

Short description

TRNSYS simulation software was used to develop the numerical model of a typical office space. Here infiltration, ventilation, shadings, internal gains and occupancy schedules are characterized as reported in Deliverable DC1 of IEA SHC Task 56 (<http://task56.iea-shc.org/publications>).

- TRNSYS (v 17.02.0028)
- TESS Library

How to install it?

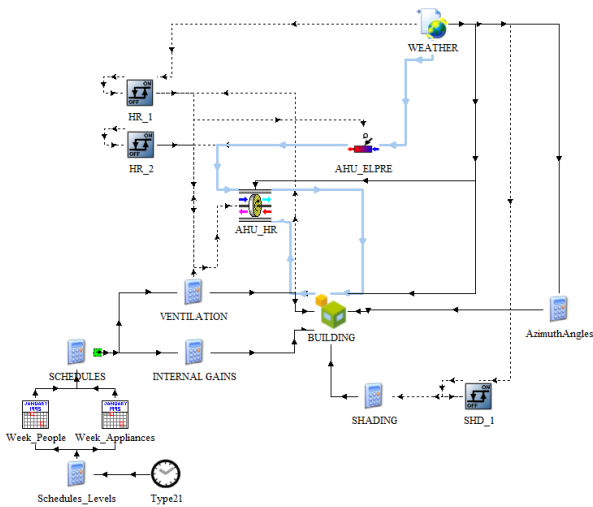
To run the simulation, a licensed version of TRNSYS and the TESS library are required. More information can be found in www.trnsys.com. To start the simulation studio, just unzip the folder and click on "Task56_Office.tpf"



How is the model structured?

The office space is modelled by using a single thermal zone and one air-node. The numerical model is constituted of interconnected blocks that model the main features of the office cell (VENTILATION, INTERNAL GAINS etc.) and exchange outputs during the iterative resolution process occurring each timestep of the simulation. The climate data is read from an external file by the block WEATHER, whereas building assemblies and material properties are described in the block BUILDING.

The predefined outputs for the user are two plots and two printed files generated in the current directory. Here, the main components of the thermal balance are reported every timestep and integrated per month.



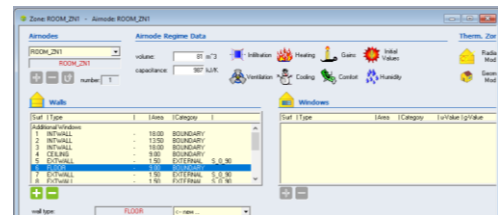
How to run and modify the model?

To launch the simulation, click on "Run" in the Project toolbar and the output files will be generated as the simulation progresses.

To modify climate, double click on WEATHER and browse to find the desired climatic data file (*.tm2) in the folder "Inputs/WEA" provided in the zipped archive. The external file linked to the BUILDING block (*.b17) is found in the folder "Inputs/BUI" and can be changed in the same way. Three locations are made available: Rome, Stuttgart or Stockholm.

To customize the simulation, a set of parameters can be modified in the "Simulation cards" space, which is accessible under the "Control card" icon in the Project toolbar.

To modify building assemblies and material properties, right click on the BUILDING block and then click on "Edit Building".



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** Simulation Constants - 5
TSTEP=60 (s) Time step
SIMSTART=0 (h) Simulation start time
MONTH=744 (h) Time period for preconditioning of thermal mass
SIMSTOP=6768 (MONTH) (h) Simulation stop time
TURN=0 (°) Angle of rotation from the azimuth

** Fluid properties - 3
RO_AIR=1.2041 (kg/m³) Density - Air
CP_AIR=1.03 (kJ/kgK) Specific heat - Air
WATER_CP=4.187 (kJ/kgK) Specific heat - Water

** Main signals - 6
Y_I0=1 (°) Main switch for internal gains
Y_WIT=1 (°) Main switch for mechanical ventilation
Y_DIF=1 (°) Main switch for infiltrations
Y_ESHD=1 (°) Main switch for external shadings
Y_JHR=1 (°) Main switch for heat recovery in air handling unit
Y_EUH=1 (°) Main switch for antifreeze resistance in air handling unit

** Reference office zone - 5
PERSON=3 (°) Number of occupants
TREAT=21 (°C) Heating setpoint air temperature, set to 100 for no heating
TCOOL=25 (°C) Cooling setpoint air temperature, set to 0 for no cooling
OMAX=13.5/1000 (kg/kg) Dehumidification setpoint (absolute humidity), set to 100 for no dehumidification
OMIN=4.5/1000 (kg/kg) Humidification setpoint (absolute humidity), set to 0 for no humidification

** Ventilation & Infiltration - 12
ACH50=0.15 (1/h) Infiltration rate
FRESHAIR=40 (m³/person) Fresh air change / person
AHU_SFP=0.55 (°Wh/m³) Specific fan power for mechanical ventilation
AHU_HR_VBS=0 (°) Electrical energy consumption of the heat recovery unit
AHU_HR_EPS=0.7 (°%/100) Heat exchanger sensible effectiveness
AHU_HR_BY=23 (°C) Heat recovery bypass activation temperature
    
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Strengths

- Dynamic simulation of single and multi-zone systems with user-defined timestep
- Modern Graphical User Interface and intuitive templates
- High potential for customization of control strategies and HVAC system layouts
- Wide range of HVAC component models is made available in TRNSYS standard and TESS libraries
- Simpler and detailed models are available for shortwave and longwave radiation distribution
- Compatibility with different input data formats and user-defined output data

