

# 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:** 268 Beamroof\_268 **POINT:** 4

**COORDINATE:** x = 0.50 L = 2.00 m

**LOADS:**

Governing Load Case: 16 ULS /43/ 1\*1.35 + 2\*1.35 + 3\*1.35 + 4\*1.35 + 5\*1.35 + 6\*1.35 + 7\*1.50 + 9\*1.50 + 15\*0.90

**MATERIAL:**

ACIER  $f_y = 235.00$  MPa



**SECTION PARAMETERS: IPE 140**

h=14.0 cm	gM0=1.00	gM1=1.00	
b=7.3 cm	Ay=11.16 cm <sup>2</sup>	Az=7.65 cm <sup>2</sup>	Ax=16.43 cm <sup>2</sup>
tw=0.5 cm	Iy=541.22 cm <sup>4</sup>	Iz=44.92 cm <sup>4</sup>	Ix=2.46 cm <sup>4</sup>
tf=0.7 cm	Wply=88.34 cm <sup>3</sup>	Wplz=19.25 cm <sup>3</sup>	

**INTERNAL FORCES AND CAPACITIES:**

N <sub>Ed</sub> = 0.24 kN	My <sub>Ed</sub> = 4.99 kN*m	Mz <sub>Ed</sub> = -0.76 kN*m
N <sub>c,Rd</sub> = 386.11 kN	My <sub>Ed,max</sub> = 4.99 kN*m	Mz <sub>Ed,max</sub> = -0.76 kN*m
N <sub>b,Rd</sub> = 386.11 kN	My <sub>c,Rd</sub> = 20.76 kN*m	Mz <sub>c,Rd</sub> = 4.52 kN*m
	MN <sub>y,Rd</sub> = 20.76 kN*m	MN <sub>z,Rd</sub> = 4.52 kN*m
	Mb <sub>Rd</sub> = 9.13 kN*m	

Class of section = 1



**LATERAL BUCKLING PARAMETERS:**

z = 1.00	Mcr = 10.96 kN*m	Curve,LT -	XLT = 0.44
L <sub>cr,upp</sub> = 4.00 m	Lam_LT = 1.38	fi,LT = 1.56	XLT,mod = 0.44

**BUCKLING PARAMETERS:**



About y axis:

$$k_{yy} = 1.00$$



About z axis:

$$k_{zz} = 1.00$$

**VERIFICATION FORMULAS:**

**Section strength check:**

$$N_{Ed}/N_{c,Rd} = 0.00 < 1.00 \quad (6.2.4.(1))$$

$$M_{y,Ed}/M_{N,y,Rd} = 0.24 < 1.00 \quad (6.2.9.1.(2))$$

$$M_{z,Ed}/M_{N,z,Rd} = 0.17 < 1.00 \quad (6.2.9.1.(2))$$

$$(M_{y,Ed}/M_{N,y,Rd})^{2.00} + (M_{z,Ed}/M_{N,z,Rd})^{1.00} = 0.23 < 1.00 \quad (6.2.9.1.(6))$$

**Global stability check of member:**

$$M_{y,Ed,max}/M_{b,Rd} = 0.55 < 1.00 \quad (6.3.2.1.(1))$$

$$N_{Ed}/(X_y \cdot N_{Rk}/gM1) + k_{yy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{yz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.72 < 1.00 \quad (6.3.3.(4))$$

$$N_{Ed}/(X_z \cdot N_{Rk}/gM1) + k_{zy} \cdot M_{y,Ed,max}/(XLT \cdot M_{y,Rk}/gM1) + k_{zz} \cdot M_{z,Ed,max}/(M_{z,Rk}/gM1) = 0.72 < 1.00 \quad (6.3.3.(4))$$

**LIMIT DISPLACEMENTS**



**Deflections (LOCAL SYSTEM):**

$u_y = 0.9 \text{ cm} < u_{y \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

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

$u_z = 0.5 \text{ cm} < u_{z \text{ max}} = L/200.00 = 2.0 \text{ cm}$

Verified

**Governing Load Case:** 19 SLS /56/  $1*1.00 + 2*1.00 + 3*1.00 + 4*1.00 + 5*1.00 + 6*1.00 + 7*0.70 + 8*0.70 + 9*0.70 + 15*1.00$



**Displacements (GLOBAL SYSTEM):** *Not analyzed*

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**Section OK !!!**