



LOCAFI+

Temperatuurbeoordeling van een verticaal lid onderworpen aan lokale brand

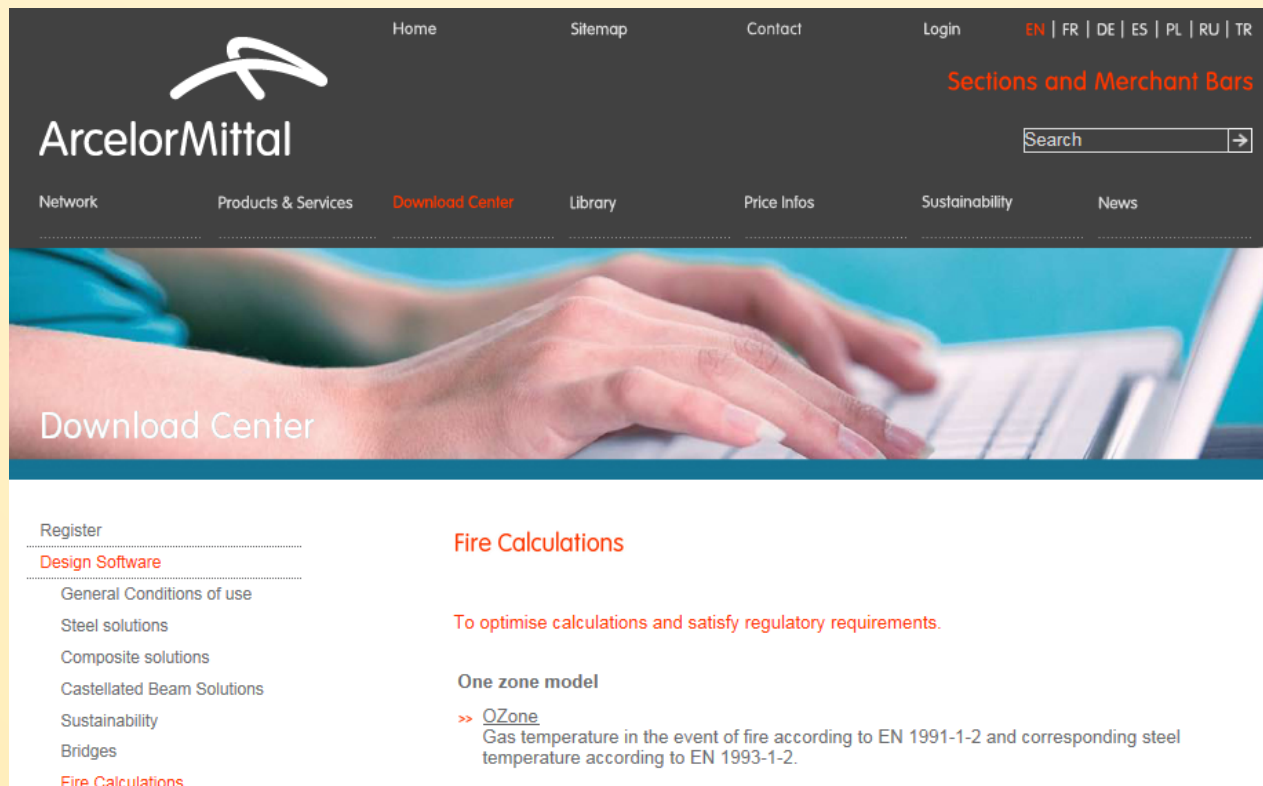
Informatie-verspreiding

Subsidieovereenkomst nr. 754072

5. Software

5. Software

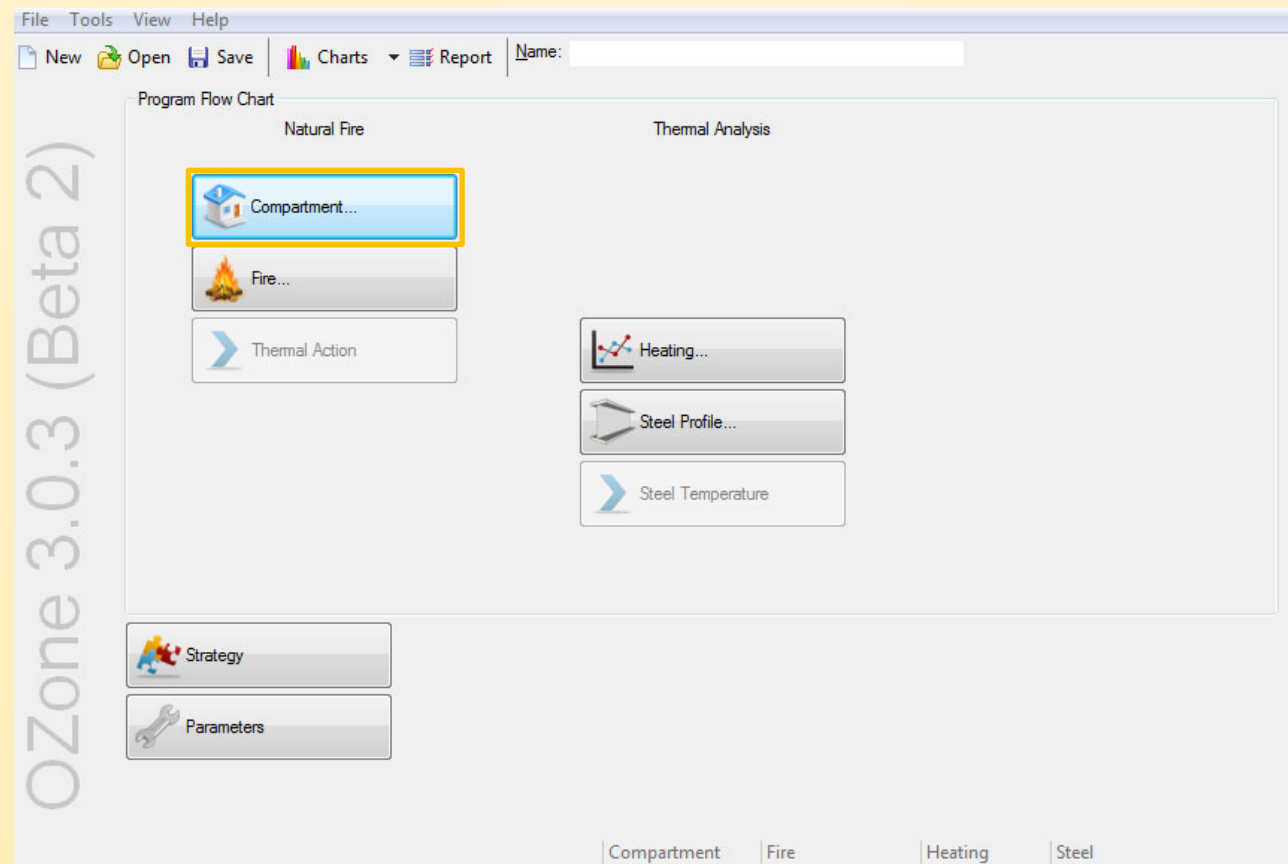
5.1. Ozone : compartment



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

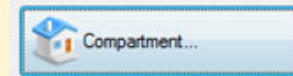
5. Software

5.1. Ozone : compartiment



5. Software

5.1. Ozone : compartiment



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:

Select Walls to Copy to:

☐ 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

Geometrie van
het
compartiment

Eigenschappen
van vloer,
wanden en
plafond

Gedwongen
ventilatie
(indien van
toepassing)

5. Software

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/m ³	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 it's 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



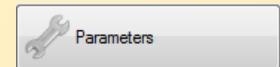
Outside

	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

Eigenschappen
van lagen voor
elke wand

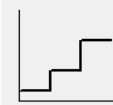
Openingen



Temperature Dependent Openings

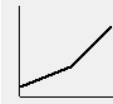
Temperature Dependent: 400 °C

Stepwise Variation



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

Linear Variation



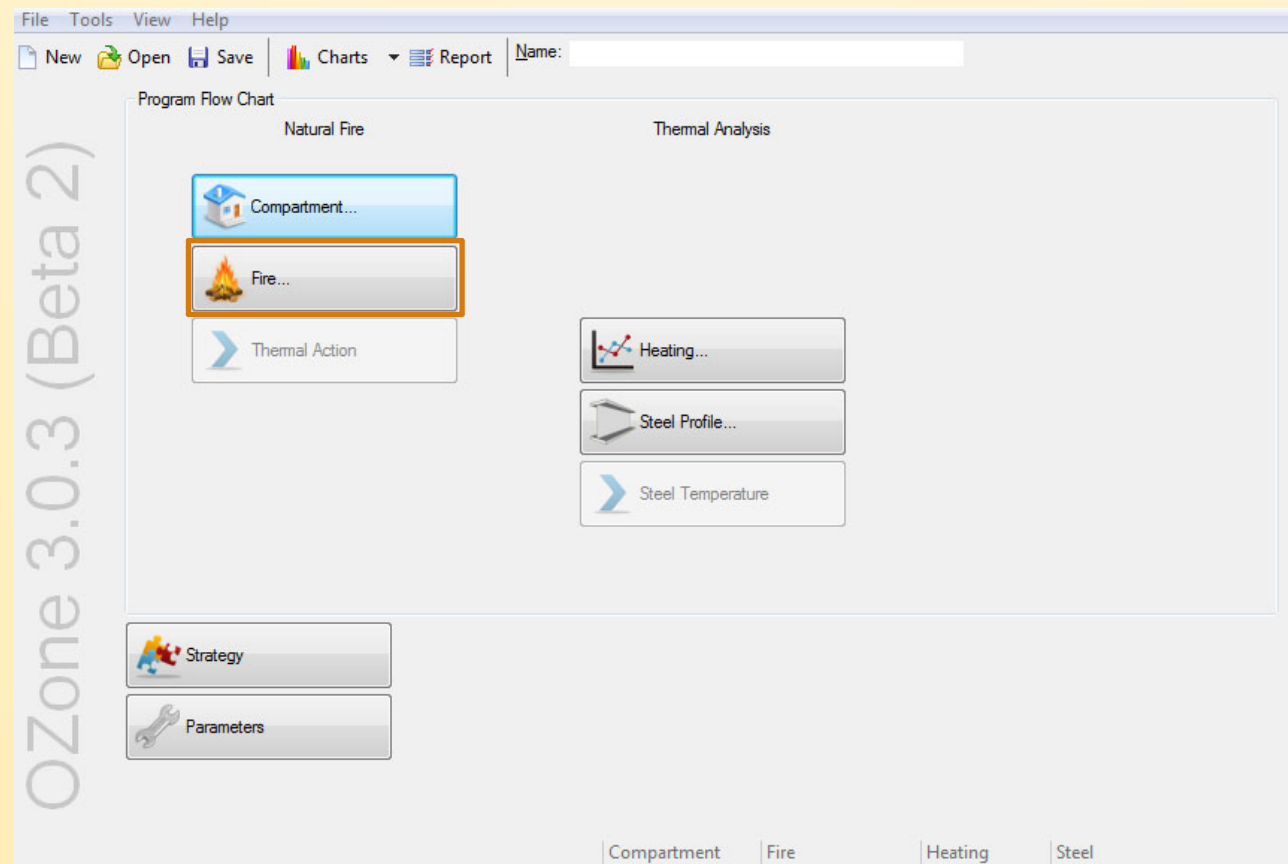
Temperature °C	% of Total Openings
20	10
400	50
500	100

Time Dependent Openings

Time sec	% of Total Openings
0	5
1200	100

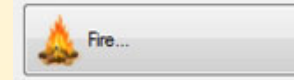
5. Software

5.1. Ozone : compartiment



5. Software

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

☒ 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:

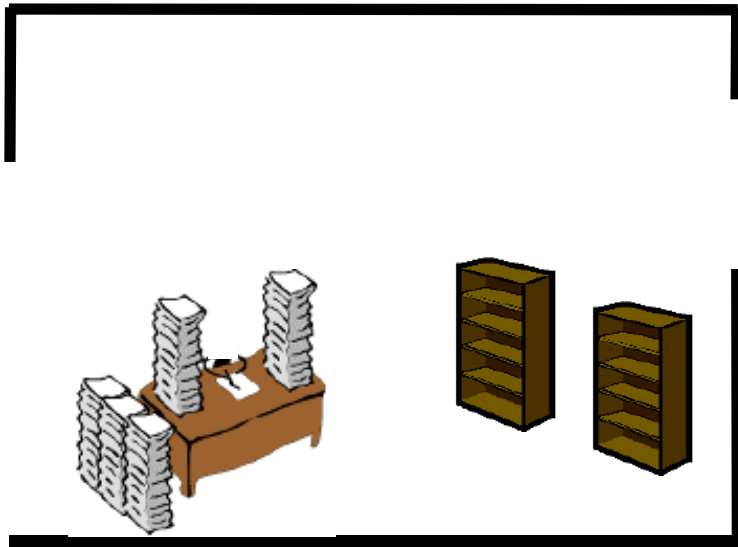
Stoichiometric Coefficient:

OK Cancel

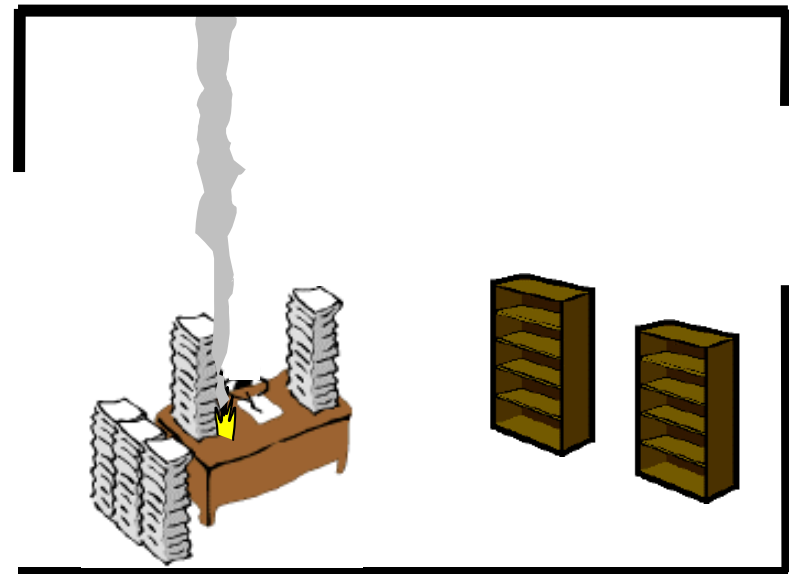
5. Software

5.1. Ozone : compartiment

Voor de brand



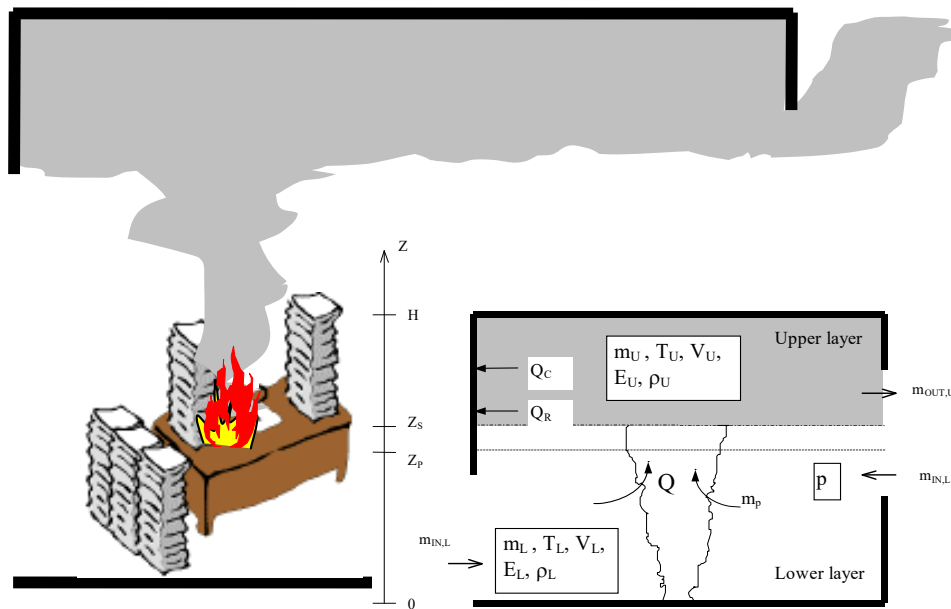
Ontsteking



5. Software

5.1. Ozone : compartment

Lokale brand

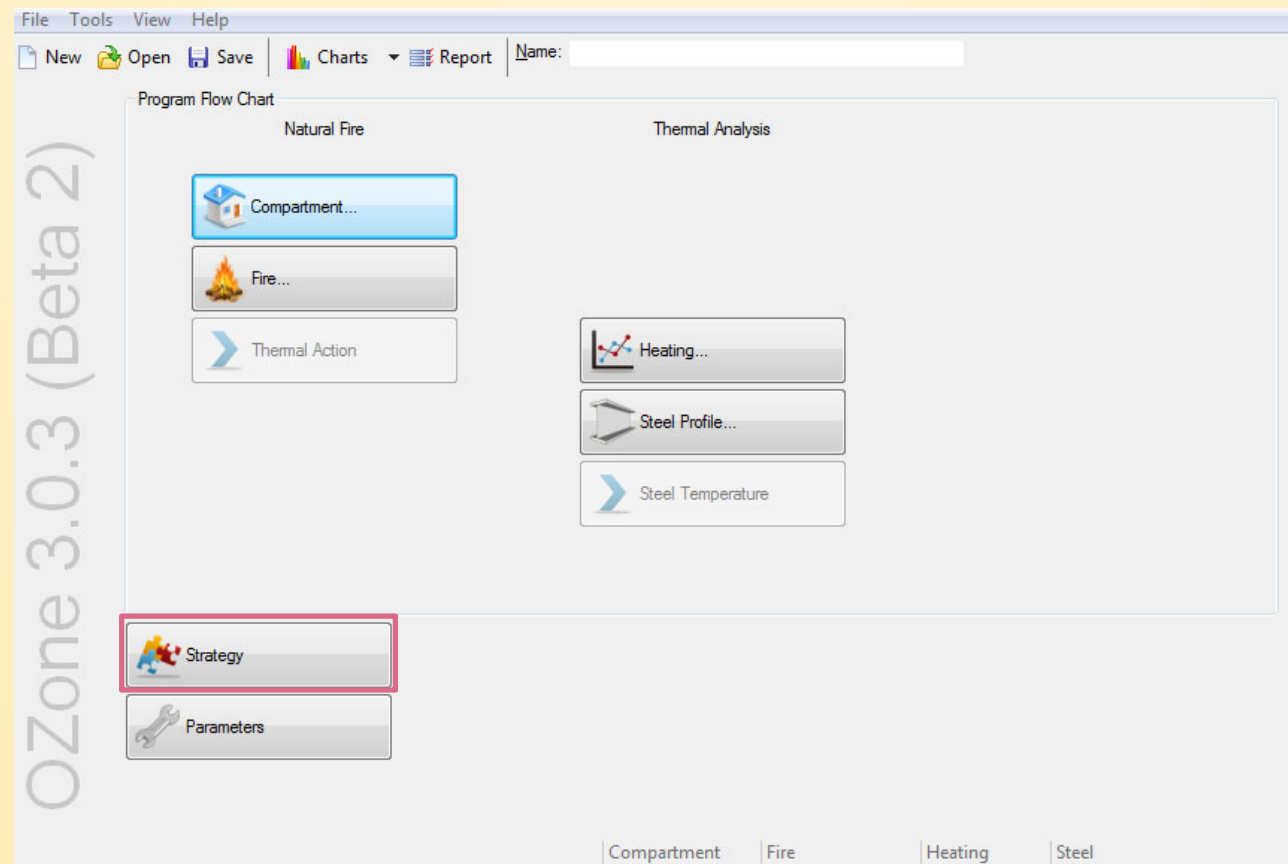


Volledig ontwikkelde brand



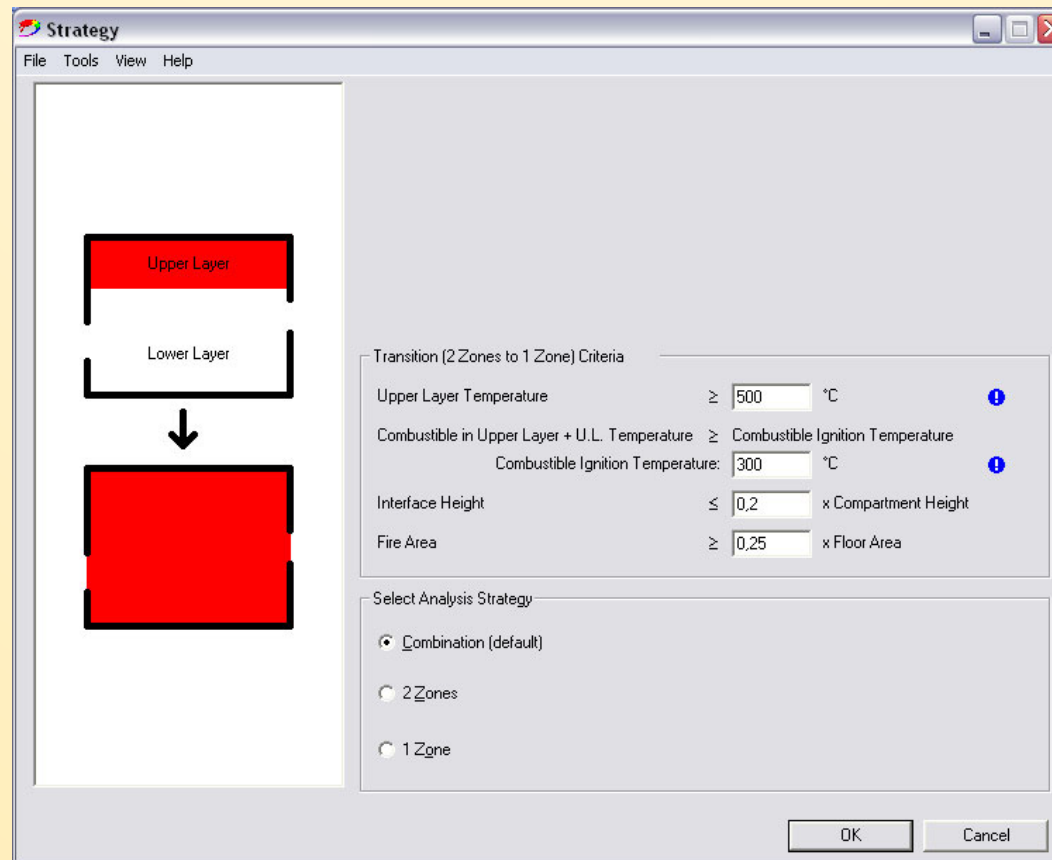
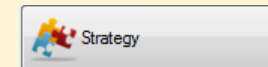
5. Software

5.1. Ozone : compartiment



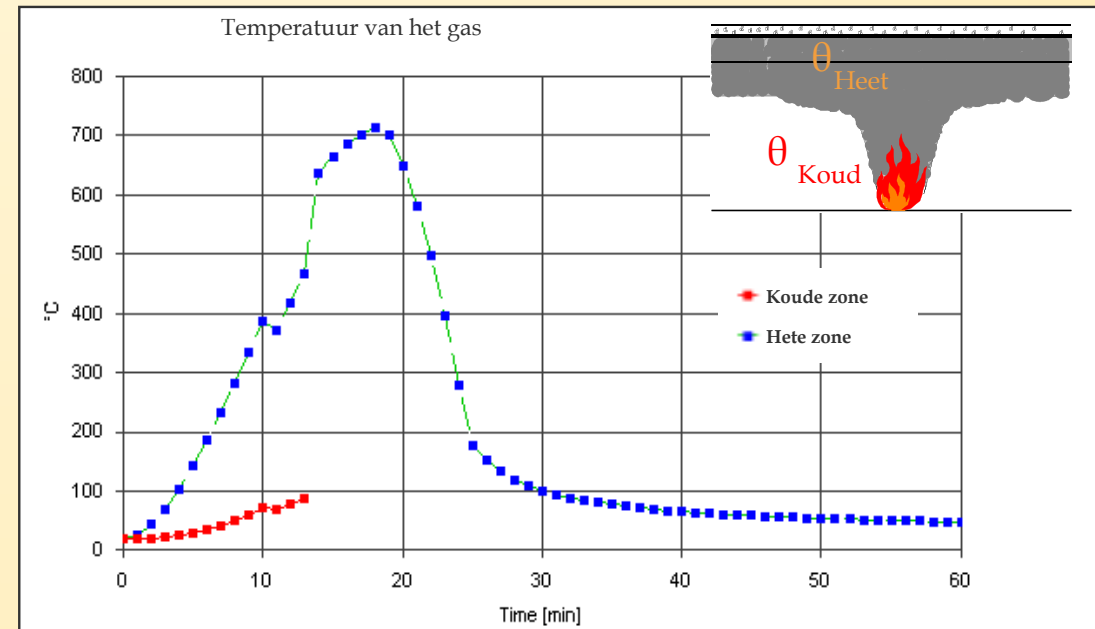
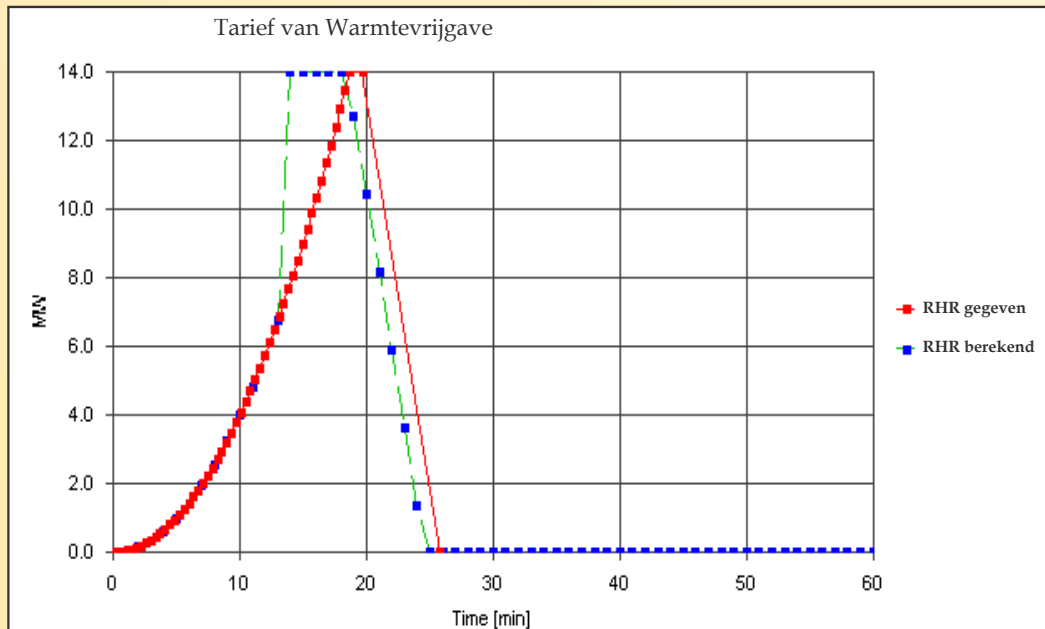
5. Software

5.1. Ozone : compartiment



5. Software

5.1. Ozone : compartiment



Na 13 minuten bereikt de warmte zone een temperatuur van 500°C → Schakel van 2 zones naar 1

5. Software

5.1. OZone-compartment

The screenshot shows the 'Fire' software window with the following components:

- Menu Bar:** File, Tools, View, Help
- Compartment Fire:** ☐ Annex E (EN 1991-1-2) ☒ **User Defined Fire** (highlighted with an orange box)
- Localised Fire:** ☐ Localised Fire
- Table:** A table with 5 columns: Point, Time (sec), RHR (MW), mf (kg/s), and Fire Area (m²). It contains 23 rows, with rows 1-10 shaded.
- Data Points:** Buttons for 'Save...' and 'Load...'.
- Fire Info:** Fields for 'Max Fire Area' (m²), 'Fire Elevation' (m), and 'Fuel Height' (m).
- User Defined Fire Columns:** Radio buttons for 'Only RHR' (selected), 'Only mf', 'RHR and mf', and a checkbox for 'Fire Area'.
- Combustion:** Fields for 'Combustion Efficiency Factor' (0.8), 'Combustion Model' (No combustion mode), and 'Stoichiometric Coefficient' (1.27).
- Buttons:** 'OK' and 'Cancel' at the bottom right.

5. Software

5.2. Ozon : lokale 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 en plaats van de plaatselijke brand(en)

Geometrical Data

Ceiling Height: 3.5 m

Distance on Axis (x): 0 m

Height on Axis (z): 3.4 m

Het doel (kolom,...) bevindt zich altijd op de as $y = 0$.
Het is aanbevolen om $x = 0$ in te stellen.

	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		

Evolutie van RHR

OK Cancel

5. Software

5.2. Ozon : lokale brand



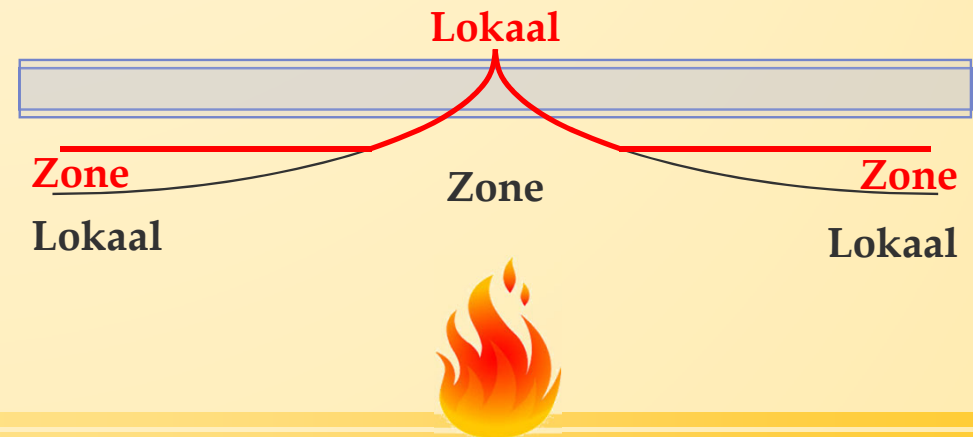
EN 1991-1-2 § 3.3.2 (4)

Om de temperatuurverdeling langs een element nauwkeuriger te kunnen berekenen, kan in het geval van een plaatselijke brand een combinatie van resultaten worden overwogen die zijn verkregen met een tweezonemodel en een plaatselijke brandaanpak.

OPMERKING Het temperatuurveld in het element kan worden verkregen door te kijken naar het maximale effect op elke locatie gegeven door de twee brandmodellen.

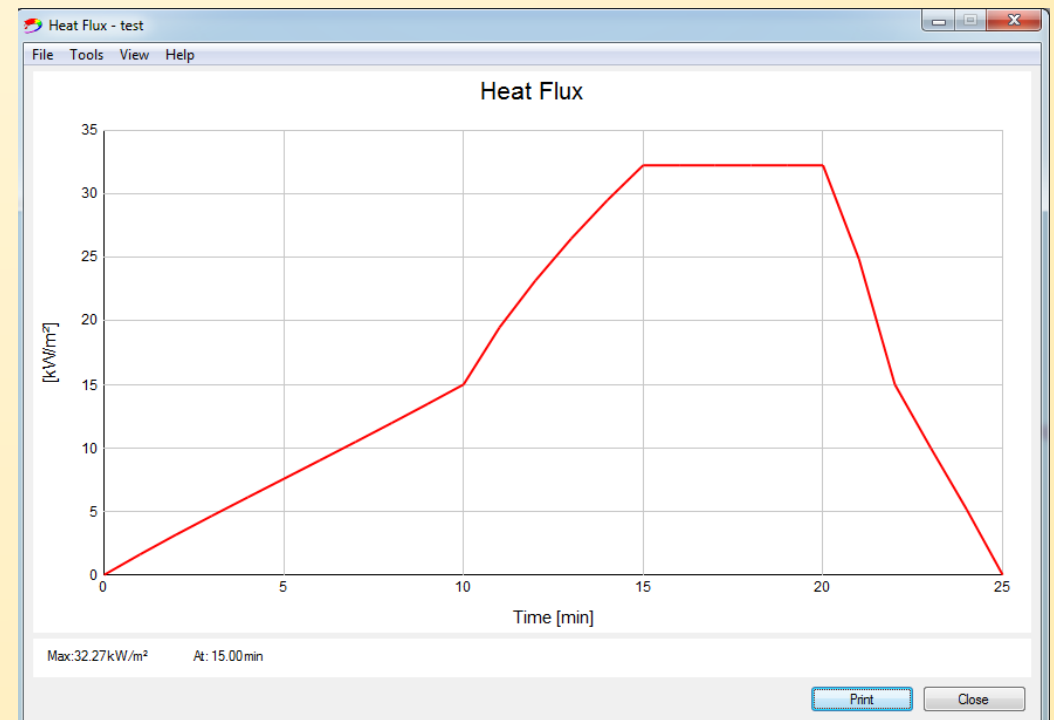
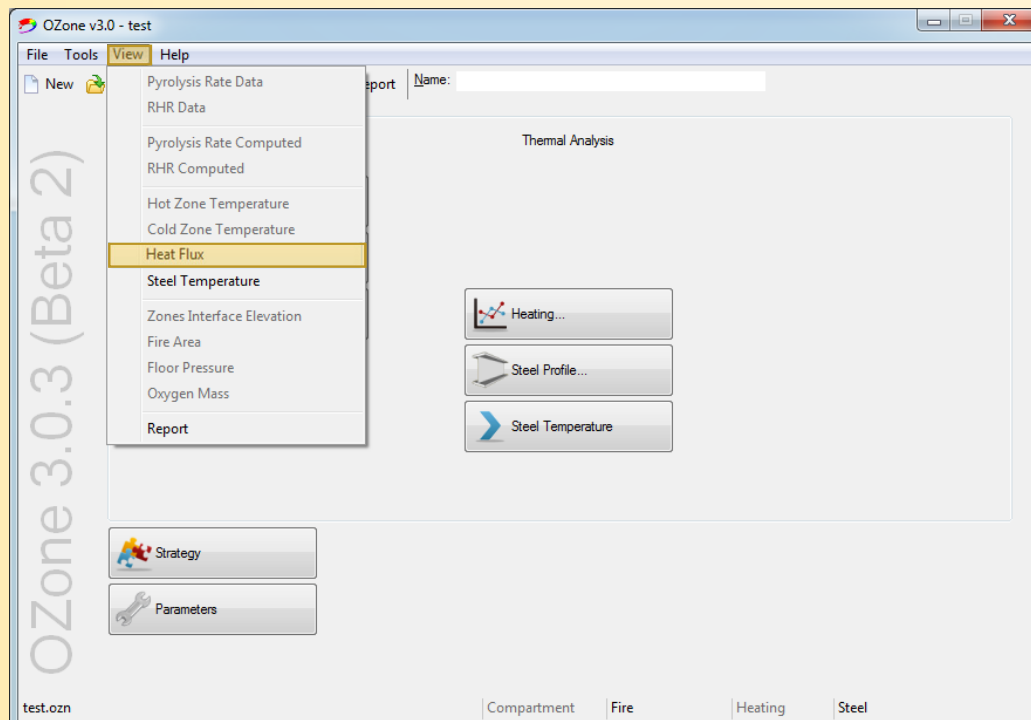
Profile Heated By

<input checked="" type="radio"/> Hot Zone Temperature	<input type="radio"/> ISO 853 Fire Curve
<input type="radio"/> Localised Fire Temperature	<input type="radio"/> ASTM E119 Fire Curve
<input checked="" type="radio"/> Maximum Between Both	<input type="radio"/> Hydrocarbon Fire Curve



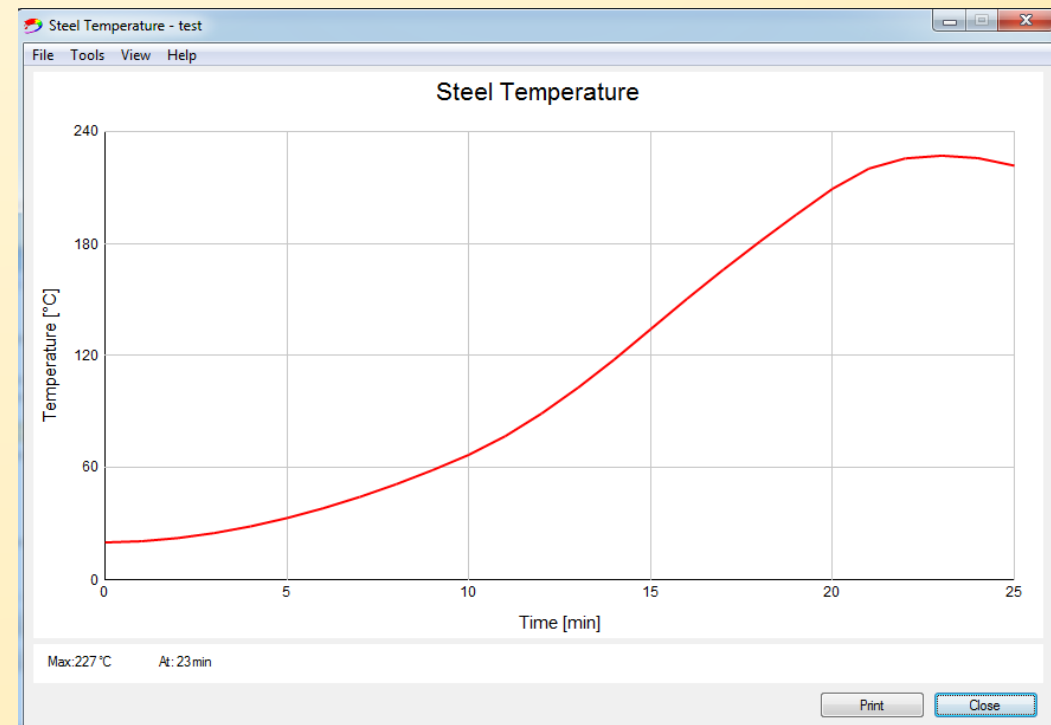
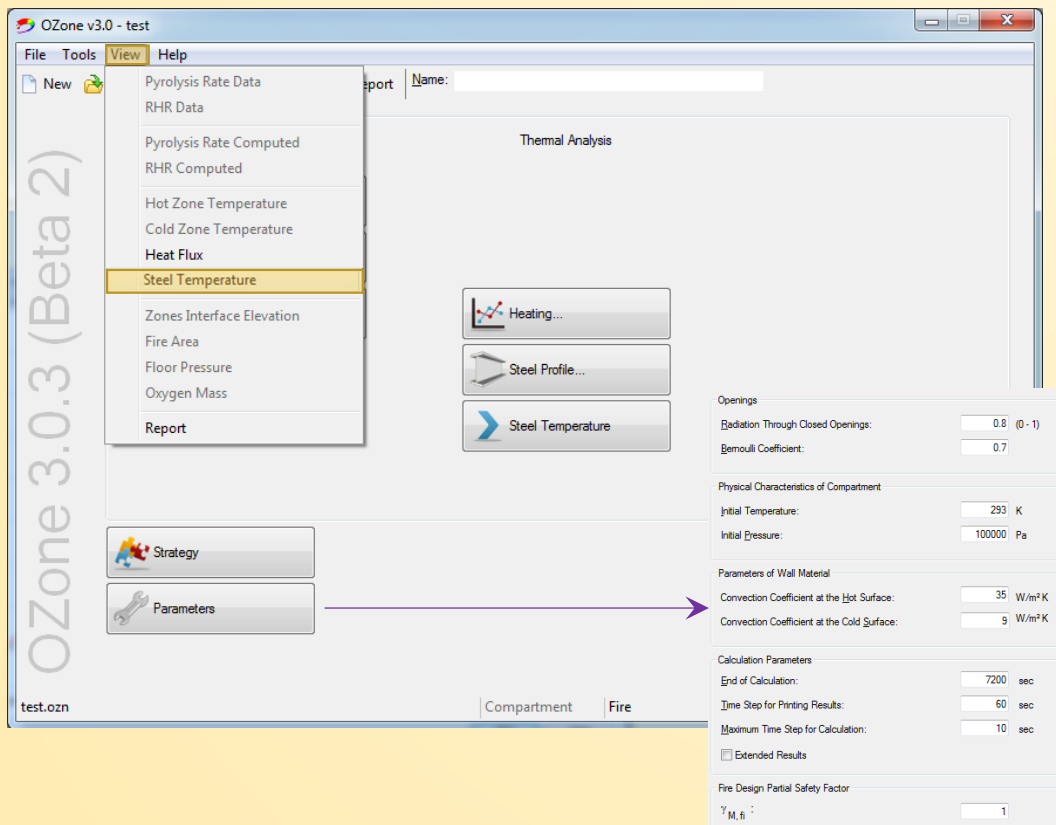
5. Software

5.2. Ozon : lokale brand



5. Software

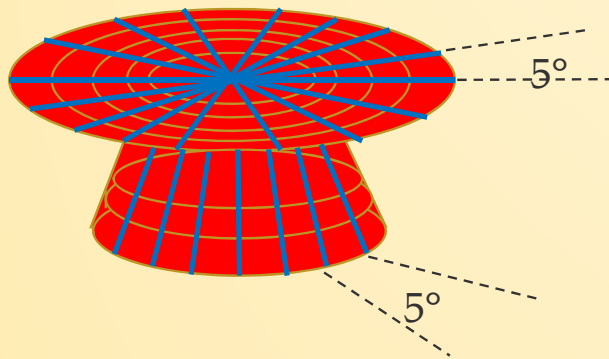
5.2. Ozon – lokale brand



5. Software

5.3. SAFIR : Plaatselijke brand

Cilindrische vlam
(raakt het plafond)



- Geometrische methode is geïmplementeerd in SAFIR (directe warmte-uitwisseling tussen eindige oppervlakken).
- Dit genereert **niet-uniforme temperatuurverdelingen** in de geanalyseerde secties.
- Elke vuurbron wordt beschreven door positie (x, y, z), vorm (cilinder of kegel), verticale positie van het plafond, evolutie van diameter en van RHR in de tijd.
- In het geval van meerdere branden worden de bijdragen opgeteld en beperkt tot 100 kW/m²

Franssen, J.-M., & Gernay, T. (2017) Modelleringsstructuren in brand met SAFIR®: Theoretische achtergrond en mogelijkheden; Journal of Structural Fire Engineering, 8(3), 300-323.

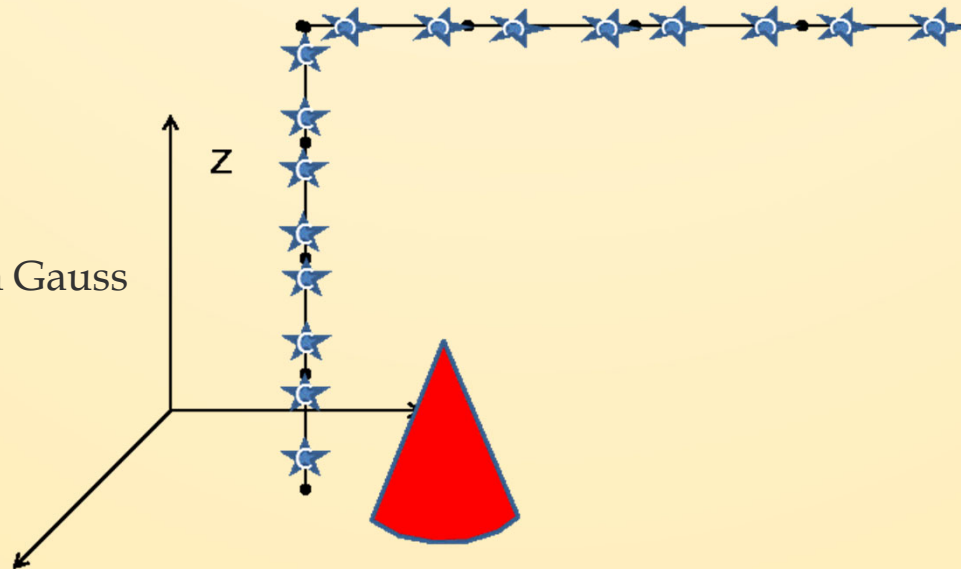
5. Software

5.3. SAFIR Plaatselijke brand

Er wordt één 2D-thermische analyse uitgevoerd in elk Gauss-punt van elk eindig element van de balk (of plaat).

Deze balk heeft 4 eindige elementen => 8 punten van Gauss

Deze kolom heeft 4 eindige
Elementen => 8 punten van Gauss



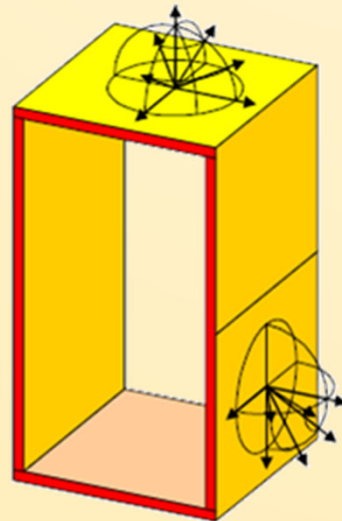
Deze kolom wordt niet verwarmd

5. Software

5.3. SAFIR : Plaatselijke brand

Bij een concave doorsnede wordt automatisch rekening gehouden met schaduwwerking als de doorsnede zich buiten het vuur bevindt.

Convexe vorm



Concave vorm

