



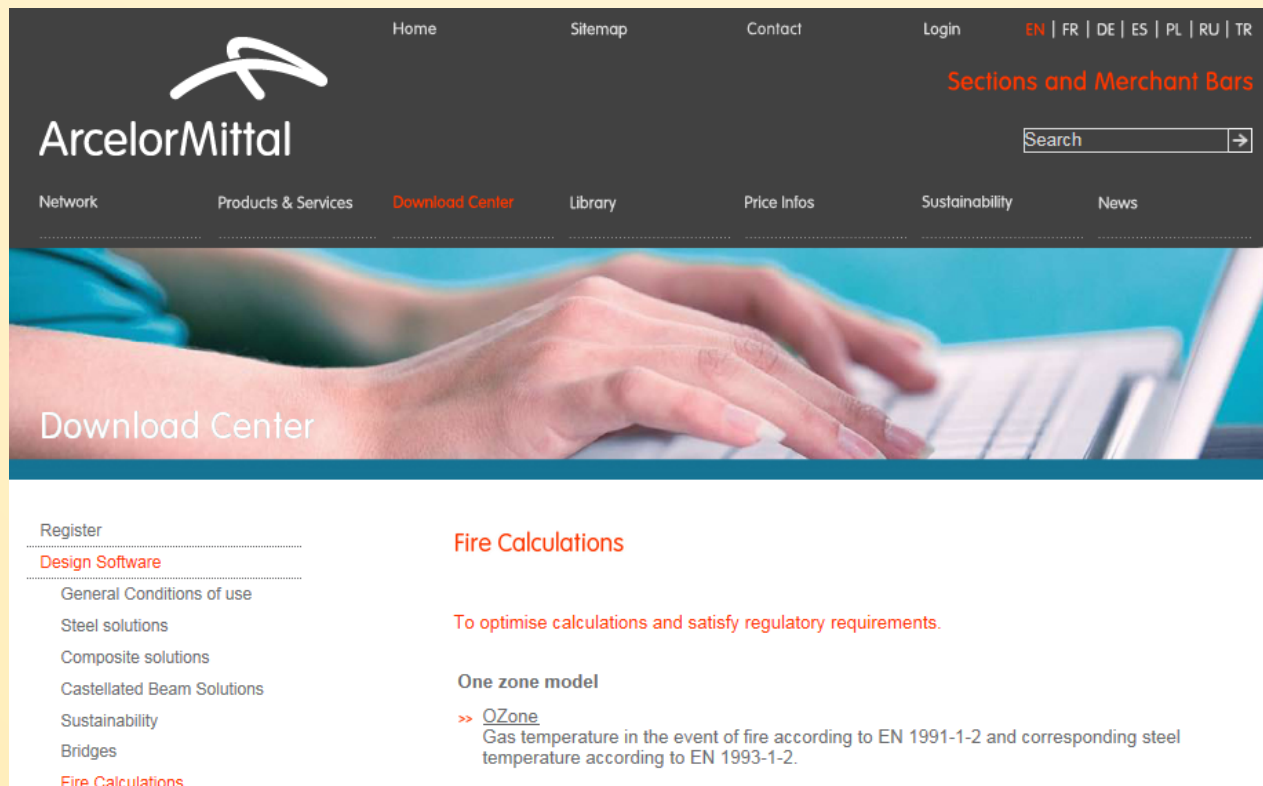
LOCAFI+

Določitev temperatur navpičnih elementov izpostavljenih lokaliziranim
požarom
Diseminacija
Grant Agreement n° 754072

5. Programska oprema

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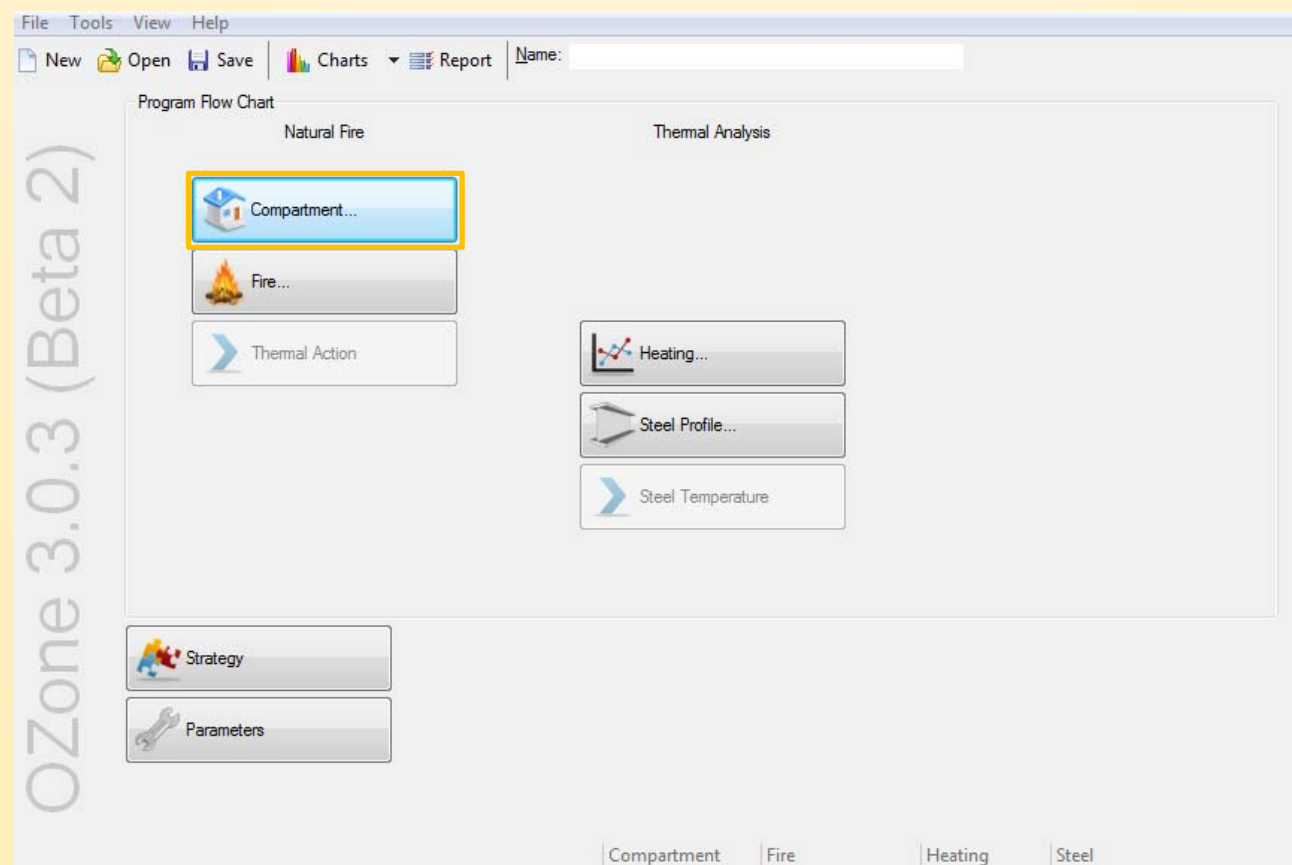
5.1. Okolje OZone



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

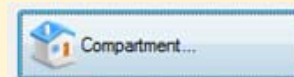
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5.1. Okolje OZone



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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

Geometrija
prostora

Lastnosti tal,
sten in stropa

Prisilno
prezračevanje
(če obstaja)

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File Tools View Help

Wall Length: 13 m

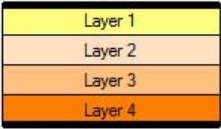
	Material	Thickness	Unit mass	Conductivity	Specific Heat	Rel Emissivity	Rel Emissivity
		cm	kg/m³	W/mK	J/kgK	Hot Surface	Cold Surface
Layer 1	Steel [EN1994-1-2]	0.1	7850	45	600	0.8	0.8
Layer 2	Glass wool _Rock wool	6	60	0.037	1030	0.8	0.8
Layer 3	Steel [EN1994-1-2]	0.1	7850	45	600	0.8	0.8
Layer 4							

Enter each layer on a single row in the table above (up to four layers). Just click in a cell and edit 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

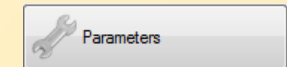


Outside

	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

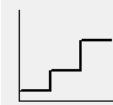
Lastnosti sloja
obodnih steb



Temperature Dependent Openings

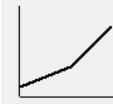
Temperature Dependent: 400 °C

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

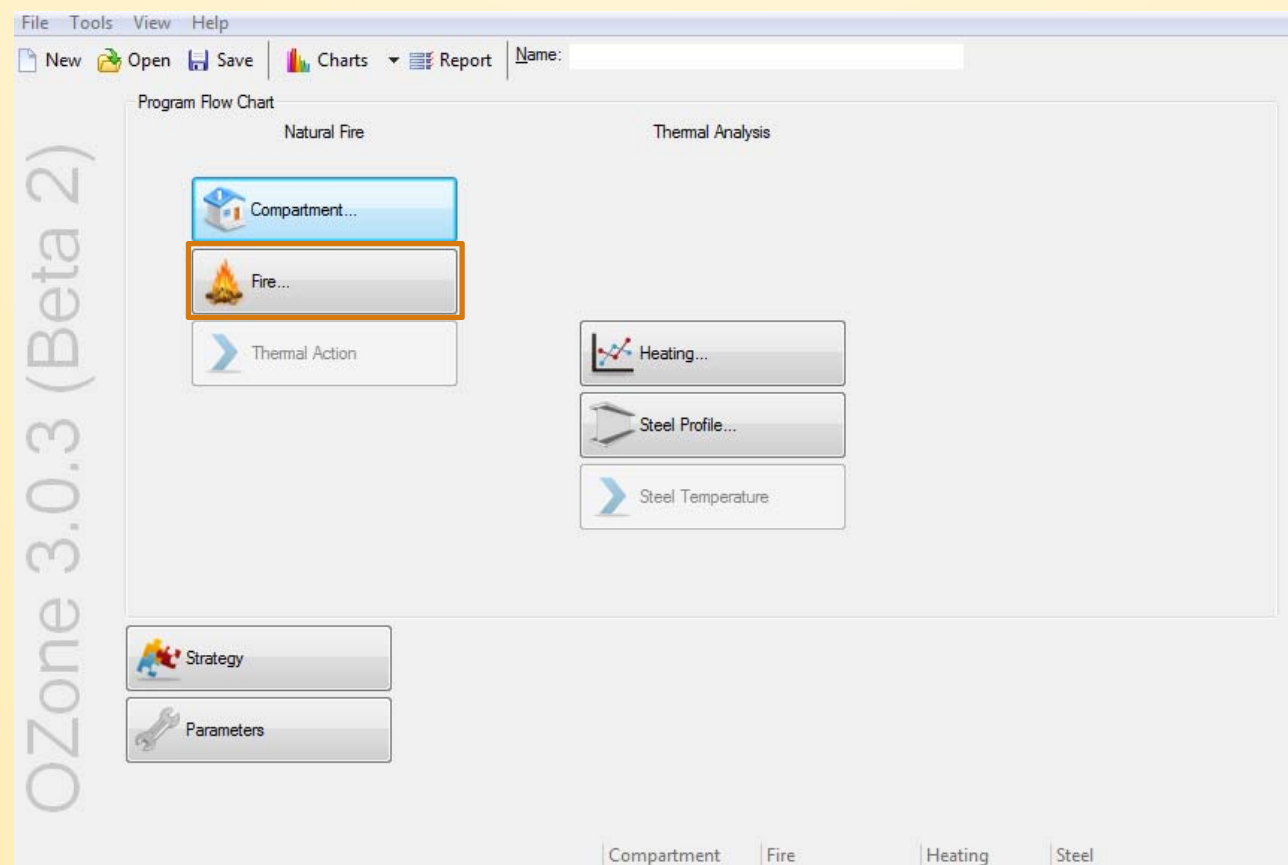
Time Dependent Openings

Time sec	% of Total Openings
0	5
1200	100

Odprtine

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5.1. Okolje OZone



5. Programska oprema

5.1. Okolje OZone



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:

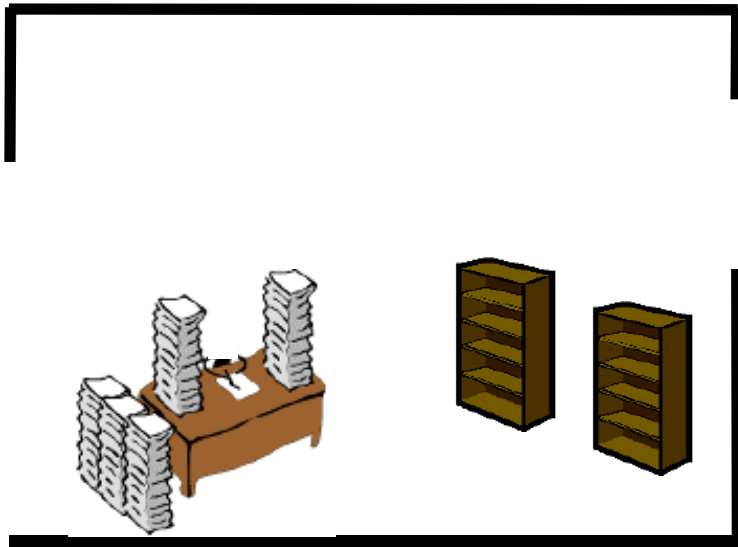
Stoichiometric Coefficient:

OK Cancel

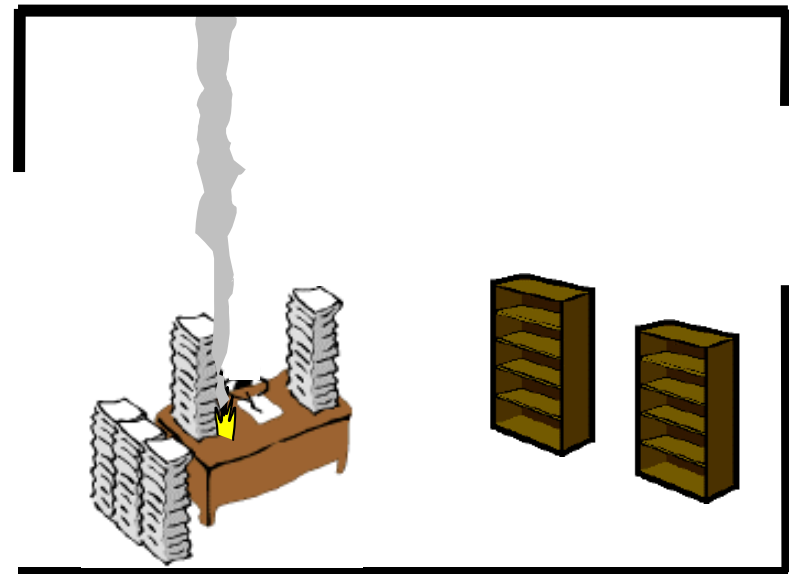
5. Programska oprema

5.1. Okolje OZone

Pred požarom



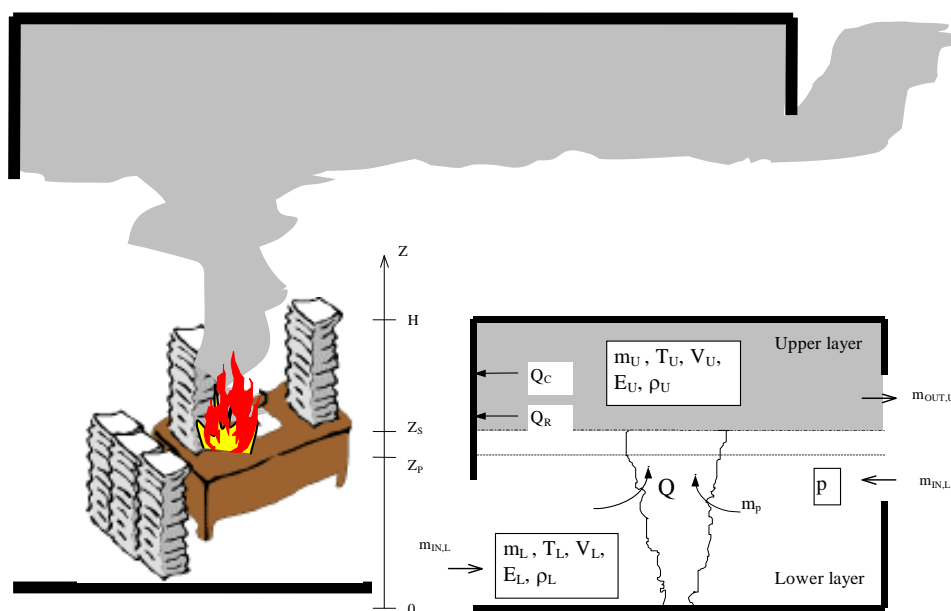
Vžig



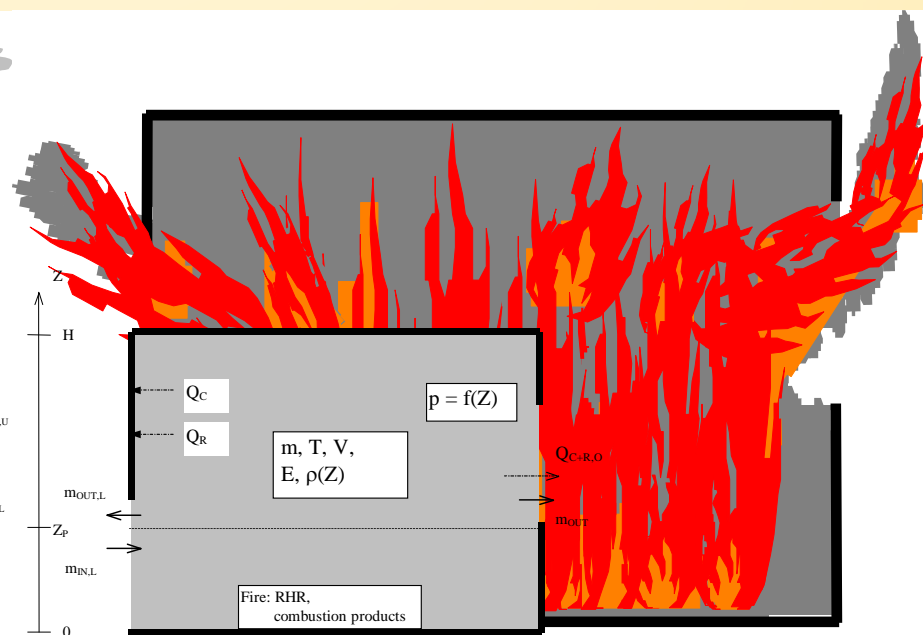
5. Programska oprema

5.1. Okolje OZone

Lokaliziran požar

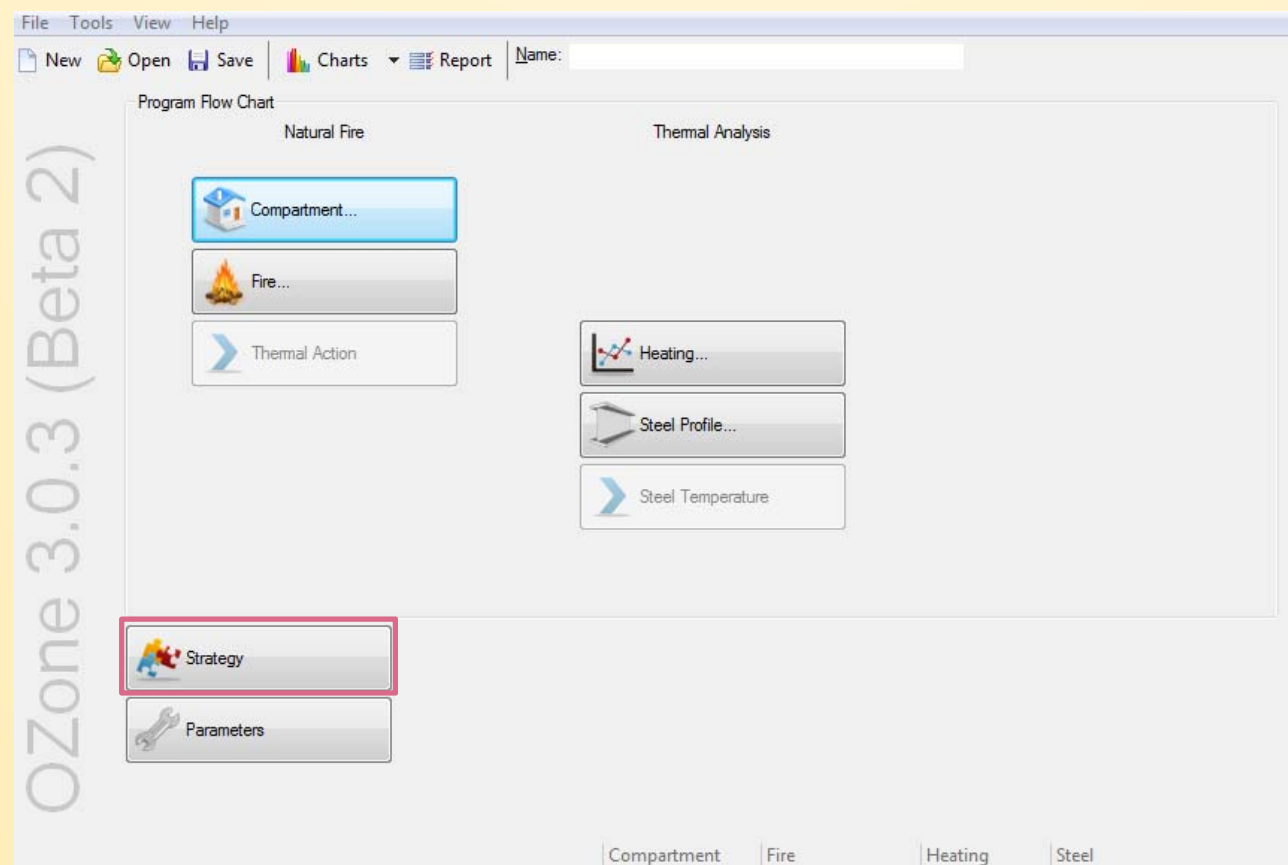


Polnorazvit požar



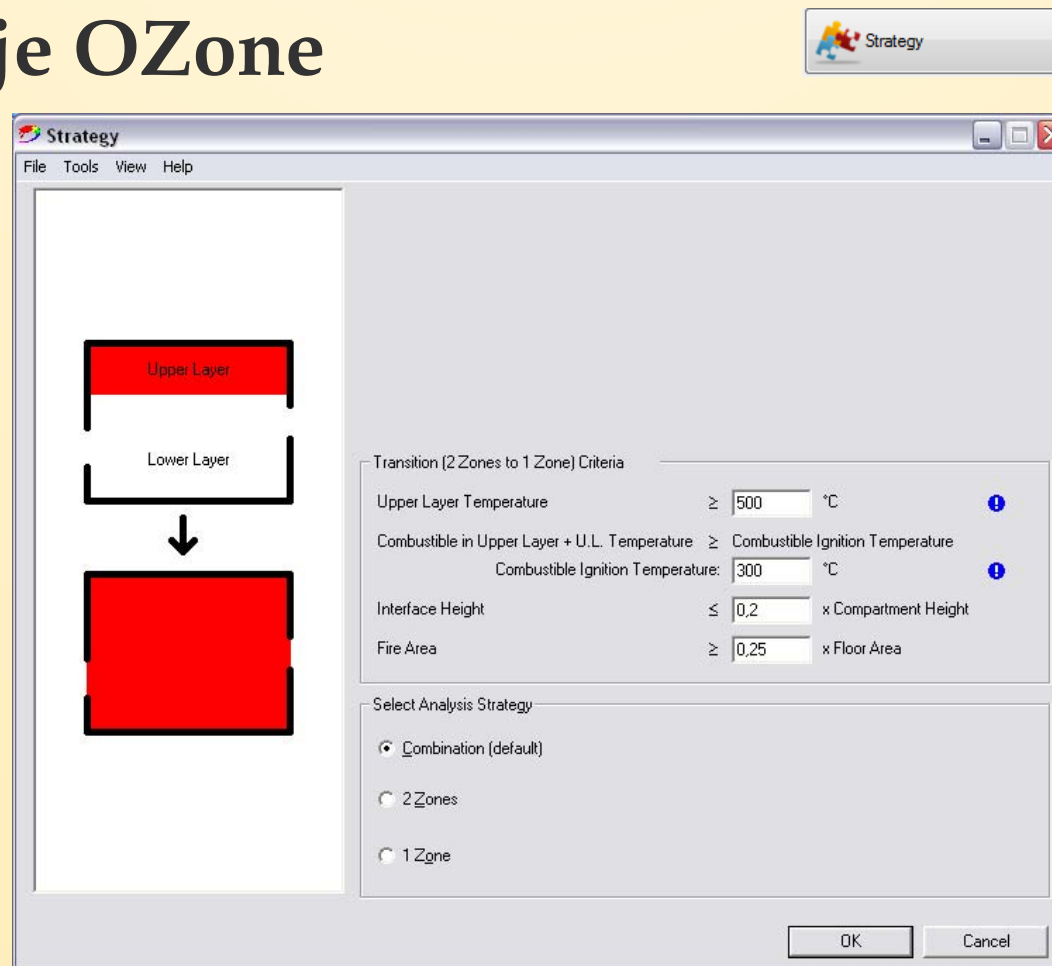
5. Programska oprema

5.1. Okolje OZone



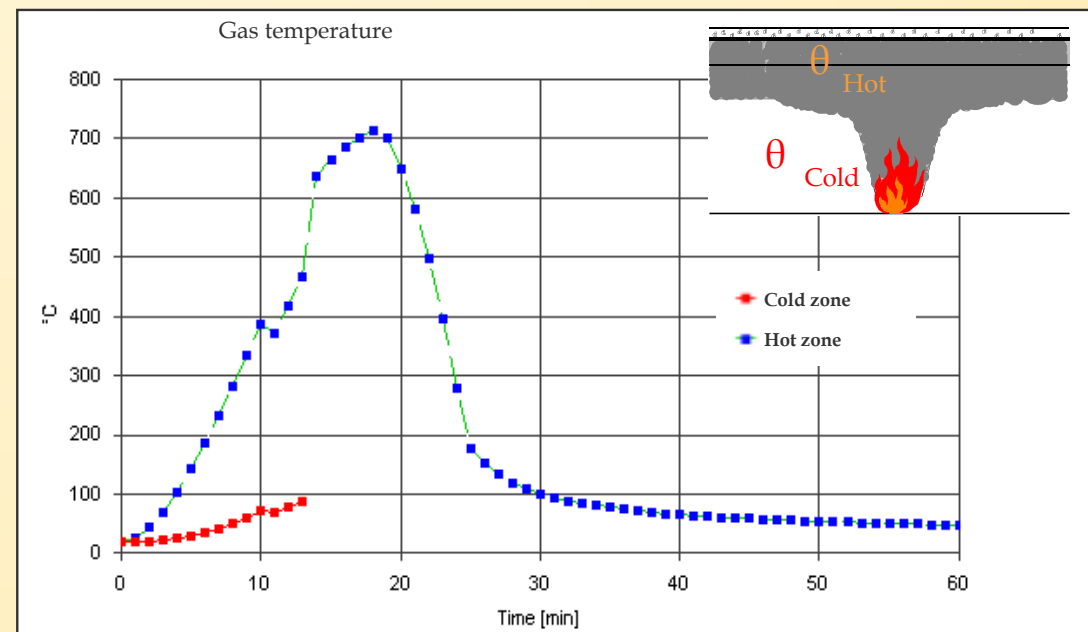
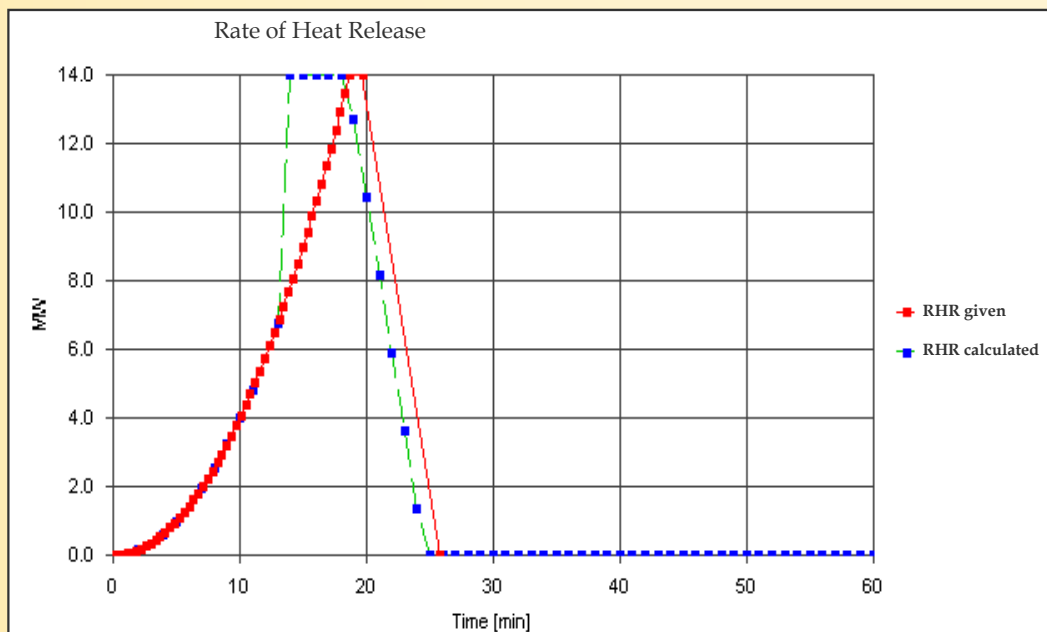
5. Programska oprema

5.1. Okolje OZone



5. Programska oprema

5.1. Okolje OZone



Po 13-ih minutah, temperatura vročega sloja doseže 500°C → Prehod iz 2 con v 1 cono

5. Programska oprema

5.1. Okolje OZone

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 panels. The 'Data Points' panel has 'Save...' and 'Load...' buttons. The 'Fire Info' panel has input fields for 'Max Fire Area' (m²), 'Fire Elevation' (m), and 'Fuel Height' (m). The 'User Defined Fire Columns' panel has four radio buttons: 'Only RHR' (selected), 'Only mf', 'RHR and mf', and 'Fire Area'. The 'Combustion' panel has input fields for 'Combustion Efficiency Factor' (0.8), 'Combustion Model' (No combustion mode), and 'Stoichiometric Coefficient' (1.27). At the bottom right, there 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. Programska oprema

5.2. OZone Lokaliziran požar

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			

Premjer in lokacija lokaliziranega požara

Geometrical Data

Ceiling Height: 3.5 m

Distance on Axis (x): 0 m

Height on Axis (z): 3.4 m

Cilj (stolpec,...) je vedno na osi = 0. Priporočljivo je, da se nastavi na 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		

OK Cancel

Razvoj RHR

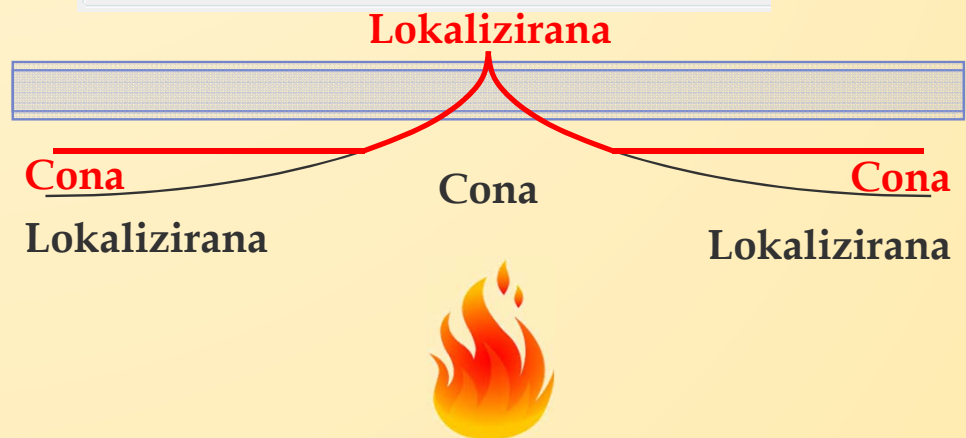
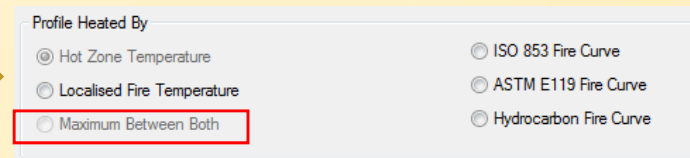
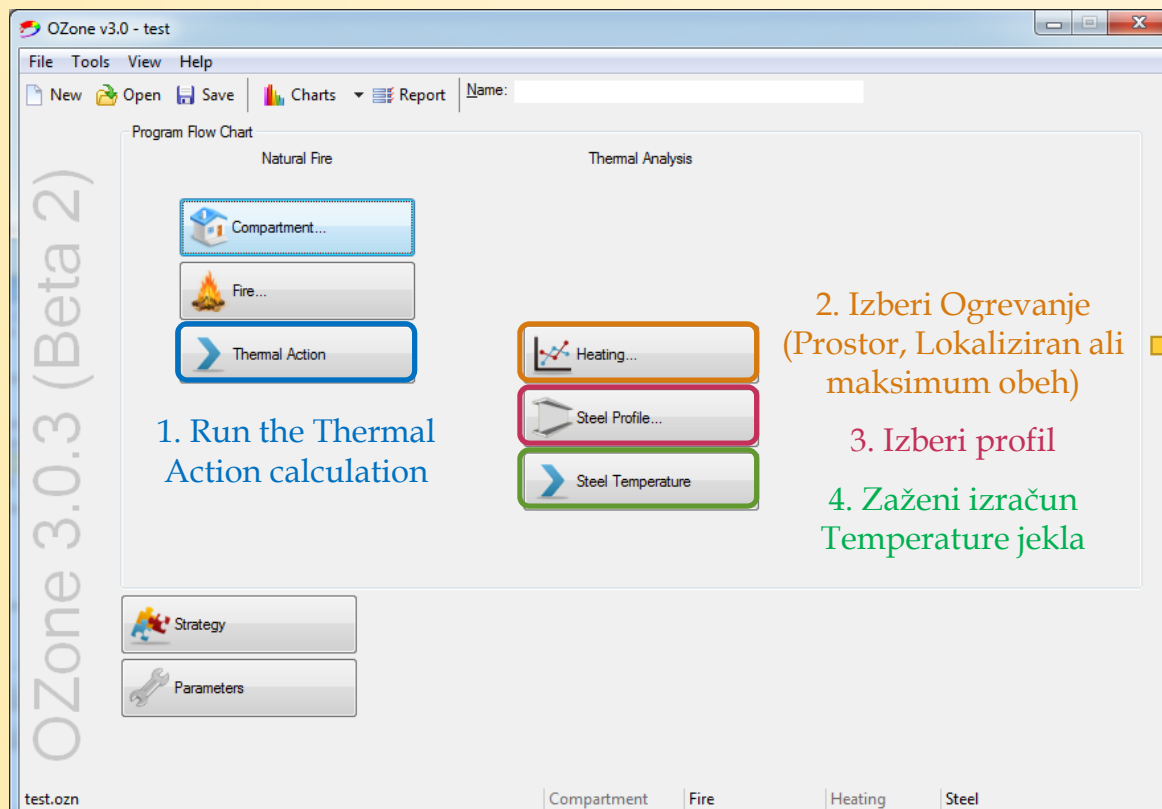
5. Programska oprema

5.2. OZone Lokaliziran požar

EN 1991-1-2 § 3.3.2 (4)

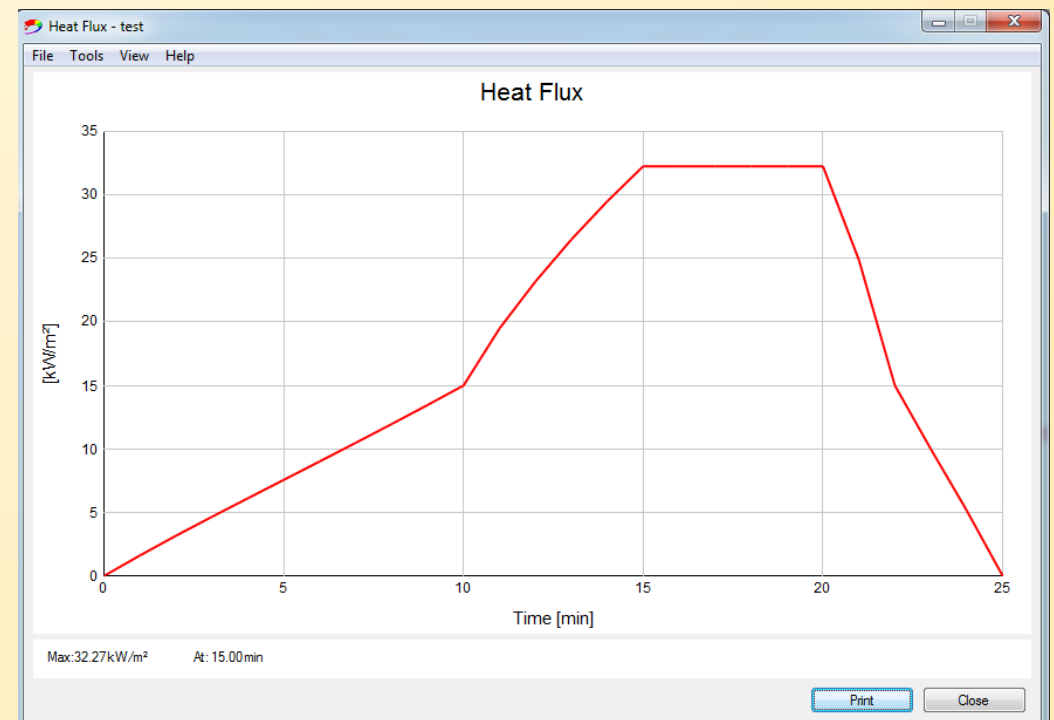
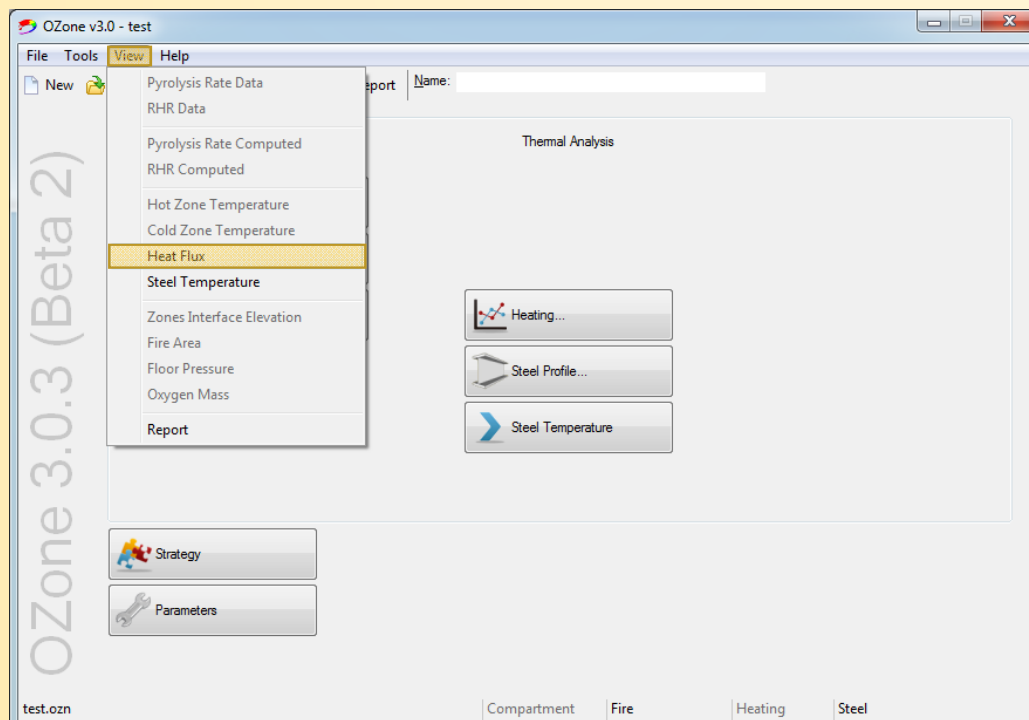
Da bi v primeru lokaliziranega požara natančneje izračunali porazdelitev temperature vzdolž elementa, se lahko upošteva kombinacija rezultatov, dobljenih z dvoconskim modelom in pristopom lokaliziranega požara.

OPOMBA Temperaturno polje se lahko na vsaki lokaciji elementa določi z upoštevanjem največjega učinka, ki ga določata oba modela požara.



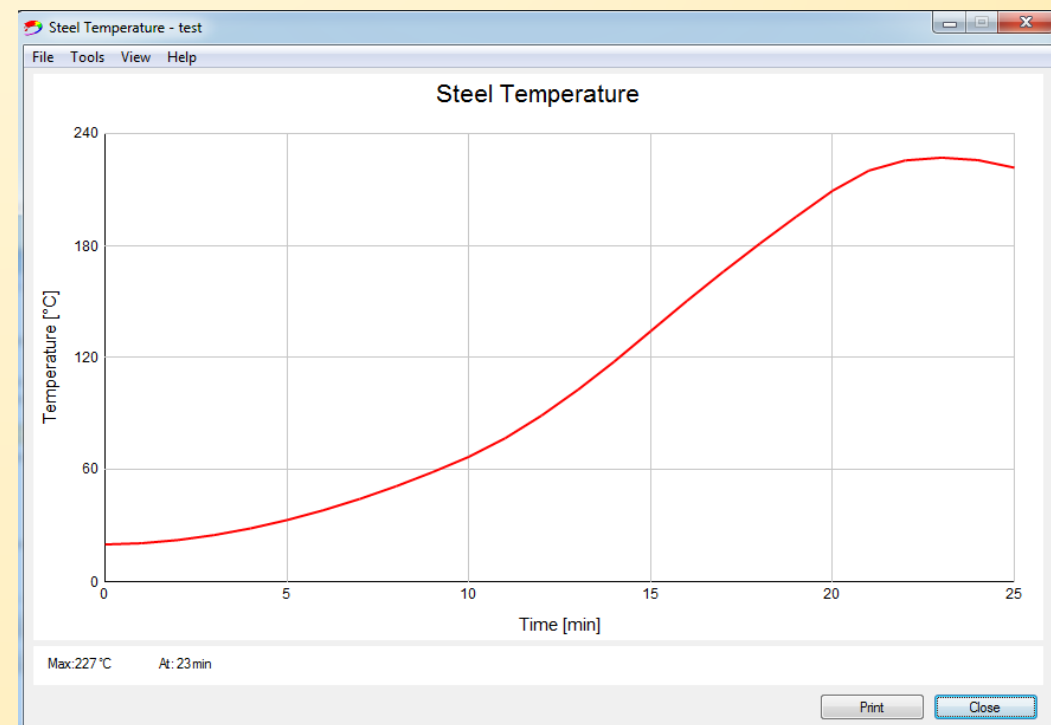
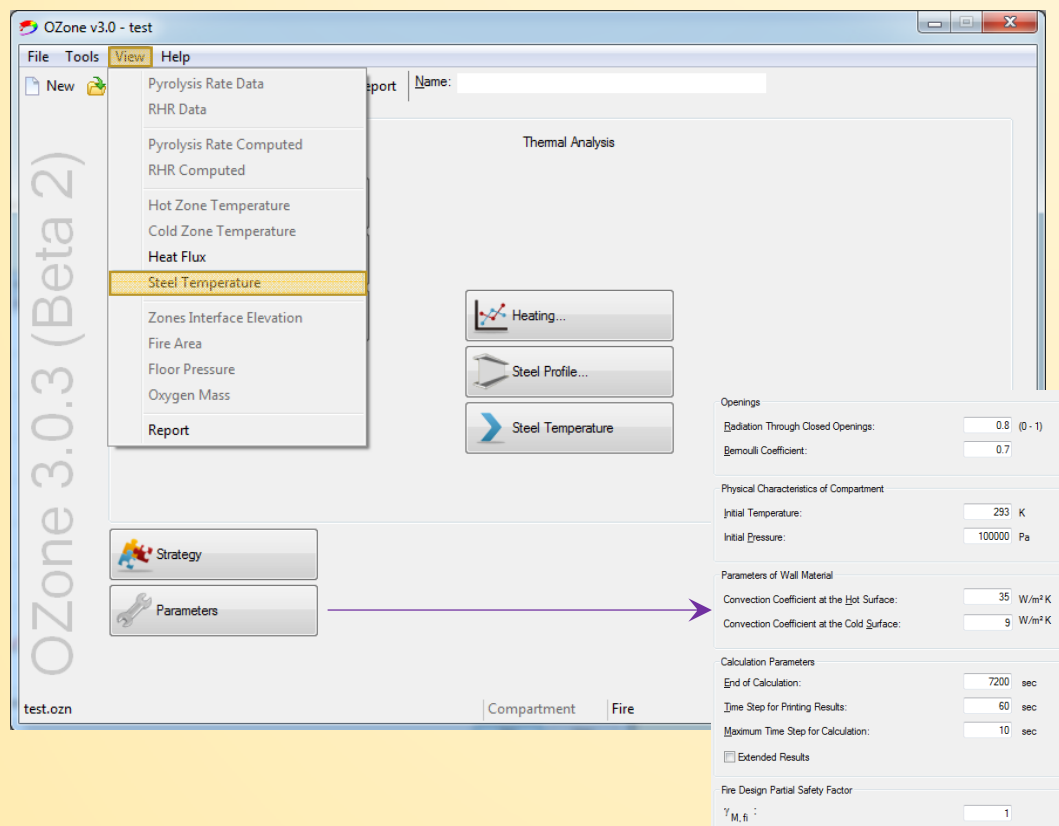
5. Programska oprema

5.2. OZone Lokaliziran požar



5. Programska oprema

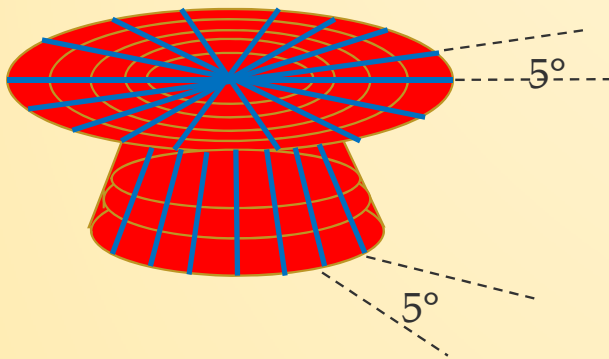
5.2. OZone Lokaliziran požar



5. Programska oprema

5.3. SAFIR Lokaliziran požar

Valjasti plamen (se dotika stropa)



- Geometrijska metoda je bila implementirana v SAFIR (neposredna izmenjava toplote med končnimi površinami).
- To povzroči **neenakomerno razporeditev temperature** v analiziranih prerezih.
- Vsak vir požara je opisan s položajem (x, y, z), obliko (valjasta ali stožčasta), navpičnim položajem stropa, razvojem premera s časom, razvojem HRR s časom.
- V primeru več požarov so prispevki sešteti in omejeni na 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.

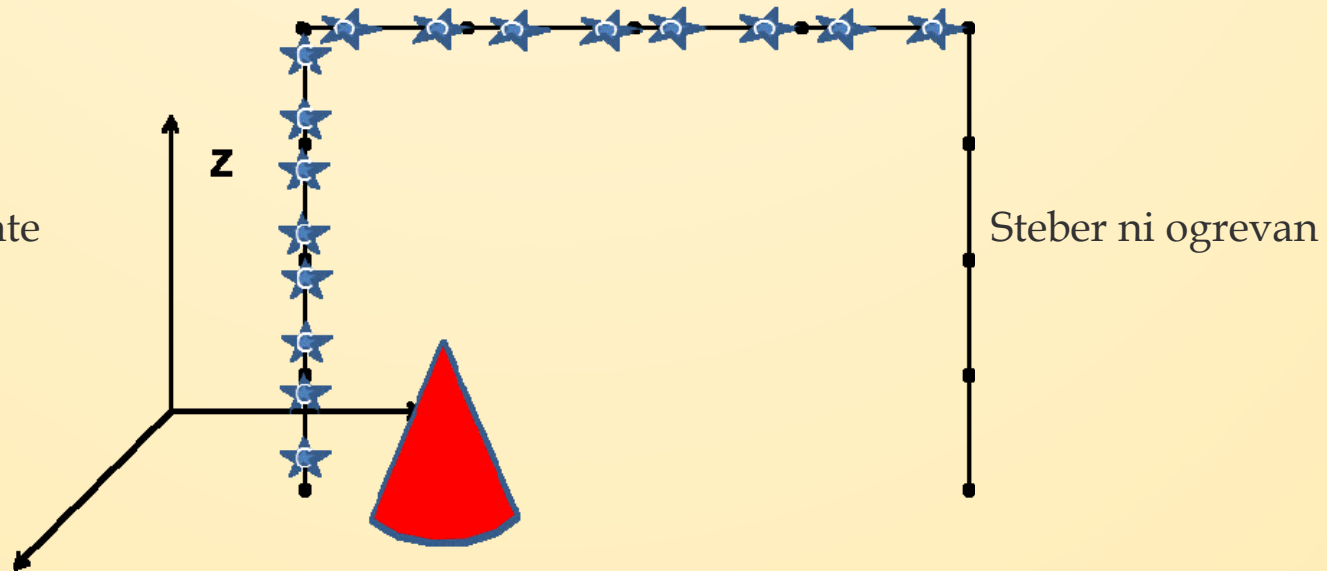
5. Programska oprema

5.3. SAFIR Lokaliziran požar

- Posamezna 2D toplotna analiza je opravljena v vsaki Gaussovi točki končnega elementa (linijskega ali lupine)

Nosilec ima 4 končne elemente => 8 Gaussovih točk

Steber ima 4 končne elemente
=> 8 Gaussovih točk

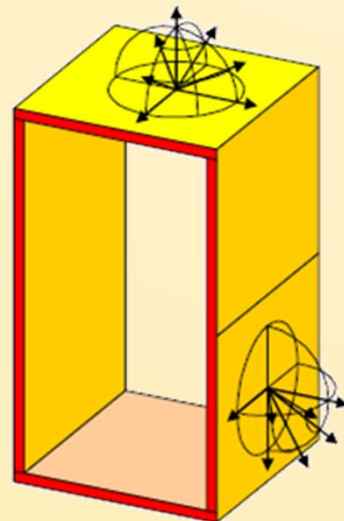


5. Programska oprema

5.3. SAFIR Lokaliziran požar

- Za konkavne prereze je vpliv zasenčenja upoštevan avtomatsko, če se prerez nahaja zunaj ognja

Konveksna oblika



Konkavna oblika

