Using HamLab for SubTask 1 Common Exercise 3 FINAL

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Summary
In this report, FINAL simulation results for SubTask 1, Common Exercise 3 (ST1CE3) are presented. The aim of this report is to provide additional information of the modifications. It is concluded that: (1) the bad correlation between the previous HAMLab results and measurements are mainly caused by an accidentally 1 day shift in the Excel sheets. (2) The new simulation results agree very well with the measurements in case of the indoor temperatures, relative humidity’s and heating.

1. Modifications

1.1 Fixing Export to Excel Sheets error
An error has occurred during the (manually) export of the simulated data in HAMLab to the requested Excel Sheets. This caused a time shift of 1 day in the Excel sheets. The data in the previous Excel sheet should start at 17 January 0:00 but they accidentally start at 18 January 0:00 causing the time shift.

1.2 Modifications using additional information
In the final version all 4 rooms are simultaneously simulated. We included improved material properties and we added more interior walls. Furthermore, the next parameters were changed:

(1) Ventilation rate is changed to 0.65 instead of 0.58
(2) Layer thickness of Aluminum has changed to 5e-6 instead of 5e-5
(3) The heating capacity is limited to 1000 W
(4) The evaporation energy of the moisture source is added to the heating

The appendix contains the complete input mfile.
2. New Modeling and Simulation Results

Figure 1 presents the Rh in the reference room

Figure 2 presents the Rh in the test room
Figure 3 presents the heating power in the reference room.

Figure 4 presents the heating power in the test room.
Figure 5 presents the Rh in the gypsum rooms room

3 Conclusions
It is concluded that: (1) the bad correlation between the previous HAMLab results and measurements are caused by an accidentally 1 day shift in the Excel sheets. (2) The new simulation results agree very well with the measurements
Append HAMBase input mfile

%ST1CE3v4 Annex 41 SubTask 1 Common Exercise 3 FINAL date19.12.2005
% By MdW/JvS
%
% This version:
% 1) 4 Rooms
% 2) Improved material properties
% 3) Interior walls added

clear all

%------------------------------------------------------------------------------
% PART 1 : THE CALCULATION PERIOD
%------------------------------------------------------------------------------

% The available climate data of De Bilt are of the years 1971 till 2000. If the
% climate files of a different location are used the name and format must be
% adapted and the geographical coordinates must be changed (in InClimate-file).
% As an average year can be considered 1 May 1974 till 30 April 1975.
% A cold winter (242 days) started 1 September 1978.
% A hot summer (123 days) started 1 May 1976.
% 9 hot days started at 1 July 1976 and 9 cold days started at 30 December 1978.
%
% FORMAT BASE.Period=[yr,month,day,ndays]
% yr   = start year
% month  = start
% month day = start day
% ndays     = number of days simulated
%BASE.Period=[1976,1,1,90,1];
%BASE.Period=[1969,01,01,33];

% If BASE.DSTime=1 the EU daylight-savings time is taken into account. It starts on the
% last Sunday of March and ends on the the last Sunday of October (the total
% duration is 30 or 31 weeks). If there is no daylight-savings period BASE.DSTime=0
% If the daylight-savings period is different from the EU the starting and ending days
% must be given:
% BASE.DSTime(1,:)=[year,starting month,day,ending month,day];
% BASE.DSTime(2,:)=[year+1,starting month,day,ending month,day]; etc.
%BASE.DSTime=0;

%------------------------------------------------------------------------------
% PART 2 : THE BUILDING
%------------------------------------------------------------------------------

% ZONES NUMBERS [-] & VOLUMES [m3]
% A zone consist of a room or several adjacent rooms with about the same
% temperature and relative humidity and the same climate control e.g. a dwelling
% might have three zones: the ground floor (living room etc), the first floor
% (sleeping) and the attic (not heated). There is however no restriction in the
% number of zones that can be simulated. Example: three zones: BASE.Vol{1}=..;
%BASE.Vol{2}=.; BASE.Vol{3}=. If alone 2: use '%' for 1 and 3 so only
%BASE.Vol{2} remains.

% FORMAT BASE.Vol[zonenumber]=volume (m3);
%BASE.Vol{1}= 49.35*0.98;
%BASE.Vol{2}= 49.35*0.98;
%BASE.Vol{3}= 49.35*0.98;
%BASE.Vol{4}= 49.35*0.98;

%1 reference room with paint
%2 test room with ALU
%3 test room + 50 m2 gypsum
%4 test room with 65 m2 gypsum

% ** CONSTRUCTION COMPONENTS DATA **
% A construction component usually consists of different layers. The order of
% the input of the properties of these layers is standard from indoors to
% outdoors and for construction components between zones from the zone with the
% lowest zone-number to the highest so: 1->2,1->3,2->3 etc.. The material
% properties of the component layer are inserted by a material ID-number. By
% typing 'help matpropf' a list of materials appear with a material ID-number.
% Also each different construction component gets a different construction
% ID-number: conID=1,2,...
% FORMAT BASE.Con{conID}=[Ri,d1,matID,...,dn,matID,Re,ab,eb].
% dn = material layer thickness [m]
% matn = material ID-number.
% Ri = internal surface heat transfer resistance (for example Ri=0.13) [Km2/W]
% Re = surface heat transfer resistance at the opposite site (for example Re=0.04) [Km2/W]
% ab = external solar radiation absorption coefficient [-] e.g.light ab=0.4, dark ab=0.9.
% eb = external longwave emissivity [-]. Almost always: eb=0.9
% BASE.Con{conID}=[Ri, d1,matID,... ,dn,matID, Re, ab, eb].
% BASE.Con{1} = [0.125, 0.01, 367, 0.02, 368, 0.24, 373, 0.07, 0.473, 0.005, 369, 0.0556, 0.23, 0.5];
% BASE.Con{2} = [0.125, 0.01, 370, 0.115, 238, 0.10, 422, 0.01, 370, 0.125, 0.4, 0.9];
% BASE.Con{3} = [0.125, 0.015, 370, 0.175, 239, 0.05, 473, 0.0125, 385, 0.125, 0.4, 0.9];
% BASE.Con{4} = [0.125, 0.015, 370, 0.175, 342, 0.2, 473, 0.05, 341, 0.025, 342, 0.015, 369, 0.07, 473, 0.005, 369, 0.0556, 0.23, 0.5];
% BASE.Con{5} = [0.125, 0.01, 367, 0.02, 368, 0.24, 373, 0.07, 0.473, 0.005, 369, 0.0556, 0.23, 0.5];
% BASE.Con{6} = [0.125, 0.01, 370, 0.115, 238, 0.10, 422, 0.01, 370, 0.125, 0.4, 0.9];
% BASE.Con{7} = [0.125, 0.015, 370, 0.175, 239, 0.05, 473, 0.0125, 385, 0.125, 0.4, 0.9];
% BASE.Con{8} = [0.125, 0.015, 370, 0.175, 342, 0.2, 473, 0.05, 341, 0.025, 342, 0.01, 0.4, 0.9];
% BASE.Con{9} = [0.125, 0.003, 563, 0.05, 341, 0.2, 473, 0.05, 342, 0.025, 516, 0.125, 0.4, 0.9];
% BASE.Con{10} = [0.125, 0.05, 473, 0.125, 0.4, 0.9];
% BASE.Con{11} = [0.125, 0.0125, 386, 5e-6, 115, 0.01, 367, 0.02, 368, 0.24, 373, 0.07, 0.473, 0.005, 369, 0.0556, 0.23, 0.5];
% BASE.Con{12} = [0.125, 0.0125, 386, 5e-6, 115, 0.01, 370, 0.115, 238, 0.10, 422, 0.0125, 385, 0.125, 0.4, 0.9];
% BASE.Con{13} = [0.125, 0.0125, 386, 5e-6, 115, 0.01, 370, 0.115, 238, 0.10, 422, 0.0125, 385, 0.125, 0.4, 0.9];
% BASE.Con{14} = [0.125, 0.0125, 386, 5e-6, 115, 0.01, 370, 0.115, 238, 0.10, 422, 0.0125, 385, 0.125, 0.4, 0.9];
%1 ref room wall 1-4 sd=0.15!
%2 ref wall 5
%3 ref room wall 6
%4 ref room ceiling
%5 test room wall 1-4 mud=1000 sd=0.15!
%6 test room wall 5 + alu 5 mud=1000
%7 test room wall 6 + alu 5 mud=1000
%8 test room ceiling
%9 floor

% ** GLAZING SYSTEMS DATA**
The solar gain factor of glazing depends on the incident angle of the solar radiation. The properties below are independent of this angle but if one wants to account for the incident angle this can be done with the shadow section below. Each different glazing system gets an ID-number: glaID=1,2,3.

**FORMAT BASE.Glas{glaID}=[Uglas,CFr,ZTA,ZTAw,CFrw,Uglasw]**

- Uglas = U-value without sunblinds \[\text{W/m²K}\]
- CFr = convection factor without blinds [-]
- ZTA = Solar gain factor [-] without blinds
- ZTAw = Solar gain factor [-] with blinds
- CFrw = convection factor with blinds [-]
- Uglasw = U-value with blinds \[\text{W/m²K}\]

**BASE.Glas{glaID}=[Uglas, CFr, ZTA, ZTAw, CFrw, Uglasw]**

BASE.Glas{1} = [1.1, 3/8, 0.0556*1.1*0.9, 0.0556*1.1*0.9, 3/8, 1.1 ];

**ORIENTATIONS**

For each surface of the building envelope (exterior walls) the tilt and the orientation with respect to the south has to be known. Each different orientation gets a different orientation-ID-number: orID.

**FORMAT BASE.Or{orID}=[beta gamma]**

- beta = tilt (vertical=90, horizontal=0)
- gamma = azimuth (east=-90, west=90, south=0, north=180)

**BASE.Or{orID}=[beta, gamma]**;

BASE.Or{1}= [90.0, 0.0 ]; % south wall
BASE.Or{2}= [0.0, 0.0 ]; % horizontal roof

**SHADOWING DATA**

For each vertical window the shadow by exterior obstacles can be accounted for. The obstacles can have any combination of blocks, cylinders and spheres, provided some limitations regarding the positioning: The position of the blocks is such that two planes are horizontal, two vertical and perpendicular to the window pane and two parallel. The axis of the cylinder must be vertical. E.g. a tree is a cylinder and a sphere. If two equal windows with the same orientation and zone have a different shadow they cannot be added to one window (with the sum of the surface areas) anymore. Each shadow situation gets a shadow ID-number: shaID.

**FORMAT BASE.shad{shaID}= [ typenr, size1, size2, size3, x, y, z, extra; typenr, size1, size2, size3, x, y, z, extra; typenr, size1, size2, size3, x, y, z, extra; ]**

- x, y, z are Cartesian coordinates where z is vertical and x is horizontal and perpendicular to the window plane. Left means left when facing the window from outside. The sizes are always positive numbers.

- typenr=1 (window): size1=depth (=distance glazing to exterior surface), size2= width, size3=height of the window
  \[x, y, z\] = the coordinates of the lowest window corner at the left side
- extra = elevation-angle of the horizon in degrees to account for far-away obstacles.

- typenr=2 (block): size1= width(in x-direction), size2=length(in y-direction), size3=height(in z-direction)
  \[x, y, z\] coordinates of the left block corner closest to the window
- extra= solar transmission factor (0 opaque)

- typenr=3 (tree): size1=radius crown, size2=radius trunk (e.g.1/20*radius crown), size3=height center of crown
% [x,y,z]: coordinates of the bottom of trunk.
% extra=solar transmission factor of crown (0 opaque). In winter(120<iday< 304)
% this is higher than in summer. e.g. winter extra=0.8, summer extra=0.35
% typenr =4 input for incident angle dependency of transmittivity of glazing.
% Perpendicular (angle=0) always 1 and for 90 degrees (parallel) always 0. So
% there is no need for an input for these angles! First row [4, incident
% angle1,..,incident angle7], second row [5, transmittivity1,..,transmittivity7]
% Example input
% BASE.shad(1)=[
1 0.07 5 1.6 0 0.5000 0.7 3;...
2 0.1 5.1 3.0000 17.00 0.0000 0 0;
2 17.00 0.1 3.0000 0 5.1000 0 0;
2 17.00 0.1 2.0000 0 0.0000 0 0;
2 0.5 24.00 9.2000 34.10 -9.0000 0 0;
3 1.25 1.25/7 2.75 15.50 0.0 0 0;
3 1.50 1.50/7 1.50 12.70 1.50 0 0;
4 0 10 30 50 60 90;...
5 1 0.9 0.7 0.6 0.5 0.4];
% Changing below '0' into '1' below, gives a drawing of the
% obstacle geometry for ShaID.
if 1==0
  shaID=1;
  figure(1)
  shaddrawf1101(BASE.shad,shaID);
end

% A building is an assembly of different construction components. The input here
% is about the seize, place in the building and ID of these different components
% (for convenience called walls and windows i.e. also if doors, floors or roofs are meant).
% They are divided into 5 groups:
% I. Constructions separating a zone from the exterior climate: EXTERNAL WALLS
% II. Windows in external walls I
% III. Constructions separating a zone from an environment with a constant
%   temperature e.g. the ground: CONSTANT TEMPERATURE WALLS
% IV. Constructions separating a zone from an environment with the same
%   conditions: ADIABATIC EXTERNAL WALLS
% V. Constructions between and in zones: INTERNAL WALLS
% For external walls and constant temperature walls the heat loss by thermal
% bridges can be accounted for if the extra steady state heat loss in Watt per 1K
% temperature difference across these bridges is known. These values can be
% obtained by thermal bridge software or a approximate methods. Use '0' if not
% known.
% ---------------------------------------------------------------------------
% I. EXTERNAL WALLS
% For each wall ID-number exID=1,2,...
% FORMAT BASE.wallex(exID) = [zonenr,surf,conID,orID,bridge];
% zonenr  = select zone number from ZONES section
% surf    = total surface area[m2] including the windows surface area.
% conID   = select construction ID-number from CONSTRUCTION section.
% orID   = select orientation ID-number from ORIENTATIONS section
% bridge= the heat loss in W/K of the thermal bridges (choose 0 if unknown)
%BASE.wallex(exID)= [zonenr, surf, conID, orID, bridge]
BASE.wallex(1) = [1, (2.5*9.9), 1, 1, 0];
BASE.wallex(2) = [2, (2.5*9.9), 5, 1, 0];
BASE.wallex(3) = [3, (2.5*9.9), 11, 1, 0];
% II. WINDOWS IN EXTERNAL WALLS
% Each external wall can have one or more windows. The surface area is the area
% of the transparent part. If the surface is curved the effective area for solar
% radiation is needed. The U-value must be increased in such a way that the
% heat loss per 1K temperature difference equals the one for the curved glazing,
% e.g. a glazed dome in a flat roof has an orientation with tilt=0, surface
% area=pi*r^2 and U-value=Uglazing*2*pi*r^2/pi*r^2.
% If a wall has 100% glazing use an EXTERNAL WALL that is slightly larger than
% the window area. Each window gets an ID-number winID=1,2,...

% FORMAT window{winID} = [exID, surf, glaID, shaID];
% exID = select external construction ID-number from CONSTRUCTIONS section
% surf = surface area of the glazing [m^2]
% glaID = select glass ID-number from GLAZING section
% shaID = select ID-number of shadow from SHADOW section, no shadow: shaID=0

BASE.window{1}= [1, (1.41*1.94), 1, 0];
BASE.window{2}= [2, (1.41*1.94), 1, 0];
BASE.window{3}= [3, (1.41*1.94), 1, 0];
BASE.window{4}= [4, (1.41*1.94), 1, 0];

% III. CONSTANT TEMPERATURE WALLS
% Each constant temperature wall gets an ID: i0ID=1,2,...

% FORMAT walli0{i0ID} = [zonernr, surf, conID, temp, bridge];
% zonernr = select zone number from ZONES section
% surf = total surface area [m^2]
% conID = select construction ID-number from CONSTRUCTION section.
% temp = constant temperature [oC], e.g. ground = '10'
% bridge = the heat loss in W/K of the thermal bridges (0 if unknown)

% Tpas=18;
% BASE.walli0{i0ID}= [zonernr, surf, conID, temp, bridge]
BASE.walli0{1}= [1, 19.34, 9, 2, 0];
BASE.walli0{2}= [2, 19.34, 9, 2, 0];
BASE.walli0{3}= [3, 19.34, 9, 2, 0];
BASE.walli0{4}= [4, 19.34, 9, 2, 0];

% IV ADIABATIC EXTERNAL WALLS
% Each adiabatic wall gets an ID: iaID=1,2,...

% FORMAT wallia{iaID} = [zonernr, surf, conID];
% zonernr = select zone number from ZONES section
% surf = total surface area in m^2
% conID = select construction ID-number from CONSTRUCTION section.

BASE.wallia{1}= [1, 2*1.94*2.5, 2 ];
BASE.wallia{2}= [2, 2*1.94*2.5, 6 ];
BASE.wallia{3}= [3, 19.34, 4 ];
BASE.wallia{4}= [2, 19.34, 8 ];
BASE.wallia{5}= [1, 5.94*2.5-1.94*0.82, 3 ];
BASE.wallia{6}= [2, 5.94*2.5-1.94*0.82, 7 ];
BASE.wallia{7}= [1, 1.94*0.82, 10 ];
BASE.wallia{8}= [2, 1.94*0.82, 10 ];
BASE.wallia{9}= [3, 2*1.94*2.5, 12 ];
BASE.wallia{10}= [4, 2*1.94*2.5, 12 ];
BASE.wallia{11}= [3, 19.34, 8 ];
BASE.wallia{12}= [4, 19.34, 14 ];
BASE.wallia{13}= [3, 5.94*2.5-1.94*0.82, 13 ];
% V. INTERNAL WALLS BETWEEN AND IN ZONES

% Also here all different internal walls get an ID-number: inID.
% If there are 3 different walls (or floors) between zonenr1 and zonenr2, the
% input is BASE.wallin{1}=[1,2,... t/m BASE.wallin{3}=[1,2,...]. If the 4th
% construction is completely in zonenr2 the input is consequently:
% BASE.wallin{4}=[2,2,... The first layer (Ri) of the construction component is
% in the zone that comes first. If instead BASE.wallin{3}=[2,1,... is used the
% construction is reversed and Ri is in zonenr2. The surface area is the surface
% area of one side of the wall also for walls that are completely in the same
% zone.

% FORMAT wallin{inID} = [zonenr1,zonenr2,surf,conID];
% zonenr1  = select zone number from ZONES section
% zonenr2  = select zone number from ZONES section
% surf   = total surface area [m2]
% conID  = select construction number from CONSTRUCTION section.

%-------------------------------------------------------------------------- --
% PART 3 : profiles for internal sources, ventilation, sunblinds and free
% cooling
% -------------------------------------------------------------------------- --

**PROFILES**

Profiles are related to the use of a zone: office, living room, school etc.
Each day of a week can have a different profile e.g. weekends are different.
Here the profiles are defined and given an ID-number; proID.
For each day up to 24 different periods can be defined with different data. period1:
start time = hrnr1 and end time = hrnr2; period2: start time = hrnr2 and end
time = hrnr3; last period: the hours that are left on the same day.
for example [1,8,18] means period1: 1h till 8h, period2: 8h till 18h, period 3:
24h(==0h) till 1h and 18h till 24h. (3 periods are often used).
The inserted hours are the clock time.
The profile allows for free cooling i.e. above a certain threshold Tfc (oC)
the ventilation is increased from vvmin to vvmax: e.g. vvmax=3*vvmin. So if
vvmin=vvmax there is no free cooling. The temperature Tfc is also used for the
control of blinds: if the solar irradiance on the window is higher than Ers
and the indoor temperature higher than Tfc the blinds will be down. This means
that if there is no free cooling the temperature Tfc is still necessary for
the control of blinds. Ers is the same for all zones. A number often
encountered for Ers is 300W/m2.

% BASE.Ers{proID} = irradiance level for sun blinds [W/m2]
% BASE.dayper{proID} = [hrnr1,hrnr2,hrnr3], the starting time of a new period
% BASE.vvmin{proID} = [ . . . ], the ventilation ACR [1/hr], for each period
% BASE.vvmax{proID} = [ . . . ], the ventilation ACR [1/hr] in case free cooling
% BASE.Tsetmin{proID}= [ . . . ], setpoint [oC] switch for heating, (in case of
% no heating choose -100)
% BASE.Tsetmax{proID} = [ . . . ], setpoint [oC] switch for cooling, (in case
% of no cooling choose 100)
% BASE.Qint{proID} = [ . . . ], internal heat gains [W]
% BASE.Gint{proID} = [ . . . ], moisture gains [kg/s]
% BASE.RVmin{proID} = [ . . . ], setpoint [%] switch for humidification,(in case of no
% humidification choose -1)
% BASE.RVmax{proID} = [ . . . ], setpoint [%] switch for dehumidification,(in case
% of no dehumidification choose 101)
for i=1:2
    BASE.Ers{i} = 300;
    BASE.dayper{i} = [6, 8, 16, 22];
    BASE.vvmin{i} = 0.65*[1, 1, 1, 1];
    BASE.vvmax{i} = 0.65*[1, 1, 1, 1];
    BASE.Tfc{i} = [100, 100, 100, 100];
    BASE.Qint{i} = [0, 0, 0, 0];
    BASE.Gint{i} = [1.11111e-004, 6.9444e-006, 5.55556e-005, 6.9444e-006];
    BASE.Tsetmin{i} = [20, 20, 20, 20];
    BASE.Tsetmax{i} = [20, 20, 20, 20];
    BASE.RVmin{i} = [-1, -1, -1, -1];
    BASE.RVmax{i} = [100, 100, 100, 100];
end

% THE PROFILES OF THE BUILDING

% FORMAT BASE.weekfun{zonenr} = [upnrmon, upnrtue, upnrwed, upnrthu, upnrfri, upnrsat, upnrsun]
% for each zone n=1.. number of zones, select profiles ID-numbers for each day
% upnrmon = select profile ID-numbers for Monday from PROFILES
% upnrtue = select profile ID-numbers for Tuesday from PROFILES
% upnrwed = select profile ID-numbers for Wednesday from PROFILES
% upnrthu = select profile ID-numbers for Thursday from PROFILES
% upnrfri = select profile ID-numbers for Friday from PROFILES
% upnrsat = select profile ID-numbers for Saturday from PROFILES
% upnrsun = select profile ID-numbers for Sunday from PROFILES
% BASE.weekfun{zonenr} = [upnrmon, upnrtue, upnrwed, upnrthu, upnrfri, upnrsat, upnrsun]
BASE.weekfun{1} = [1, 1, 1, 1, 1, 1, 1];
BASE.weekfun{2} = 2*[1, 1, 1, 1, 1, 1, 1];
BASE.weekfun{3} = [1, 1, 1, 1, 1, 1, 1];
BASE.weekfun{4} = 2*[1, 1, 1, 1, 1, 1, 1];

%-------------------------------------------------------------------------- --
% PART 4 : Heating, cooling, humidification, dehumidification
% ------------------------------------------------------------------------- ---
% If the maximum heating capacity is known then that value can be used. If it is
% unknown the value '-1' means an infinite capacity. The value '-2' can be used
% for a reasonable estimate of the maximum heating capacity. Cooling and dehumidification
% are negative! If there is no cooling the dehumidification capacity is '0'.
% For each zone :
% FORMAT BASE.Plant{zonenr}=[heating capacity [W], cooling capacity [W],
% humidification capacity [kg/s],dehumidification capacity [kg/s]];
BASE.Plant{1} = [1000, 0, 0, 0];
BASE.Plant{2} = [1000, 0, 0, 0];
BASE.Plant{3} = [1000, 0, 0, 0];
BASE.Plant{4} = [1000, 0, 0, 0];

% The simulation program treats radiant heat and convective heat differently.
% For each zone:
% FORMAT BASE.convfac{zonenr}=[CFh, CFset, CFint ];
% CFh = Convection factor of the heating system: air heating CFh=1, radiators CFh=0.8 floor heating CFh=0.5, cooling usually CFh=1
% CFset= Factor that determines whether the temperature control is on the air
% temperature (CFset=1), or comforttemperature (CFset=0.6), Tset=CFset*Ta+(1-CFset)*Tr
% CFint= is the convection factor of the casual gains (usually CFint=0.5)

BASE.convfac{1}=[1, 1, 0.5 ];
BASE.convfac{2}=[1, 1, 0.5 ];
BASE.convfac{3}=[1, 1, 0.5 ];
BASE.convfac{4}=[1, 1, 0.5 ];

% If a heat recovery from ventilation air is used the effective temperature
% efficiency 'etaww' and the maximum indoor air temperature 'Twws' above which
% the heat exchanger will be by-passed must be known. In summer with cooling
% conditions this temperature is used to switch the exchanger on, e.g Twws=22oC
% FORMAT BASE.heatexch{zonenr}=[etaww, Twws];

BASE.heatexch{1}=[0.08 22]; %rho kleiner door hoogte
BASE.heatexch{2}=[0.08 22];
BASE.heatexch{3}=[0.08 22];
BASE.heatexch{4}=[0.08 22];

% Real rooms are furnished. Furnishings are important for moisture storage.
% Moisture is released dependent on the change in relative humidity. Especially
% in zones with a lot of paper or textiles this can easily outweigh the moisture
% storage of the building. A value of '1' means that about the same amount is
% stored as in the air that fills the volume of the zone. The heat storage of
% furnishings is less important but by absorbing solar radiation and releasing
% that directly to the indoor air more solar energy is released in a convective
% way. A value for the convective fraction of 0.2 can be considered as
% reasonable. For each zone:
% FORMAT BASE.furnishings{zonenr}=[fbv, CFfbi];
% fbv = Moisture storage factor
% CFfbi= The convection factor for the solar radiation due to furnishings.

BASE.furnishings{1}=[0, 0];
BASE.furnishings{2}=[0, 0];
BASE.furnishings{3}=[0, 0];
BASE.furnishings{4}=[0, 0];

% This input is now completely stored in the structured array BASE. By typing
% BASE in the command window, the input can be checked and changed.
% In Hambasefun input is changed to an input the simulation program WAVO needs.

[Control,Profiles,InClimate,InBuil]=Hambasefun4(BASE);

% The advanced user can modify the files InClimate, InBuil,Profiles, Control
% (type help_wavooutput2)
for i=1:4
InBuil.con{i}.Zvi=(0.15*62000/1.8+1000/3/0.92);
end
for i=5:8
InBuil.con{i}.Zvi=1000*62000/1.8;
end
InBuil.con{10}.Zvi=1000*62000/1.8;

% Adjust for IBPT
InClimate.LAT=47.88;
load QSV4Data.txt
measres=QSV4Data(1:409,1:2)-[Profiles.Gintu(1:2,ts),6.9444e-006*([1,1])]*2.4e6;
tz=[16*24:33*24-1];
figure(3)
bwplot(1+tz/24,Output.Qplant(tz,2),1+tz/24,measres(2,2:409)),axis([17 34 300 900])
legend('HAMbase','heating')
meanreftmeas=mean(measres(2,2:409))
print -deps fig433

figure (5)
bwplot(ty,100*Output.RHa(ts,3),ty,100*Output.RHa(ts,4)),axis([17 34 20 60])
legend('gypsum 50m2','gypsum 65m2')
title('test room with gypsum')
xlabel('time [days]
ylabel('RH')
print -deps fig435