

POŽAR - vaje: 9.3.2016

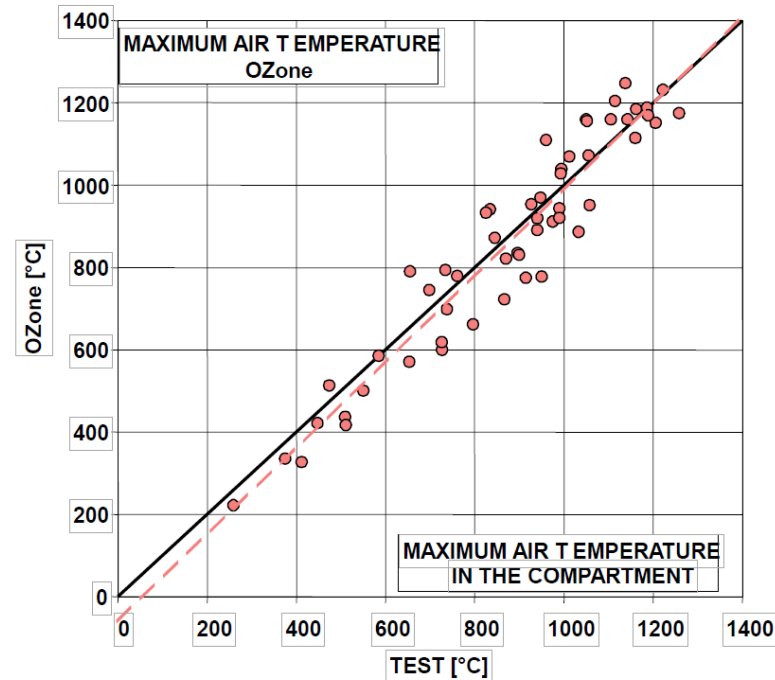
Program Ozone v2.2

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Uvod

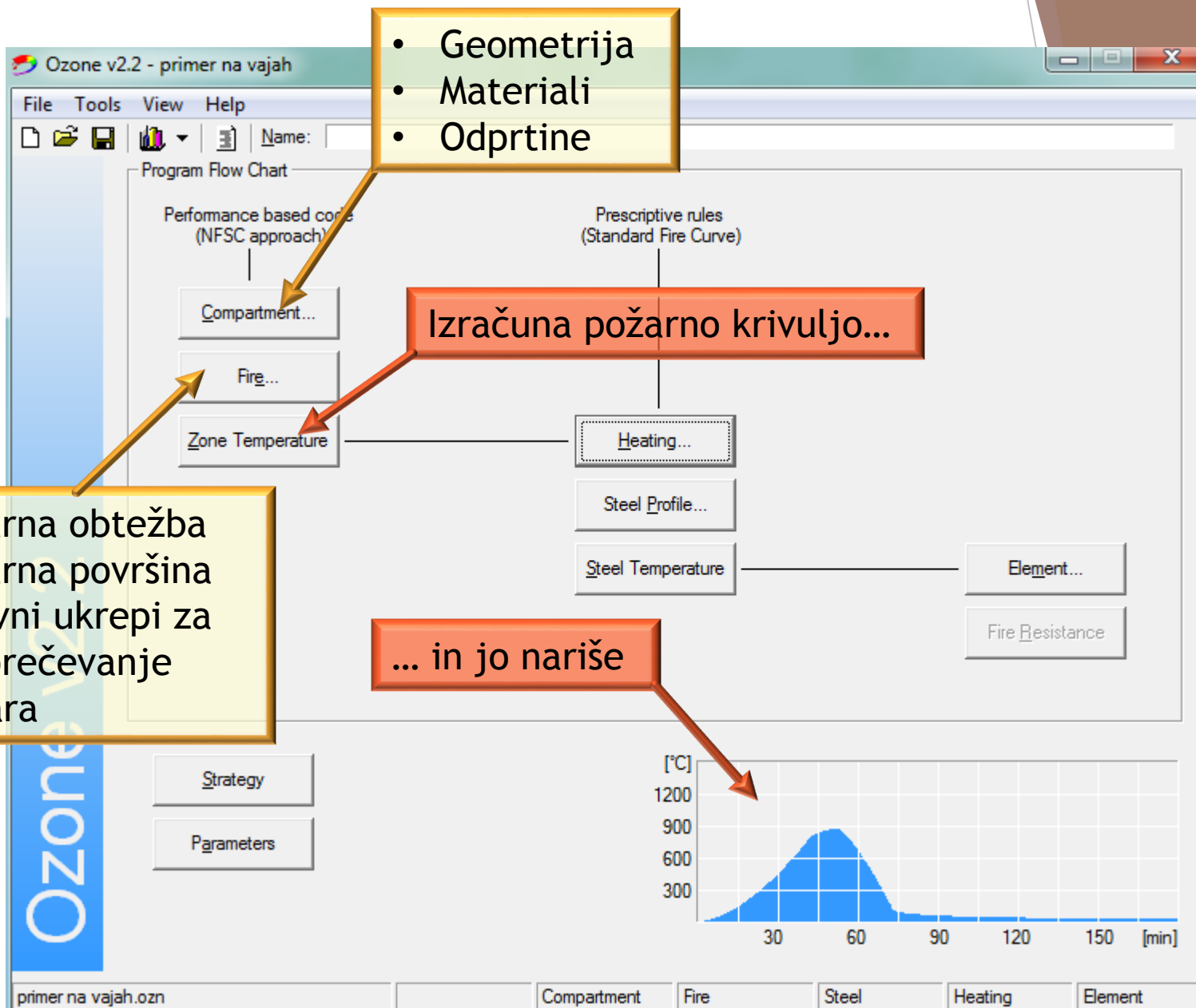
- Razvoj: University of Liege (Belgija)
- Validacija: z eksperimenti

Université
de Liège



- Omejitve:
 - 1 požarni sektor
 - Toplotna in mehanska analiza jeklenih elementov

Določitev projektnega požara



Toplotna analiza jeklenega prereza

Ozone v2.2 - primer na vajah

File Tools View Help

Program Flow Chart

Performance based code (NFSC approach)

Prescriptive rules (Standard Fire Curve)

Compartment...

Fire...

Zone Temperature

Heating...

Steel Profile...

Steel Temperature

Element...

Fire Resistance

Strategy

Parameters

[°C]

1200

900

600

300

30 60 90 120 150 [min]

primer na vajah.ozn

Compartment Fire Steel Heating Element

- Požarna krivulja za račun temperatur v jeklenem prerezu
- Geometrija prereza
• Zaščita
- Izračuna temperaturo v jeklenem prerezu

Mehanska analiza jeklenega elementa

Ozone v2.2 - primer na vajah

File Tools View Help

Name: _____

Program Flow Chart

Performance based code (NFSC approach)

- Compartment...
- Fire...
- Zone Temperature

Prescriptive rules (Standard Fire Curve)

- Heating
- Steel Profile...
- Steel Temperature

- Geometrija elementa
- Podpore
- Obtežba

Element...

Fire Resistance

Strategy

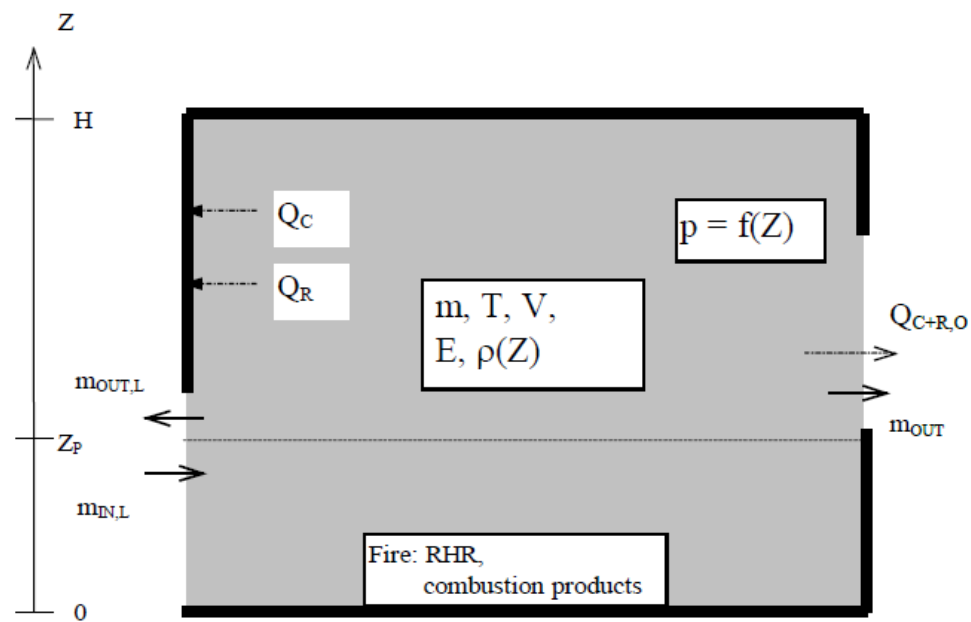
Parameters

Izračuna odpornost jeklenega elementa v požaru

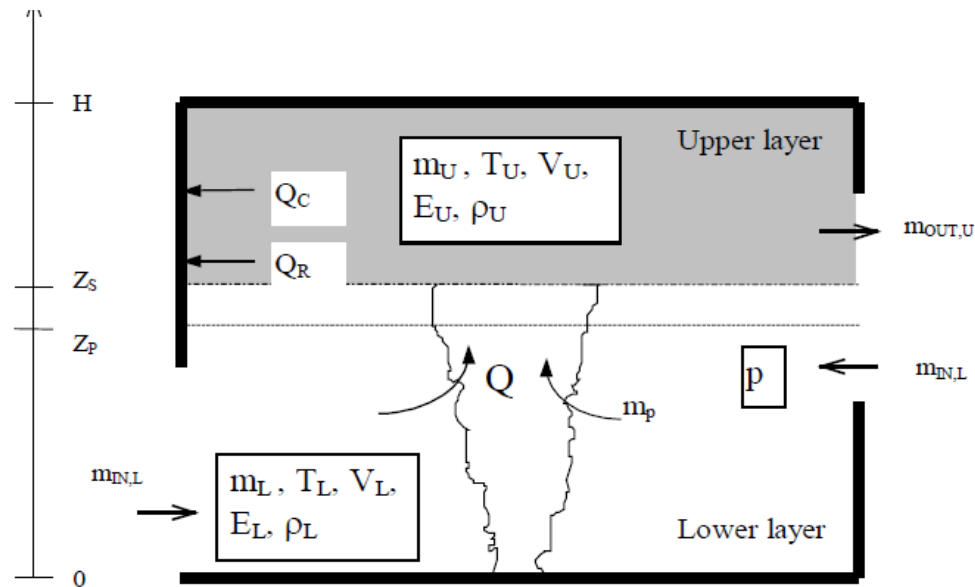
primer na vajah.ozn

Compartment Fire Steel Heating Element

1-conski model:



2-conski model:



Kombinacija: 2-conski \rightarrow 1-conski model; pogoji...

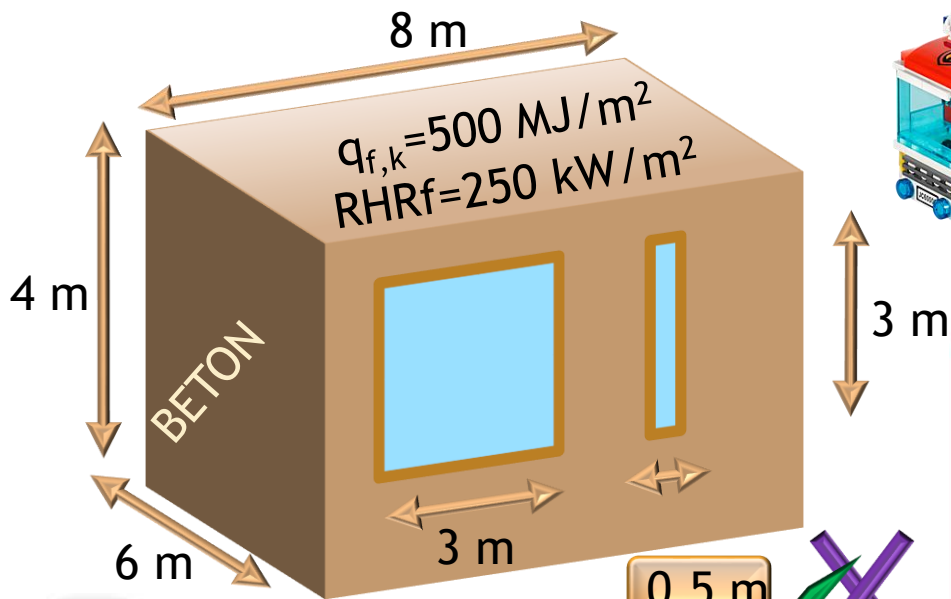
Vpliv aktivnih ukrepov za preprečevanje požara

Zunanja gasilska enota

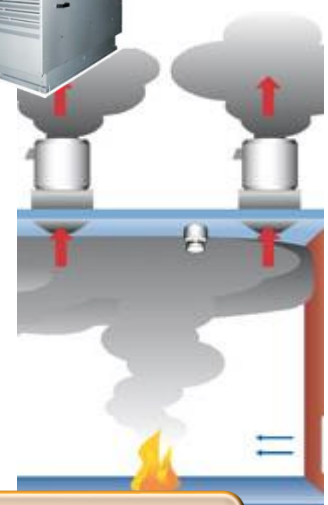


Varne intervencijske poti

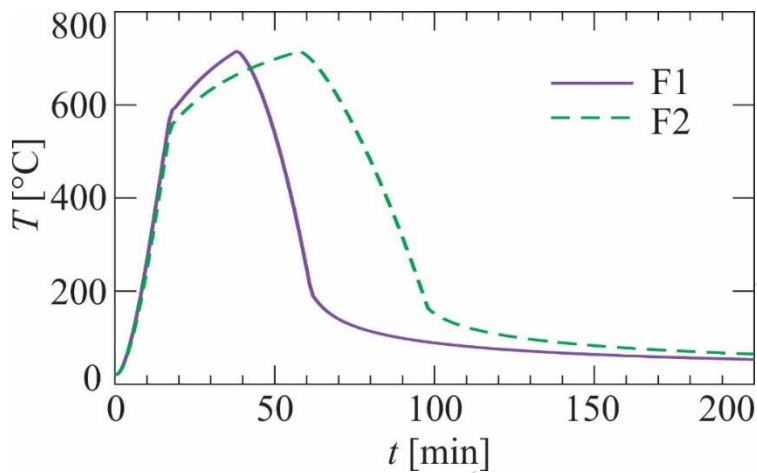
Gasilski pripomočki



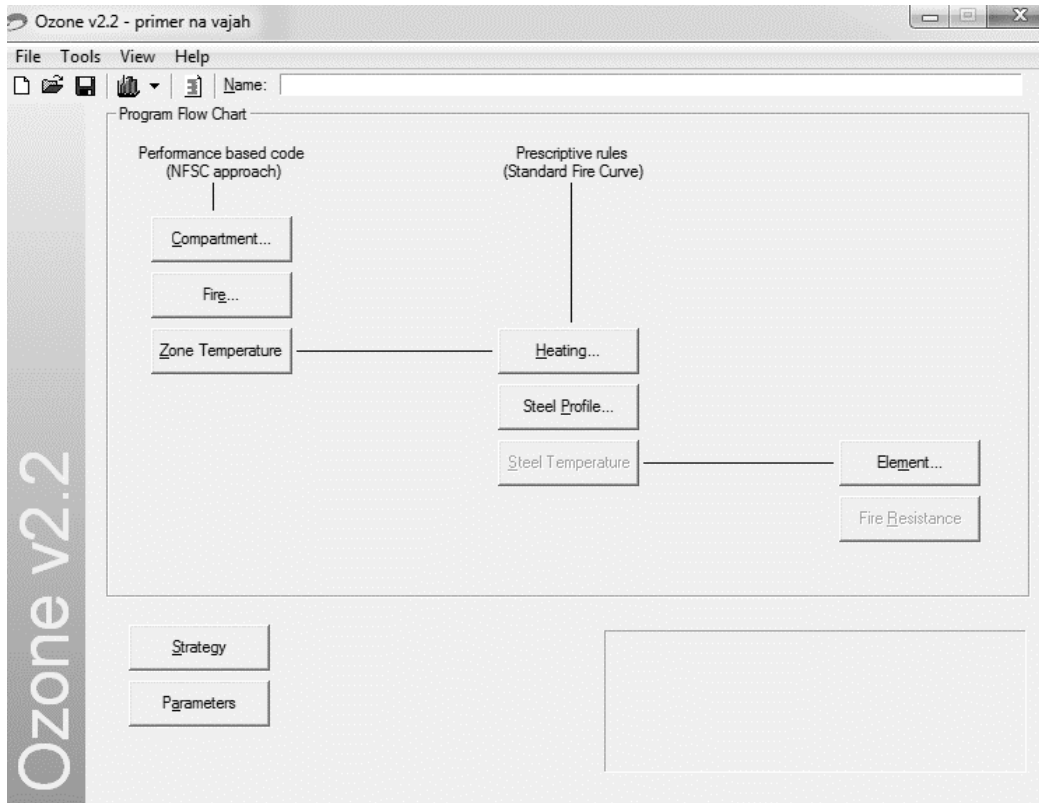
Nadtlak v stopnišču med požarom



Sistem za odvod dima



POŽARNA ANALIZA S PROGRAMOM Ozone v2.2



DOLOČITEV PROJEKTNEGA POŽARA

Layers and Openings Wall 2 - primer na vajah

File Tools View Help

Form of Compartment

- Rectangular Floor Height: m
- Flat Roof Depth: m
- Single Pitch Roof Length: m
- Double Pitch Roof
- Any Compartment

Define Layers and Openings

Select Wall: Define

Select Walls to Copy to: Copy

Copy Openings

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

Forced Ventilation

Smoke Extractors:

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

OK Cancel

Layers and Openings Wall 2 - primer na vajah

File Tools View Help

Wall Length: m

| | Material | Thickness [cm] | Unit mass [kg/m ³] | Conductivity [W/mK] | Specific Heat [J/kgK] | Rel Emissivity Hot Surface | Rel Emissivity Cold Surface |
|---------|----------|----------------|--------------------------------|---------------------|-----------------------|----------------------------|-----------------------------|
| Layer 1 | | | | | | | |
| Layer 2 | | | | | | | |
| Layer 3 | | | | | | | |
| 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

| |
|---------|
| Layer 1 |
| Layer 2 |
| Layer 3 |
| Layer 4 |

Outside

Ceiling



Floor

| | Sill Height Hi [m] | Soffit Height Hs [m] | Width [m] | Variation | Adiabatic |
|-----|--------------------|----------------------|-----------|-----------|-----------|
| g 1 | | | | Constant | no |
| g 2 | | | | Constant | no |
| g 3 | | | | Constant | no |

Fire - primer na vajah

File Tools View Help

Fire Curve

EN 1991 - 1 - 2 User Defined Fire

| Occupancy | Fire Growth Rate | RHRf [kW/m ²] | Fire Load qf,k 80% Fractile [MJ/m ²] | Danger of Fire Activation |
|--------------|------------------|---------------------------|--|---------------------------|
| User Defined | | | | |
| Description | | | | |

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
- Automatic Alarm Transmission to Fire Brigade $\delta_{n,5} = 1$
- Work Fire Brigade $\delta_{n,6} = 1$
- Off Site Fire Brigade
- Safe Access Routes $\delta_{n,8} = 1.5$
- Staircases Under Overpressure in Fire Alarm
- Fire Fighting Devices $\delta_{n,9} = 1.5$
- Smoke Exhaust System $\delta_{n,10} = 1.5$

Fire Info

Max Fire Area: m²

Fire Elevation: 0 m Fuel Height: 0 m

Design Fire Load

Fire Risk Area: m² $\delta_{q,1} = 1.53$

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

Active Measures: $\prod \delta_{n,i} = 3.375$

$q_{f,d} = \delta_{q,1} \cdot \delta_{q,2} \cdot \prod \delta_{n,i} \cdot q_{f,k} = 509.8 \text{ MJ/m}^2$

Combustion

Combustion Heat of Fuel: 17.5 MJ/kg

Combustion Efficiency Factor: 0.8

Combustion Model: Extended fire duration

Stoichiometric Coefficient: 1.27

IZBIRA PARAMETROV RAČUNA

Strategy - primer na vajah

File Tools View Help

Transition (2 Zones to 1 Zone) Criteria

Upper Layer Temperature \geq 500 °C

Combustible in Upper Layer + U.L. Temperature \geq Combustible Ignition Temperature
 Combustible Ignition Temperature: 300 °C

Interface Height \leq 0,2 x Compartment Height

Fire Area \geq 0,25 x Floor Area

Select Analysis Strategy

Combination (default)

2 Zones

1 Zone

OK Cancel

Parameters - primer na vajah

File Tools View Help

Openings

Radiation Through Closed Openings: 0,8 (0 - 1)

Bernoulli Coefficient: 0,7

Physical Characteristics of Compartment

Initial Temperature: 293 K

Initial Pressure: 100000 Pa

Parameters of Wall Material

Convection Coefficient at the Hot Surface: 25 W/m²K

Convection Coefficient at the Cold Surface: 9 W/m²K

Calculation Parameters

End of Calculation: 10800 sec

Time Step for Printing Results: 60 sec

Maximum Time Step for Calculation: 10 sec

Extended Results

Fire Design Partial Safety Factor

$\gamma_{M,fi}$: 1

Air Entrained Model: Heskestad

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

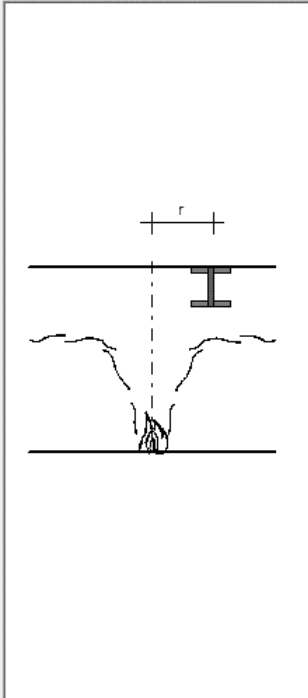
| Time sec | % of Total Openings |
|----------|---------------------|
| 0 | 5 |
| 1200 | 100 |

Default Restore OK Cancel

TOPLOTNA ANALIZA JEKLENEGA PREREZA

Heating - primer na vajah

File Tools View Help



Profile Heated By

Hot Zone Temperature ISO 853 Fire Curve
 Localised Fire Temperature ASTM E119 Fire Curve
 Maximum Between Both Hydrocarbon Fire Curve

Heat transfer coefficients

Convection coefficient: W/m²K
 Emissivity ϵ_m - ϵ_f : (0 - 1)

Localised Fire

Horizontal Distance Between Fire Axis and Profile (r): m

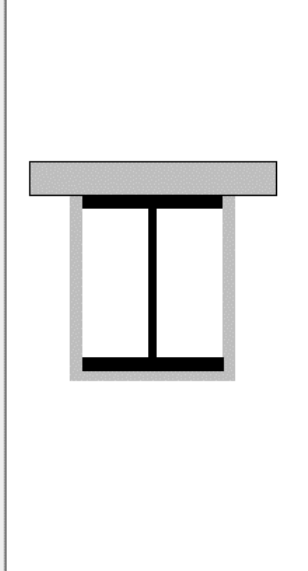
OK Cancel

Steel Profile - primer na vajah

File Tools View Help

Cross Section

Unprotected Cross Section
 Protected Cross Section



Steel Profile

Profile Type:
 Profile:

Exposure

Exposed on Four Sides Exposed on Three Sides

Encasement

Contour Encasement Hollow Encasement

Protection Material

From Catalog
 Constant Values Thickness: mm
 Temperature Dependent Material Name:

| Temperature | Unit Mass | Specific Heat | Thermal Conductivity |
|-------------|----------------------|---------------|----------------------|
| [°C] | [kg/m ³] | [J/kgK] | [W/mK] |
| | | | |

OK Cancel

MEHANSKA ANALIZA JEKLENEGA ELEMENTA

Element - primer na vajah

File Tools View Help

Analysis: Tension

Nominal Steel Grade: S 355 $f_{y,20} : 355 \text{ N/mm}^2$

Section: HE 260 A Class: (irrelevant)

Design effect of actions in fire situation

$N_{fi,d} :$ kN

OK Cancel

