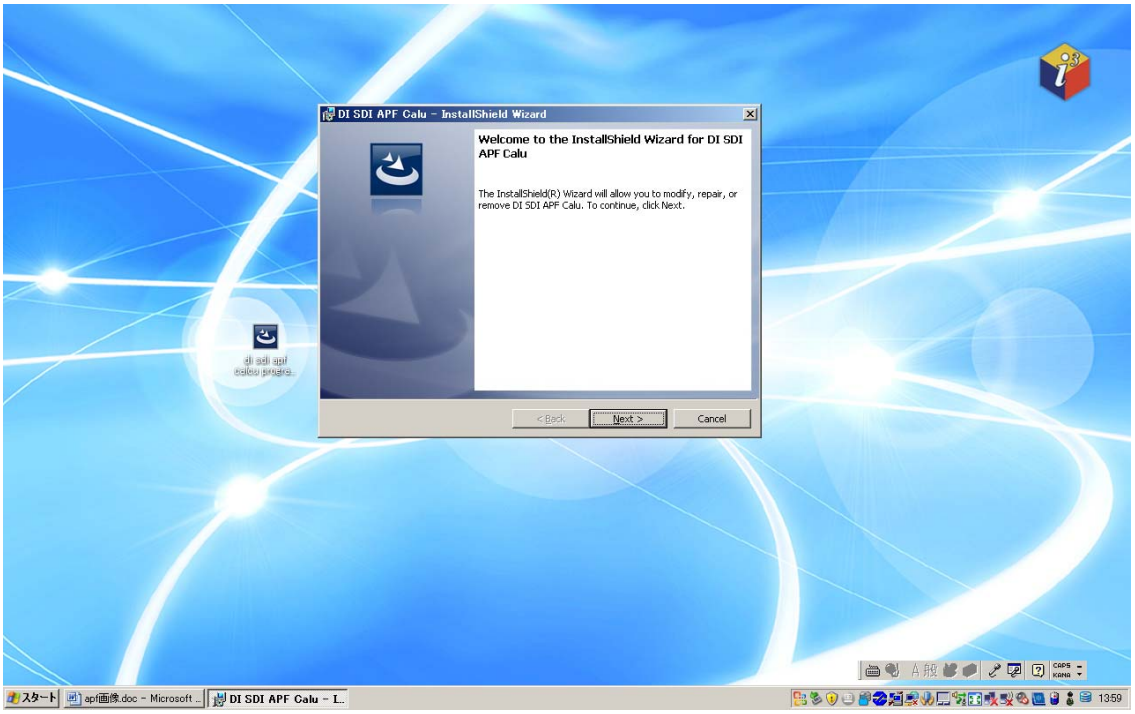
3. Installing and starting the software

System requirements

1.) Operating system: Windows XP, Windows Vista, or Windows 7
2.) Microsoft .NET Framework 2.0 SP1 or newer. Excel 2000, 2003 or 2007 is required for exporting the report.
3.) Monitor resolution: 1280x800 or larger is recommended.
Run “di sdi apf calcu program setup.exe” to start installation. The installer window shown below will appear. Follow the instructions on the window to continue installation.



The installation is automatically cancelled if the system requirements above are not fulfilled.
By default, the software is installed in C:¥Program Files¥Toshiba Carrier Corp¥My Product Name following the file structure below.

custom apf.exe (executable file)
Interop.Excel.dll
Interop.MSXML2.dll
System.Windows.Forms.DataVisualization.dll
· excel folder: param_reportdefault.xls, model_reportdefault.xls, pjcost_comparison.xls
· config folder: nameofcountry.xml (file containing registered country names) , country_a.xml, country_b.xml, country_c.xml... (Temperature data of cities – grouped by initial letters of countries) , custommodel.xml (specification data of air conditioners)

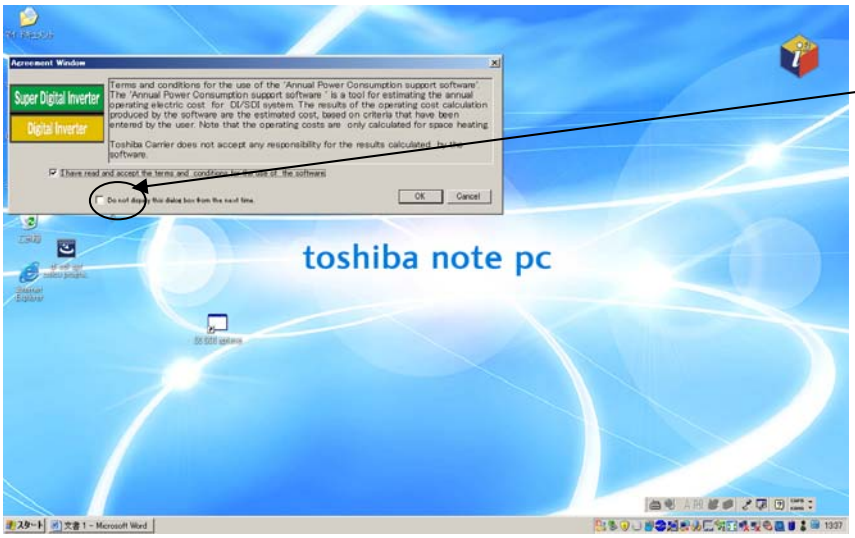
Note: to register a new country, add the country name on “nameofcountry.xml” and the temperature data on “country_*.xml” following the procedure shown on 4.6.1. "*" represents the initial letter of the country.

· project folder: projecthistory.xml, projectdata.xml (data used for project management)

To start the software,

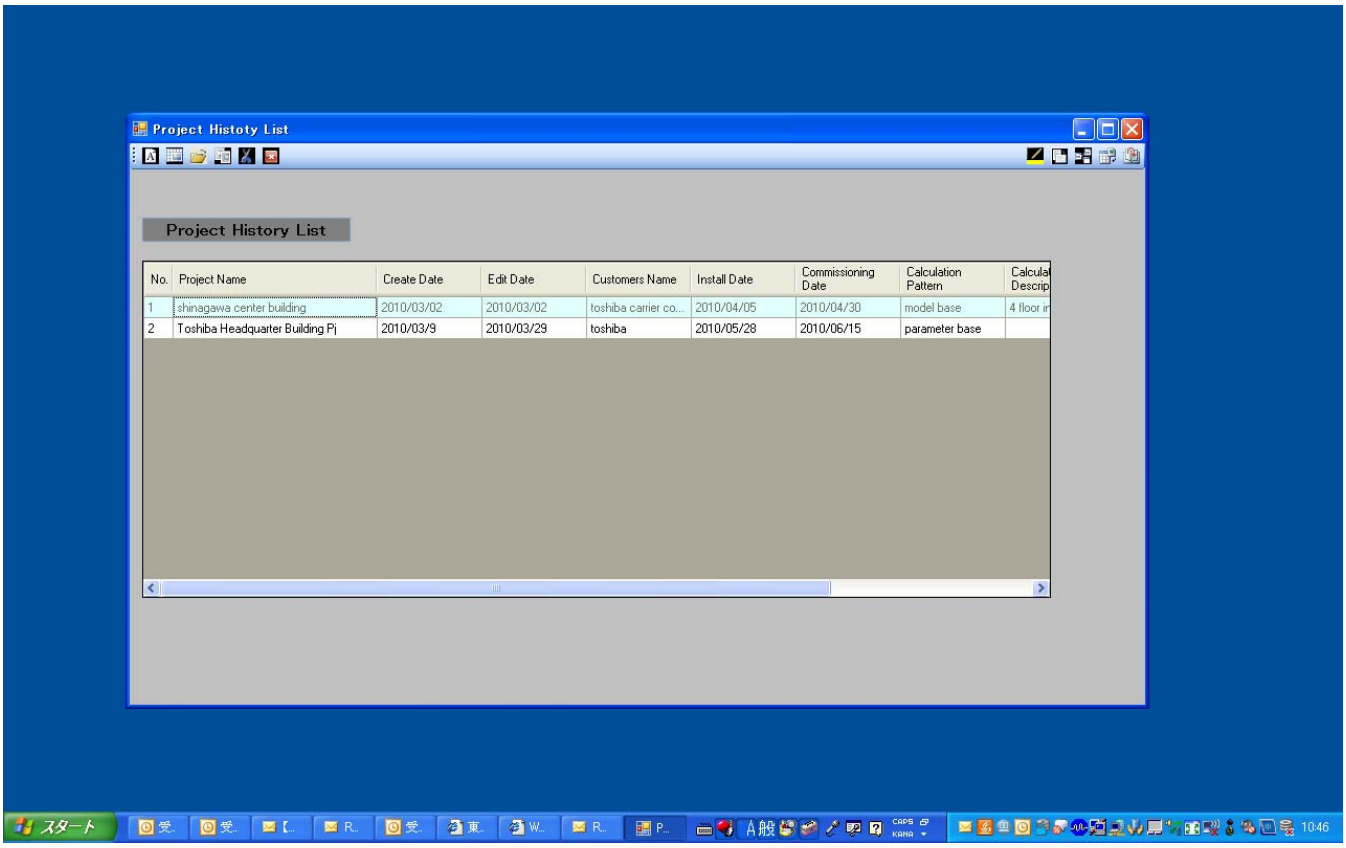
1) Click [start] on the desktop and select [program] - [Toshiba Carrier Corp] – [DI SDI APT Calculation], then click [DI SDI APT Calculation].
2) Click the "di sdi apf exe." shortcut icon on the desktop.
3) Execute C:¥Program Files¥Toshiba Carrier Corp¥My Product Name¥custom apf.exe.

Any of the three ways above will start the software.
After starting the software, the license agreement window (shown below) appears after the splash has disappeared. Check the acceptance check box and click [OK] to proceed to the “Project History List” window. If it is not checked, the software will be closed. To skip the agreement in future, check the box pointed below before clicking [OK].



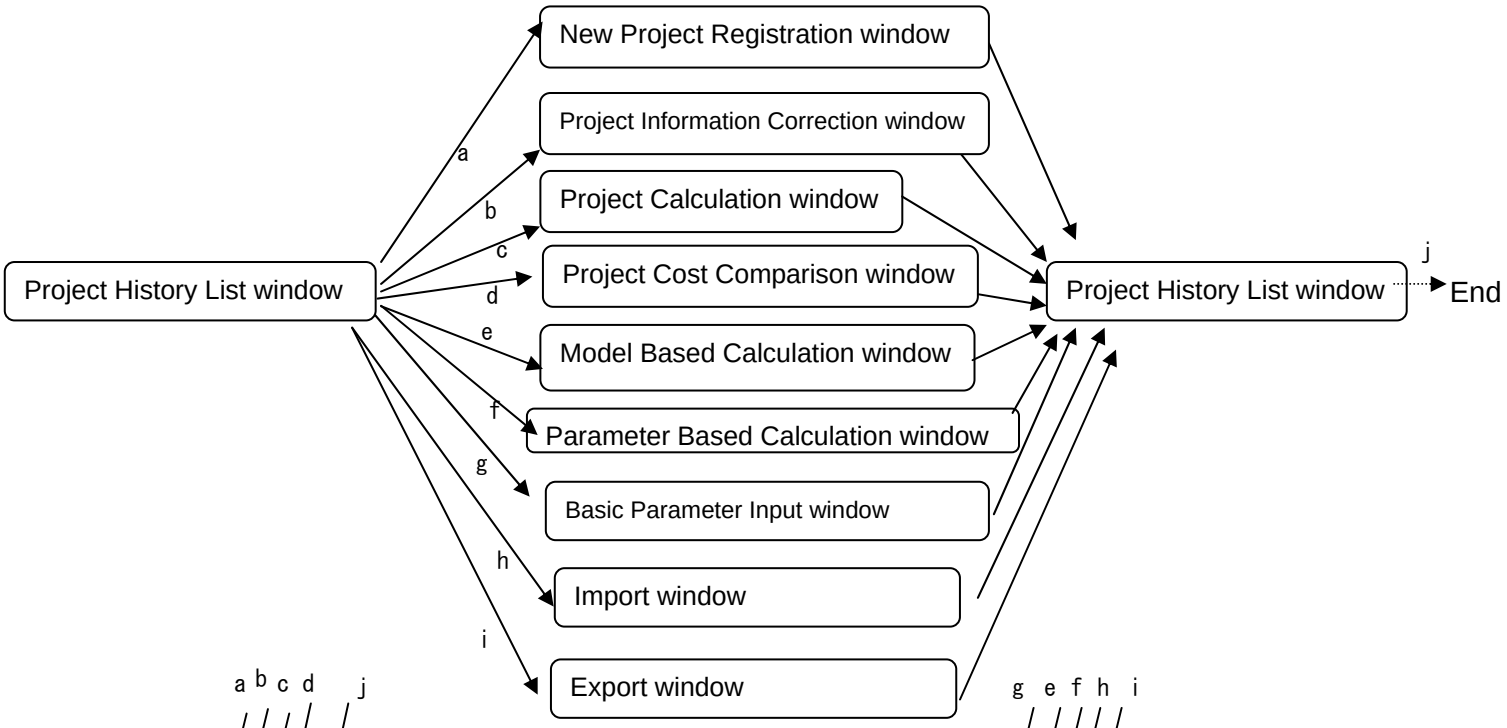
Check here to skip the window in future

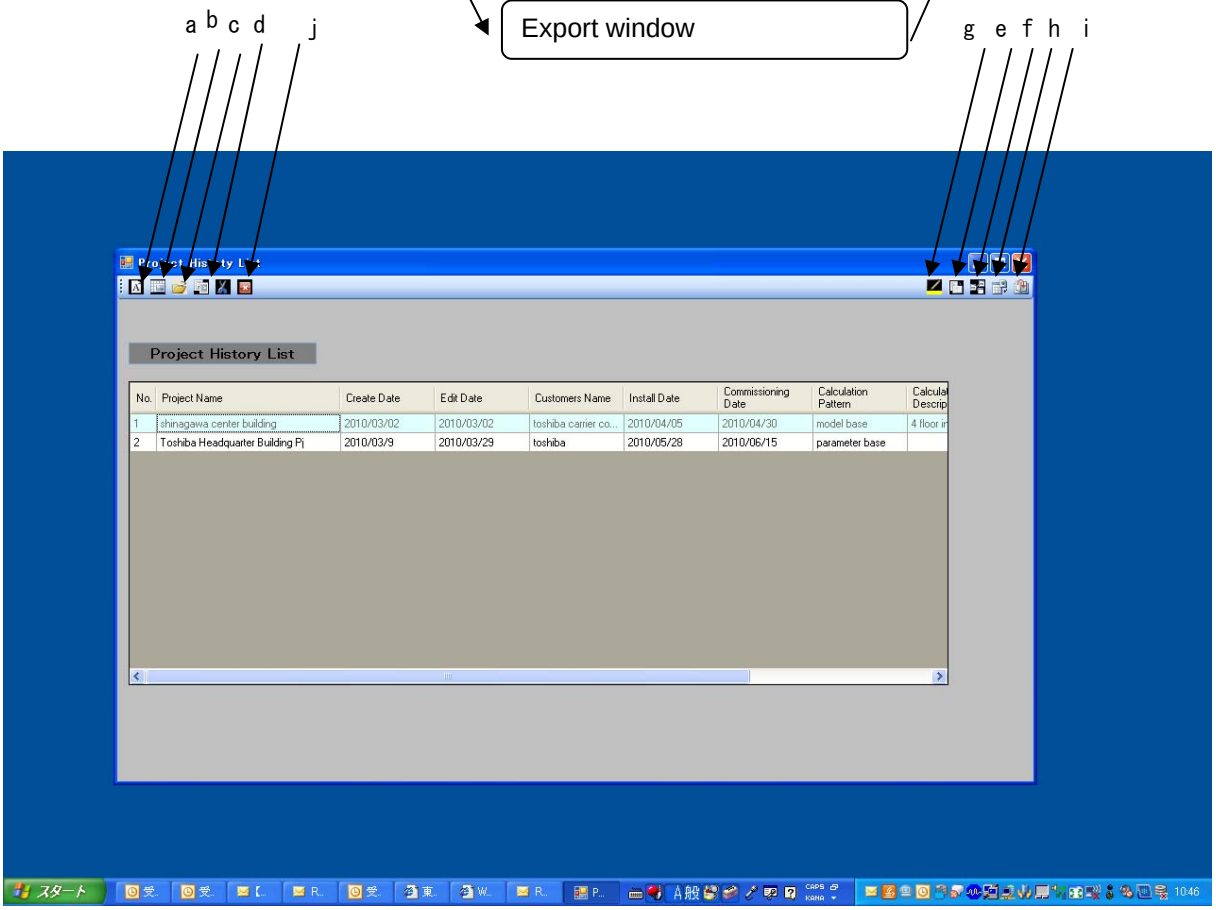
The “Project History List” window appears in initial status as below.



4. Using the software

The screen transition of the software is shown below. “a” – “j” on the chart and the screenshot below indicate which icon to click to open the window you want.





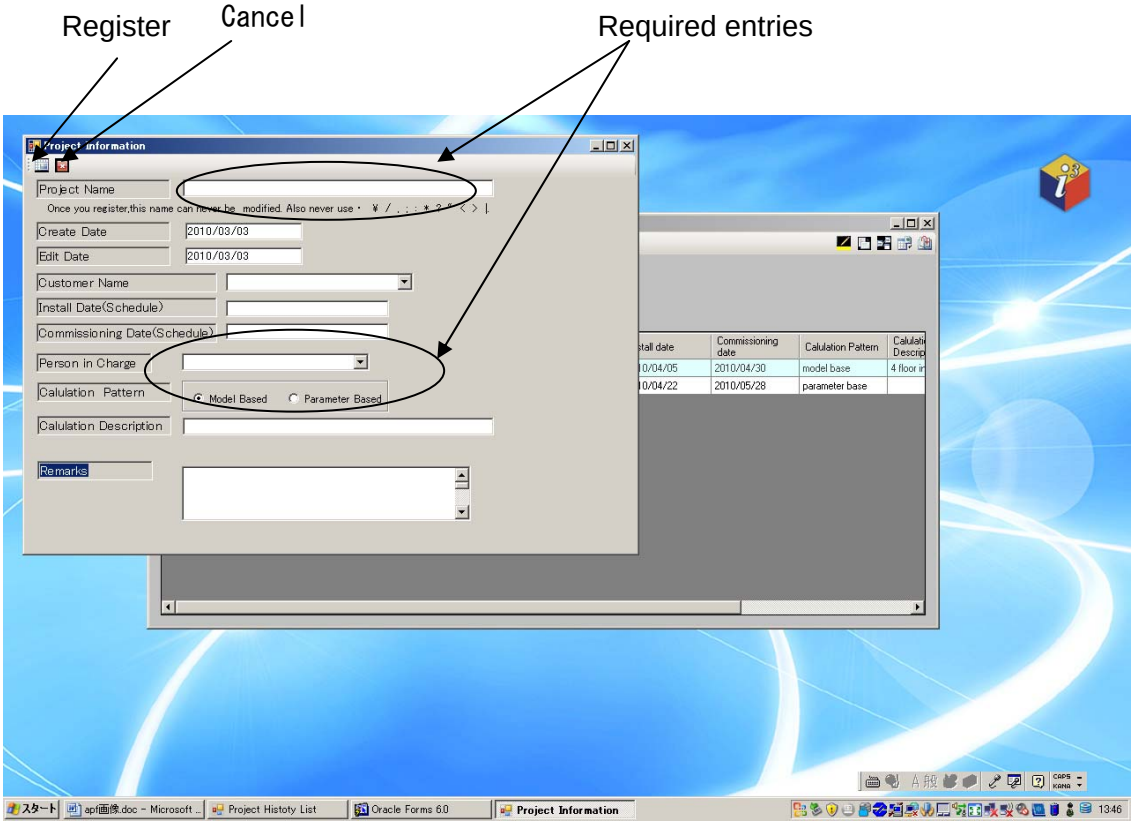
The usage of each window will be explained below.

4.1. Project History List window

The window displays a table. The items on the table are: Project Name, Create Date, Edit Date, Customer Name, Install Date, Commissioning Date, Calculation Pattern, Person in Charge and Calculation Description. To add a new project to the list, click the Create New Pj icon (icon “a”) and open the “New Project Registration” window. To edit the items of an existing project on the list, click the line to edit and click the Edit Existing Pj icon (icon “b”) to open the “Project Information Correction” window. To delete a project from the list, click the line to delete and click the “Delete Pj Record” icon (Scissors icon).

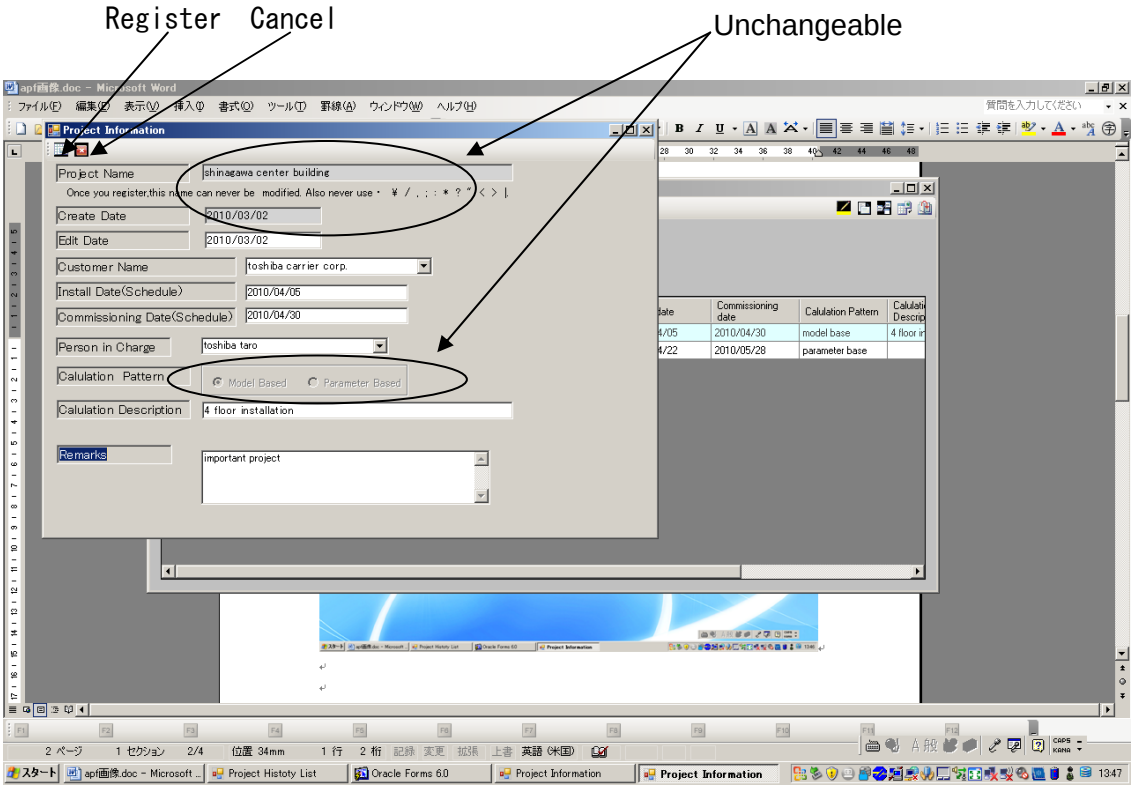
4.2. New Project Registration window

The “New Project Registration” window is shown below. The project name must be unique. A caution appears if you enter the same name as any other existing project. “Calculation Pattern” must be assigned as well as “Project Name”. In a “Model Based” calculation, model names are selected for calculation and in a “Parameter Based” calculation you can assign a compressor type and other parameters. Click the “Register” icon to save the registration. Click the “Cancel” icon to return to the “Project History List” window without registering.



4.3. Project Information Correction window

The “Project Information Correction” window is shown below. “Project Name” and “Calculation Pattern” are unchangeable. You can edit contents of the other entries. Click the “Register” icon to save the corrections. Click the “Cancel” icon to return to the “Project History List” window without saving corrections.



4.4. Project Calculation window

Click the “Open Calculation page” icon (the third icon from the left on the tool bar of the “Project History List” window) to open the window. The window contains six tabs: Setting, Calcu., Monthly Data, Cost Calc., Cost graph and Temperature.

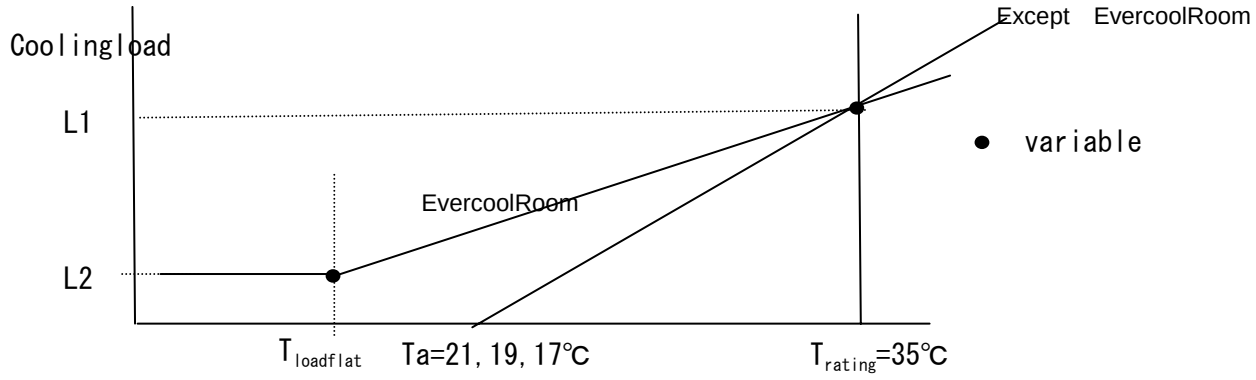
4.4.1. Setting tab

This tab is used to set the conditions for calculation of power consumption. The "Calculation Pattern” selected when registering the project (Model Based Calculation or Parameter Based Calculation) is indicated in the upper-left of the window as the window name.

- Project name: The project name selected on the “Project History List” window is indicated.
- Country/Area: Select a country and area from the drop-down lists.
- Building Type:

Building Type defines the heating and cooling load for this calculation.

The cooling load for Stand-alone shop ,Tennant shop and Office is changeable only by a heatload parameter at 35℃,whereas in case of EvercoolRoom ,it is changeable by additional 2 parameters. Below is the figure for the load.



Select a building type from the three types below according to the type of the target building.

Stand-alone shop building: The outside temperature in which building cooling load becomes 0: 21°C, The outside temperature in which building heating load becomes 0: 15°C, Blr=1.11

Tennant shop in a building: The outside temperature in which building cooling load becomes 0: 19℃, The outside temperature in which building heating load becomes 0: 13℃, Blr=0.86

Office building: The outside temperature in which building cooling load becomes 0: 17℃, The outside temperature in which building heating load becomes 0: 11℃, Blr=0.55

"Blr" here represents the ratio of the building cooling load at 35°C outside temperature to the building heating load at 0°C outside temperature.

EvercoolRoom: This case is applied for the room whose internal heating is big. The calculation is executed only for cooling mode. The building cooling load is set by next 3 parameters.

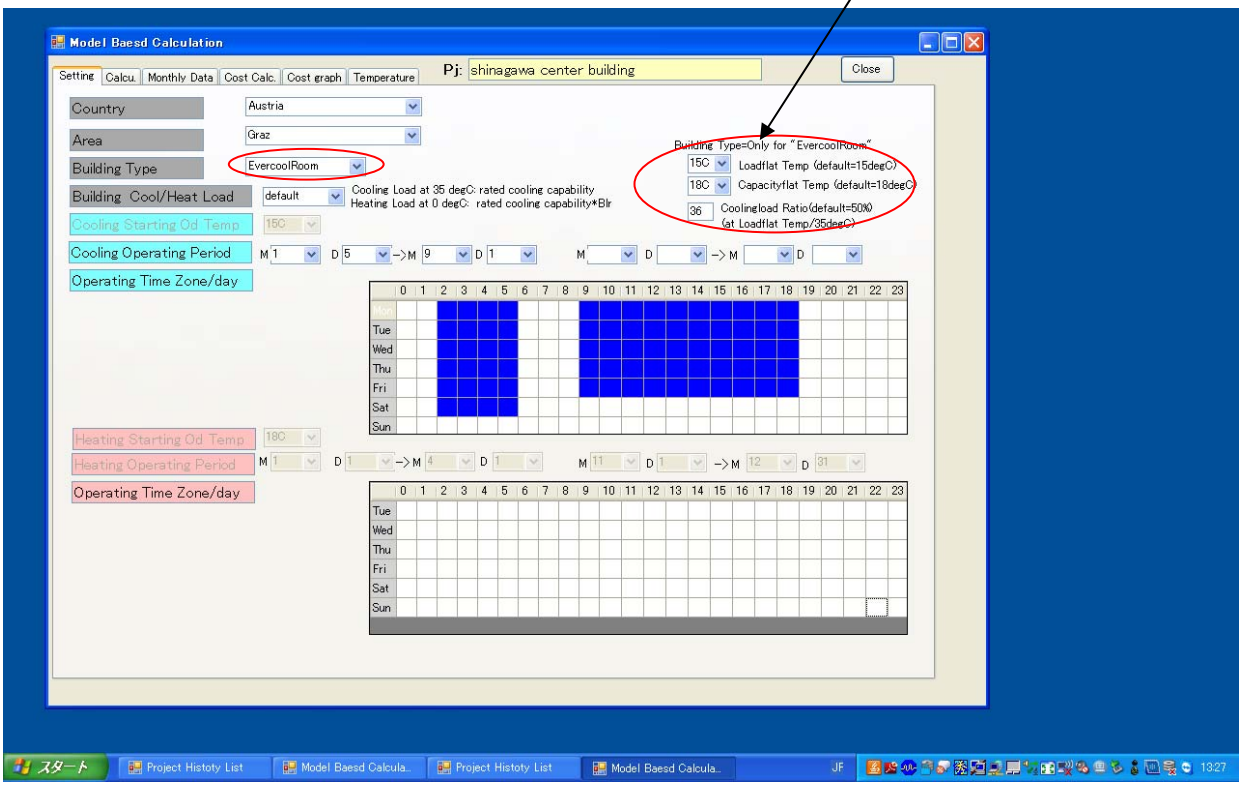
Load flat temperature: At the temperature which is lower than this temperature, the cooling load is constant.

Capability flat temperature: At the temperature which is lower than this temperature, the cooling capability and power consumption is constant.

Cooling load Ratio: 100*(cooling load at Load flat temperature/cooling load at 35℃)

See the figure at 5.1 for "EvercoolRoom" ..

For EevercoolRoom

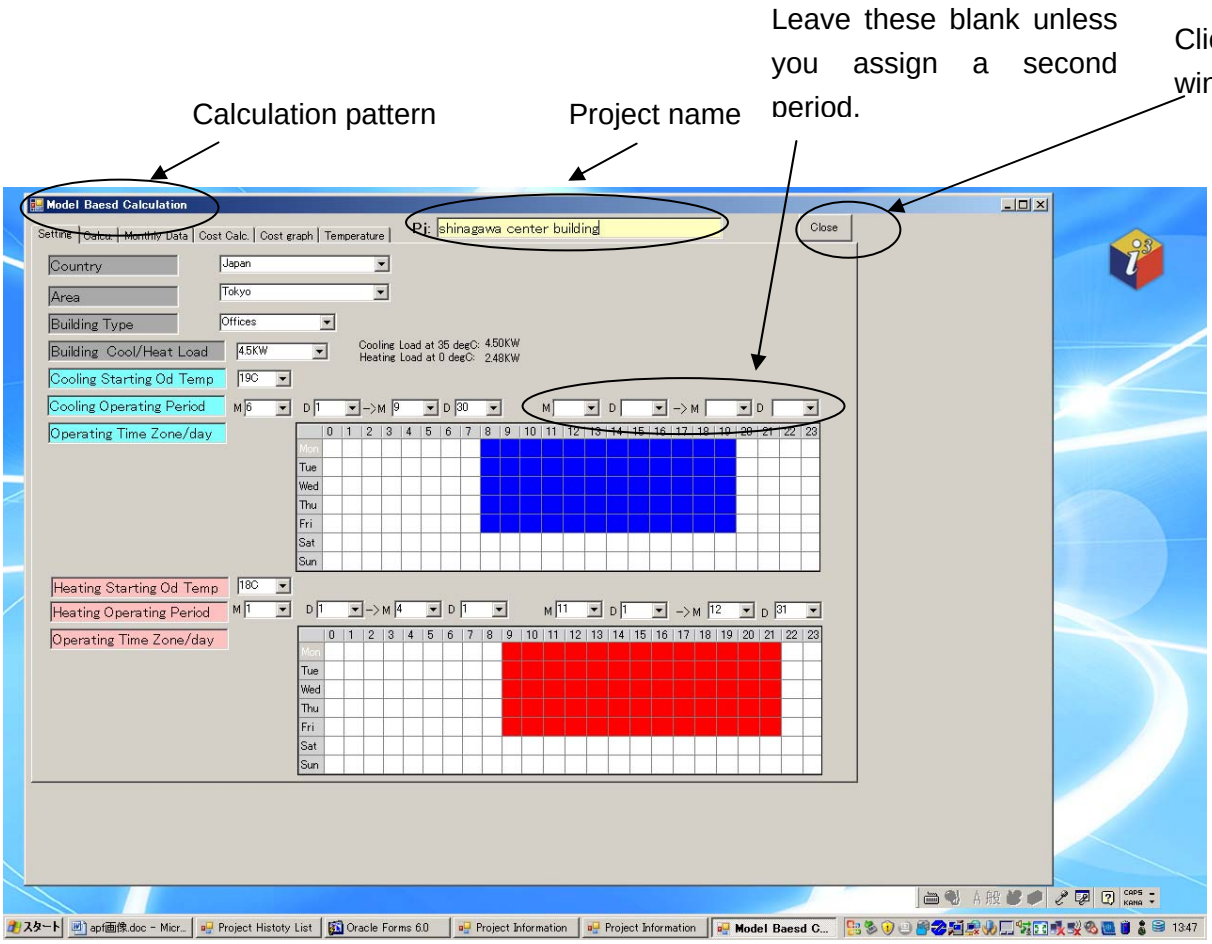


- Building Cool/Heat Load

Default setting values: Cooling load at 35°C: rated cooling performance value of the selected model; heating load: (rated cooling performance value)*Blr.

When you assign a value manually, the value you select or enter will become the building cooling load at 35°C (kW). The heating load at 0°C is derived from (input value)*Blr. You can assign a value by selecting one from the dropdown list or entering one directly with the keyboard.

- Cooling Starting Od Temp (Outdoor temperature): Set the outdoor temperature to start cooling here. However, depending on the building, the value is ignored if it is the temperature of cooling load=0. Select a value from the dropdown list. The ending “C” and “F” mean “centigrade” and “Fahrenheit” respectively. The unit setting depends on the setting on the “Basic Parameter Input” window.
- Cooling Operating Period: Enter the starting and ending date of the period. The value of the ending month must be larger or the same as that of the starting month. Consequently, to assign two seasons a year, for example from January 1 to April 1 and from November 1 to December 31, divide the seasons into two periods and enter “1, 1, 4, 1” in the first “MD->MD” boxes and “11, 1, 12, 31” in the second. When assigning one period only, leave the second “MD->MD” boxes blank.
- Operating Time Zone/day: Click and select the running day and time using the mouse. The blue cells show the time calculated as cooling time. Assigning no cells is regarded as no operation being done.
- The setting methods of “Heating Starting Od Temp”, “Heating Operating Period” and “Operating Time Zone/day” are the same as the settings concerning cooling above. The red cells on “Operating Time Zone/day” show the time calculated as heating time.
- Close button: Click the “Close” button on the upper-right of the window to return to the “Project History List” window.



4.4.2. Calcu tab

The items to input are different depending on the selected calculation pattern: Model Based Calculation or Parameter Based Calculation.

4.4.2.1. Model Based Calculation

When selecting the models, select an outdoor unit first and then an indoor unit which is compatible with the selected outdoor unit. Click the “Add to List” button to add the selection to the list for calculation. You can add up to nine combinations of models by repeating the procedure above. You can delete an unnecessary combination of models by selecting the line to delete and clicking the “Delete” button. You can change “Q’ty” (Quantity) directly on the table.

- Click the “Calculate” button to start calculation. The result is indicated in blue. In addition, the monthly analysis graph is displayed in the lower-left of the window (showing load, power consumption for cooling and heating, and COP/EER (=monthly load/monthly power consumption)). In the lower-right of the window, the system comparison graph is displayed (showing annual load, annual power consumption for cooling and heating, and COP/EER (annual load/annual power consumption) of the systems on the list). If you add a new combination of models after calculation and click the “Calculate” button, all the previous results are cleared and the whole list is calculated again.

  You can see the items below as the calculation result.

  CoolLo: The total cooling load during the assigned period(s) (kWh). If the air conditioning performance is not sufficient for the estimated building load, the performance is regarded as the load.

  HeatLo: The total heating load during the assigned period(s) (kWh). If the air conditioning performance is not sufficient for the estimated building load, the load of auxiliary heaters is added to the total load.

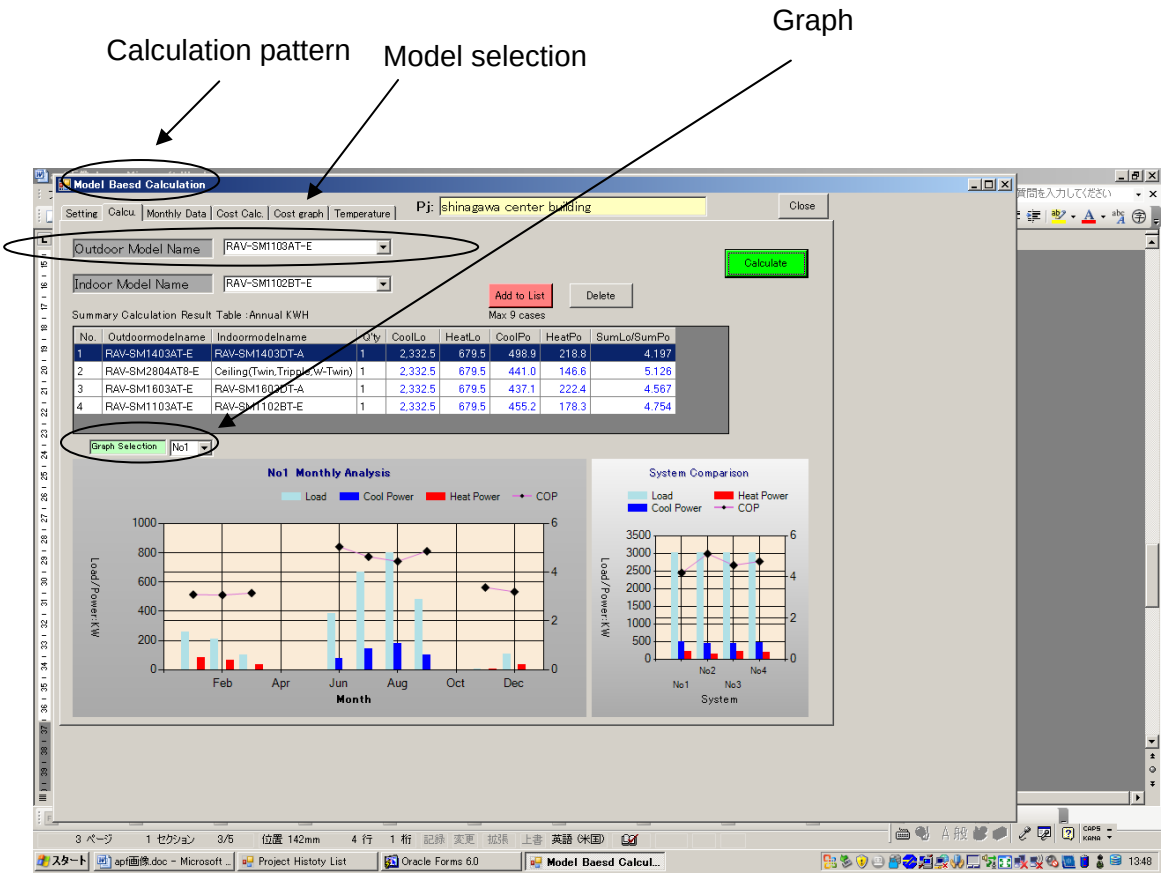
  CoolPo: Power consumption for cooling corresponding to the value of “CoolLo” (kWh).

HeatPo: Power consumption for heating corresponding to the value of “HeatLo” (kWh).

SumLo/SumPo: The value derived from (CoolLo+HeatLo)/(CoolPo+HeatPo). It represents the annual air-conditioning efficiency.

・ Graph selection

You can select which monthly analysis graph you want to see. You can select one from up to nine items on the list.



4.4.2.2. Parameter Based Calculation

You can assign parameters of air-conditioning performance with this calculation method.

· Type of Compressor

Select a compressor type from the pulldown list.

Fixed speed: A compressor whose rotation speed is fixed except for the fluctuation derived from the compressing motor’s slip caused by varying of the compression load.

Inverter RevolutionControl: A compressor which can change the rotation speed in three steps or more, or change it continuously according to the amount of compression load. If two or more compressors are equipped, at least one compressor must have one of the features above.

Inverter AbilityControl (less than 2 stages): A compressor which can change the compression performance in two steps by changing the pole number or unloading cylinders according to the amount of compression load. Select this also when two or more compressors are equipped and the number of running compressors is automatically changed according to the amount of compressing load.

Inverter AbilityControl (3 stages more): Select this when one or more compressors are equipped and the performance can be changed in three steps or more according to the amount of compressing load (except rotation-speed control type).

· Single/Multi indoor

Assign whether an outdoor unit is connected to one indoor unit or two or more indoor units.

· Constant assignment (Unit:: kW)

Rated Cooling Capacity (RCC)
Rated input Power for Cooling (RPC)
Rated Half-power Cooling Capacity (RHCC) (Not required when “Fixed Speed” is selected)
Rated input Power for Half-power Cooling (RPHC) (Not required when “Fixed Speed” is selected)
Rated Heating Capacity (RHC)
Rated input Power for Heating (RPH)
Rated Half-power Heating Capacity (RHHC) (Not required when “Fixed Speed” is selected)
Rated input Power for Half-power Heating (RPHH) (Not required when “Fixed Speed” is selected)
Heating Capacity at Low temperature (LHC)
Input Power for Heating at Low temperature (PLH)

After assigning the parameters above, click the “Add to List” button to register them to the table in the middle of the window. You can register up to nine sets of parameters to the table. You can change “Q’ty” (Quantity) directly in the table. You can delete unnecessary sets using the “Delete” button.

- Click the “Calculate” button to start calculation. The result is indicated on the table in the middle of window in blue. In addition, the monthly analysis graph is displayed in the lower-left of the window (showing load, power consumption, and COP/EER (=monthly load/monthly power consumption)). In the lower-right of the window, the system comparison graph is displayed (showing annual load, annual power consumption, and COP/EER (annual load/annual power consumption) of the systems on the list).

You can see the items below as the calculation result.

CoolLo: The total cooling load during the assigned period(s) (kWh). The value is equal to the estimated building load, but if the air conditioning performance is not sufficient for the estimated building load, the performance is regarded as the load.

HeatLo: The total heating load during the assigned period(s) (kWh). If the air conditioning performance is not sufficient for the estimated building load, the load of auxiliary heaters is added to the total load.

CoolPo: Power consumption for cooling corresponding to the value of “CoolLo” (kWh).

HeatPo: Power consumption for heating, corresponding to the value of “HeatLo” (kWh).

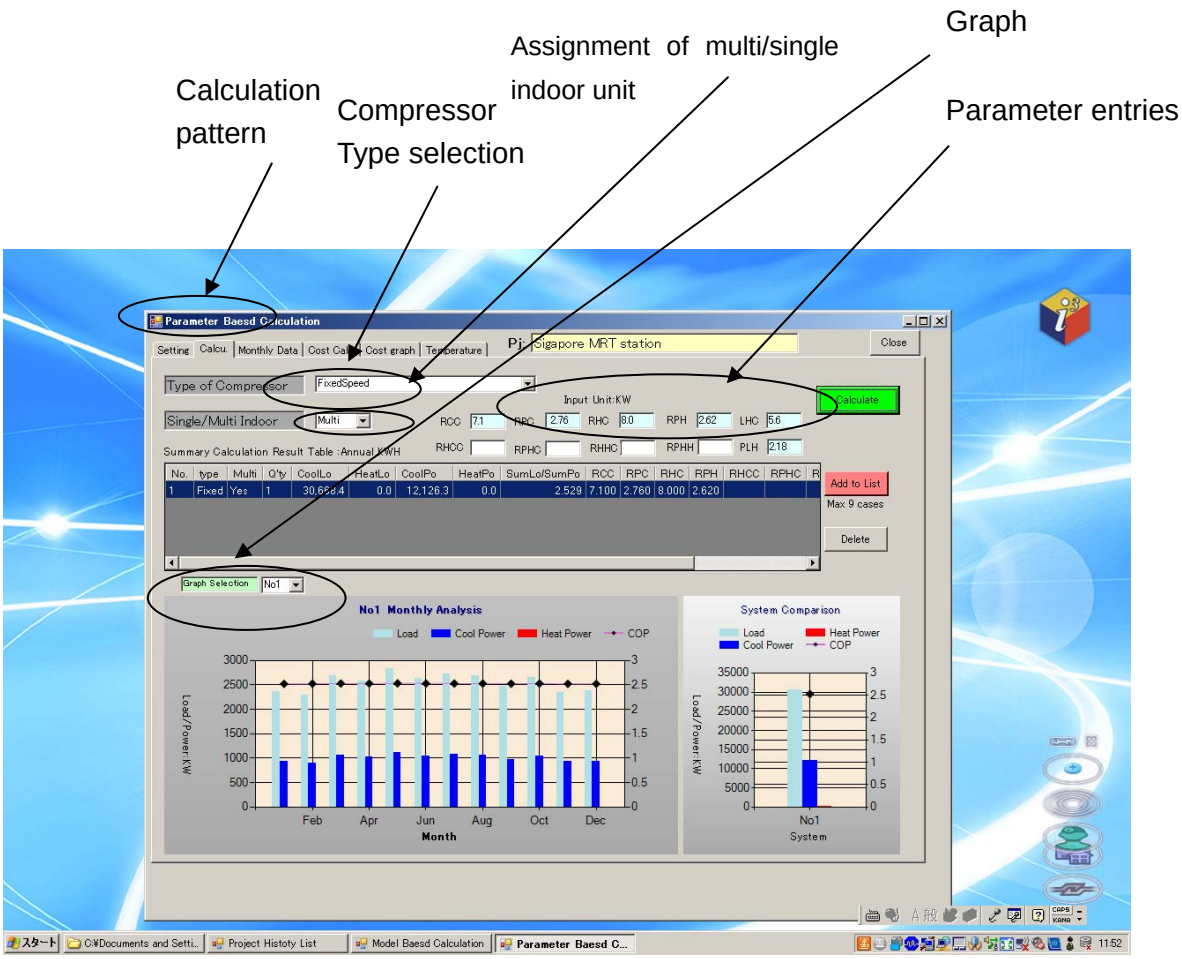
SumLo/SumPo: The value derived from (CoolLo+HeatLo)/(CoolPo+HeatPo). It represents the annual air-conditioning efficiency.

The values of the items below are the same as those you input. (Unit: kW)

Rated Cooling Capacity (RCC)
Rated input Power for cooling (RPC)
Rated Half-Power Cooling Capacity (RHCC) (Not required when “Fixed Speed” is selected)
Rated input Power for Half-power Cooling (RPHC) (Not required when “Fixed Speed” is selected)
Rated Heating Capacity (RHC)
Rated input Power for Heating (RPH)
Rated Half-power Heating Capacity (RHHC) (Not required when “Fixed Speed” is selected)
Rated input Power for Half-power Heating (RPHH) (Not required when “Fixed Speed” is selected)
Heating Capacity at Low temperature (LHC)
Input Power for Heating at Low temperature (PLH)

- Graph selection

You can select which monthly analysis graph you want to see. You can select one from up to nine items on the list.



4.4.3. Monthly Data tab

The results calculated in 4.4.2 are shown in the table. The items are displayed by month (Unit: kWh, Blue: cooling, Red: heating).

You can see the items below in the table.

CLoad: The monthly total cooling load during the assigned period(s) and time (kWh). The value is equal to the estimated building load, but if the air conditioning performance is not sufficient for the estimated building load, the performance is regarded as the load.

CPower: Monthly power consumption for cooling corresponding to the value of “CLoad” (kWh).

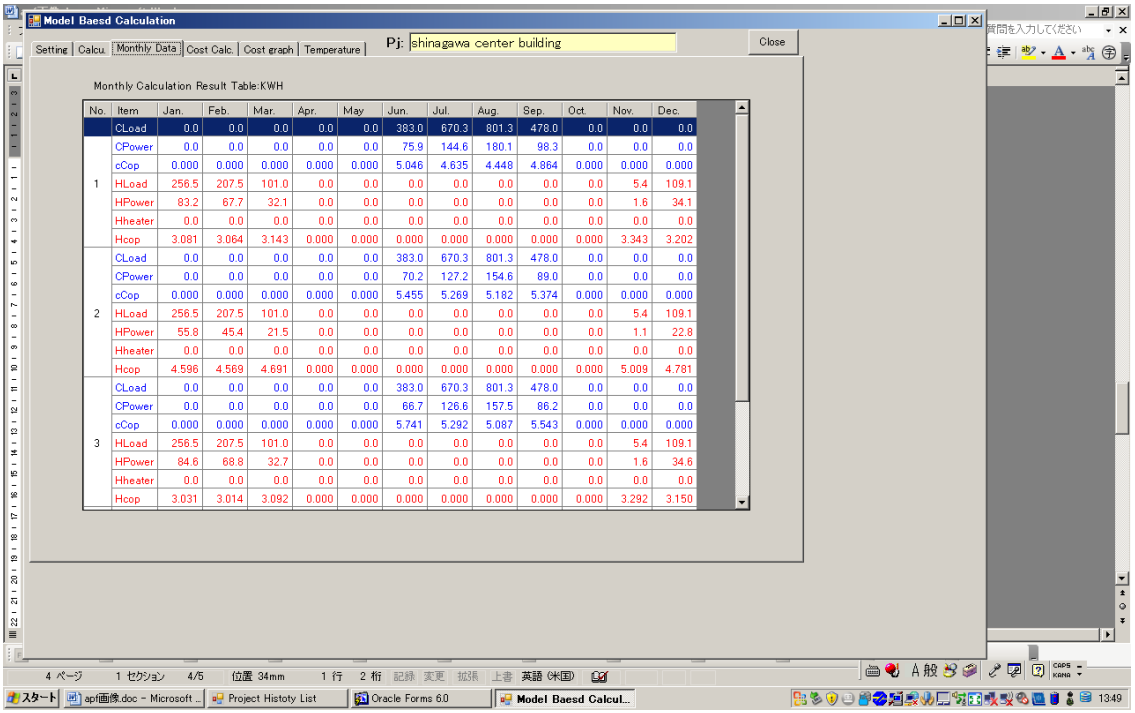
EER: The value derived from CLoad/CPower. It shows the monthly cooling efficiency.

HLoad: The total monthly heating load during the assigned period(s) (kWh). If the air conditioning performance is not sufficient for the estimated building load, the load of auxiliary heaters is added to the total load.

HPower: The monthly power consumption for heating of the air conditioners corresponding to the value of “HLoad” (kWh).

Hheater: The monthly power consumption for heating of the auxiliary heaters assisting the air conditioners (kWh)

COP:　The value derived from Hload/(HPower+Hheater). It shows the monthly heating efficiency.



No.	Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
	CLoad	0.0	0.0	0.0	0.0	0.0	383.0	670.3	801.3	478.0	0.0	0.0	0.0
	CPower	0.0	0.0	0.0	0.0	0.0	75.9	144.6	180.1	98.3	0.0	0.0	0.0
	cCop	0.000	0.000	0.000	0.000	0.000	5.046	4.635	4.448	4.864	0.000	0.000	0.000
1	HLoad	256.5	207.5	101.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	109.1
	HPower	83.2	67.7	32.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	34.1
	Hheater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Hcop	3.081	3.064	3.143	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.343	3.202
	CLoad	0.0	0.0	0.0	0.0	0.0	383.0	670.3	801.3	478.0	0.0	0.0	0.0
	CPower	0.0	0.0	0.0	0.0	0.0	70.2	127.2	154.6	89.0	0.0	0.0	0.0
	cCop	0.000	0.000	0.000	0.000	0.000	5.455	5.269	5.182	5.374	0.000	0.000	0.000
2	HLoad	256.5	207.5	101.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	109.1
	HPower	55.8	45.4	21.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	22.8
	Hheater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Hcop	4.596	4.569	4.691	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.009	4.781
	CLoad	0.0	0.0	0.0	0.0	0.0	383.0	670.3	801.3	478.0	0.0	0.0	0.0
	CPower	0.0	0.0	0.0	0.0	0.0	66.7	126.6	157.5	86.2	0.0	0.0	0.0
	cCop	0.000	0.000	0.000	0.000	0.000	5.741	5.292	5.087	5.543	0.000	0.000	0.000
3	HLoad	256.5	207.5	101.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	109.1
	HPower	84.6	68.8	32.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	34.6
	Hheater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Hcop	3.031	3.014	3.092	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.292	3.150

4.4.4.　Cost Calc. tab

You can calculate the initial cost and the twelve-year running costs on this tab. The calculation is executed for the top three model cases selected on the Calcu tab. The items on the table are as follows.

No:　It corresponds to the list numbering on the table on the Calcu tab.

Total Initial Cost: Price including the device and installation cost. Enter the value in the basic currency unit. The currency unit is assigned on the “Basic Parameter Input” window.

Annual Power cost:　Annual Power*Electric Fee (Unit: 1000 (currency unit)). The currency unit is assigned on the “Basic Parameter Input” window. The value of “Annual Power” is the annual power consumption (CoolPo+HeatPo) calculated on the Calcu tab.

Annual CO2:　Annual Power*the value of CO2-KG. This value shows the annual CO2 emissions (Unit: CO2-KG). The unit value of CO2-KG is assigned on the “Basic Parameter Input” window.

Annual Power:　Annual power consumption (sum total of “CoolPo” and “HeatPo” calculated on the Calcu tab) (Unit:

kWh) Initial:　"Total Initial Cost" you entered is displayed to the nearest thousand (currency unit).

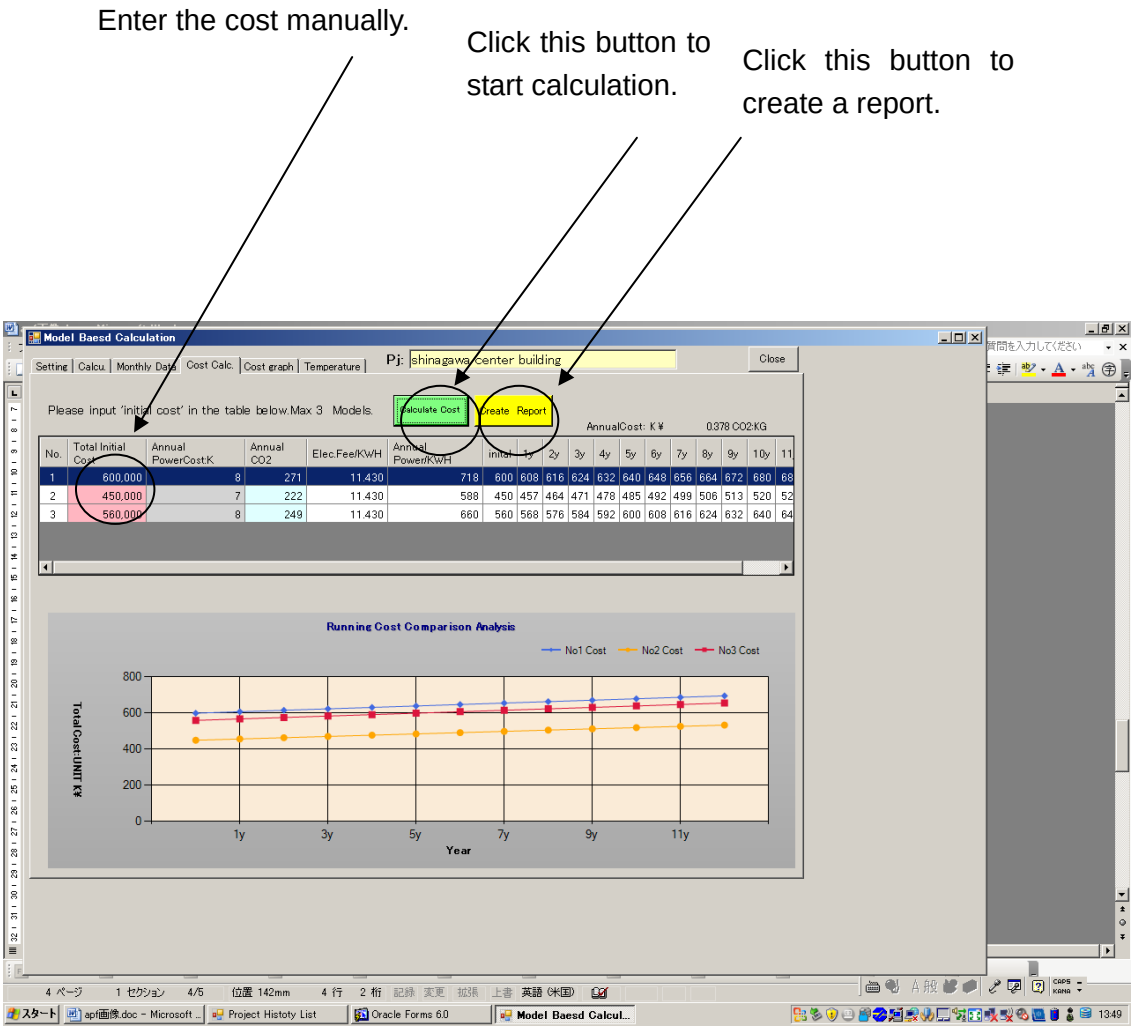
1y, 2y,……:　The values are derived from (Total Initial cost)+(Annual Power cost*years since starting running) and show the sum of accumulated electric power cost and initial cost.

"Calculate Cost" button:

Click this to calculate and display the yearly cost.

"Create Report" button:

Click this button after finishing the calculation on the Calcu tab to generate an excel file which contains the calculation results and graphs in the format shown below. No report is output if the calculation has not finished. The "Save As" window appears after clicking the button. Select a place to save and assign a file name for the Excel file. The report has two pages and its paper size is A3.



The first page of the report:

Seasonal Power Consumption Calculation Report

Date: 2010/6/15

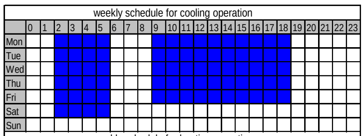
Applied Standard:JRA4048:2006 for Package air conditioner

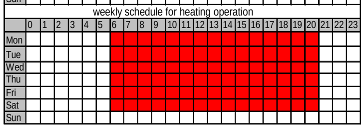
Project Data	
Project Name	shinagawa center building
Create Date	2010/03/02
Edit Date	2010/03/02
Customer Name	toshiba carrier corp.
Install date	2010/04/05
Commissioning Date	2010/04/30
Calculation Pattern	model base
Calculation Deacription	4 floor installation
Person in Charge	toshiba taro
remark	important project

Electric fee /KWH	229876
CO2 Emission KGCO2/KWH	23456

Calculation condition							
Country		Austria					
Area		Graz					
Period	Cooling	1/5	~	9/1		~	
	Heating	1/1	~	4/1	11/1	~	12/31
Building type		Offices					
Cool Load at 35degC		default	KW				
HeatLoad at 0degC		default *0.55	KW				
Heating Start Outdoor Temp		15					
Cooling Start Outdoor Temp		18					
Load flat Temp		-					
Capaity flat Temp		-					
Ratio of Internal Heat(%)		-					

Temp Unit = C





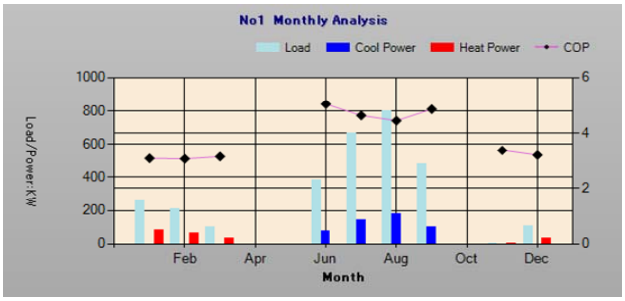
1, SDI/DI Power consumption calculation(Model based)

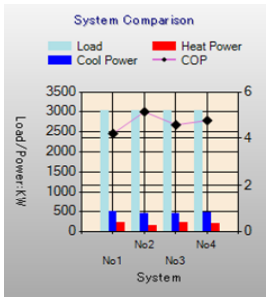
~List of Machinery~

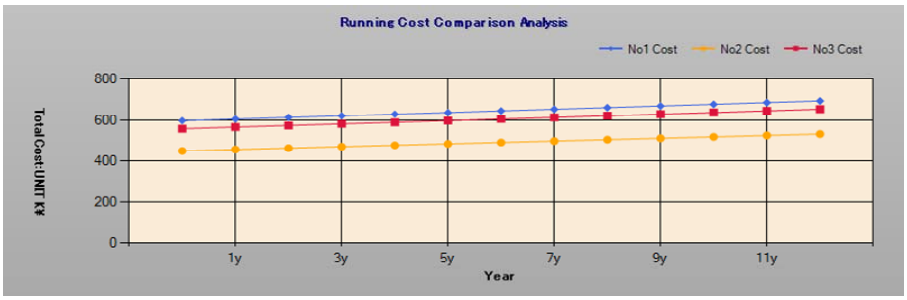
No	MODEL NAME(out)	MODEL NAME(in)	Q'ty	Heat Load(KWH) Cooling 1	Heat Load(KWH) Heating 2	Total Power Consumption(KWH) Cooling 3	Heating aircon 4	Heating heater 5	Total 3+4+5	Energy efficiency Cooling 1/3	Heating 2/(4+5)	Total (1+2)/(3+4+5)	CO2 Emission	Electric charge
1	RAV-SM1403AT-E	RAV-SM1403UT-E	1	2,260.500	11,844.900	379.400	3,577.400	731.900	4,688.800	5.958	2.749	3.008	##########	##########
2	RAV-SM1403AT-E	RAV-SM1403UT-E	1	2,260.500	11,844.900	379.400	3,577.400	731.900	4,688.800	5.958	2.749	3.008	##########	##########
			Total	4,521.000	23,689.800	758.800	7,154.800	1,463.800	9,377.600				##########	##########

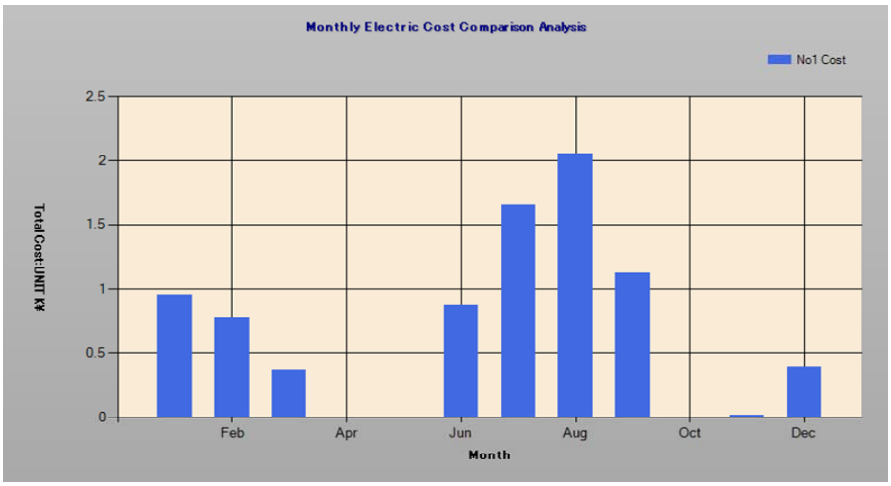
3.Monthly Analysis

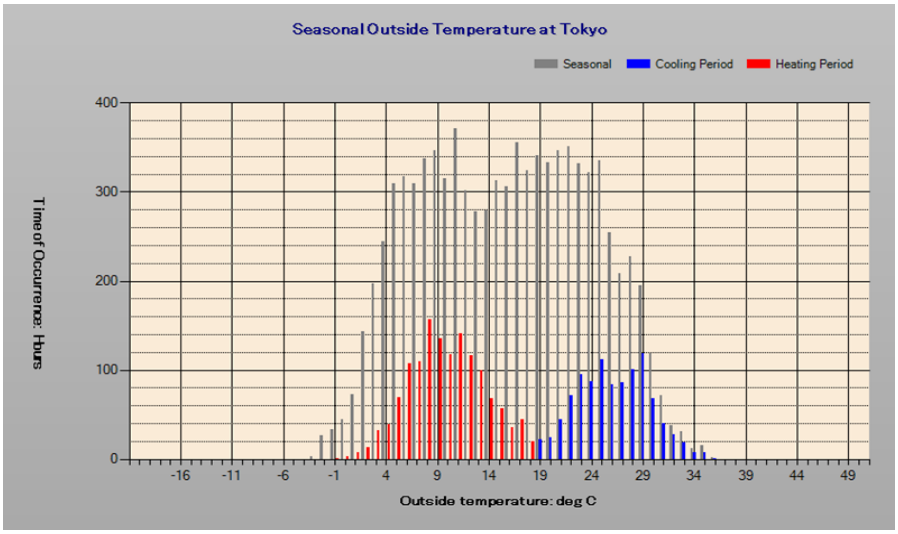
	Data	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Cooling Load				15.7	254.2	516.6	854.9	619.1				
	Power Consumption(cooling)				2.3	40.1	88	147.3	101.7				
	COP for Cooling				6.861	6.333	5.871	5.805	6.086				
1	Heating Load	3342.5	2268.1	1469.2	28.9							1806.9	2929.2
	Power Consumption Aircon(heating)	1341.3	865	441.4	7.8							561.8	1092.1
	Power Consumption Heater(heating)	326	186	8.2								16.9	194.9
	COP for Heating	2.005	2.158	3.268	3.694							3.122	2.276
	Cooling Load				15.7	254.2	516.6	854.9	619.1				
	Power Consumption(cooling)				2.3	40.1	88	147.3	101.7				
	COP for Cooling				6.861	6.333	5.871	5.805	6.086				
2	Heating Load	3342.5	2268.1	1469.2	28.9							1806.9	2929.2
	Power Consumption Aircon(heating)	1341.3	865	441.4	7.8							561.8	1092.1
	Power Consumption Heater(heating)	326	186	8.2								16.9	194.9
	COP for Heating	2.005	2.158	3.268	3.694							3.122	2.276
	Cooling Load												
	Power Consumption(cooling)												
	COP for Cooling												
	Heating Load												
	Power Consumption Aircon(heating)												
	Power Consumption Heater(heating)												
	COP for Heating												
	Cooling Load												
	Power Consumption(cooling)												
	COP for Cooling												
	Heating Load												
	Power Consumption Aircon(heating)												
	Power Consumption Heater(heating)												
	COP for Heating												
	Cooling Load												
	Power Consumption(cooling)												
	COP for Cooling												
	Heating Load												
	Power Consumption Aircon(heating)												
	Power Consumption Heater(heating)												
	COP for Heating												
	Cooling Load												
	Power Consumption(cooling)												
	COP for Cooling												
	Heating Load												
	Power Consumption Aircon(heating)												
	Power Consumption Heater(heating)												
	COP for Heating												
	Cooling Load												
	Power Consumption(cooling)												
	COP for Cooling												
	Heating Load												
	Power Consumption Aircon(heating)												
	Power Consumption Heater(heating)												
	COP for Heating												
	Cooling Load												
	Power Consumption(cooling)												
	COP for Cooling												
	Heating Load												
	Power Consumption Aircon(heating)												
	Power Consumption Heater(heating)												
	COP for Heating												
	Cooling Load												
	Power Consumption(cooling)												
	COP for Cooling												
	Heating Load												
	Power Consumption Aircon(heating)												
	Power Consumption Heater(heating)												
	COP for Heating												


No1 Monthly Analysis
Load
Cool Power
Heat Power
COP
Load/Power:KW
1000
800
600
400
200
0
6
4
2
0
Feb
Apr
Jun
Aug
Oct
Dec
Month


System Comparison
Load
Heat Power
Cool Power
COP
Load/Power:KW
3500
3000
2500
2000
1500
1000
500
0
6
4
2
0
No1
No2
No3
No4
System

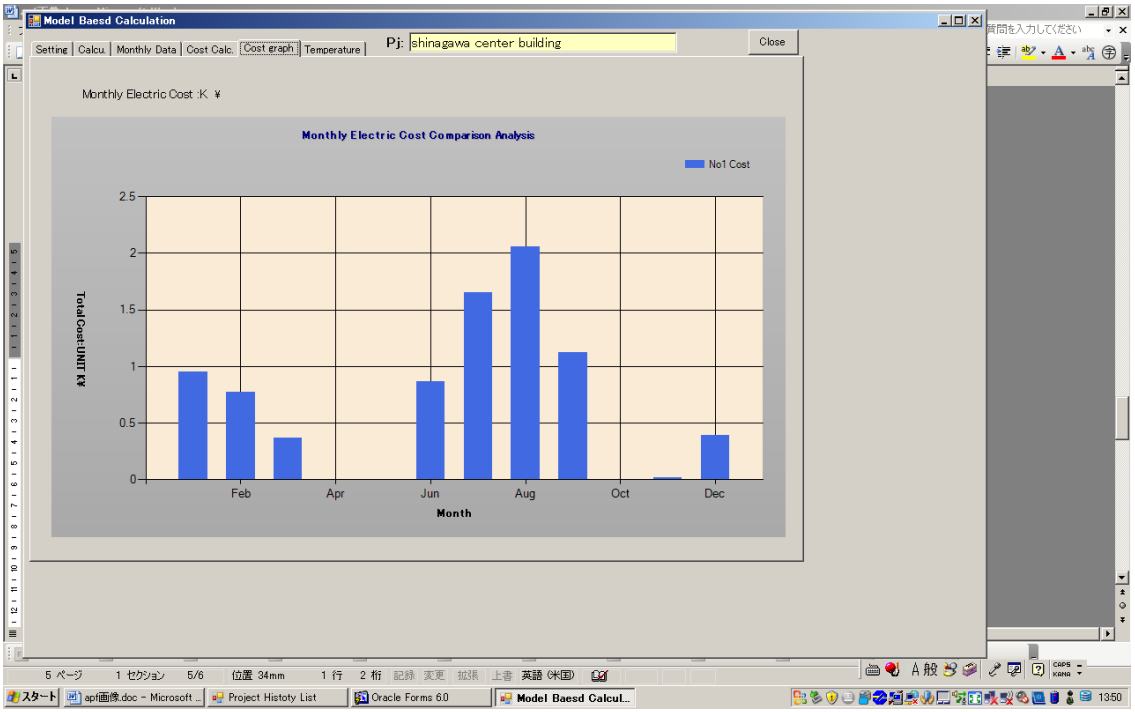

Running Cost Comparison Analysis
No1 Cost
No2 Cost
No3 Cost
TotalCost:UNIT ¥¥
800
600
400
200
0
1y
3y
5y
7y
9y
11y
Year


Monthly Electric Cost Comparison Analysis
No1 Cost
TotalCost:UNIT ¥¥
2.5
2
1.5
1
0.5
0
Feb
Apr
Jun
Aug
Oct
Dec
Month


Seasonal Outside Temperature at Tokyo
Seasonal
Cooling Period
Heating Period
Time of Occurrence: Hours
400
300
200
100
0
-16
-11
-6
-1
4
9
14
19
24
29
34
39
44
49
Outside temperature: deg C

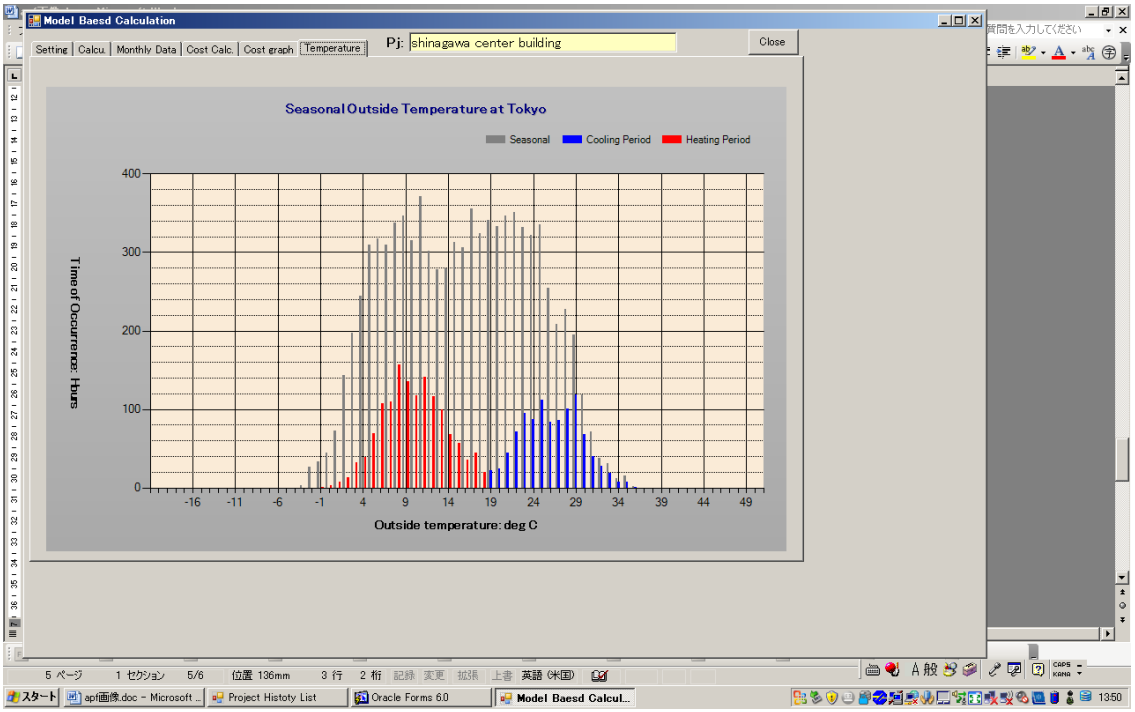
4.4.5. Cost graph tab

This tab shows the monthly electric fees of the top three systems, which are indicated on the list on the Monthly Data tab as No. 1-No. 3 (unit: 1000 (currency unit)). The graphs are not indicated unless calculation on the Calcu tab has finished.



4.4.6. Temperature tab

This tab shows for how many hours it is certain outside temperatures (from -20°C/0°F to 50°C/122°F) in the city selected for calculation in a year. It also shows the temperature-hour distribution during the assigned cooling and heating periods and time. The graphs are not indicated unless calculation on the Calcu tab has finished.



4.5. Project cost comparison window

Project cost comparison window is displayed below.

This window shows the comparison of yearly and monthly costs which have been calculated in each Project.

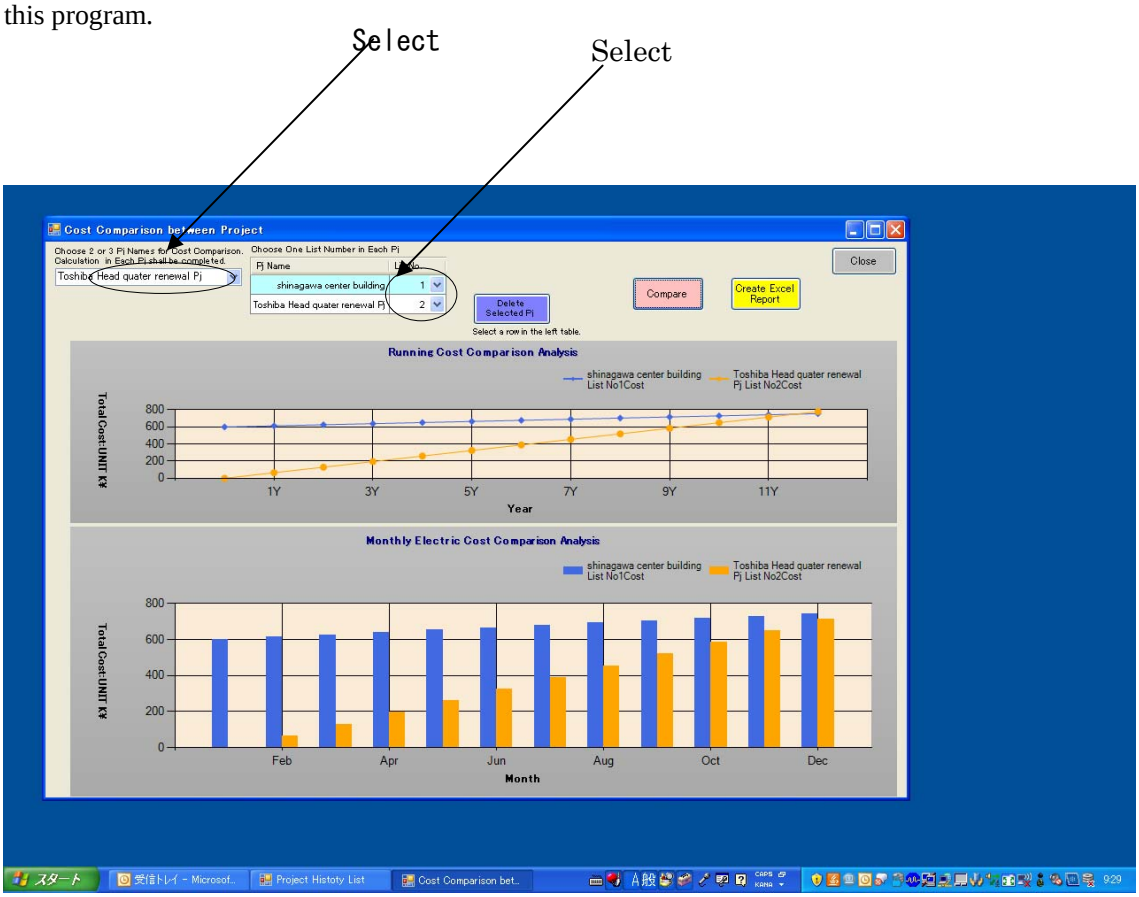
Just after finishing the calculations of each Project, this window shall be opened from the Project History List window.

At first, select the Project names for the cost comparison from the list box at left upper side of this screen. Then, select the list number of the selected Project name from the second column in the newly created table. Maximum 3 different Projects are selected and one list number of each Project shall be selected for cost comparison. List number corresponds to the “No” at the tables in the Cal tab and Cost cal tab in the Calculation windows in each Project.

A selected Project can be deleted by clicking “Delete selected Pj” button after selecting the Project name in the Project table by clicking the Project name.

By Clicking the “Compare” button , yearly and monthly cost graphs are shown.

Please note the comparison is effective in case each Project ‘s calculation is completed and this screen is opened before exiting this program.



4.6. Calculation window

This window contains the “Basic Parameter Input” window and “Parameter Based Calculation" window. You can proceed to the “Calculation” window without registering a project. Unlike the calculation for a registered project, the calculation result using this window is not saved, but you can output a report of the results.

4.7. Import window

You can add/delete necessary/unnecessary countries and cities on the “country_*.xml” file, which contains the temperature data of cities in a predetermined format. Copy the “country_*.xml” file in the “config” folder into a certain directory and click the “Selected saves created xml file” button to select the copied file. The city and country data on the copied file are available to edit. After editing, replace the “country_*.xml” file in the “config” folder with the new edited file to use the new one as the outside temperature data for this software.

4.7.1. Adding cities and countries

After selecting a file to edit by clicking the “Selected saves created xml file” button, select a country and a city using the “Country” and “Area” pulldown list. You can enter a new country/city name using the keyboard. To add a new city to a country existing in the data, select the country using the “Country” pulldown list and enter the name of the new city under "Area”. On the screenshot below, “Tampere” is added to the already registered country Finland.

Click the “Selected Read Excel file” button to select the Excel file containing the temperature data of the new city to add.

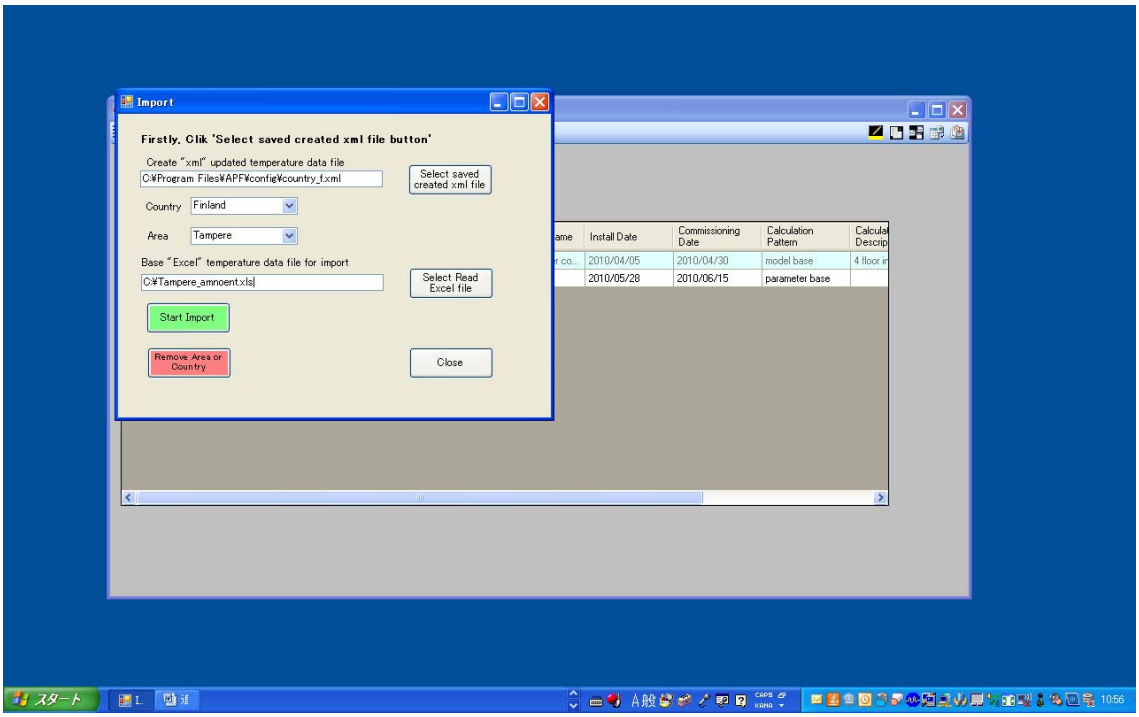
The Excel file must be in the predetermined format and its sheet name must be the same as the new city name. To add a country, enter the country name only and leave the city name blank, and assign the city names to sheets. The data format of the Excel sheet must be the same as the format of the data on the sheet generated by the export function. Click the “Start Import” button to change the xml file.

Example) Adding a new country “XNEW”

- Make an Excel file containing temperature data of cities which use the default format shown in 4.7 for data description. Assign a city name to a sheet.
- Add “XNEW” on “nameofcountry.xml”, which contains the registered country names, in ¥config folder using an appropriate editor. Designate “country_x.xml”, which contains the temperature data of cities in countries whose names start with “x”, in the ¥config folder using the absolute path and confirm the designation by clicking the “Select saved created xml file” button.
- Enter “XNEW” in the “Country” box to add the country name. Enter the city name in the “Area” box.
- Click the “Start Import” button to add the country and city assigned with Excel to “country_x.xml” and finish importing.

4.7.2. Deleting cities and countries

Select a country to delete using the “Country” pulldown list and click the “Remove area or country” button. All cities in the selected country are deleted. To delete a city, select the city and its country using the “Area” and “Country” pulldown lists and click the “Remove area or country” button. Repeat this for each city to delete. Click the “Close” button to return to the initial window.

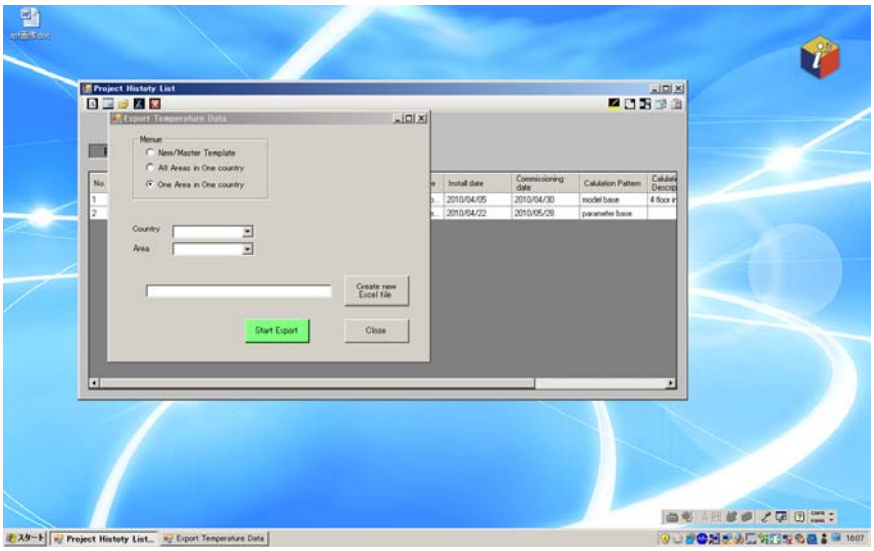

Import
Firstly, Clik 'Select saved created xml file button'
Create "xml" updated temperature data file
C:¥Program Files¥APF¥config¥country_f.xml
Select saved created xml file
Country
Finland
Area
Tampere
Base "Excel" temperature data file for import
C:¥Tampere_amnoent.xls
Select Read Excel file
Start Import
Remove Area or Country
Close
Install Date
Commissioning Date
Calculation Pattern
2010/04/05
2010/04/30
model base
2010/05/28
2010/06/15
parameter base

4.8. Export window

The data of the country and city selected on this window is exported from the “country_*.xml” file in the “config” folder to a predetermined Excel file in Excel format to output base data for editing city data. Designate the name and directory of the Excel file using the “Create new Excel file” button.

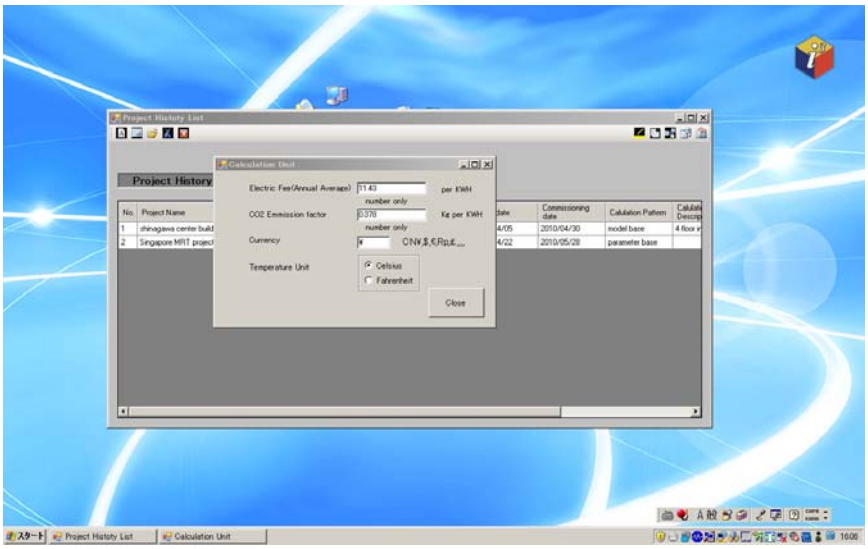
Select one of the three radio buttons below in accordance with the purpose.
New/Master Template: Select this to export an Excel file containing months, dates and hours based on the calendar of the exporting year.
All Areas in One country: Select this to export all city data of the selected country.
One Area in One country: Select this to export the data of the selected city of the selected country.

Click the “Start Export” button to start data export from the “country_*.xml” to the designated Excel file.
Click the “Close” button to return to the initial window.



4.9. Basic Parameter Input window

The electric fee, CO2 emissions, currency unit and temperature unit are to be configured on this window. Set the values on this window while the “Calculation” window is open. The configuration is applied for calculation after closing the Basic Parameter Input window.



5. Annex: the outline of calculation of power consumption

Here the outline of the calculation of power consumption based on the standard “JRA4048” is explained.

The software calculates the input powers of every running hour in each day of the assigned periods through the formulae shown below applying the outside temperature data (data for all hours of all the days of a year) of the area to assess. Then it sums up the calculated input powers of all running hours and derives the total power consumption. The inside temperature is fixed at 27°C during cooling and 20°C during heating in the calculation.

Here the calculation for the case in which a rotation-speed-controllable compressor is used is shown. The building load, performance and power consumption are supposed to be proportional to the outside temperature.

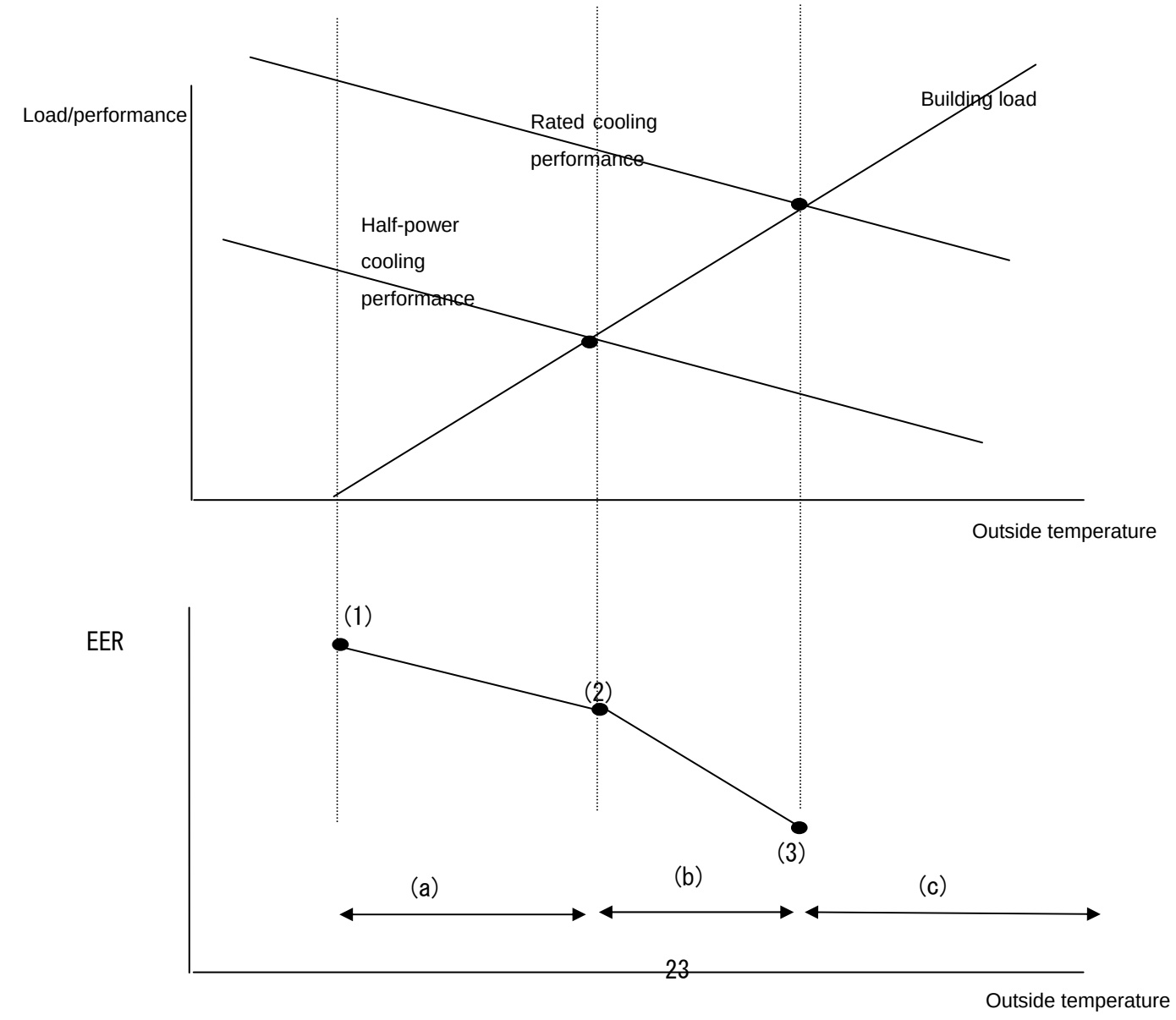
5.1. Calculation of the cooling mode

<EXCEPT EvercoolRoom>

Range (a): Power consumption=Building load/EER1 (EER1 here is derived from the straight-line approximation using the EER values on points (1) and (2).)

Range (B): Power consumption=Building load/EER2 (EER2 here is derived from the straight-line approximation using the EER values on points (2) and (3).)

Range (c): Use the value derived from the straight-line approximation using the power consumption at 29°C and 35°C outside temperature. No correction is done though the cooling load in relation to the building load is smaller than it should be.

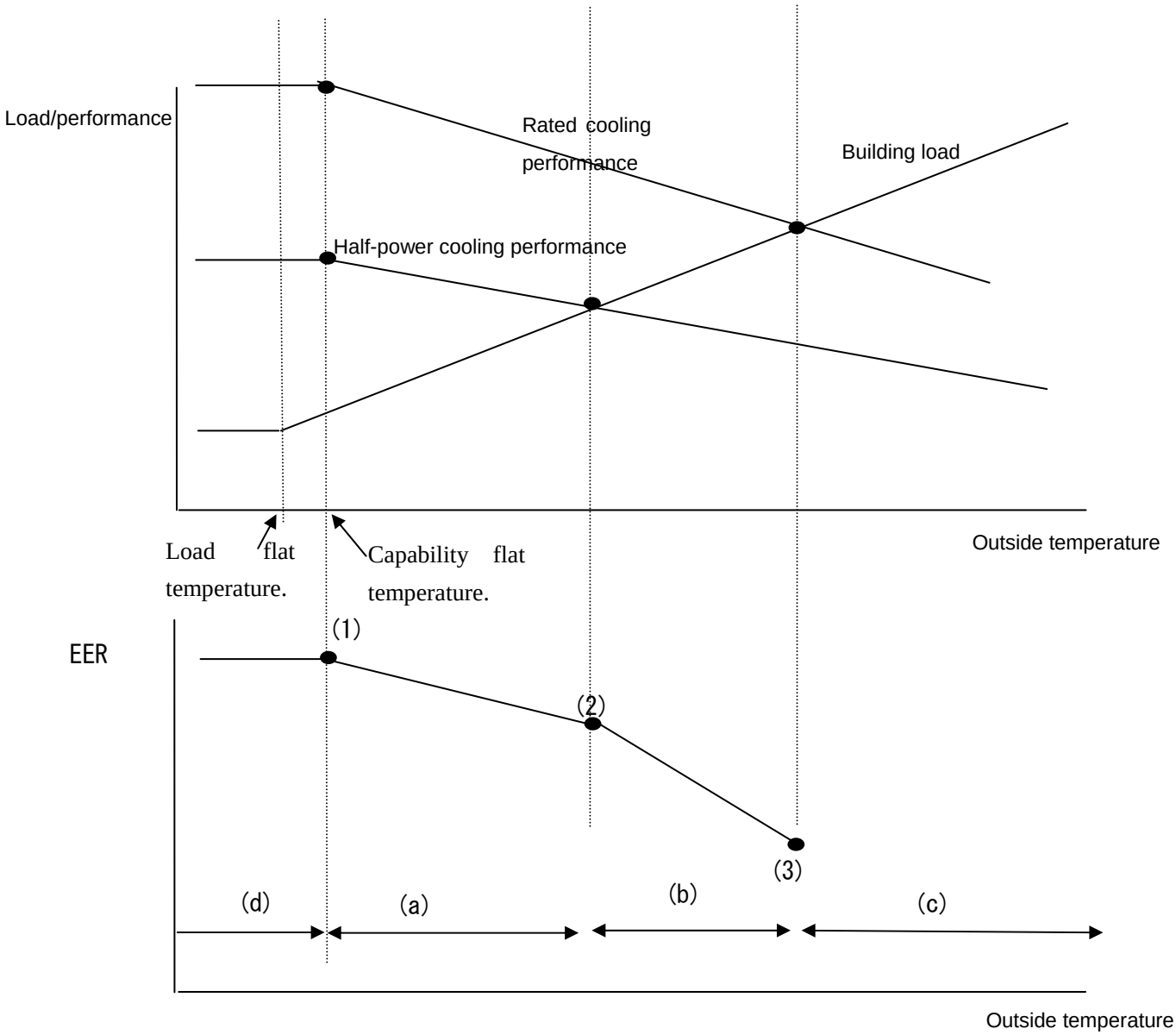


<EvercoolRoom>

Building load is flat at less than Loadflat temperature.

Both Rated cooling performance and Half-power cooling performance are flat at less than Capabilityflat temperature.

Range(d):Power consumption=Building load/EER3 (EER3 here is constant value as same as at points (1).)



5.2. Calculation of the heating mode

The cases below are calculated using the following values: rated heating performance, rated power input, half-power heating performance, power input at half-power, rated heating performance at low temperature, and power input while heating at low temperature.

Ta, Tc, Te, Tg, Tb, Td and Tf show the temperatures at intersections of the “building load” line and the lines of performance on the graph below.

a) Frost-free range (the outside temperature is 5.5°C or higher)

<1> Range of variable running corresponding to the building load

1.1 Higher than Tc: Power consumption=Building load/cop1 (cop1 here is derived from the straight-line approximation using the cop values at Ta and Tc of half-power heating.)

1.2 Higher than 5.5°C and lower than Tc: Power consumption=Building load/cop2 (cop2 here is derived from the straight-line approximation using the cop values at Tb of rated and Tc of half-power.)

b) Frosting range (between -7°C and 5.5°C)

<1> Range of variable running corresponding to the building load

1.1 Higher than Te: Power consumption=Building load/cop3 (cop3 here is derived from the straight-line approximation using the cop values at Ta and Te (while defrosting at half-power).)

1.2 Between Tg and Te: Power consumption=Building load/cop4 (cop4 here is derived from the straight-line approximation using the cop values at Te and Tg.)

1.3 Higher than Tf and lower than Tg: Power consumption=Building load/cop5 (cop5 here is derived from the straight-line approximation using the cop values at Tf and Tg.)

<2> Range of continuous running at maximum rotation speed (Higher than -7°C and lower than Tf)

The power consumption derived from the straight-line approximation using the value of rated power consumption while heating at low temperature (2°C) and that of presumed power consumption at -7°C. Auxiliary heaters are used to compensate for the shortage.

c) Frost-free range (the outside temperature is -7°C or lower)

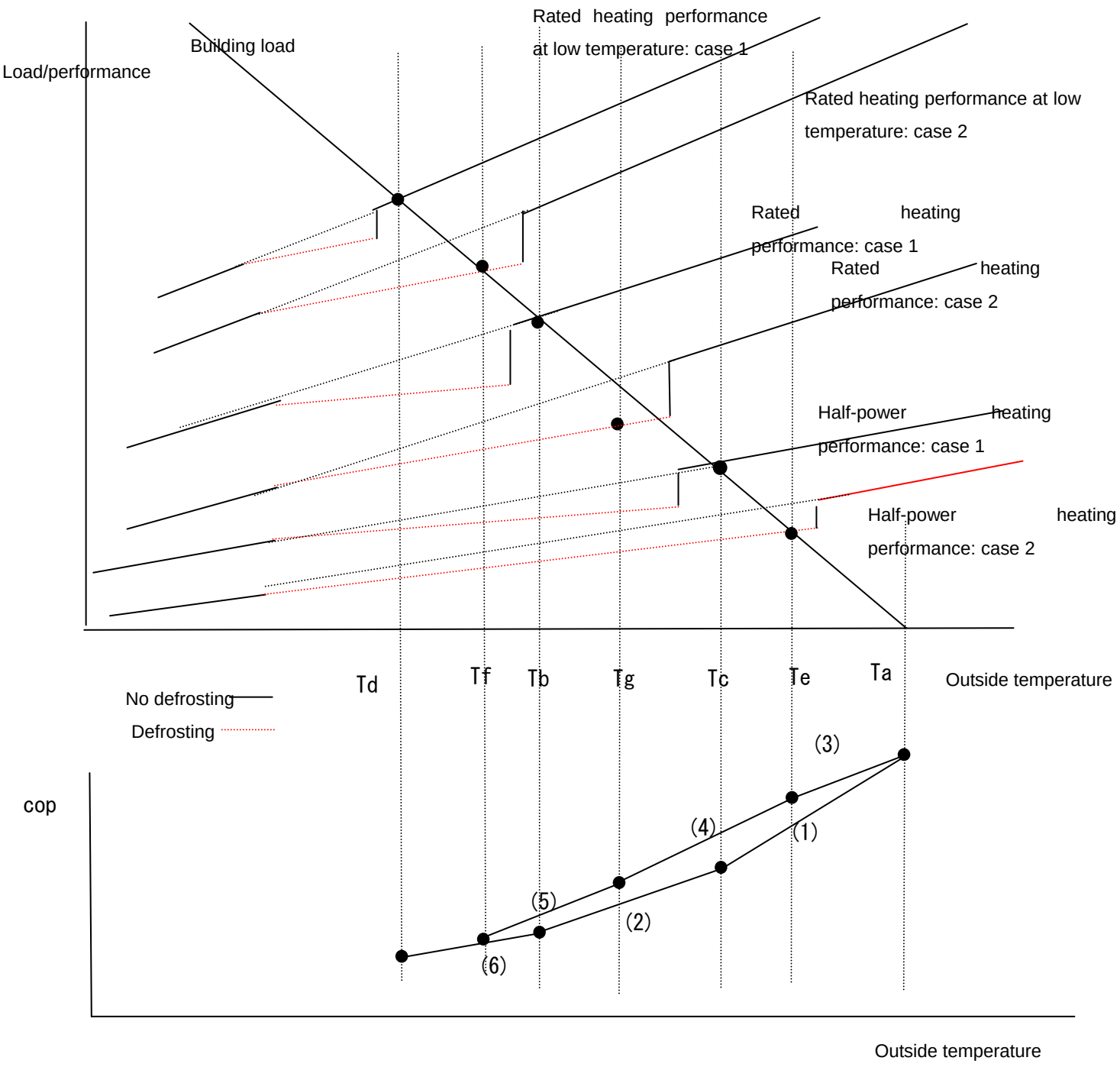
<1> Range of variable running corresponding to the building load

1.1 Between Tb and Tc: Power consumption=Building load/cop2 (cop2 here is derived from the straight-line approximation using the cop values at Tc and Tb.)

1.2 Between Td and Tb: Power consumption=Building load/cop6 (cop6 here is derived from the straight-line approximation using the cop values at Td and Tb.)

<2> When the outside temperature is lower than Td and the building load is larger than the heating performance

The power consumption is derived from the straight-line approximation using the value of the power consumption while heating at low temperature and that of presumed power consumption at -7°C. Auxiliary heaters are used to compensate for the difference from the building load.


Load/performance
Building load
Rated heating performance at low temperature: case 1
Rated heating performance at low temperature: case 2
Rated heating performance: case 1
Rated heating performance: case 2
Half-power heating performance: case 1
Half-power heating performance: case 2
Td
Tf
Tb
Tg
Tc
Te
Ta
Outside temperature
No defrosting
Defrosting
cop
(1)
(2)
(3)
(4)
(5)
(6)
Outside temperature