



LOCAFI+

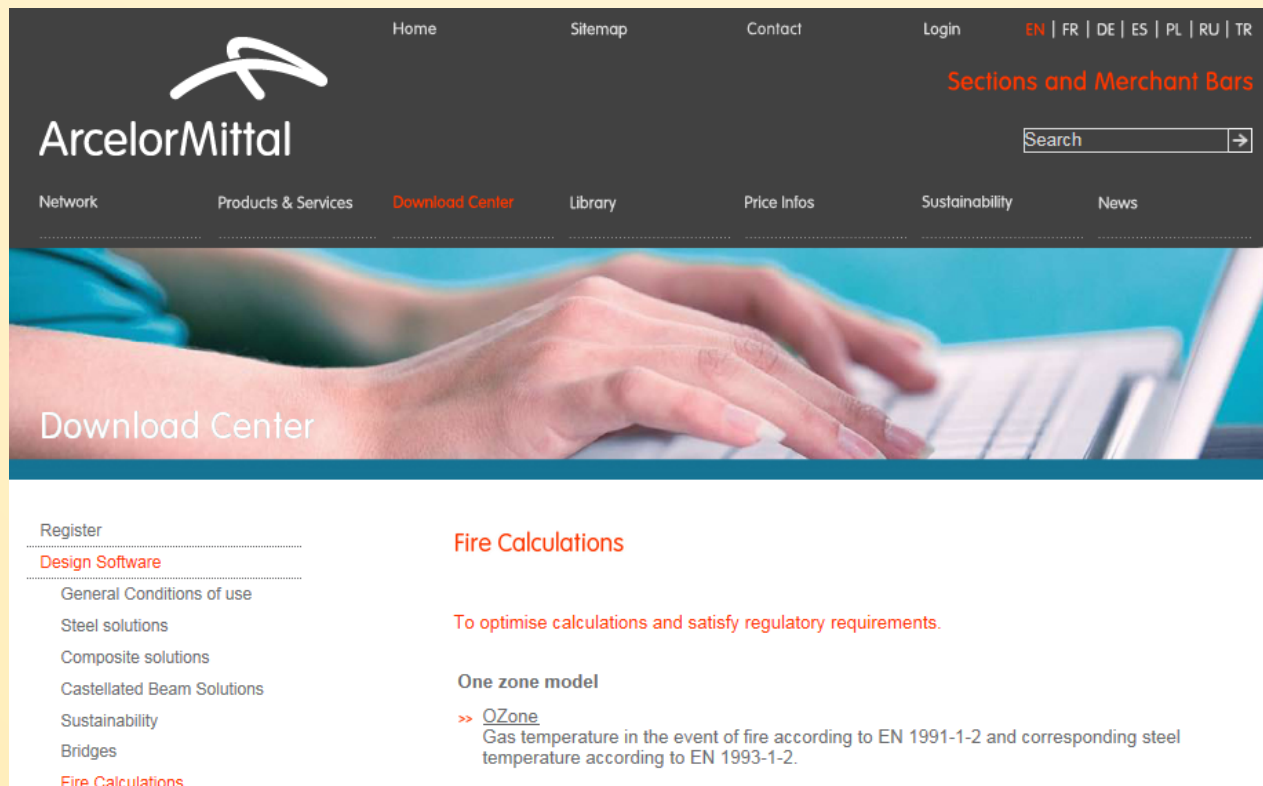
Temperaturberäkning av pelare utsatt för local brand

Anslagsnr. 754072

5. Beräkningsprogram

5. Beräkningsprogram

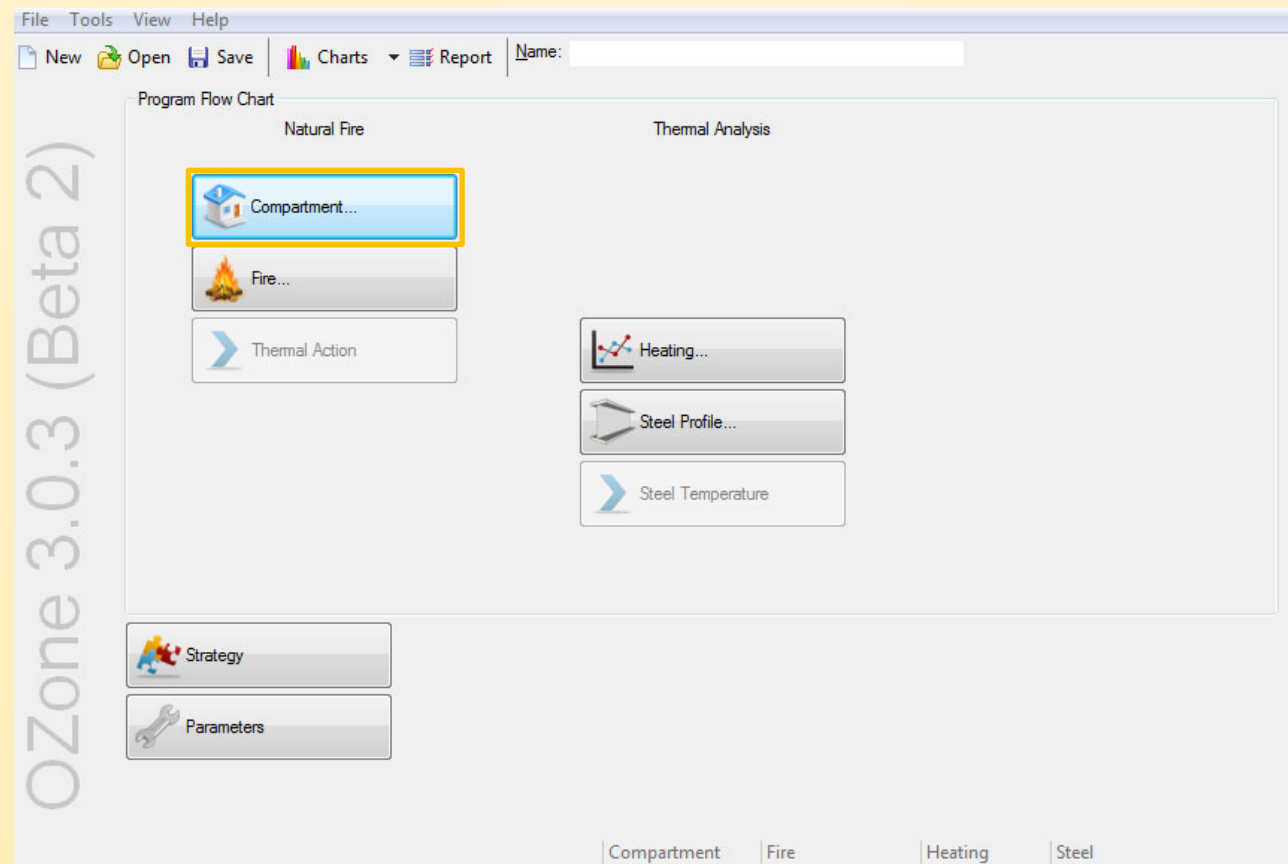
5.1. OZone Compartment



<http://sections.arcelormittal.com/download-center/design-software/fire-calculations.html>

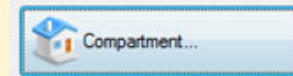
5. Beräkningsprogram

5.1. OZone Compartment



5. Beräkningsprogram

5.1. OZone Compartment



File Tools View Help

Form of Compartment

☒ Rectangular Floor
☒ Flat Roof
☐ Single Pitch Roof
☐ Double Pitch Roof
☐ Any Compartment

Height: m
Depth: m
Length: m

Define Layers and Openings

Select Wall: Define

Select Walls to Copy to:
Ceiling
Wall 1
Wall 2
Wall 3
Wall 4

Copy

☐ Copy Openings

Defined Walls:

Wall	Type	Openings	Length
Floor			
Ceiling			
Wall 1			
Wall 2			
Wall 3			
Wall 4			

Forced Ventilation

Smoke Extractors:

	Height	Diameter	Volume	In/Out
	m	m	m³/sec	
Extractor 1				
Extractor 2				
Extractor 3				

OK Cancel

Lokalens
geometri

Egenskaper hos
golv, väggar och
tak

Mekanisk
ventilation
(om tillämpligt)

5. Beräkningsprogram

5.1. OZone Compartment

File Tools View Help

Wall Length: 13 m


	Material	Thickness	Unit mass	Conductivity	Specific Heat	Rel Emissivity	Rel Emissivity
		cm	kg/m³	W/mK	J/kgK	Hot Surface	Cold Surface
Layer 1	Steel [EN1994-1-2]	0.1	7850	45	600	0.8	0.8
Layer 2	Glass wool _Rock wool	6	60	0.037	1030	0.8	0.8
Layer 3	Steel [EN1994-1-2]	0.1	7850	45	600	0.8	0.8
Layer 4							

Enter each layer on a single row in the table above (up to four layers). Just click in a cell and edit its value. If not found in the list of materials you can define your own material, by filling in the appropriate cells. Define your layers starting from Layer 1 (Inside).

Define your openings if any (up to three openings in a single wall). Click in the desired cell and input your values. Start from Opening 1.

To delete or insert a row, right click on a row header and select the appropriate command from the popup menu.

Inside

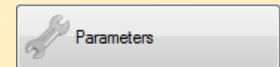


Outside

	Sill Height Hi	Soffit Height Hs	Width	Variation	Adiabatic
	m	m	m		
Opening 1	0	4	4.2	Stepwise	no
Opening 2	0	2	1	Stepwise	no
Opening 3					

OK Cancel

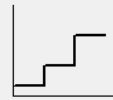
Egenskaper av
lager i varje
vägg



Temperature Dependent Openings

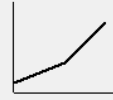
Temperature Dependent: 400 °C

Stepwise Variation



Temperature °C	% of Total Openings
20	10
400	50
500	100

Linear Variation



Temperature °C	% of Total Openings
20	10
400	50
500	100

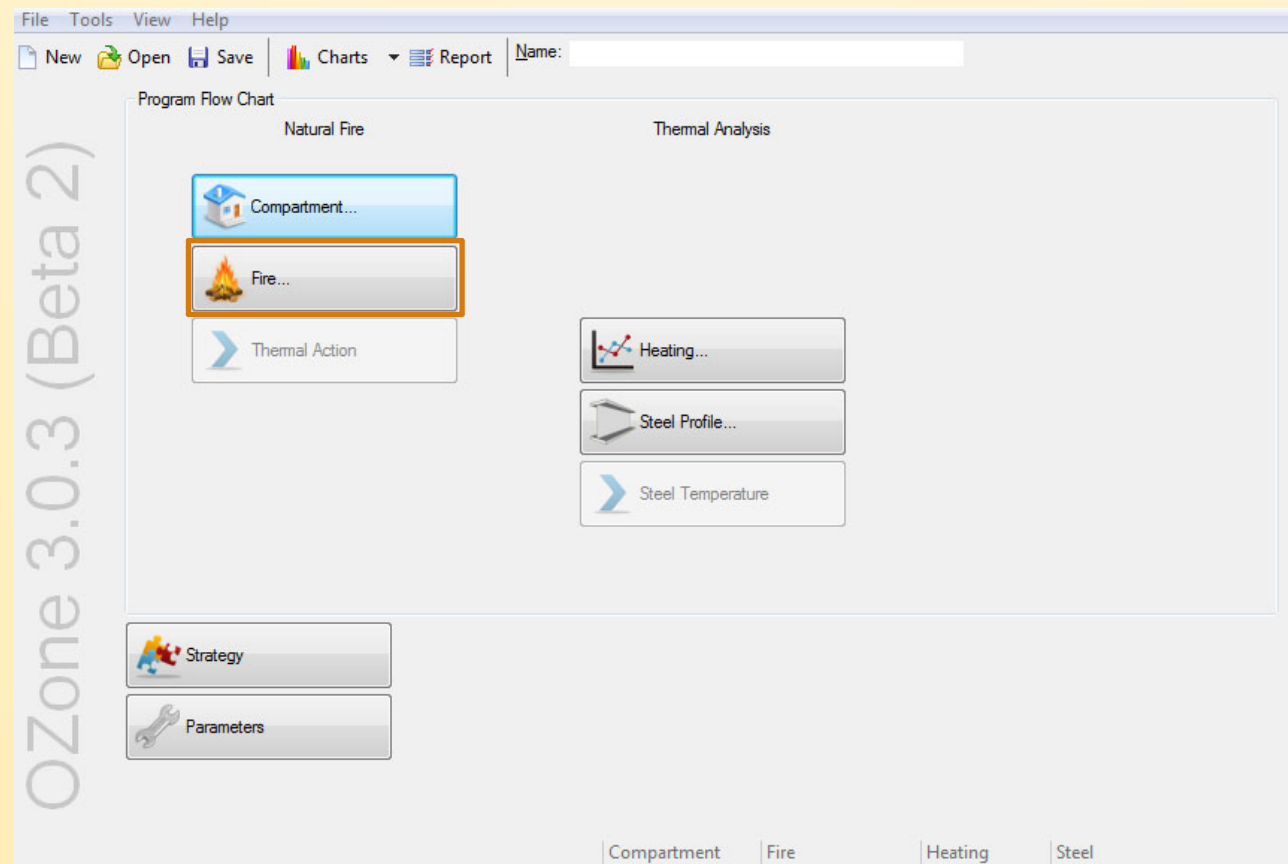
Time Dependent Openings

Time sec	% of Total Openings
0	5
1200	100

Öppningar

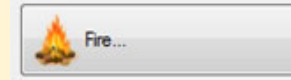
5. Beräkningsprogram

5.1. OZone Compartment



5. Beräkningsprogram

5.1. OZone Compartment



Fire

File Tools View Help

Compartment Fire: ☒ Annex E (EN 1991-1-2) ☐ User Defined Fire

Localised Fire: ☐ Localised Fire

National Annex:

Occupancy	Fire Growth Rate	RHRf [kW/m²]	Fire Load q _{f,k} 80% Fractile MJ/m²	Danger of Fire Activation
School	Medium	250	347	1

Active Fire Fighting Measures

- ☐ Automatic Water Extinguishing System $\delta_{n,1}=1$
- ☐ Independent Water Supplies ☒ 1 ☐ 2 $\delta_{n,2}=1$
- ☐ Automatic Fire Detection by Heat $\delta_{n,3}=1$
- ☐ Automatic Fire Detection by Smoke $\delta_{n,5}=1$
- ☐ Automatic Alarm Transmission to Fire Brigade $\delta_{n,6}=1$
- ☐ Work Fire Brigade $\delta_{n,8}=1$
- ☐ Off Site Fire Brigade $\delta_{n,9}=1$
- ☒ Safe Access Routes $\delta_{n,10}=1$
- ☐ Staircases Under Overpressure in Fire Alarm $\delta_{n,10}=1$
- ☒ Fire Fighting Devices $\delta_{n,10}=1$
- ☒ Smoke Exhaust System $\delta_{n,10}=1$

Fire Info

Max Fire Area: m²

Fire Elevation: m

Fuel Height: m

Design Fire Load

Fire Risk Area: m² $\delta_{q,1}=1$

Danger of Fire Activation: $\delta_{q,2}=1$

Active Measures: $\prod \delta_{n,i}=1$

$q_{f,d} = \delta_{q,1} \delta_{q,2} \prod \delta_{n,i} m q_{f,k} = 277.6 \text{ MJ/m}^2$

Combustion

Combustion Efficiency Factor:

Combustion Model:

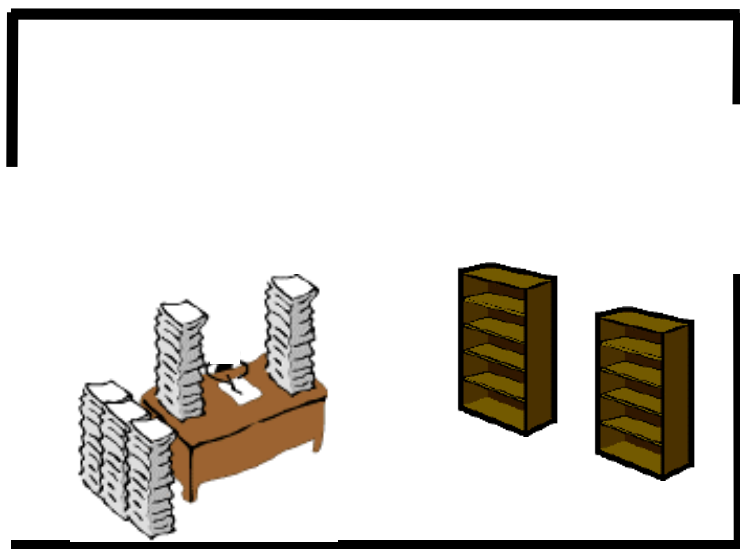
Stoichiometric Coefficient:

OK Cancel

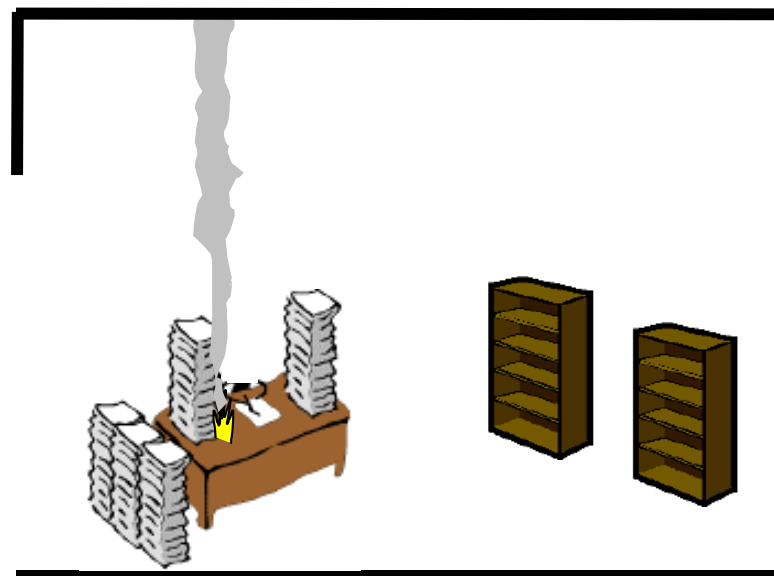
5. Beräkningsprogram

5.1. OZone Compartment

Före brand



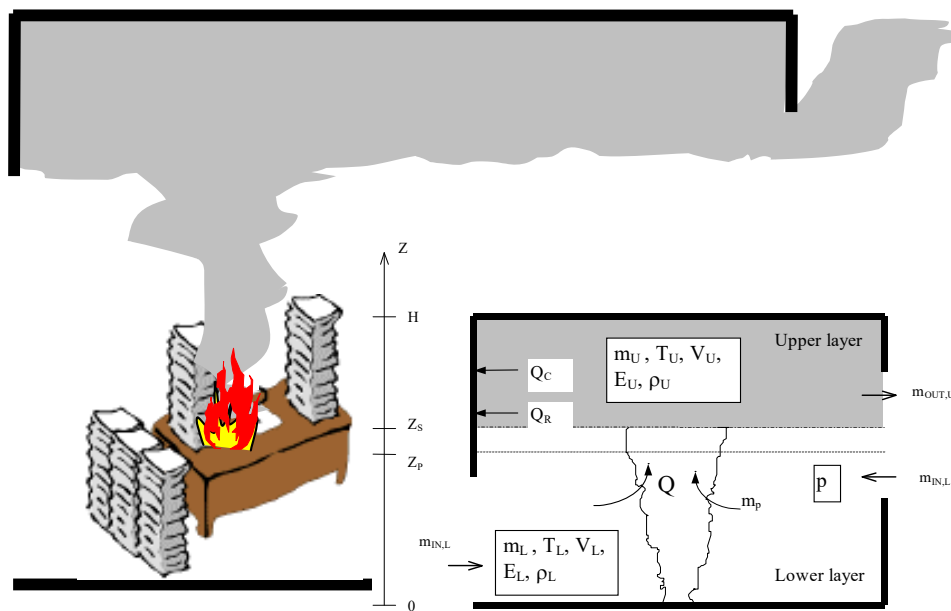
Antändning



5. Beräkningsprogram

5.1. OZone Compartment

Lokal brand

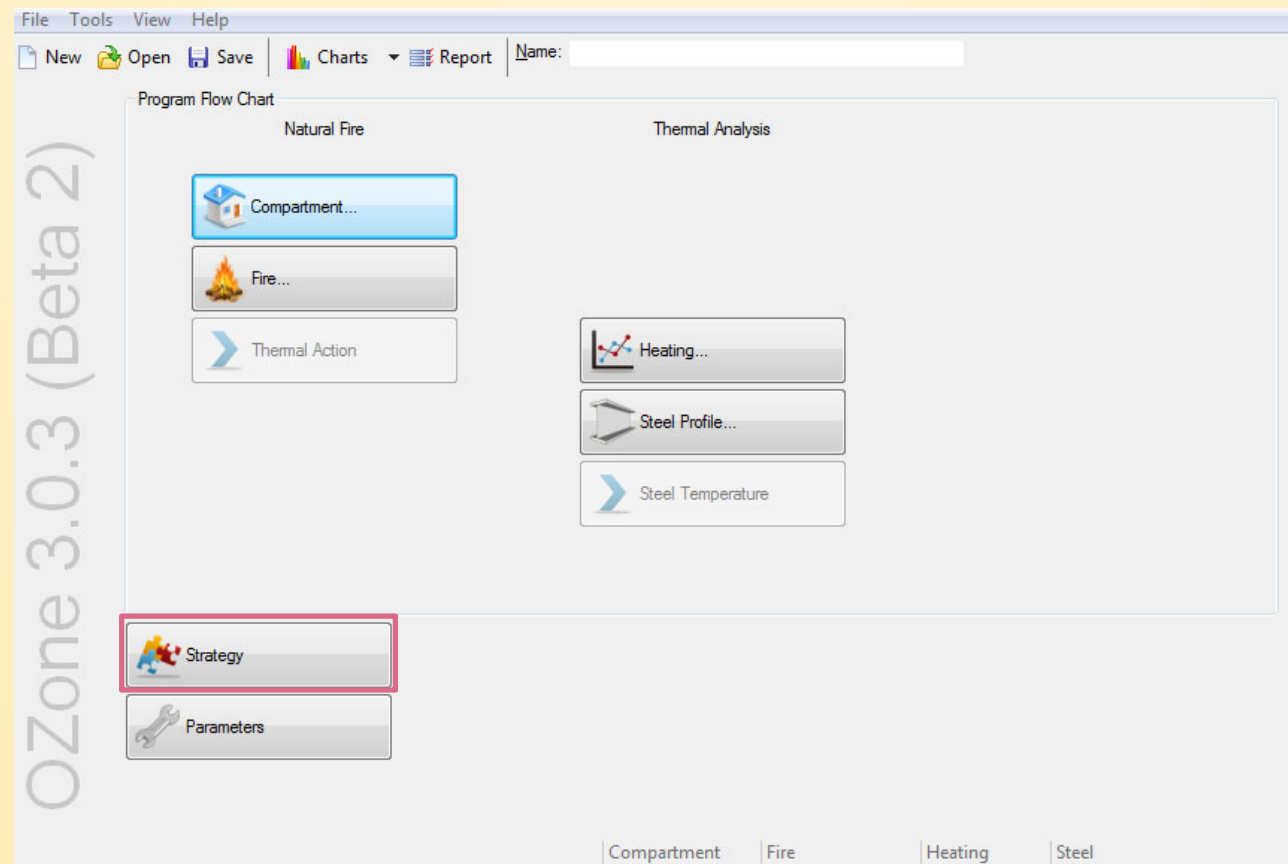


Fullt utvecklad brand



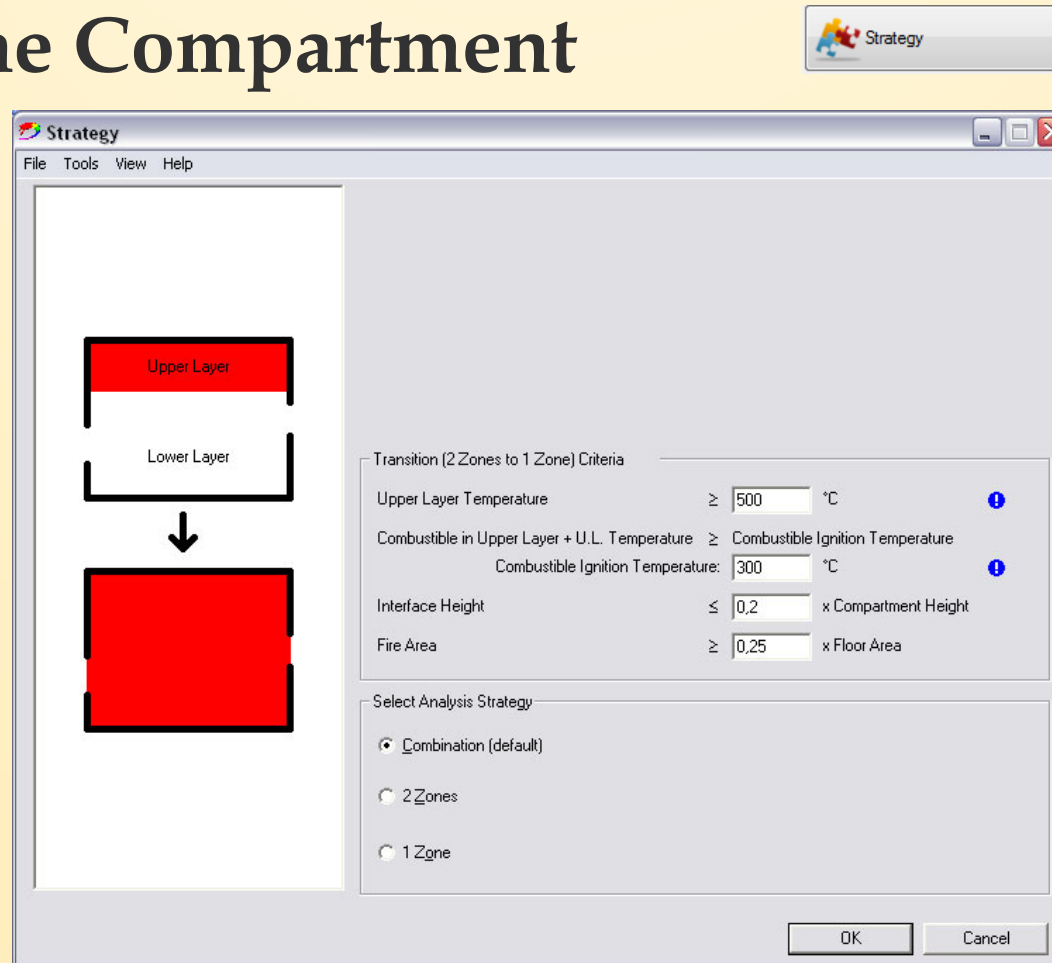
5. Beräkningsprogram

5.1. OZone Compartment



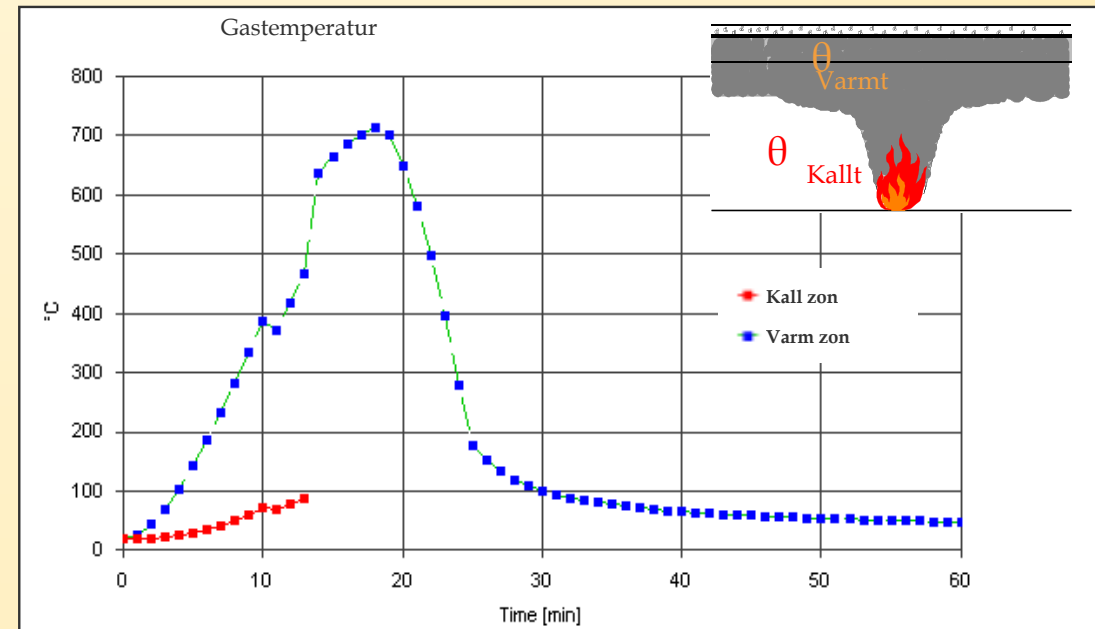
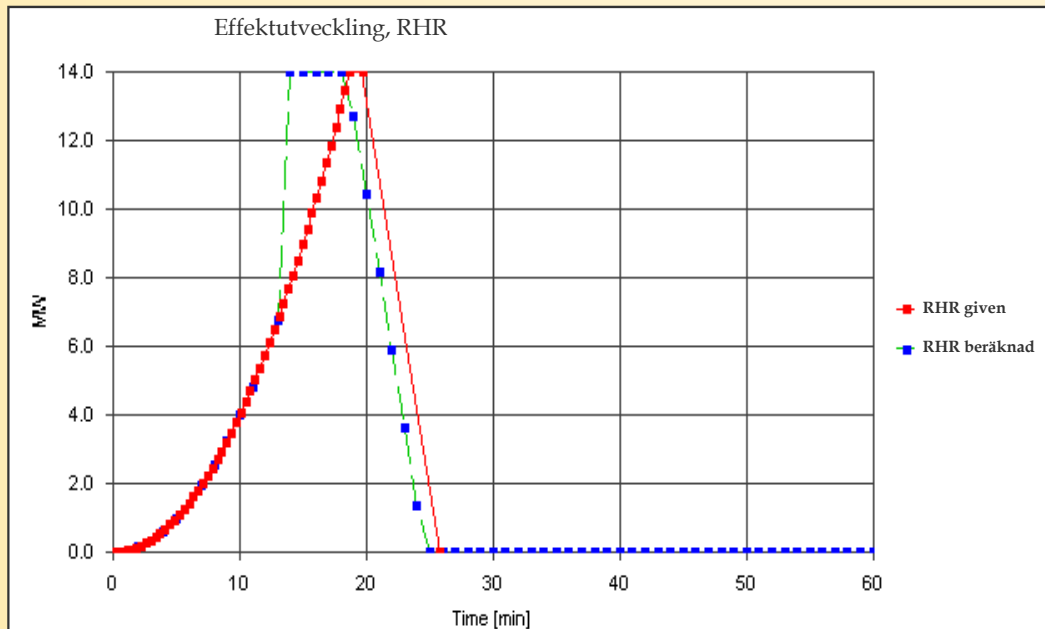
5. Beräkningsprogram

5.1. OZone Compartment



5. Beräkningsprogram

5.1. OZone Compartment



Efter 13 minuter når rökgaslagret 500°C → Gå från 2-zons- till 1-zonsmodell

5. Beräkningsprogram

5.1. OZone Compartment

The screenshot shows the 'Fire' software interface. The 'Compartment Fire' section has two radio buttons: 'Annex E (EN 1991-1-2)' and 'User Defined Fire'. The 'User Defined Fire' option is selected and highlighted with an orange box. Below it, the 'Localised Fire' section has a radio button for 'Localised Fire'. The main area is a table with 23 rows and 5 columns: Point, Time (sec), RHR (MW), mf (kg/s), and Fire Area (m²). The table is currently empty. To the right of the table, there are several configuration sections: 'Data Points' with 'Save...' and 'Load...' buttons; 'Fire Info' with input fields for 'Max Fire Area' (m²), 'Fire Elevation' (m), and 'Fuel Height' (m); 'User Defined Fire Columns' with radio buttons for 'Only RHR' (selected), 'Only mf', 'RHR and mf', and a checkbox for 'Fire Area'; and 'Combustion' with input fields for 'Combustion Efficiency Factor' (0.8), 'Combustion Model' (No combustion mode), and 'Stoichiometric Coefficient' (1.27). At the bottom right are 'OK' and 'Cancel' buttons.

File Tools View Help

Compartment Fire: ☐ Annex E (EN 1991-1-2) ☒ User Defined Fire

Localised Fire: ☐ Localised Fire

Point	Time sec	RHR MW	mf kg/s	Fire Area m²
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				

To delete or insert a row, right click on a row header and select the appropriate command from the popup menu.

Data Points
Save... Load...

Fire Info
Max Fire Area: m²
Fire Elevation: m
Fuel Height: m

User Defined Fire Columns
☒ Only RHR
☐ Only mf
☐ RHR and mf
☐ Fire Area

Combustion
Combustion Efficiency Factor: 0.8
Combustion Model: No combustion mode
Stoichiometric Coefficient: 1.27

OK Cancel

5. Beräkningsprogram

5.2. OZone Lokal brand

File Tools View Help

Compartment Fire: ☐ Annex E (EN 1991-1-2) ☐ User Defined Fire

Localised Fire: ☒ Localised Fire

Number of fires: 1

Select fire: 1

Fire	Diameter [m]	Pos X [m]	Pos Y [m]
Fire 1	3	2.5	1.25
Fire 2			
Fire 3			
Fire 4			
Fire 5			

Diameter and position av lokal brand (bränder)

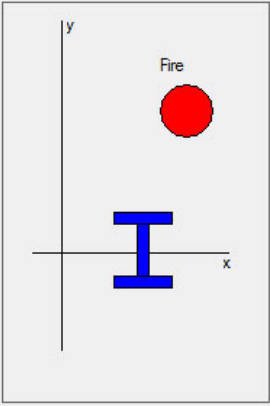
Geometrical Data

Ceiling Height: 3.5 m

Distance on Axis (x): 0 m

Height on Axis (z): 3.4 m

Den utsatta pelaren (eller balk ...) är alltid placerad vid $y = 0$. Det rekommenderas även att placera den på $x = 0$



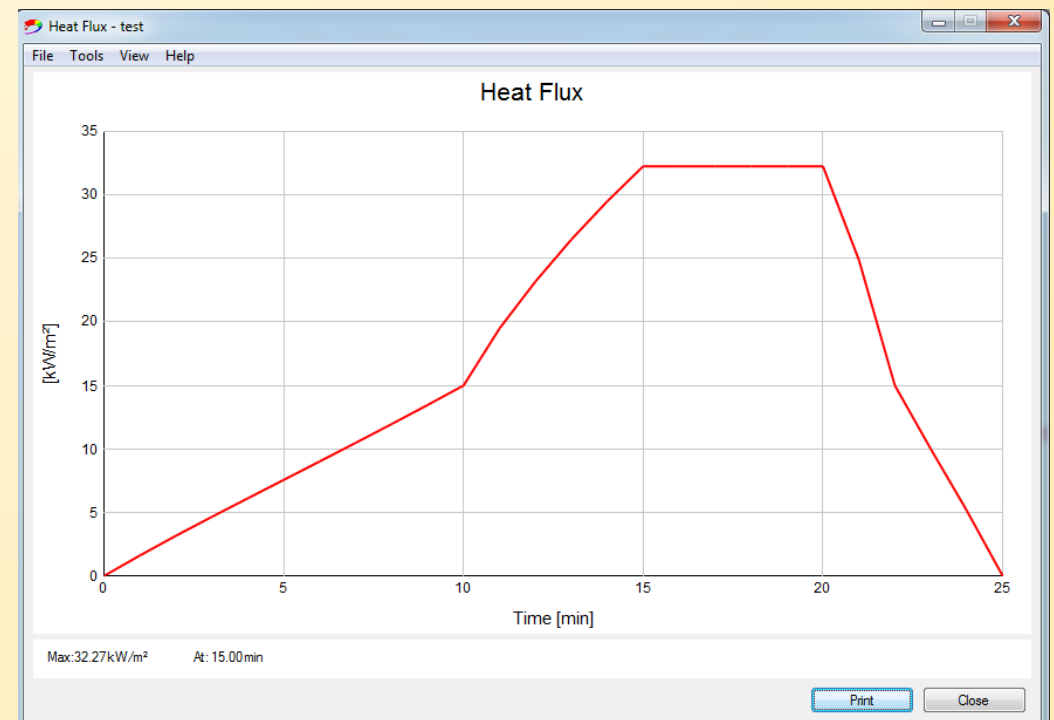
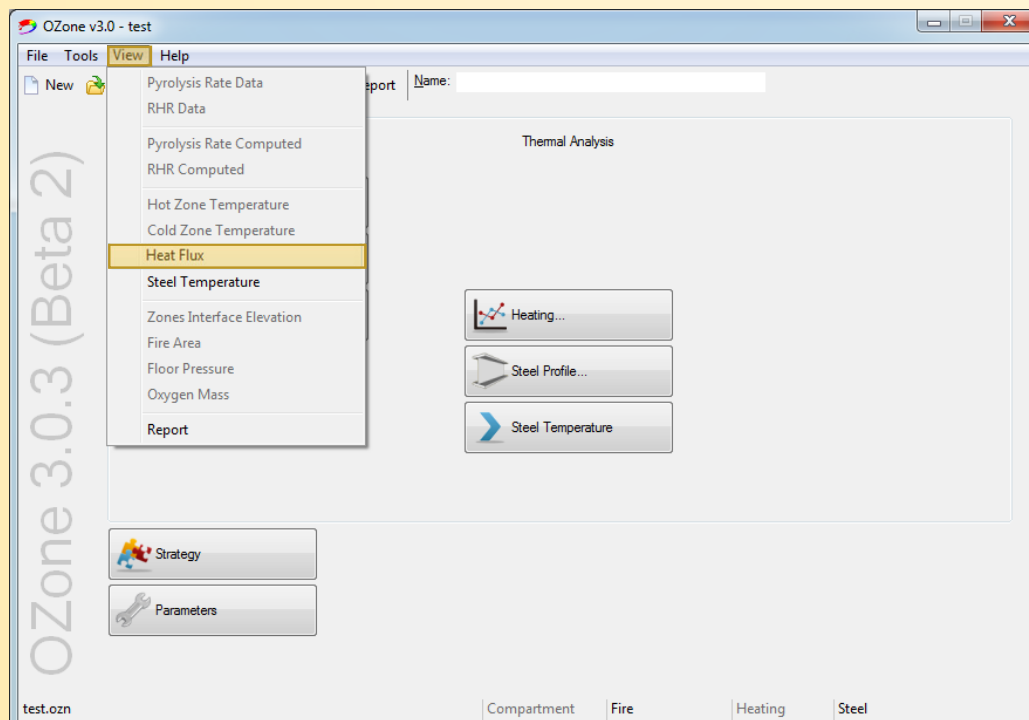
	Time [min]	RHR [MW]
Point 1	0	0
Point 2	5	1
Point 3	10	2
Point 4	15	2.5
Point 5	20	1.5
Point 6	25	0
Point 7		
Point 8		
Point 9		
Point 10		
Point 11		
Point 12		
Point 13		
Point 14		
Point 15		
Point 16		
Point 17		
Point 18		
Point 19		
Point 20		

Tidsberoende RHR

OK Cancel

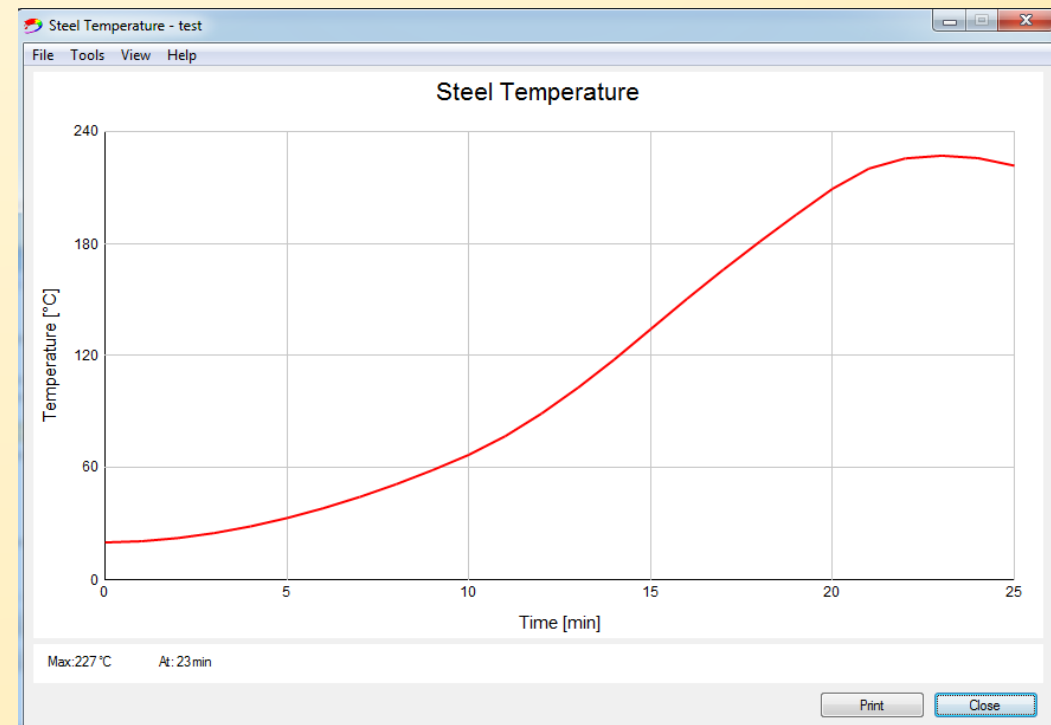
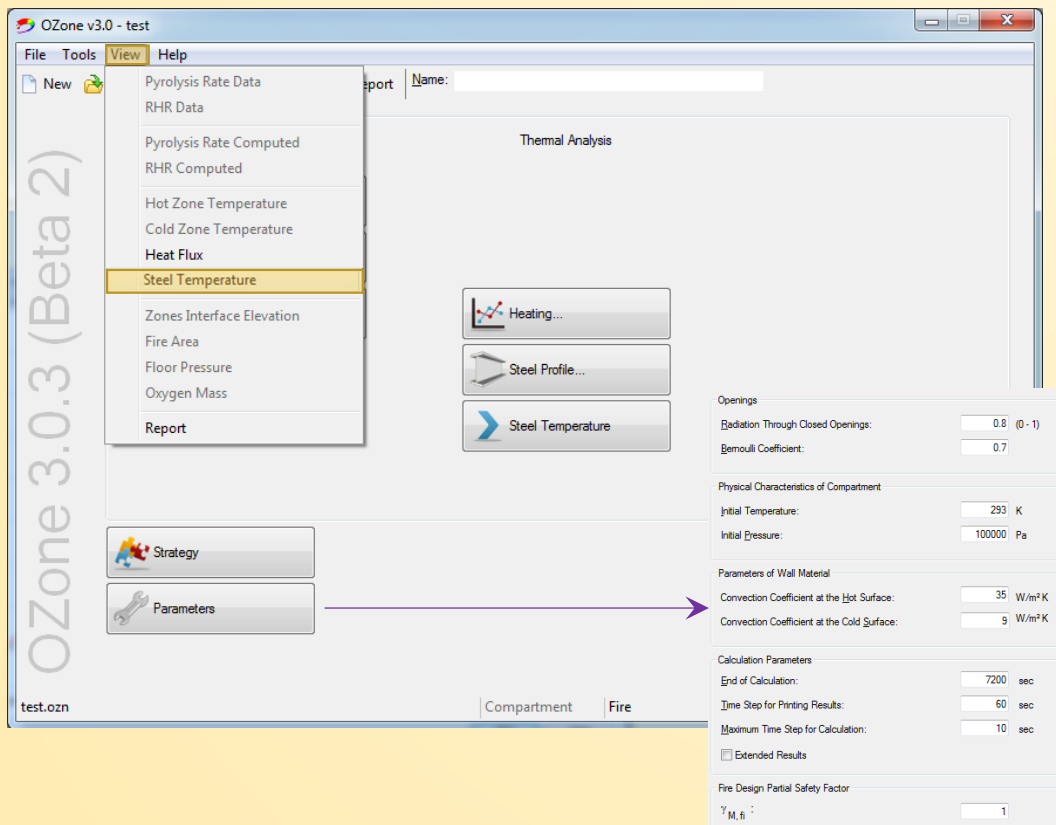
5. Beräkningsprogram

5.2. OZone Lokal brand



5. Beräkningsprogram

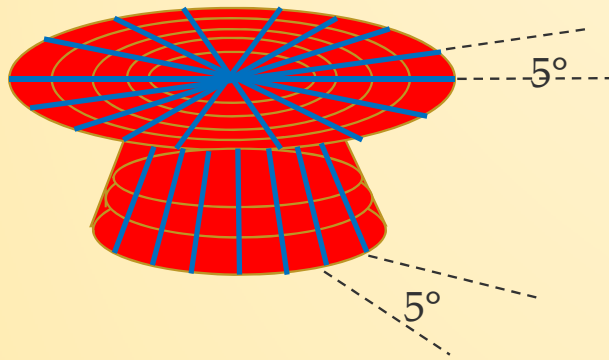
5.2. OZone Localised fire



5. Beräkningsprogram

5.3. SAFIR Lokal brand

Cylinderflamma
(som når taket)



- Geometrisk metod har implementerats i SAFIR
- (direkt strålningsutbyte mellan ytor).
- Detta genererar varierande tempepraturfördelningar i den analyseradde pelaren.
- Varje brandkälla definieras av position (x, y, z), form (cylinder eller kon), position relativt taket, diameters storlek som funktion av tid, RHR som funktion av tid.
- Vid flera brandkällor summeras bidragen men begränsas till 100 kW/m^2

Franssen, J.-M., & Gernay, T. (2017). Modeling structures in fire with SAFIR®: Theoretical background and capabilities. Journal of Structural Fire Engineering, 8(3), 300-323.

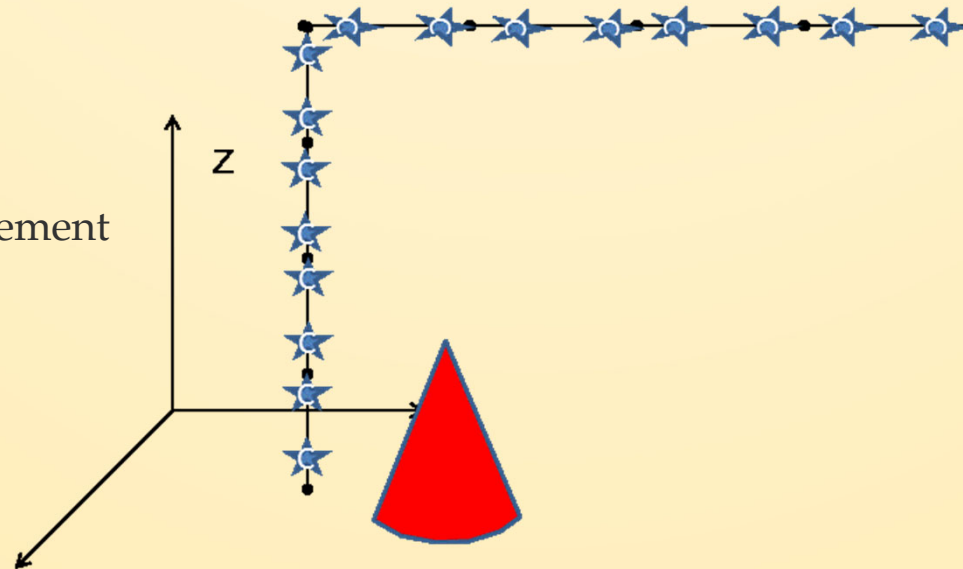
5. Beräkningsprogram

5.3. SAFIR Lokal brand

- En termisk 2D analysis genomförs i varje Gausspunkt för varje balkelement (eller skalelement).

Denna balk har 4 finita element => 8 Gausspunkter

Denna pelare har 4 finita element
=> 8 Gausspunkter



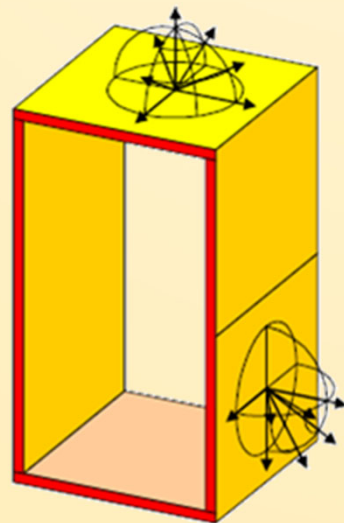
Denna pelare värms ej upp

5. Beräkningsprogram

5.3. SAFIR Lokal brand

- I en konkav profil beaktas skuggeffekten automatiskt om elementet befinner sig utanför flammorna.

Konvex form



Konkav form

