

STEEL DESIGN

CODE: NF EN 1993-1:2005/NA:2007/AC:2009, Eurocode 3: Design of steel structures.

ANALYSIS TYPE: Member Verification

CODE GROUP:

MEMBER: 38 rafter_38
m

POINT: 7

COORDINATE: x = 0.01 L = 0.06

LOADS:

Governing Load Case: 16 ULS /7/ 1*1.35 + 2*1.35 + 3*1.35 + 4*1.35 + 5*1.35 + 6*1.35 + 7*1.50 + 8*1.50 + 9*1.50 + 15*0.90

MATERIAL:

ACIER $f_y = 235.00$ MPa



SECTION PARAMETERS: IPE 300

h=57.1 cm	gM0=1.00	gM1=1.00	
b=15.0 cm	Ay=32.10 cm ²	Az=38.99 cm ²	Ax=88.31 cm ²
tw=0.7 cm	Iy=35682.49 cm ⁴	Iz=905.49 cm ⁴	Ix=29.11 cm ⁴
tf=1.1 cm	Wely=1244.91 cm ³	Welz=120.73 cm ³	

INTERNAL FORCES AND CAPACITIES:

N _{Ed} = 57.68 kN	My _{Ed} = 27.55 kN*m	Mz _{Ed} = -10.29 kN*m	Vy _{Ed} = 0.30 kN
Nc _{Rd} = 2075.32 kN	My _{el,Rd} = 292.55 kN*m	Mz _{el,Rd} = 28.37 kN*m	Vy _{T,Rd} = 242.69 kN
Nb _{Rd} = 2046.98 kN	My _{c,Rd} = 292.55 kN*m	Mz _{c,Rd} = 28.37 kN*m	Vz _{Ed} = 9.68 kN
			Vz _{T,Rd} = 389.65 kN
	Mb _{Rd} = 292.55 kN*m		Tt _{Ed} = 2.05 kN*m
			Class of section = 3



LATERAL BUCKLING PARAMETERS:

z = 1.00	Mcr = 616431.98 kN*m	Curve,LT - d	XLT = 1.00
Lcr,upp=0.06 m	Lam_LT = 0.02	fi,LT = 0.43	XLT,mod = 1.00

BUCKLING PARAMETERS:



About y axis:

Ly = 6.12 m	Lam_y = 0.24
Lcr,y = 3.06 m	Xy = 0.99
Lamy = 22.39	kzy = 1.00



About z axis:

Lz = 6.12 m	Lam_z = 0.02
Lcr,z = 0.06 m	Xz = 1.00
Lamz = 1.79	kzz = 1.00

Torsional buckling:

Curve,T=c	alfa,T=0.49
Lt=3.06 m	fi,T=1.12
Ncr,T=2366.00 kN	X,T=0.58
Lam_T=0.94	Nb,T,Rd=1198.59 kN

Flexural-torsional buckling

Curve,TF=c	alfa,TF=0.49
Ncr,y=3823118.01 kN	fi,TF=1.12
Ncr,TF=2366.00 kN	X,TF=0.58
Lam_TF=0.94	Nb,TF,Rd=1198.59 kN

VERIFICATION FORMULAS:

Section strength check:

$$N_{Ed}/N_{c,Rd} + My_{Ed}/My_{c,Rd} + Mz_{Ed}/Mz_{c,Rd} = 0.48 < 1.00 \quad (6.2.1(7))$$

$$\sqrt{(\sigma_{x,Ed})^2 + 3 \cdot (\tau_{xy,Ed})^2} / (f_y / gM0) = 0.99 < 1.00 \quad (6.2.1(5))$$

$$Vy_{Ed}/Vy_{T,Rd} = 0.00 < 1.00 \quad (6.2.6-7)$$

$$Vz_{Ed}/Vz_{T,Rd} = 0.02 < 1.00 \quad (6.2.6-7)$$

$$\tau_{xy,Ed}/(f_y/(\sqrt{3} \cdot g_{M0})) = 0.86 < 1.00 \quad (6.2.6)$$

$$\tau_{xz,Ed}/(f_y/(\sqrt{3} \cdot g_{M0})) = 0.57 < 1.00 \quad (6.2.6)$$

Global stability check of member:

$$\lambda_{y} = 22.39 < \lambda_{y,max} = 210.00 \quad \lambda_{z} = 1.79 < \lambda_{z,max} = 210.00 \quad \text{STABLE}$$

$$N_{Ed}/\min(N_{b,Rd}, N_{b,T,Rd}, N_{b,TF,Rd}) = 0.05 < 1.00 \quad (6.3.1)$$

$$M_{y,Ed}/M_{b,Rd} = 0.09 < 1.00 \quad (6.3.2.1.(1))$$

$$N_{Ed}/(X_{min} \cdot N_{Rk}/g_{M1}) + k_{yy} \cdot M_{y,Ed}/(X_{LT} \cdot M_{y,Rk}/g_{M1}) + k_{yz} \cdot M_{z,Ed}/(M_{z,Rk}/g_{M1}) = 0.50 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_{min} \cdot N_{Rk}/g_{M1}) + k_{zy} \cdot M_{y,Ed}/(X_{LT} \cdot M_{y,Rk}/g_{M1}) + k_{zz} \cdot M_{z,Ed}/(M_{z,Rk}/g_{M1}) = 0.50 < 1.00 \quad (6.3.3.(4))$$

LIMIT DISPLACEMENTS



Deflections (LOCAL SYSTEM):

$$u_y = 0.1 \text{ cm} < u_{y,max} = L/200.00 = 3.1 \text{ cm} \quad \text{Verified}$$

Governing Load Case: 19 SLS /7/ $1 \cdot 1.00 + 2 \cdot 1.00 + 3 \cdot 1.00 + 4 \cdot 1.00 + 5 \cdot 1.00 + 6 \cdot 1.00 + 7 \cdot 1.00 + 8 \cdot 1.00 + 9 \cdot 1.00 + 15 \cdot 0.60$

$$u_z = 0.5 \text{ cm} < u_{z,max} = L/200.00 = 3.1 \text{ cm} \quad \text{Verified}$$

Governing Load Case: 19 SLS /91/ $1 \cdot 1.00 + 2 \cdot 1.00 + 3 \cdot 1.00 + 4 \cdot 1.00 + 5 \cdot 1.00 + 6 \cdot 1.00 + 7 \cdot 0.70 + 9 \cdot 0.70 + 14 \cdot 1.00$



Displacements (GLOBAL SYSTEM): Not analyzed

Section OK !!!