Project
Date: 17.9.2015

1 Input data

1.1 Fire zone walls

Wall height: 3,000 m

<table>
<thead>
<tr>
<th>Wall no.</th>
<th>Start X[m]</th>
<th>Start Y[m]</th>
<th>End X[m]</th>
<th>End Y[m]</th>
<th>Material density ρ [kg/m³]</th>
<th>Specific heat c [J/kg/K]</th>
<th>Thermal conductivity λ [W/m/K]</th>
<th>Opening width b[mm]</th>
<th>Opening height h[m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0,000</td>
<td>0,000</td>
<td>10,000</td>
<td>0,000</td>
<td>800,0</td>
<td>960,0</td>
<td>0,58</td>
<td>3,000</td>
<td>1,600</td>
</tr>
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<td>10,000</td>
<td>5,000</td>
<td>800,0</td>
<td>960,0</td>
<td>0,58</td>
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<td>5,000</td>
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<td>5,000</td>
<td>800,0</td>
<td>960,0</td>
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<td>960,0</td>
<td>0,58</td>
<td>1,000</td>
<td>2,000</td>
</tr>
</tbody>
</table>

1.2 Floor material

density $\rho = 2400,0$ kg/m³
specific heat $c = 840,0$ J/kg/K
therm conductivity $\lambda = 1,50$ W/m/K

1.3 Ceiling material

density $\rho = 2400,0$ kg/m³
specific heat $c = 840,0$ J/kg/K
therm conductivity $\lambda = 1,50$ W/m/K

1.4 Fire parameters

Time of fire development $t_{lim} = 20,0$ min
The characteristic fire load density per unit floor area $q_{f,k} = 511,0$ MJ/m²
Factor of combustion $m = 0,8$
Factor related to the size of the compartment on fire risk $\delta_{q1} = 1,144$
Factor related to the kind of operation to fire hazard $\delta_{q2} = 1,000$
Factor related to the active fire protection measures $\delta_{n} = 1,000$

2 Results

The result of the calculation are the values of the parameters that determine the parametric temperature curve for the fire zone according to EN 1991-1-2, Annexes A and E.
Parameter values are as follows:

Opening factor:

\[ O = 0.047 \, m^{1/2} \]

Thermal characteristics of boundary structures surface:

\[ b = 1252.321 \, J/(m^2s^{1/2}K) \]

The design value of the fire load density, relative to the total enveloping constructions of the fire zone:

\[ q_{t,d} = 123.1 \, MJ/m^2 \]

Time to peak temperature:

\[ t_{\text{max}} = 31.6 \, \text{min} \]

\[ t_{\text{max}} > t_{\text{lim}} \Rightarrow \text{ventilation controlled fire} \]

Parametric curve graph is described by the functions:

\[ \Theta_g = 20 + 1325 \left(1 - 0.324 \, e^{-0.004t} - 0.204 \, e^{-0.033t} - 0.472 \, e^{-0.370t}\right) \quad \text{for } t \text{ in interval } <0;31.649>, \]

\[ \Theta_g = 870.585 - 11.599 \,(t - 31.649) \quad \text{for } t \text{ in interval } <31.649;104.979>, \]

\[ \Theta_g = 20 \quad \text{for } t >104.979, \]

where \( \Theta_g \) is temperature °C and \( t \) is time [minutes].