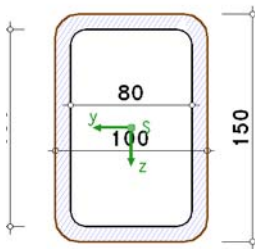


POS. 184: M-SECTION

fire design EC 3-1-2 (12.10), NA: Deutschland

1. input report



steel

steel grade S235

material safety factor

resistance of cross-sections $\gamma_{M0} = 1.00$

resistance of components in the event of fire $\gamma_{M,fi} = 1.00$

geometry

section RR 150 x 100 x 10.0(w)

cross-section temperature

thermal action due to the standard curve, fire resistance time $t = 30$ min

all sides flamed

thermal insulation protection by plaster cladding s. EC 3-1-2, appendix AA:

thermal conductivity $\lambda_p = 0.12$ W/(m·K), specific heat capacity $c_p = 1100$ J/(kg·K), maximum density $\rho_p = 550$ kg/m³

thickness of insulating material $d_p = 5.0$ mm

resistance

plastic verification incl. c/t-verification

fire design at temperature level

adjustment factors for uneven temperature distribution

across the cross section $\kappa_1 = 1.00$, along the beam $\kappa_2 = 1.00$

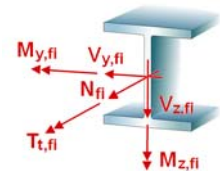
internal forces and moments (event of fire)

σ -generating forces (N, M) work at centroid, τ -generating forces (V, T_i) work at shear center

Lk 1: $M_{y,fi} = 40.00$ kNm

notes

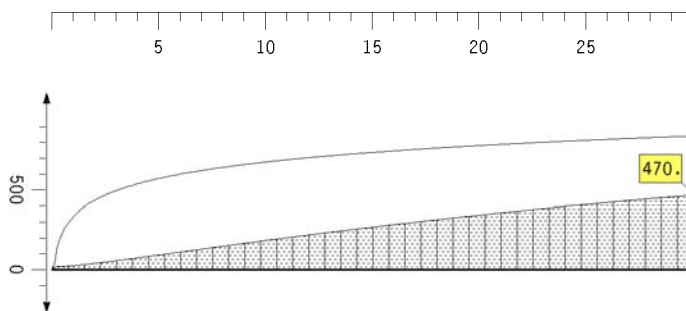
stability is not investigated.



2. cross-section temperature

section factor of the protected component $A_p/V = 474.2 / 4492.7 \cdot 10^3 = 105.6$ 1/m

temperature development:



temperature in °C
fire time in min
max $T_a = 469.6^\circ\text{C}$
max $t = 30$ min

cross-section temperature acc. to $t = 30$ min: $T_a = 469.6^\circ\text{C}$

3. Lk 1

3.1. fire design

3.1.1. plastic verification

3.1.1.1. verification at temperature level

Utilisation rate at time $t = 0$ (normal temperature): $U_{\sigma} = 0.788 < 1$ **ok**

critical temperature $T_{a,cr} = 499.8$ °C

verification: $U_T = T_a/T_{a,cr} = 0.940 < 1$ **ok**

c/t-verification: utilization $U_{c/t} = 0.186 < 1$ **ok**

4. final result

maximum utilization:	temperature	$\max U_T = 0.940 < 1$ ok
	stress	$\max U_{\sigma,t=0} = 0.788 < 1$ ok
	c/t-ratio	$\max U_{c/t} = 0.186 < 1$ ok
	resistance	$\max U = 0.940 < 1$ ok

verification succeeded

5. Regulations

DIN EN 1990, Eurocode 0: Grundlagen der Tragwerksplanung;

Deutsche Fassung EN 1990:2002 + A1:2005 + A1:2005/AC:2010, Ausgabe Dezember 2010

DIN EN 1990/NA, Nationaler Anhang zur DIN EN 1990, Ausgabe Dezember 2010

DIN EN 1991-1-2, Eurocode 1: Einwirkungen auf Tragwerke - Teil 1-2: Allgemeine Einwirkungen -

Brandeinwirkungen auf Tragwerke; Deutsche Fassung EN 1991-1-2, Ausgabe Dezember 2010

DIN EN 1991-1-2/NA, Nationaler Anhang zur DIN EN 1991-1-2, Ausgabe September 2015

DIN EN 1993-1-2, Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 1-2: Allgemeine Regeln -

Tragwerksbemessung für den Brandfall; Deutsche Fassung EN 1993-1-2, Ausgabe Dezember 2010

DIN EN 1993-1-2/NA, Nationaler Anhang zur DIN EN 1993-1-2, Ausgabe Dezember 2010