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: 91 Posts_91 **POINT:** 1 **COORDINATE:** x = 0.00 L = 0.00 m

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LOADS:
Governing Load Case: 16 ULS /101/ 1*1.35 + 2*1.35 + 3*1.35 + 4*1.35 + 5*1.35 + 6*1.35 + 7*1.05 + 8*1.05 + 9*1.05 + 10*1.50

MATERIAL:
ACIER fy = 235.00 MPa

SECTION PARAMETERS: IPE 220

h=22.0 cm	gM0=1.00	gM1=1.00	
b=11.0 cm	Ay=22.89 cm2	Az=15.88 cm2	Ax=33.37 cm2
tw=0.6 cm	Iy=2771.84 cm4	Iz=204.89 cm4	Ix=8.86 cm4
tf=0.9 cm	Wply=285.43 cm3	Wplz=58.11 cm3	

INTERNAL FORCES AND CAPACITIES:

N,Ed = 22.74 kN	My,Ed = 14.54 kN*m	Mz,Ed = 0.07 kN*m	Vy,Ed = 0.02 kN
Nc,Rd = 784.21 kN	My,Ed,max = 14.54 kN*m	Mz,Ed,max = -0.07 kN*m	Vy,T,Rd = 310.40 kN
Nb,Rd = 236.91 kN	My,c,Rd = 67.08 kN*m	Mz,c,Rd = 13.66 kN*m	Vz,Ed = -10.41 kN
	MN,y,Rd = 67.08 kN*m	MN,z,Rd = 13.66 kN*m	Vz,T,Rd = 215.39 kN
	Mb,Rd = 45.75 kN*m		Tt,Ed = 0.00 kN*m
			Class of section = 1


LATERAL BUCKLING PARAMETERS:

z = 0.00	Mcr = 62.98 kN*m	Curve,LT -	XLT = 0.61
Lcr,upp=5.38 m	Lam_LT = 1.03	fi,LT = 1.15	XLT,mod = 0.68

BUCKLING PARAMETERS:


About y axis:

Ly = 5.38 m	Lam_y = 0.44	Lz = 5.38 m	Lam_z = 1.62
Lcr,y = 3.77 m	Xy = 0.94	Lcr,z = 3.77 m	Xz = 0.30
Lamy = 41.32	kyy = 0.96	Lamz = 151.99	kyz = 0.81


About z axis:

Torsional buckling:

Curve,T=b	alfa,T=0.34	Curve,TF=b	alfa,TF=0.34
Lt=5.38 m	fi,T=1.02	Ncr,y=4050.67 kN	fi,TF=0.64
Ncr,T=984.95 kN	X,T=0.67	Ncr,TF=4050.67 kN	X,TF=0.91
Lam_T=0.89	Nb,T,Rd=522.39 kN	Lam_TF=0.44	Nb,TF,Rd=713.53 kN

Flexural-torsional buckling

VERIFICATION FORMULAS:
Section strength check:
N,Ed/Nc,Rd = 0.03 < 1.00 (6.2.4.(1))
My,Ed/MN,y,Rd = 0.22 < 1.00 (6.2.9.1.(2))
Mz,Ed/MN,z,Rd = 0.01 < 1.00 (6.2.9.1.(2))
(My,Ed/MN,y,Rd)^ 2.00 + (Mz,Ed/MN,z,Rd)^1.00 = 0.05 < 1.00 (6.2.9.1.(6))

Vy,Ed/Vy,T,Rd = 0.00 < 1.00 (6.2.6-7)
Vz,Ed/Vz,T,Rd = 0.05 < 1.00 (6.2.6-7)
Tau,ty,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Tau,tz,Ed/(fy/(sqrt(3)*gM0)) = 0.00 < 1.00 (6.2.6)
Global stability check of member:
Lambda,y = 41.32 < Lambda,max = 210.00 Lambda,z = 151.99 < Lambda,max = 210.00 STABLE
N,Ed/Min(Nb,Rd,Nb,T,Rd,Nb,TF,Rd) = 0.10 < 1.00 (6.3.1)
My,Ed,max/Mb,Rd = 0.32 < 1.00 (6.3.2.1.(1))
N,Ed/(Xy*N,Rk/gM1) + kyy*My,Ed,max/(XLT*My,Rk/gM1) + kyz*Mz,Ed,max/(Mz,Rk/gM1) = 0.34 < 1.00 (6.3.3.(4))
N,Ed/(Xz*N,Rk/gM1) + kzy*My,Ed,max/(XLT*My,Rk/gM1) + kzz*Mz,Ed,max/(Mz,Rk/gM1) = 0.26 < 1.00 (6.3.3.(4))

LIMIT DISPLACEMENTS

Deflections (LOCAL SYSTEM): *Not analyzed*

Displacements (GLOBAL SYSTEM):
vx = 0.6 cm < vx max = L/150.00 = 3.6 cm Verified
Governing Load Case: 19 SLS /54/ 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 + 13*1.00
vy = 0.3 cm < vy max = L/150.00 = 3.6 cm Verified
Governing Load Case: 19 SLS /6/ 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 + 14*0.60

Section OK !!!