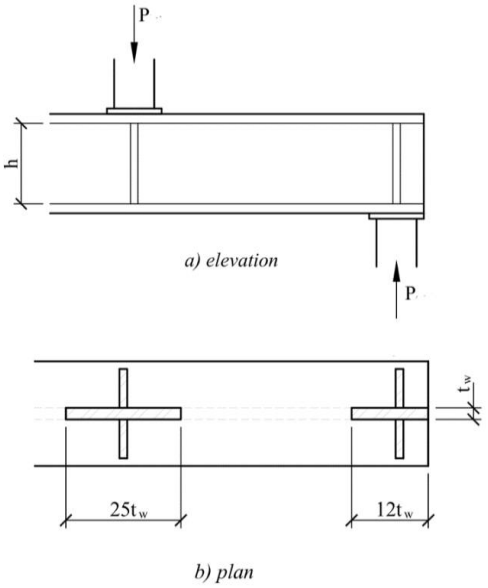
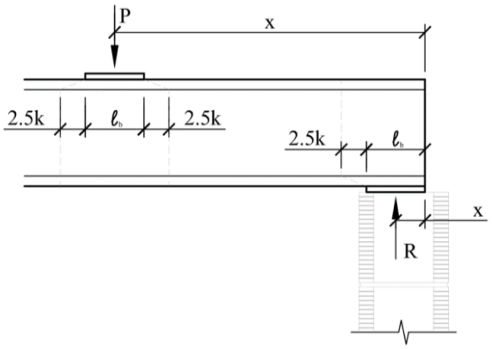
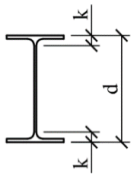
BEARING STIFFENERS FOR COMPRESSIVE FORCE

Based on AISC 360-16 J10

Client:		**Designed By:**	*A. Shaikhzadeh*	**Date:**	*23-Feb-21*
Job Name:		**Verified By:**		**Revision:**	*100%*







DESIGN STATUS :	**O.K.**
WEB LOCAL YIELDING	**0.63**
WEB LOCAL CRIPPLING	**0.52**
STIFFENERS THICKNESS	**N/A**
STIFFENERS COMP. BUCKLING	**N/A**
STIFFENERS BEARING	**N/A**
WELD SIZE	**N/A**
WELD STRENGTH	**N/A**

DESIGN INPUT DATA

FACTORED CONCENTRATED LOAD, P	300	kN
YEILD STRENGTH OF STEEL, F_y	240	MPa
MODULUS OF ELASTICITY OF STEEL, E	200000	MPa
BEAM DEPTH, d	400	mm
BEAM FLANGE WIDTH, b_f	200	mm
BEAM FLANGE THICKNESS, t_f	20	mm
BEAM WEB THICKNESS, t_w	8	mm
DISTANCE FROM FLANGE OUTER FACE TO FILLET TOE, k	20	mm
BEARING LENGTH, L_b	200	mm
DISTANCE FROM BEAM END TO THE LOAD, x	1000	mm
USE BEARING STIFFENERS	NO	
STIFFENER THICKNESS, t_{st}	10	mm
STIFFENER WIDTH, b_{st}	90	mm
TYPE OF STIFFENER	INTERIOR	
STIFFENER FILLET SIZE AT FLANGE-WEB CORNER	5	mm
WELD SIZE, w	5	mm
WELD ELECTRODE	E60	

WEB LOCAL YEILDING

$x > d$	YES		Interior concentrated force	
ϕ	1.0		Strength reduction factor	J10.2
ϕR_n	480	kN	Web local yeilding strength	J10-2
Status	**O.K.**			
D/C	**0.63**			

(cont'd)

WEB LOCAL CRIPPLING

$x \geq d/2$	YES		Interior concentrated force	
L_b/d	0.50			
ϕ	0.75		Strength reduction factor	J10.3
Q_f	1.0		1.0 for wide-flange sections	J10.3
ϕR_n	580	kN	Strength based on Equation J10-4	
ϕR_n	N/A	kN	Strength based on Equation J10-5a	
ϕR_n	N/A	kN	Strength based on Equation J10-5b	
Status	**O.K.**			
D/C	**0.52**			

BEARING STIFFENERS

Compression Buckling

$t_{st} \geq 0.5\, t_f$ *or* $1/16\, b_{st}$	**N/A**	mm		Control of minimum thickness of stiffener	J10.8
$A_{st} = 2 \times b_{st}\, t_{st}$	N/A	mm^2		Area of stiffener plates	
I_{st}	N/A	mm^4		Moment of inertia of the two stiffeners about beam longitudinal axis	
L_w	N/A	mm		Effective strip of the web allowed to be used in stiffeners design	J10.8
$A_w = L_w\, t_w$	N/A	mm^2		Area of the effective web strip	
I_w	N/A	mm^4		Moment of inertia of the effective web strip about beam longitudinal axis	
$A_{total} = A_{st} + A_w$	N/A	mm^2		Total area of stiffeners and effective web strip	
$I_{total} = I_{st} + I_w$	N/A	mm^4		Total moment of inertia of stiffeners and effective web strip	
$r = (I_{total} / A_{total})^{0.5}$	N/A	mm		Radius of gyration	
$KL = 0.75\, h$	N/A	mm		Effective length	J10.8
KL/r	N/A		<	25 (see note 3)	
$\phi R_n = 0.9\, F_y\, A_{total}$	N/A	kN		Compression buckling strength	J4.4
Status	**N/A**				
D/C	**N/A**				

Bearing (Local Compressive Yeilding)

ϕ	N/A		Strength reduction factor	J7
$A_{st,bearing}$	N/A	mm^2	Bearing area (area of the two stiffener plates, excluding the fillets)	
$\phi R_n = 1.8\, F_y\, A_{st,bearing}$	N/A	kN	Bearing strength	J7-1
Status	**N/A**			
D/C	**N/A**			

Plate to Web Weld

L_{weld}	N/A	mm	Weld length of each stiffener equals its length excluding the fillets	
$t_{min} = min(t_w, t_{st})$	N/A	mm	Thickness of thinner connected part	
w_{min}	N/A	mm	Minimum size of weld	Table J2.4
w_{max}	N/A	mm	Maximum size of weld	J2b. (b)
Status	**N/A**			

F_{EXX}	N/A	MPa	Electrode ultimate tensile stress
$F_{nw} = 0.6F_{EXX}$	N/A	MPa	Electrode ultimate shear stress
ϕR_n	N/A	kN	Total weld strength for both stiffeners
Status	**N/A**		
D/C	**N/A**		

NOTES:

1- N/A = Not Applicable

2- Since bearing stiffeners (if used) are provided to resist the full compressive force, the limit states of web local buckling, web crippling, and web sidesway bucklin

have to be checked.

3- If $KL/r > 25$, provision of chapter E must be used for control of compression buckling. (360-16 J4.4)

4- Bearing stiffeners are designed as short columns when they are provided to reinforce the web of a beam subjected to concentrated loads.

5- Bearing stiffeners are different from transverse stiffeners which assist in forming tension field action of plate girders.