



PROJECT NAME: TELKWA 62.2
 BULKLEY RIVER CROSSING, WIDENING OF 24.0m SPAN, TPG BRIDGE
 TASK: 6. SUPERSTRUCTURE ANALYSIS AND DESIGN

JOB NUMBER: CNRAIL0802
 DESIGNED: CHECKED
 DGT:
 DATE: DATE:
 5-Aug-08

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SUBTASK: 6.4. TPG SHEARS

AT END OF SPAN, Vdl+sdl= 541.537357 .KN
 Vll= 1200.8812 .KN
 Vll_impact= 350.687512 .KN
 V(LL+IMP)max= 1551.56871 .KN

TOTAL MAX SHEAR 2093.10607 .KN
 max SHEAR STRESS 50.3150497 MPA

WEB SLENDERNESS

WEB DEPTH 2600 .mm 102.36 in
 WEB THICKNESS 16 .mm 0.63 in
 2600 : 41600 .mm 16 = 162.5

SHEAR AREA= 41600 .mm

§ 1.7.3 a) Thickness of web plate Girder

$\sqrt{F_y}$

30,500 = 0.0074 X 2600 = 19.2131211 .mm > 16 MUST HAVE LONGITUDINAL STIFFENERS!

§ 1.7.3 b) Thickness of web plate Girder

MINIMUM THCK OF WEB WITH LONG. STIFFENERS= 9.60656054 .mm < 16 .mm

§ 1.7.3 c) Thickness of web plate Girder not to be less than 1/6 of the flange thck

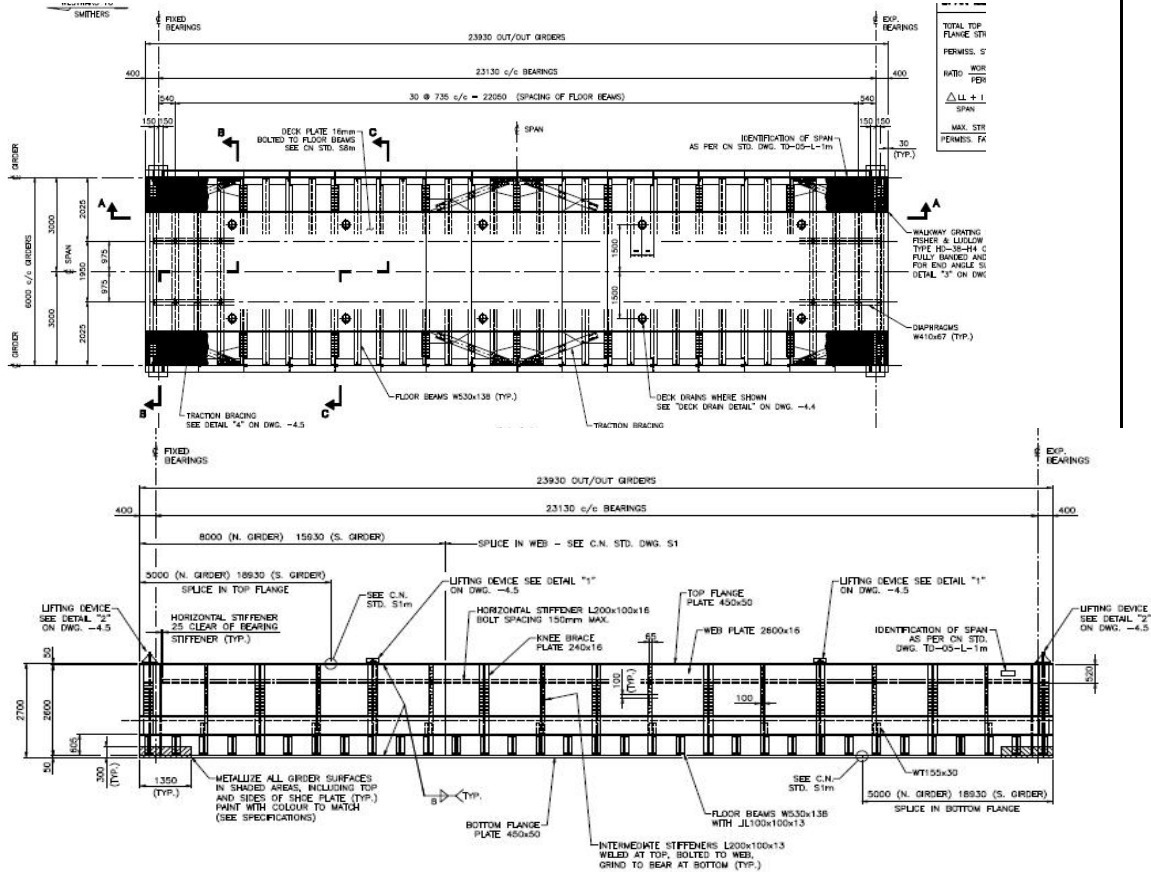
8.33333333 .mm < 16 .mm


REFERENCES:

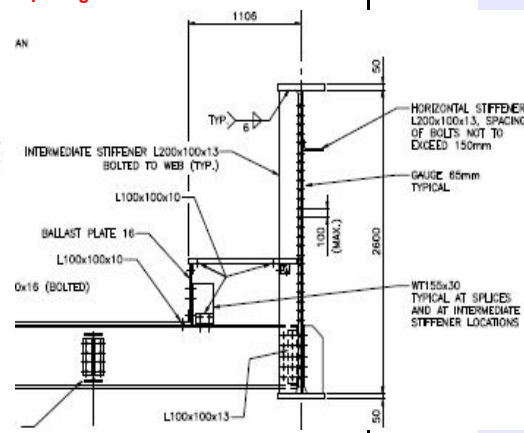
AREMA, CHAPTER 15
 § 1.7.3.


LONGITUDIANL STIFFENERS L 200x100x13 At 520mm from top flange

TRANSVERSE STIFFENERS:
 INTERMEDIATE STIFFENERS L 200x100x13
 STIFFENER SPACINGS 1470 .mm



A	B	C	D	E	F	G	H	TPG SHEAR	J	K	L	M	N	O	P	Q
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www.severko.com			SUBTASK: 6.4. TPG SHEARS										DGT: DATE: 5-Aug-08 DATE:			
1.7.8 WEB PLATE STIFFENERS (INTERMEDIATE TRANSVERSE AND LONGITUDINAL)¹															§ 1.7.8.	
a. Where the depth of the web between the flanges or side plates of a riveted, bolted or welded plate girder exceeds times its thickness, it shall be transversely stiffened by pairs (except as noted in paragraph c) of angles riveted or bolted, or of plates welded, to the web. The clear distance, d, between intermediate transverse stiffeners shall not exceed 96 inches, nor the clear distance between the flanges or side plates, nor that given by the formula:																
$d = \frac{10,500t}{\sqrt{S}}$																
where:																
d = clear distance between intermediate transverse stiffeners, inch t = thickness of web, inch S = calculated shear stress in the gross section of the web at the point under consideration, psi F _y = yield point as specified in Table 15-1-1 for the web material, psi																
shear stress at the max shear 50.32 MPA 7302.62 psi																
Requirements for stiffeners spacings:																
(a) 76 in 1930.4 mm (b) web depth 2600 mm (c) as per § 1.7.8. .10500*0.63/sqrt(7302.62) 1966.18 mm min 1930.40 mm > 1470 mm															spacing is o.k.	
The moment of inertia of the intermediate transverse stiffeners shall not be less than:																
$I = 2.5d_a t^3 \left(\frac{D^2}{d_a^2} - 0.7 \right)$																
taken about the centerline of the web plate in the case of stiffeners furnished in pairs (on each side of web plate) and taken about the face of the web plate in contact with the stiffener in the case of single stiffeners.																
where:																
I = moment of inertia, inches ⁴ d _a = actual clear distance between intermediate transverse stiffeners, inch D = depth of web between flanges or side plates, inch																
d _a = .1470-13 1457 mm 57.36 in D = 2600 2600 mm 102.36 in t = 16 mm 0.63 in																
I = 89.05250352 in⁴ 3.7066E+07 mm⁴																
for L 200x100x13, mom. of inertia, I 1.60E+07 mm ⁴ about axis x-x plus statical moment=areaxdistance to the web face 1.94E+07 mm ⁴																
area= 3710 mm ² distance from c.g. of the angle to the web face 72.4 mm 2.85039 in																
Total moment of inertia of the intermediate stiffener 3.54E+07 mm⁴ note: moment of inertia for the intermediate stiffener is very close to the required, may use better stiffener: L 203x102x19																
Moment of inertia is: 2.29E+07 mm⁴ statical moment of inertia is: 3.05E+07 mm⁴ 5.34E+07 mm⁴																
area= 5460 distance from c.g. of the angle to the web face 7.48E+01																
b. For immediate transverse stiffeners, the width of the outstanding leg of each angle, or the width of the welded stiffener plate, shall not be more than 16 times its thickness nor less than 2 inches plus 1/30 of the depth of the girder.																
Width of the outstandig leg of the angle stiffener 200.00 mm Max leg width: .16*13 208.00 mm o.k. Min leg width: .2*25.4+2600/30 137.466667 mm o.k.																
c. Intermediate transverse stiffeners used on one side of the web plate only (single stiffeners), shall be connected to the outstanding portion of the compression flange.																
Stiffener leg is welded by both side 6mm fillet weld. o.k.																



A	B	C	D	E	F	G	H	TPG SHEAR	J	K	L	M	N	O	P	Q
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3			BULKLEY RIVER CROSSING, WIDENING OF 24.0m SPAN, TPG BRIDGE										DESIGNED	CHECKED		
4			TASK: 6. SUPERSTRUCTURE ANALYSIS AND DESIGN										DGT			
5			SUBTASK: 6.4. TPG SHEARS										DATE:	DATE:		
6														5-Aug-08		
7		www.severko.com														
159			d. Where the depth of the web between the flanges or side plates of a riveted, bolted, or welded plate girder													
160			exceeds $22,500/(\sqrt{f})$ times its thickness (where f = the calculated compressive bending stress in the													
161			flange, psi), it shall be stiffened by intermediate transverse stiffeners in accordance with paragraph a, b,													
162			and c; and by a longitudinal stiffener. Longitudinal stiffeners may be discontinuous at their intersections													
163			with intermediate transverse stiffeners. Longitudinal stiffeners are usually placed on one side of the web													
164			plate. The stress in the stiffener (from participation in the girder stress) shall not be greater than the													
165			basic allowable bending stress for the material used in the stiffener.													
166																
167																
168																
169																
170			<i>f</i> -the calculated compressive bending in the flange										145.484 .MPA	=	21115 psi	
171			$22,500/\sqrt{f}$ =										154.84 x		0.63 97.54 in	
172			so, at the max compression in flange long. Stiffener is almost required, at any other location where, bending stress is less than 130 MPA, longitudinal													
173			stiffener is required													
174			$22,500/\sqrt{18500}$										165.423 x		0.63 104.2	
175																
176			e. The centerline of a plate longitudinal stiffener or the gage line of an angle longitudinal stiffener shall be													
177			D/5 from the inner surface or leg of the compression flange component.													
178																
179			$D/5 =$										520 O.K.			
180			f. The longitudinal stiffener shall be proportioned so that:													
181																
182																
183																
184																
185			$I_E = Dt^3 \left(2.4 \frac{d_a^2}{D^2} - 0.13 \right)$													
186																
187			where:													
188			I_E = minimum required moment of inertia of longitudinal stiffeners about the edge in contact with													
189			the web plate, inches ⁴ , for stiffeners used on each side of the web and about the centerline of													
190			the web plate for stiffeners used on each side of the web.													
191																
192																
193																
194																
195																
196			$I_E =$										15.95718239 in ⁴		6.6419E+06 mm ⁴	
197			moment of inertia about the line that is													
198			contact with the L200x100x13 long.stiff.										3.54E+07 mm ⁴		o.k.	
199																
200																
201			g. The thickness of the longitudinal stiffener shall not be less than:													
202																
203			$\frac{b' \sqrt{f}}{2250}$													
204			where:													
205			b' = width of outstanding leg of longitudinal stiffener, inch													
206			f = calculated compressive bending stress in the flange, psi													
207																
208																
209																
210			$b' =$										200 mm	=	7.87 in	
211			$f =$										145.4841616 .Mpa	=	21115.26 psi	
212			$t_{long} =$										13 mm	=	0.512 in	
213			$b' \sqrt{f} / 2250 =$										0.509 in		12.9165 mm o.k.	
214																
215																
216			h. All intermediate stiffeners on the track side of through plate girders shall be fastened to the compression													
217			flange in order to minimize out-of-plane deformations in the web caused by rotations of the ends of the													
218			floorbeam.													
219																
220																
221			done													
222																
223																
224			i. Intermediate stiffeners on through plate girders located within a distance equal to the depth of the													
225			girder from the bearing shall be fastened to the tension flange.													
226																
227																
228			done													
229																
230																
231																
232																

A		B		C		D		E		F		G		H		I		J		K		L		M		N		O		P		Q	
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