COMPANY NAME

CALCULATION SHEET

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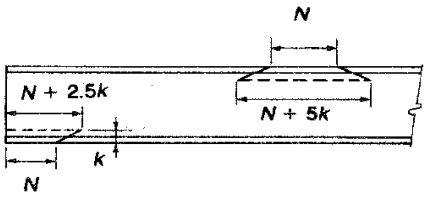
Calculation No.				
CALCULATION NUMBER				
Project No.				
PROJECT NUMBER				
Project Title:	**Project Name**	Calc. By	Date	Rev.
		Author	today	0
Subject/Feature:	**Check Bearing Stiffener Requirement / Webs With Concentarted Forces**	Checked By	Date	
	LRFD Imperial Units calculation / spreadsheet	Checker	today	

Input	Output
Steel section properties and dimensions Bracing length Steel properties (type)	Beam Bearing Stiffener Requirement



Web Local Yielding / Web Crippling / Web Sidesway Buckling

per Manual of Steel Construcion (LRFD)
Chapter K Sections K1-3, K1-4 & K1-5

d_F =	32.4	in	distance of applied force from the member end
l =	299	in	largest laterally umbraced length along either flange at the point of load
N =	2.25	in	length of bearing (not less than k for end beam reactions)

Section properties

Section	W14x30		
F_y =	50	ksi	minimum yield stress of the type of steel being used
F_{yw} =	50	ksi	yield stress of web
k =	0.785	in	distance from outer face of the flange to the web toe of the fillet
d =	13.8	in	overal depth of the member
t_w =	0.27	in	web thickness
t_f =	0.385	in	flange thickness
b_f =	6.73	in	flange width
h =	13.03	in	clear distance between the flanges less the filler or corner radius for rolled shapes
S_x =	42	in^3	elastic section modulus - major axis

Steel properties

E =	29000	ksi	modulus of elasticity of steel

Local Web Yielding

per Manual of Steel Construcion (LRFD)
Chapter K Section K1-3

Transverse stiffners shall be provided adjacent to a concentrated tensile or compressive force when the required strenght of the web at the toe of the fillet exceeds ϕR_n

ϕ =	1	resistance factor

When the concentrated force to be resisted is applied at a distance from the member end that is greater than the deph of the member d. $d_F > d$

Chapter K Section K1-3 (a)

R_n =	$(5k + N)*F_{yw}*t_w$ =	83.36 kip	Eq. K1-2
$\phi * R_n$ =	83.36 kip	allowable concetrated force	

References:
Manual of Steel Construction - American Institute of Steel Construction Inc.,
Load and resistance factor design (LRFD)

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Web crippling — per Manual of Steel Construcion (LRFD) Chapter K Section K1-4

Transverse stiffners shall be provided adjacent to a concentrated tensile or compressive force when the required strenght of the web at the toe of the fillet exceeds ϕR_n

ϕ = 0.75 resistance factor

d_F = 32.4 in

d/2 = 6.90 in

When the concentrated force to be resisted is applied at a distance from the member end that is greater than or equal to d/2. $d_F > d/2$ — Chapter K Section K1-4 (a)

$R_n = 0.80*t_w^2*[1+3(N/d)*(t_w/t_f)^{1.5}]*(E*F_{yw}*t_f/t_w)^{0.5}$ — Eq. K1-4

R_n = 107.95 kip

$\phi * R_n$ = 80.96 kip allowable concetrated force

Web Sidesway Buckling — per Manual of Steel Construcion (LRFD) Chapter K Section K1-5

Compressive single concentrated force applied to the member, lateral movement between the loaded compression flange and the tension flange is not restrained at the point of application of the concentrated force.

ϕ = 0.85 resistance factor

Restraint at compression flange: YES

C_r = 960000 ksi — C_r is 960000 ksi when $M_u < M_y$; 480000 ksi when $M_u > M_y$ — per Manual of Steel Construcion (LRFD) Chapter K Section K1-5

M_y = 2100 kip*in (F_y*S_x) moment corresponding to onset of yielding at the extreme fiber from an elastic stress distribution

Compression flange is restrained against rotation. — Chapter K Section K1-5 (a)

$(h/t_w)/(l/b_f)$ = 1.09 < 2.3

$R_n = (C_r*t_w^3*t_f/h^2)*\{1+0.4*[(h/t_w)/(l/b_f)]^3\}$ — Eq. K1-6

R_n = 64.82 kip

$\phi * R_n$ = 55.09 kip allowable concetrated force

when the required strength of the web exceeds ϕR_n, local lateral bracing shall be provided at the tension flange or either a pair of transverse stiffeners or a doubler plate, extending at least one-half the depth of the web, shall be provided adjacent to the concentrated compressive force.

References:

Manual of Steel Construction - American Institute of Steel Construction Inc., Load and resistance factor design (LRFD)