

SENT BY:
SUPER STUD5-13-98 ; 8:11AM ; CANTOR SEINUK GROUP-
110020441105/12/98 15:42 NO.971 05/05
2190059;# 2/ 3

AISI BEAM COLUMN DESIGN WITH LATERAL TORSIONAL BUCKLING

JOB NAME: WORLD TRADE CENTER

5/12/98

LOCATION: TYPICAL STUD W/240 SQFT LATERAL LOAD

MEMBER SIZE: 8SJW14

Stress increase due to wind= 1.333

ALL UNITS IN POUNDS AND INCHES

LOADS	AXIAL=	130	LB	Mx=	60640	SHEAR=	1560
	EXT. LOAD=	140	PER	My=	P=0	Spacing=	12
MEMBER CAPACITY				Ag=	60981	Yp=	1992

For Member Capacity See Super Stud Catalog

SECTION PROPERTIES

Lx=	156	Lxh=	156	Thick=	0.0713	DEPTH=	8
Lt=	48	Kx=	1	Xo=	-1.311		
Ly=	48	Ky=	1	Ro=	3.35		
Area=	0.916	Aef=	0.51	Cw=	6.90		
rx=	3	ry=	0.704	J=	0.00156		
Ixo=	8.242	Iy=	0.464	Sy=	0.27		
Fy=	50000	G=	11300000	E=	29500000		
KxLx/rx=	52	KyLy/ry=	68.18182	Pun Dep	2.5		
Sx/Sx=	2.037	Sx(Sx/rx)=	2.037	see Super Stud Catalog			

Allowable Load

$\lambda=$	2.22840017	$\sigma_{cr}=$	107565.9	Eq.C3.1.2-12
$\rho=$	0.40444911	$\sigma_r=$	74897.42	Eq.C3.1.2-14
$F_{ey}=$	62566.8306	Eq.C4.1-1	$\sigma_{cr}+\sigma_r=$	182463.3
$F_r=$	39917	Eq.C4-3&C4-4	$\beta=$	0.84685
$P_{cr}=$	98506.463	Eq.C5-5	$F_r=$	61986.77
$P_r=P_r A_{ef}$	20470.3983	Eq.C4-2		Eq.C4.2-1
$\phi_{cr}=$	0.99746616	Eq.C5-4		
$P_r=P_{cr} \phi_{cr}$	10661.6458	Eq.C4-1	14212	

Lateral Torsional Buckling

$\phi_{ey}=$	62566.8306	Eq.C3.1.2-13
$C_b=$	1	
$M_{cr}=$	210061.168	Eq.C3.1.2-10
$M_y=$	101850	Eq.C3.1.2-5
$M_{cr}=$	89504.2835	Eq.C3.1.2-8
$M_{cr}=$	89504.2835	Eq.C3.1.2-1
$M_{cr}=$	93595.3794	Eq.C3.1-1

Minor Axis Bending Capacity

$S_y=$	0.27
$P_{cr}=$	57313.2
$1/\phi_y=$	1.004374
$M_y=$	8083.832

Interaction Equation

$P/F_y + 1/\phi_{cr}(M_x/M_{cr}) + 1/\phi_y(M_y/M_{cr})$	=	0.863	<=	1	O.K.	Eq.C5-1
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Combined Bending & Shear

$(M/M_{cr})^2 + (V/V_{cr})^2$	=	0.65	<	1	O.K.
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DEFLECTION L/	240	=	0.65	<	1	O.K.
$I/(rd)$		=	8.04	< A ₅₀	8.24	O.K.

SENT BY:

5-13-98 : 8:12AM : CANTOR SEINUK GROUP-
1302047112190059;# 3/ 3
05/12/98 12:42 NO.971 05/05

AISI BEAM COLUMN DESIGN WITH LATERAL TORSIONAL BUCKLING

JOB NAME: WORLD TRADE CENTER

5/12/98

LOCATION: TYPICAL STUD W/420 SQFT LATERAL LOAD

MEMBER SIZE: 10SSW14

Stresses increase due to wind- 1.333

ALL UNITS IN POUNDS AND INCHES

LOADS	AXIAL=	130	LB	Mx=	106479	SHEAR=	2790
	EXT. LOAD=	420	PSF	My-P ^c =	0	Spacing=	12

MEMBER CAPACITY

M_x= 24211 V_x= 1128

For Member Capacity See Super Stud Catalog

SECTION PROPERTIES

L _x =	156	L _{unb} =	156	Thick=	0.0713	DEPTH=	10
L _y =	48	K _x =	1	X _o =	-1.097		
L _y =	48	K _y =	1	R _o =	4.231		
Area=	1.165	A _{cf} =	0.62	C _w =	19.827		
r _x =	3.768	r _y =	0.904	I _x =	0.00197		
I _x =	16.549	I _y =	0.062	E _y =	0.448		
F _y =	50000	G=	11300000	E=	29500000		
K _{dLx/rx} =	41.4012739	K _{yLy/ry} =	53.09735	Pun Dep	2.5		
B _f -S _x	3.29	S _c (S _{xeff})=	3.29	see Super Stud Catalog			

Allowable Load

λ _c =	3.1547307	σ _{ex} =	169689.1	Eq.C3.1.2-12
ρ _c =	0.29487888	σ _{ey} =	121087.3	Eq.C3.1.2-14
P _{ey} =	103165.788	σ _{ex+ey} =	290776.4	
P _u =	43679	β ₁ =	0.839129	Eq.C4.2-3
P _{u1} =	197789.791	F _u =	98876.82	Eq.C4.2-1
P _u -P _u *A _{cf}	27265.921			
α ₂ =	0.99873805			
P _u -P _{u1} *ρ ₂	14201.0005			
				18929.93

Lateral Torsional Buckling

σ _{ty} =	103165.788	Eq.C3.1.2-13
C _b =	1	
M _c =	350916.946	Eq.C3.1.2-10
M _y =	164500	Eq.C3.1.2-5
M _o =	152220.359	Eq.C3.1.2-8
M _{ux} =	152220.359	Eq.C3.1.2-1
M _{ux} =	91149.9134	Eq.C3.1-1

Minor Axis Bending Capacity

S _y =	0.448
P _{or} =	120181
I/α _y =	1.002081
M _y =	13413.17

Interaction Equation

$P/P_u + 1/\alpha_x (M_x/M_{ux}) + 1/\alpha_y (M_y/M_{uy})$	=	0.884	<=	1	O.K.	Eq.C3-1
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Combined Bending & Shear

$(M/M_u)^2 + (V/V_u)^2$	=	1.12	<	1	NO GOOD
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DEFLECTION L/ 240

$I/(req)$	=	14.08	< A _{ac}	16.55	O.K.
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use 12 Gage, OK
10 SD W/2 @ 12" on cen,