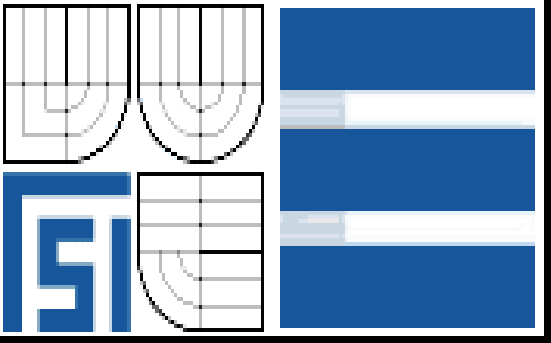

•Brno University of Technology
•Faculty of Mechanical Engineering
•Energy Institute
•Dept. of Thermodynamics and Environmental Engineering

Control Systems of Buildings by Using Modeling and Simulation

« Create a Model of a Hall by Using TRANSYS 16 »

Supervisor: doc. Ing. Josef ŠTĚTINA, Ph.D.
Ing. Pavel CHARVÁT, Ph.D.

Ing. Mohamad Kheir MOHAMAD

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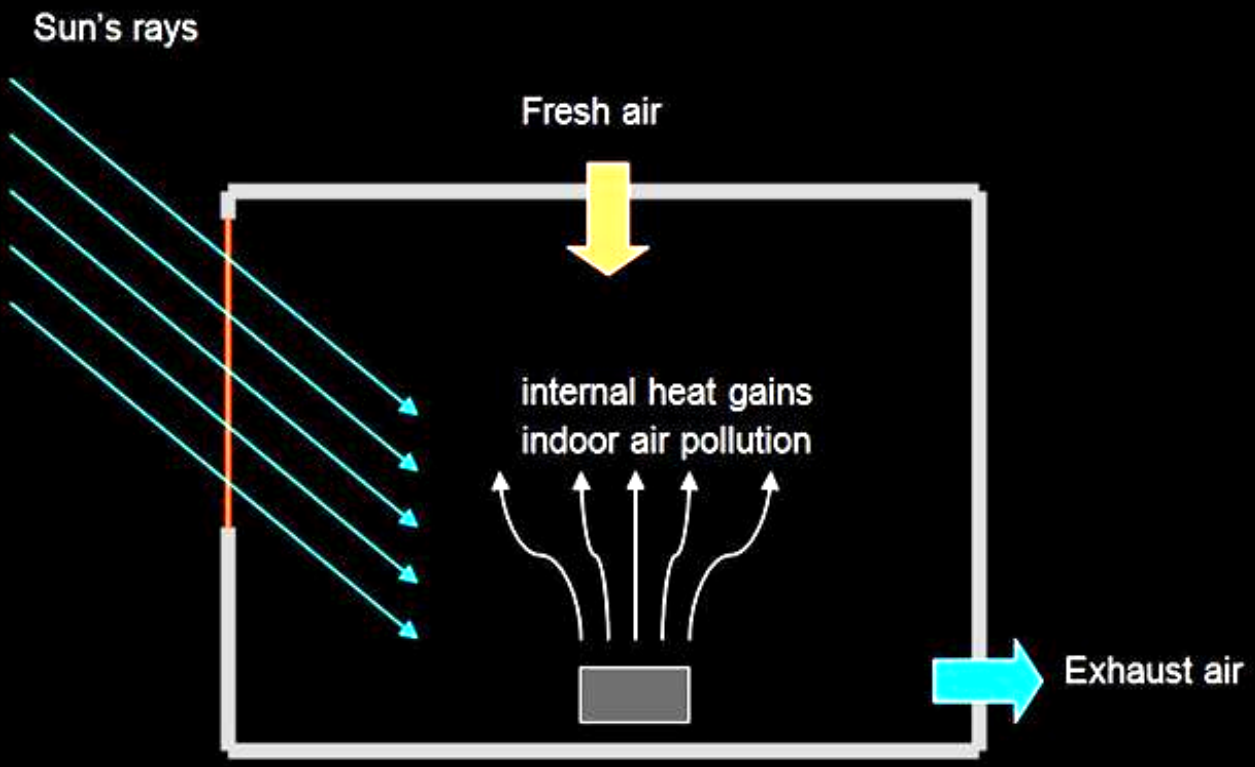
Contents :

1- Motivation

- ***Find an easy and available method that can control the climatic conditions in the building.***
- ***achieve adaptability and adjustability.***
- ***minimize the required input data.***

2- Description of the problem

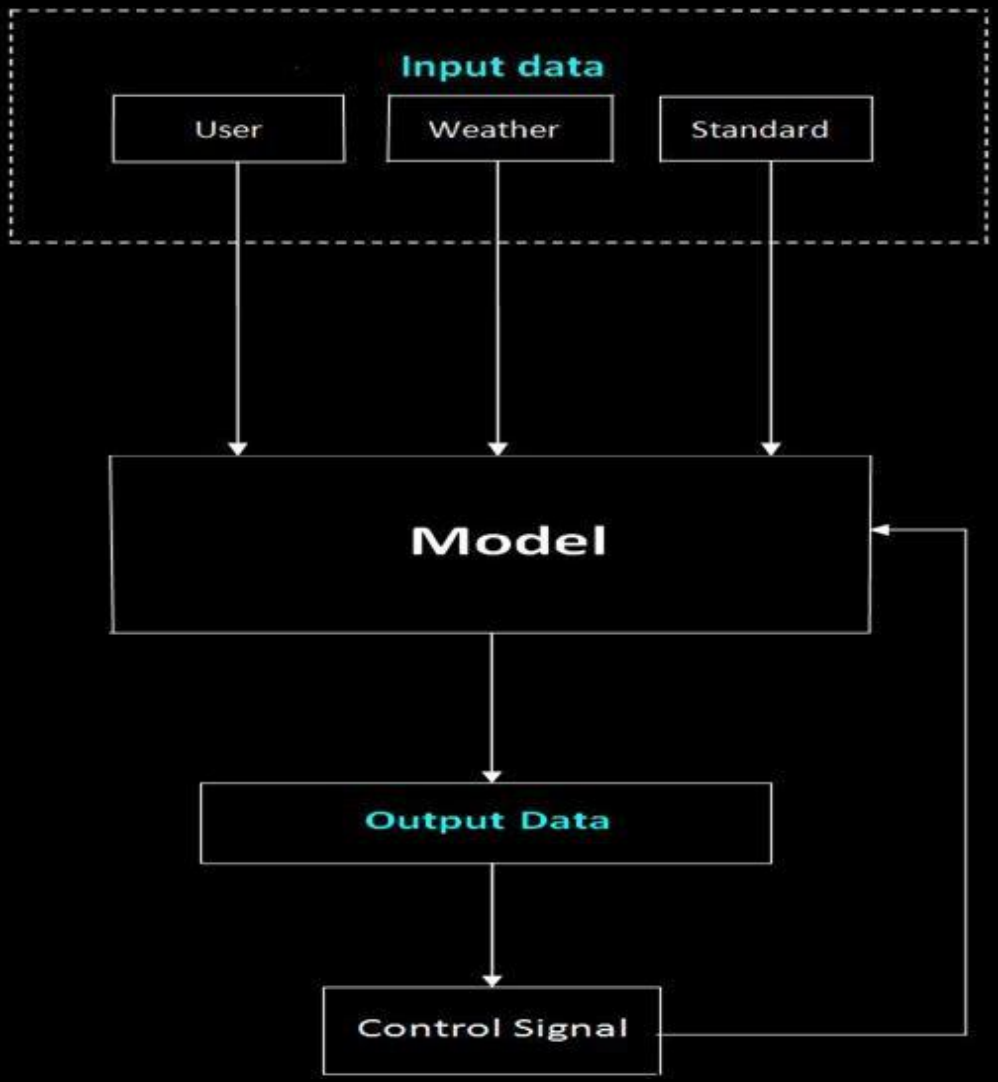
we should create a computer model can control climate conditions inside an imposed building by using TRANSYS 16 software



Some problems that model should deal with:

- ***transmission heat (loss/gain)***
- ***ventilation (indoor air quality)***
- ***internal heat gains***
- ***solar heat gain***
- ***control of HVAC***

Supposed algorithm model



3– Steps to resolve the problem by TRANSYS 16 software:

1- create thermal zones

2- enter dimensions of the room

3- set the glazing fraction of each side of the building and a global rotation angle for the building

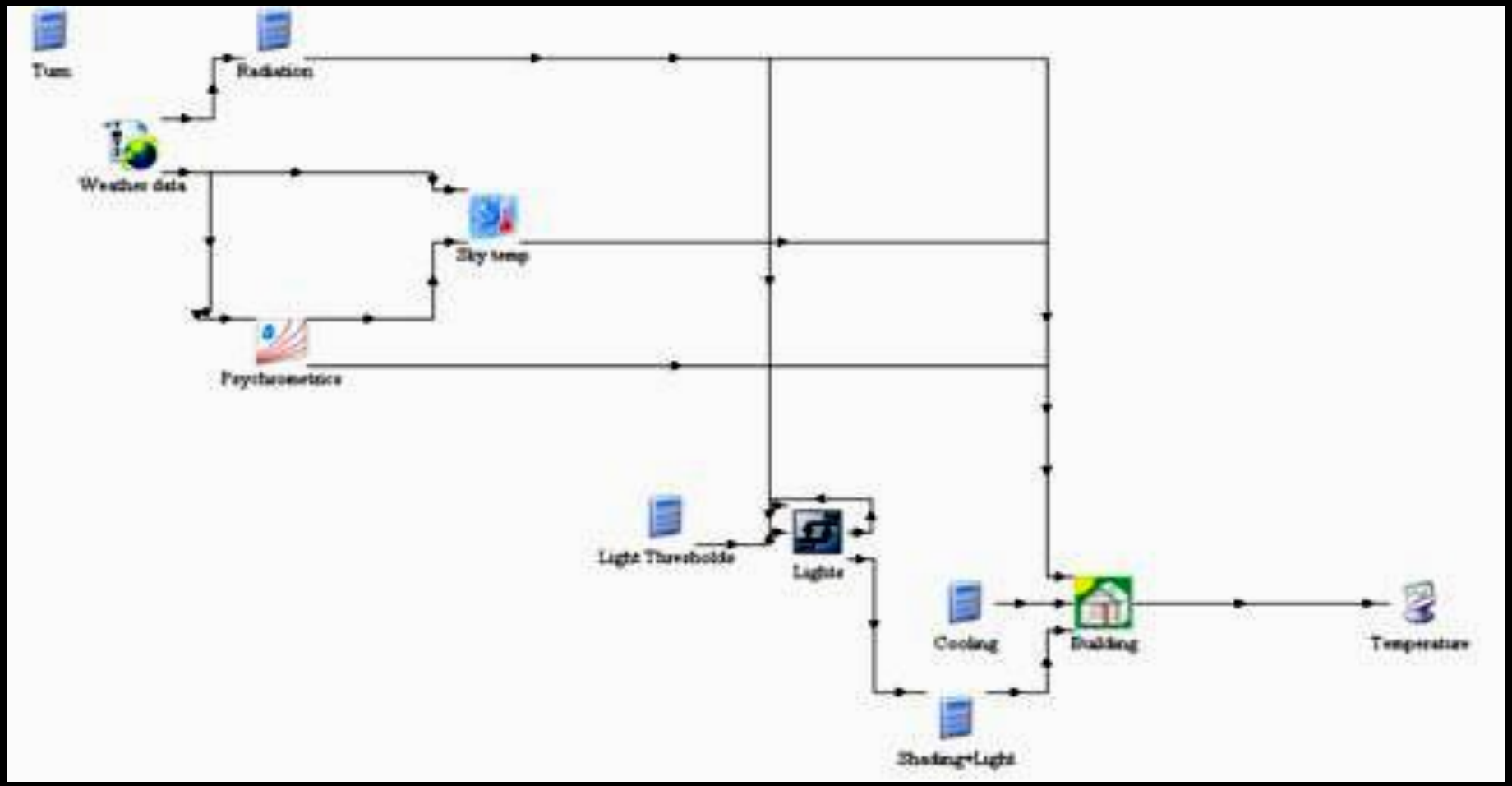
4- define the parameters of the infiltration and ventilation

5- define the parameters of the heating and the cooling

6- define Internal gains

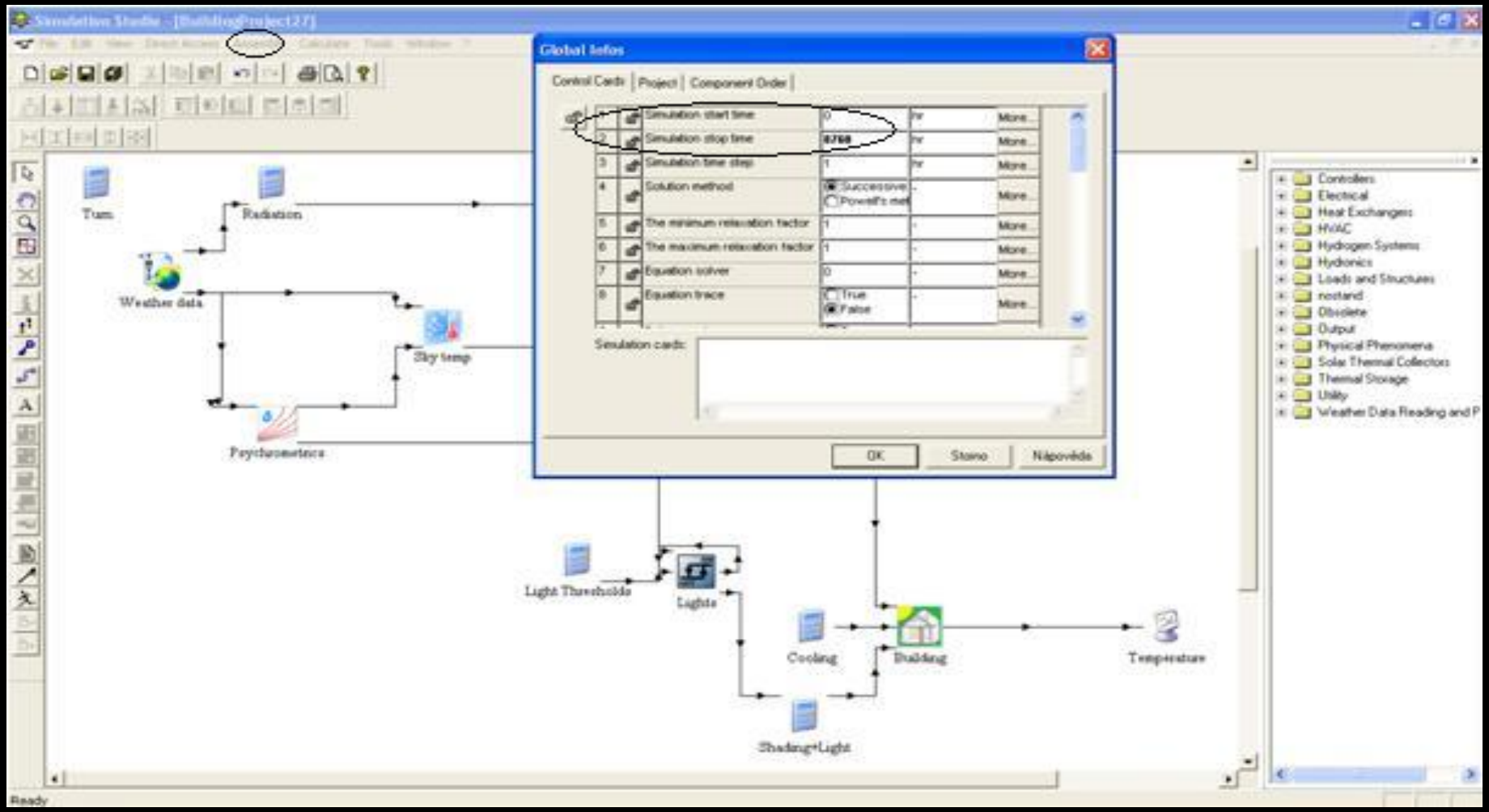
generate the model

The TRNSYS project created by the building wizard has all the necessary components .

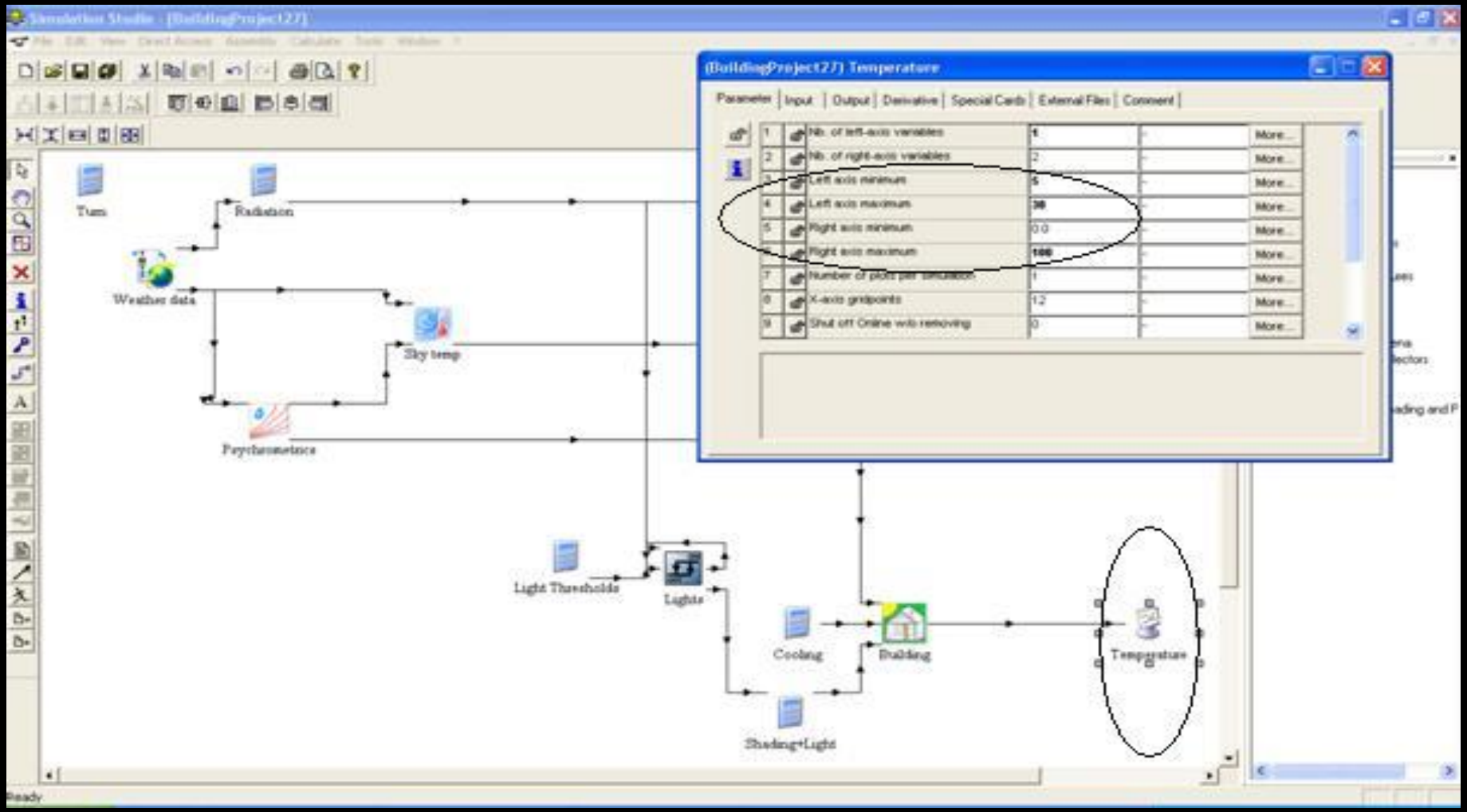


Modifying the wizard-generated project

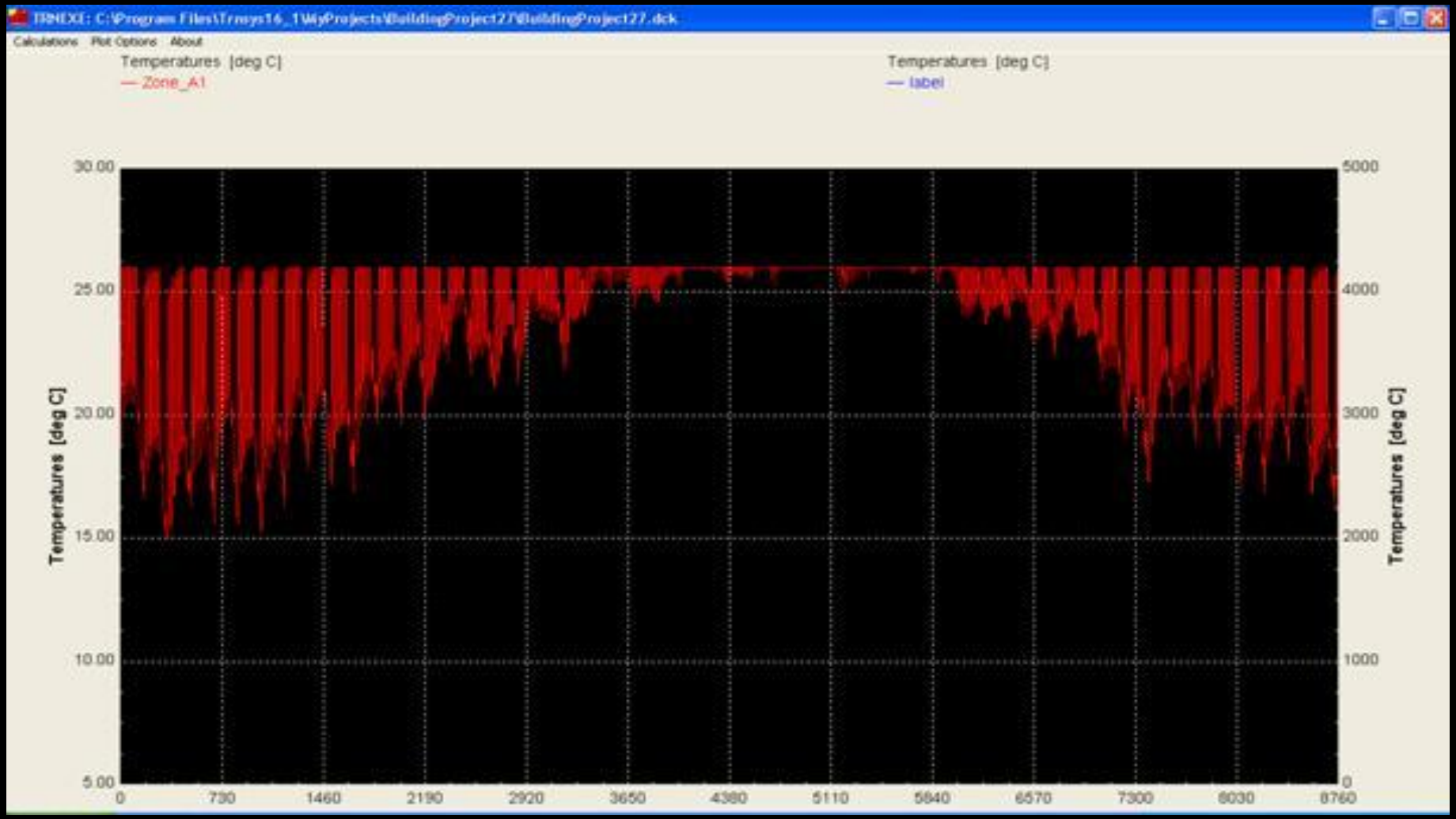
- *change the simulation period*



- *change the axis limits on the online plotter*

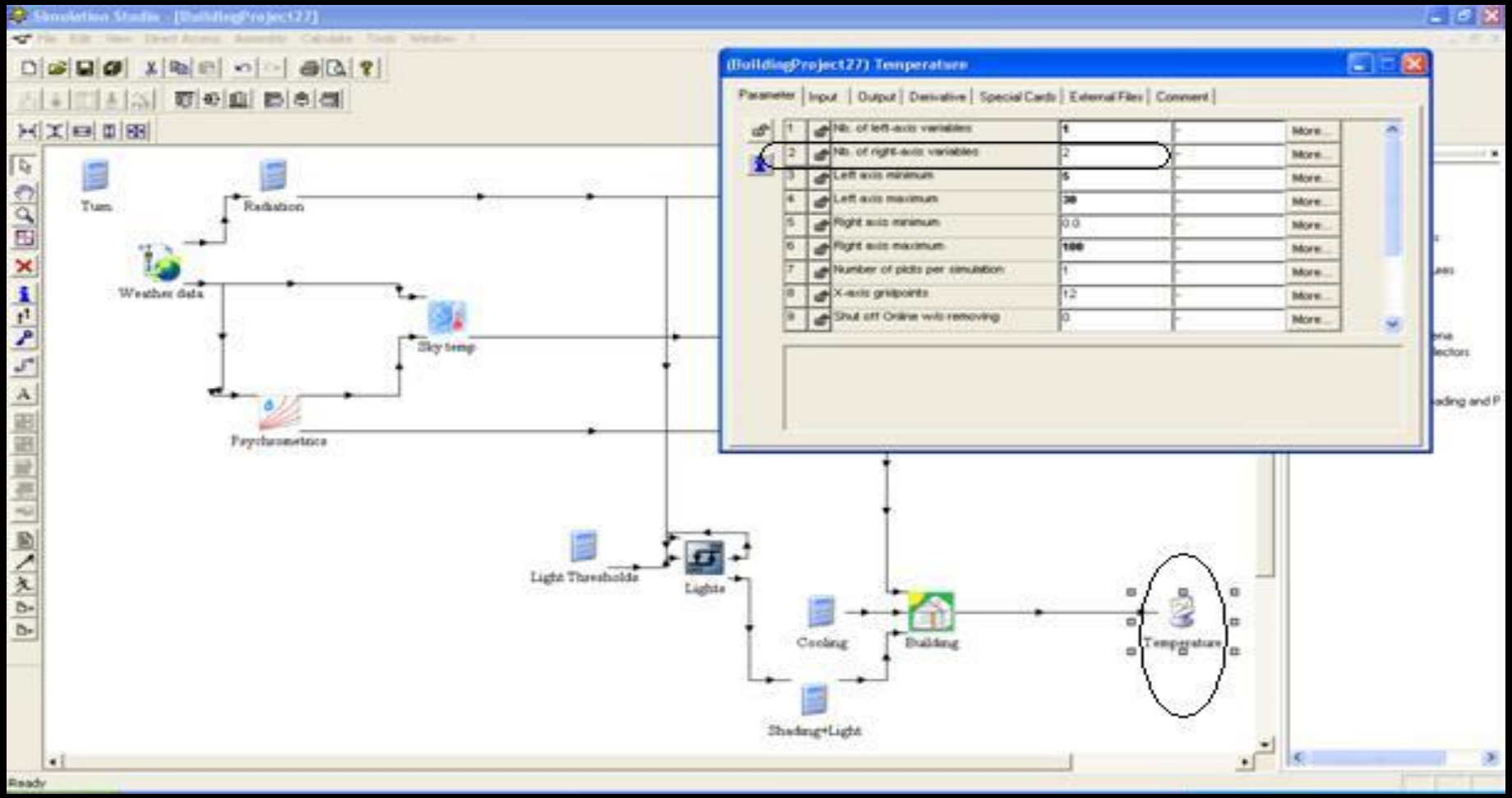


Run simulation

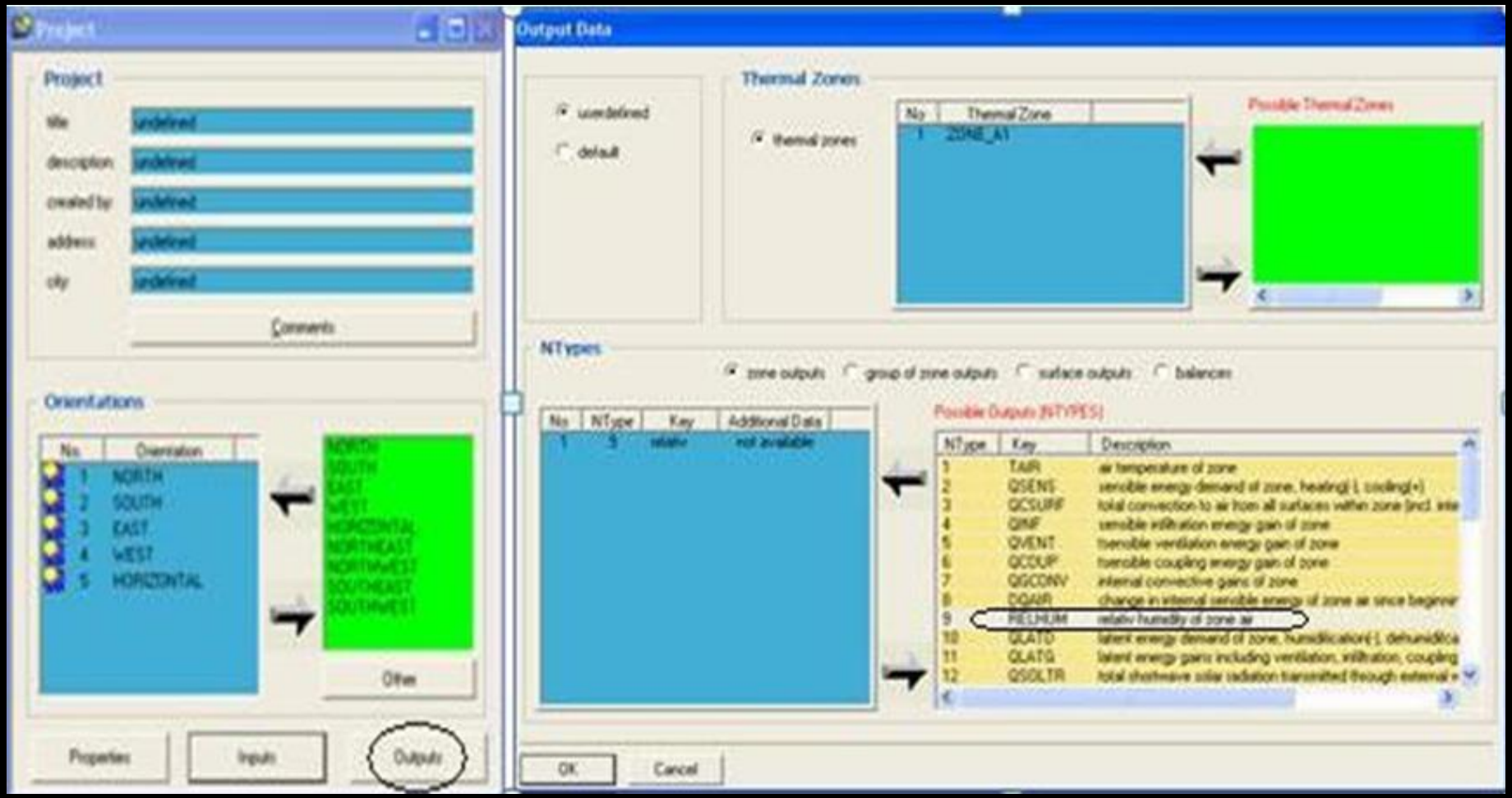


Steps to read values of the relative humidity

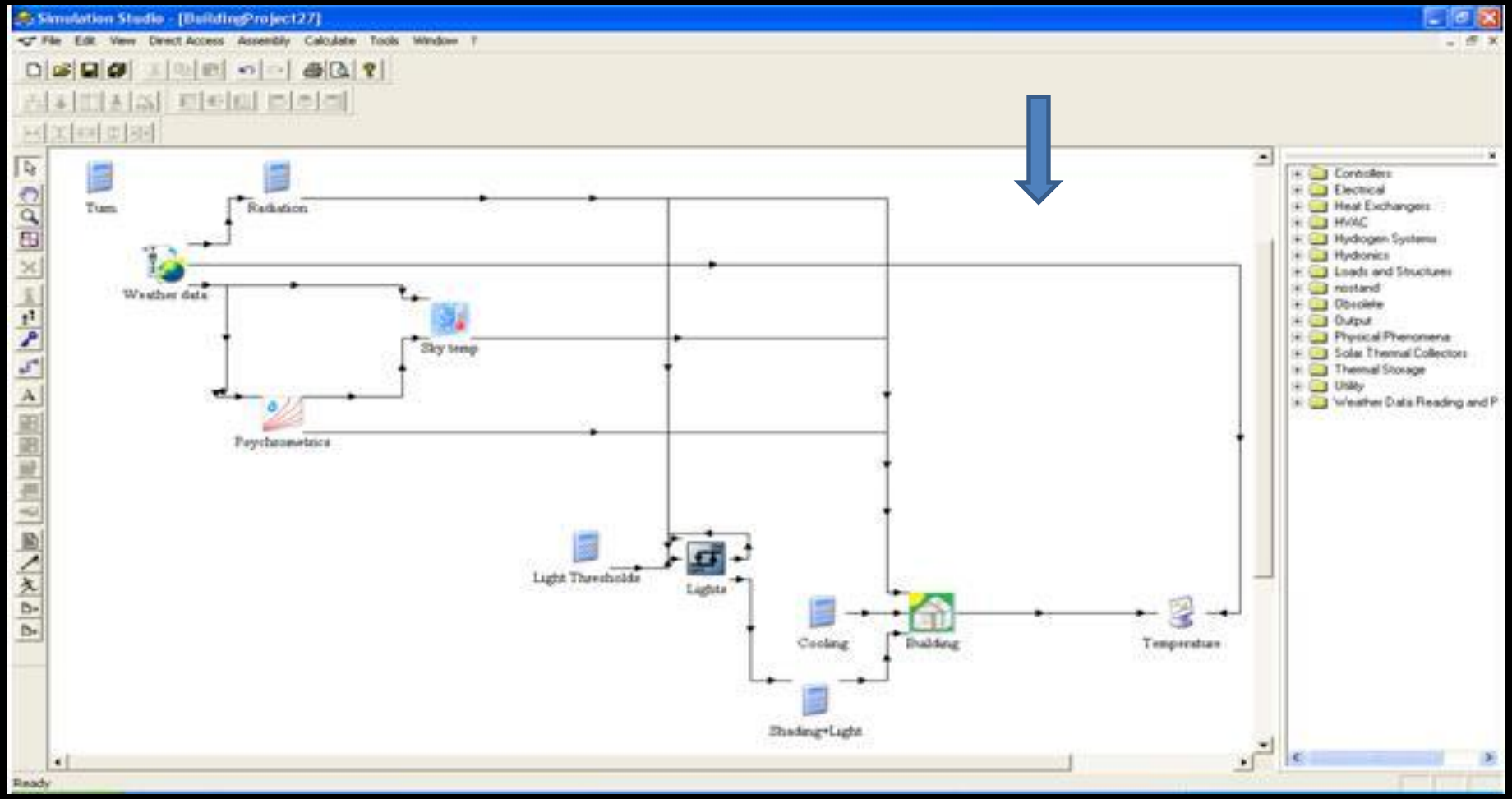
- *change the number of variables representing on the plotter*



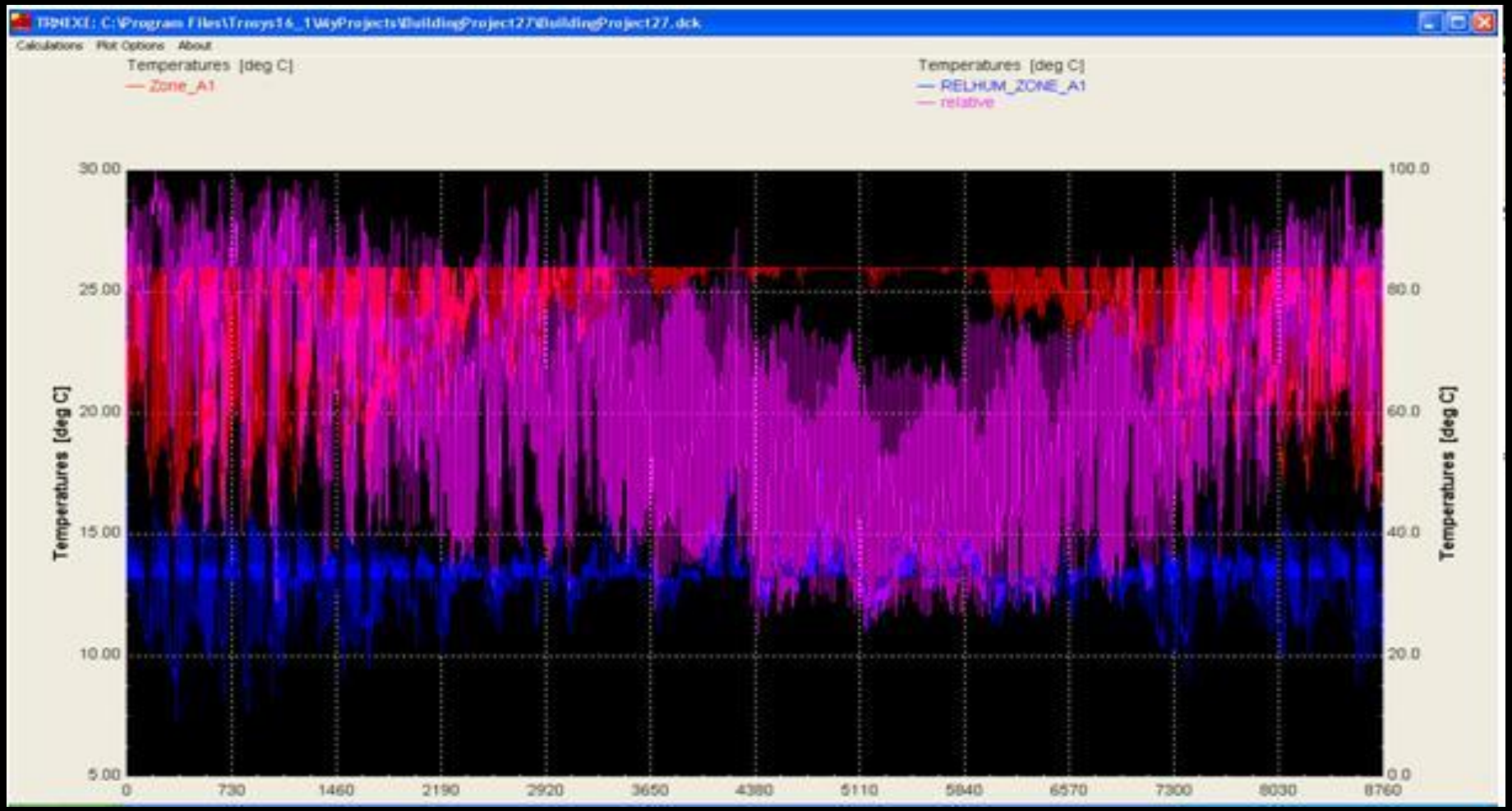
- *insert the relative humadity as a new output of the building*



- *connect between the weather data and building on the one hand and the online plotter on the other hand by humidity*



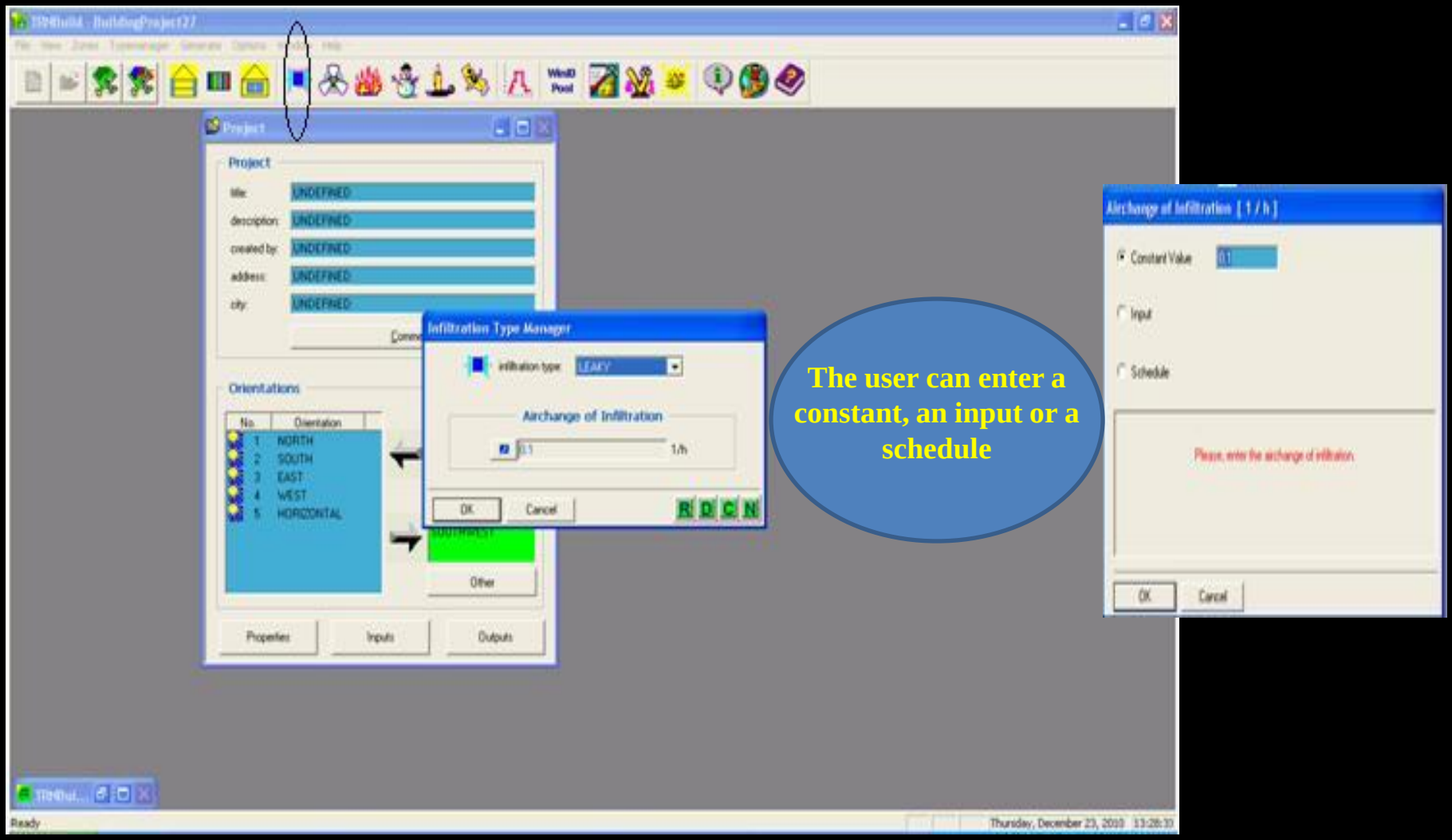
run simulation again



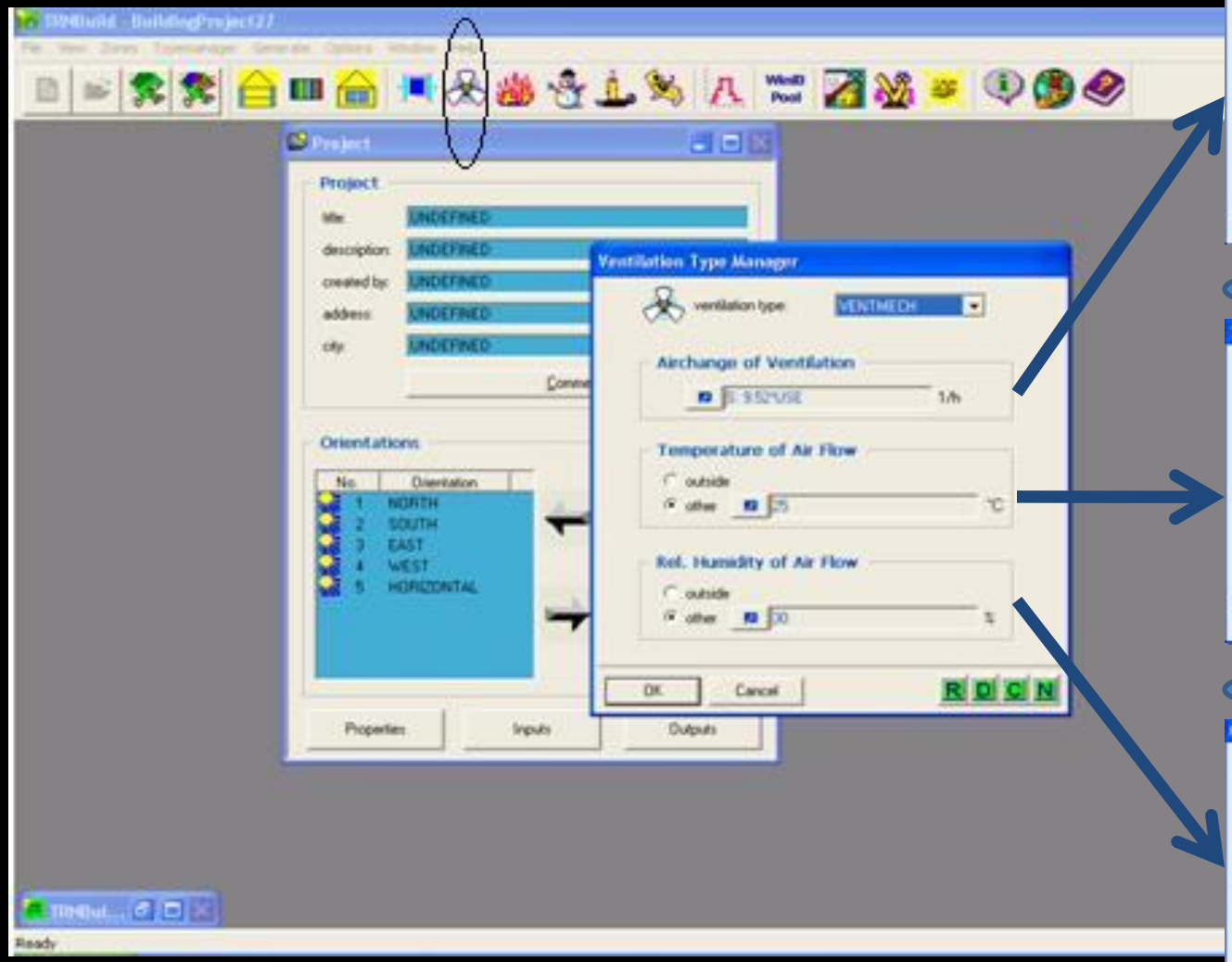
4- change the basic conditions indoor

- ***Infiltration***
- ***Ventilation***
- ***Heating***
- ***Cooling***
- ***Gains***

Infiltration



Ventilation

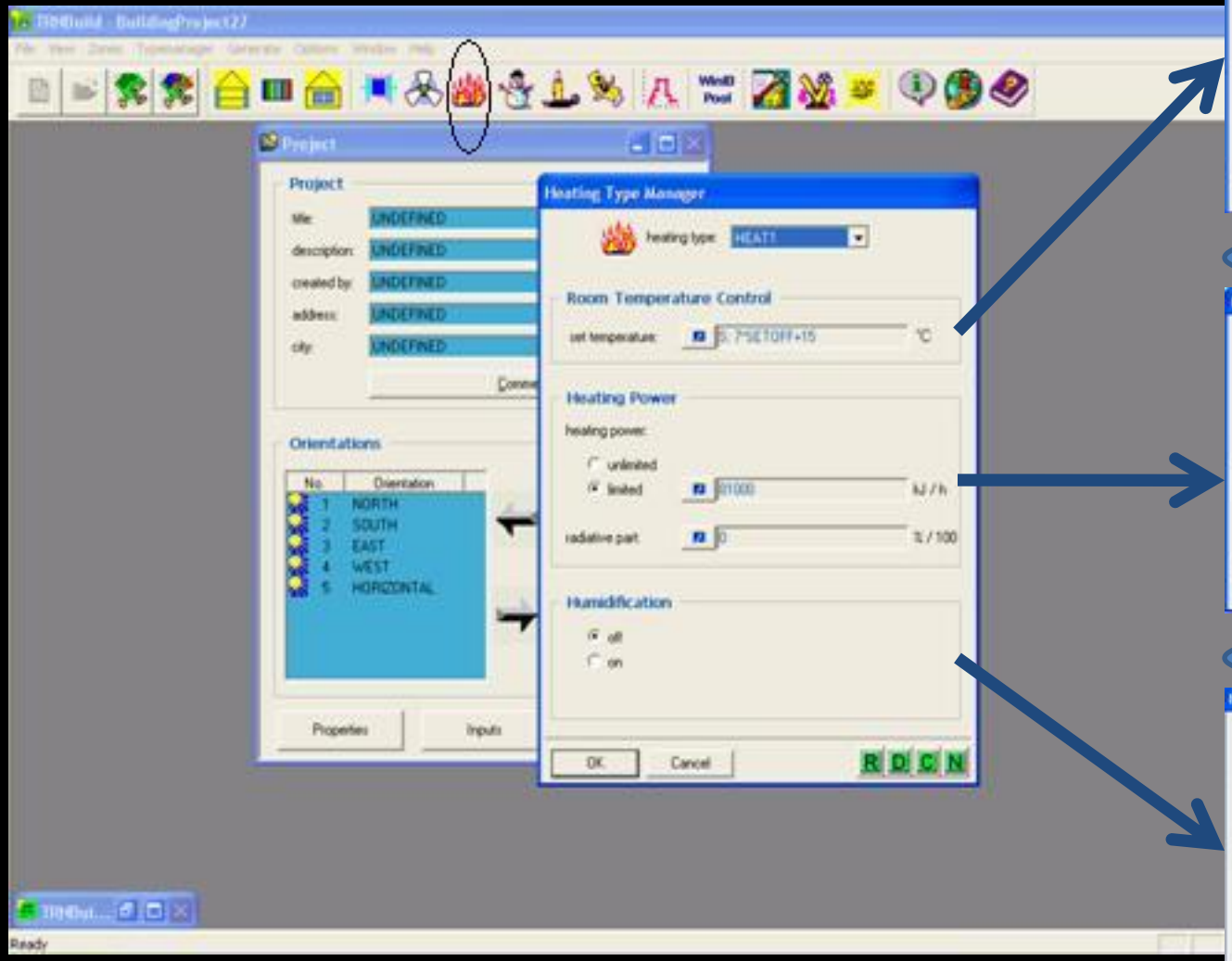


Airchange of Ventilation

Temperature of Air Flow

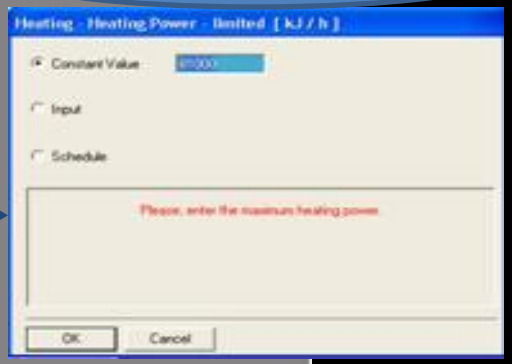
Rel. Humadity of Air Flow

Heating



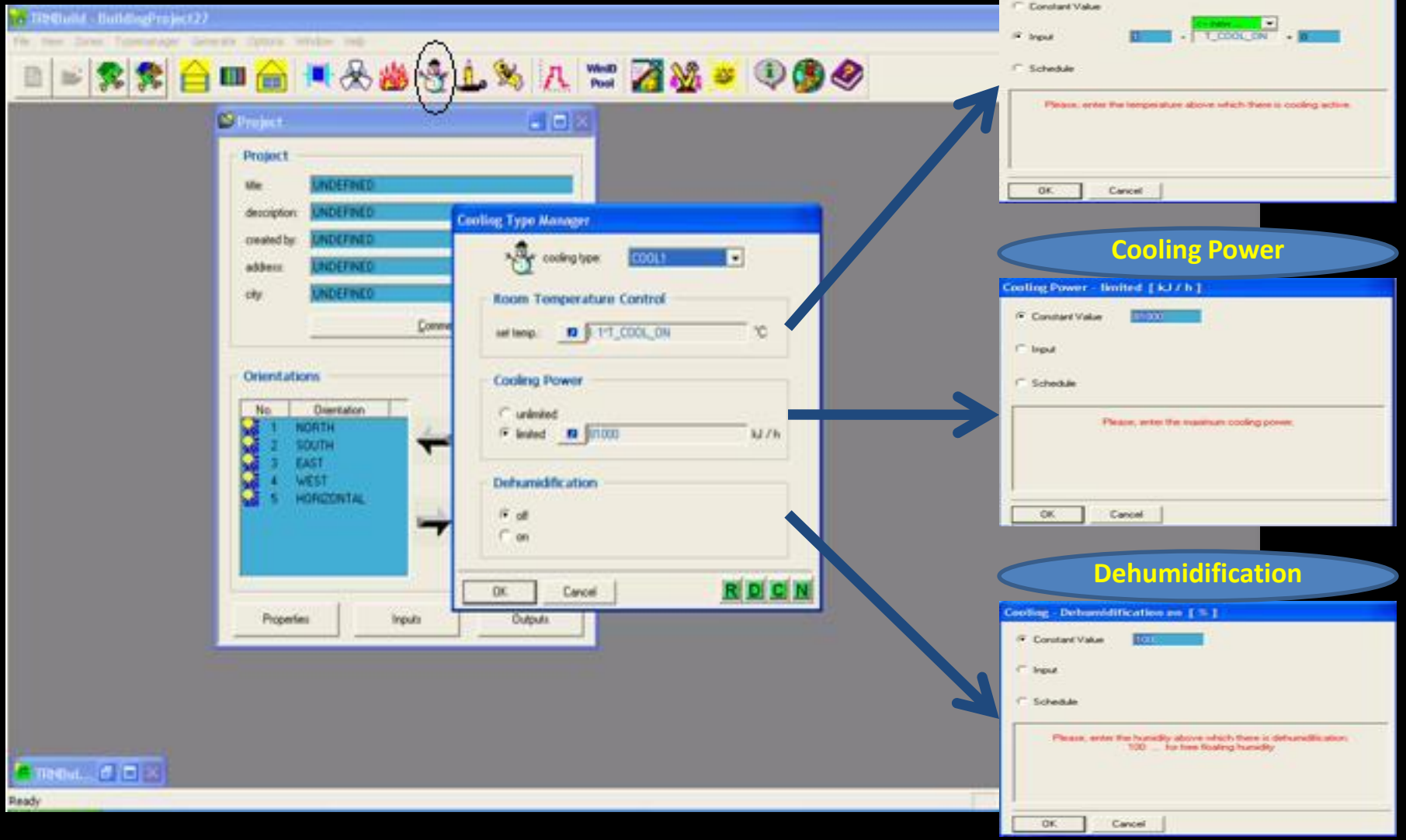
Room Temperature Control

Heating Power

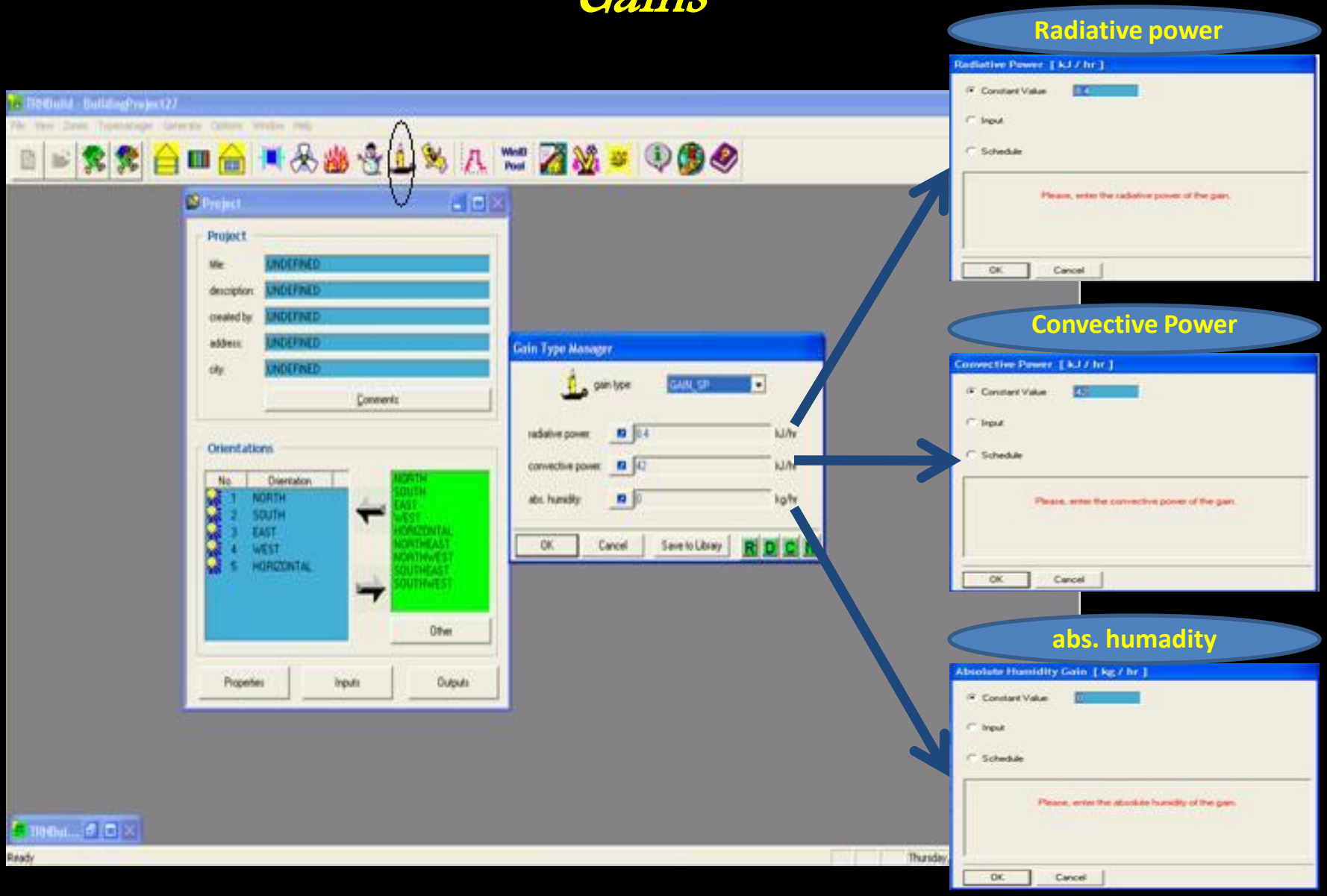


Humidification

Cooling


Project
Project
title
UNDEFINED
description
UNDEFINED
created by
UNDEFINED
address
UNDEFINED
city
UNDEFINED
Orientations
No.
Orientation
1 NORTH
2 SOUTH
3 EAST
4 WEST
5 HORIZONTAL
Properties
Inputs
Outputs
Cooling Type Manager
cooling type
COOL1
Room Temperature Control
set temp.
T_COOL_ON
°C
Cooling Power
unlimited
limited
kJ / h
Dehumidification
off
on
OK
Cancel
R D C N
Ready
Room Temperature Control
Cooling - room temperature control [°C]
Constant Value
Input
Schedule
T_COOL_ON
Please, enter the temperature above which there is cooling active.
OK
Cancel
Cooling Power
Cooling Power - limited [kJ / h]
Constant Value
Input
Schedule
Please, enter the maximum cooling power.
OK
Cancel
Dehumidification
Cooling - Dehumidification on [%]
Constant Value
Input
Schedule
Please, enter the humidity above which there is dehumidification.
100 ... for free floating humidity
OK
Cancel

Gains

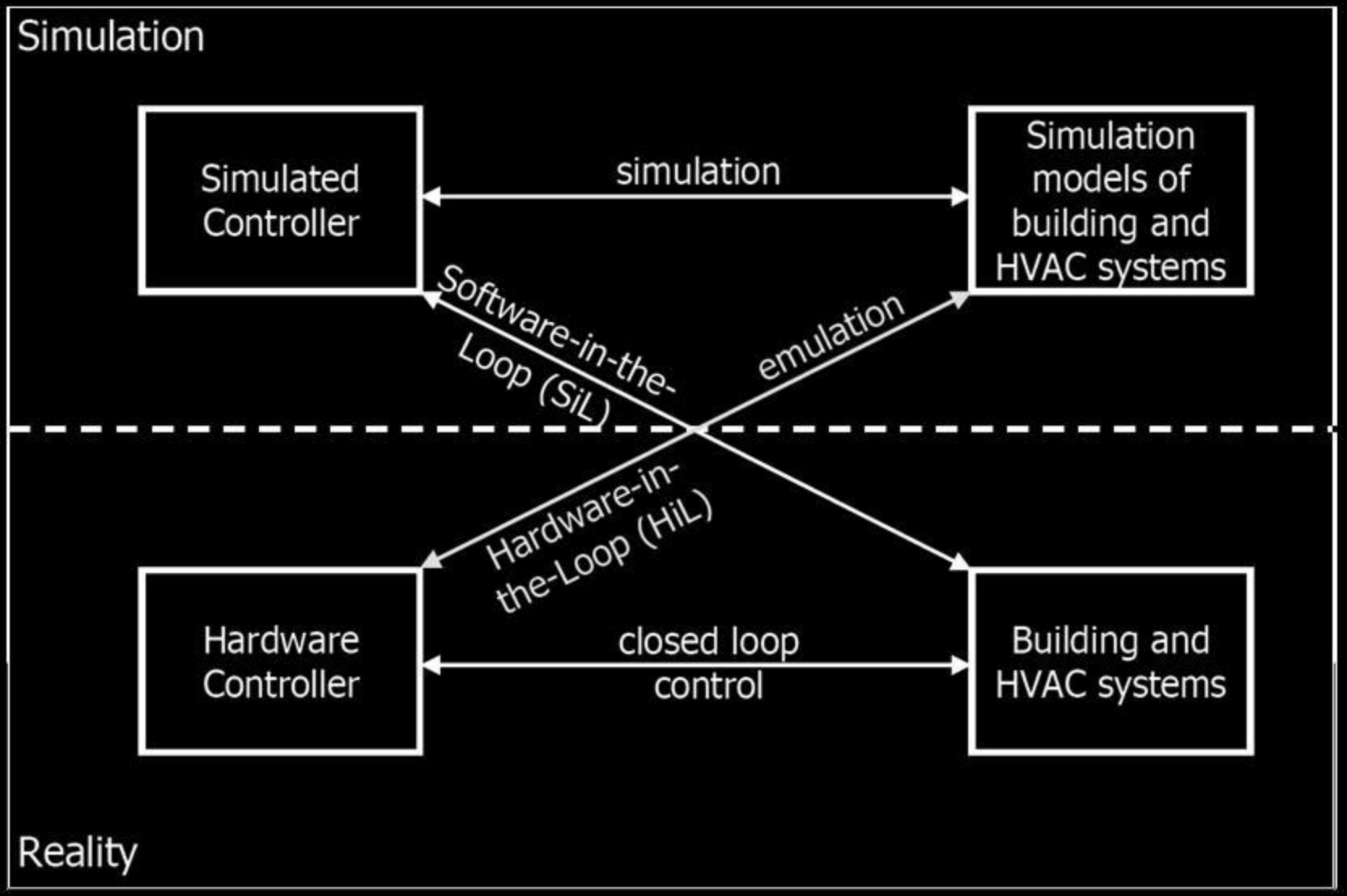

Radiative power
Convective Power
abs. humadity
Project
Project
title: UNDEFINED
description: UNDEFINED
created by: UNDEFINED
address: UNDEFINED
city: UNDEFINED
Comments
Orientations
No. Orientation
1 NORTH
2 SOUTH
3 EAST
4 WEST
5 HORIZONTAL
Other
Properties
Inputs
Outputs
Gain Type Manager
gain type:
radiative power:
convective power:
abs. humidity:
OK
Cancel
Save to Library
Radiative Power [kJ / hr]
Constant Value
Input
Schedule
Please, enter the radiative power of the gain.
OK
Cancel
Convective Power [kJ / hr]
Constant Value
Input
Schedule
Please, enter the convective power of the gain.
OK
Cancel
Absolute Humidity Gain [kg / hr]
Constant Value
Input
Schedule
Please, enter the absolute humidity of the gain.
OK
Cancel
Ready

5– Summary

- ✓ *Use TRANSYS 16 software to create model of simple building.*
- ✓ *Change the basic conditions to become compatible with the requirements of the user.*

6- Outlook

- ***Taking into account all the design requirements of building such as installation of walls and the presence of extensions and windows …..***
- ***Taking into account the climatic requirements other than those mentioned, such as comfort and other different requirements …..***
- ***Model CO_2***
- ***Hardware in the loop (HIL)***
- ***Virtual building***


Simulation
Simulated Controller
simulation
Simulation models of building and HVAC systems
Software-in-the-Loop (SiL)
emulation
Hardware-in-the-Loop (HiL)
Hardware Controller
closed loop control
Building and HVAC systems
Reality

Thank you very much
for your attention