



PROJECT NAME: TELKWA 62.2  
 BULKLEY RIVER CROSSING, WIDENING OF 24.0m SPAN, TPG BRIDGE  
 TASK: 6. SUPERSTRUCTURE ANALYSIS AND DESIGN  
 SUBTASK: 6.3. TPG BENDING

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

**.6.3.1.**  
 DEAD+SUPERIMPOSED DEAD LOAD

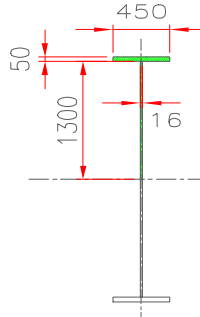
Mdl+sdl= 3131.439765 KN-m  
 fb1=Mdl+sdl/Sbott= 43.37000754 .MPa  
 fb2=Mdl+sdl/Stop= 41.46683219 .MPa

LIVE LOAD:  
 MAX INFLUENCES-MOMENTS  
 Mmax(1+LLI)= 7855.049071 KN-m  
 LLI= 29.20%

Lunsupported= 2940 .mm Knee-braces support  
 fb1=Mmax(1+LLI)/Sbott= 108.7913429 .MPa  
 fb2=Mmax(1+LLI)/Stop= 104.0173294 .MPa

Total stresses:  
 fb1,total,bott= 152.1613505 .MPa  
 fb2,total,top= 145.4841616 .MPa

Allowable bending pressure as per Table 15.1.11.



ALLOWABLE STRESS in tension (0.55Fy) **192.5 .Mpa**

Compression in extreme fibers of I-type members subjected to loading perpendicular to the web	0.55F <sub>y</sub>
<b>Stress Area</b>	<b>Pounds per square inch</b>
Compression in extreme fibers of welded built-up or rolled beam flexural members symmetrical about the principal axis in the plane of the web (other than box-type flexural members), and compression in extreme fibers of rolled channels, the larger of the values computed by the following formulas	0.55F <sub>y</sub> - $\frac{0.55(F_y)^2}{1.8 \times 10^9} \left(\frac{l}{r_y}\right)^2$ (Note 1)
where:	or
l = distance between points of lateral support for the compression flange, inch.	10, 500, 000
r <sub>y</sub> = minimum radius of gyration of the compression flange and that portion of the web area on the compression side of the axis of bending, about an axis in the plane of the web, inch.	Id/A <sub>f</sub>
A <sub>f</sub> = area of the smaller flange excluding any portion of the web, inch <sup>2</sup>	but not to exceed:
d = overall depth of the member, inch.	0.55F <sub>y</sub>

Fy= 350 = 50798.25835 Psi 27939.042  
 ry=sqrt(I/A) = 93.69638369 .mm= 3.688834004 Inch  
 I=450\*3\*50/12+1300\*16\*3/12 = 3.80E+08 Mm<sup>4</sup>  
 Area=450\*50+16\*1300= 43300 .mm<sup>2</sup>  
 .55Fy-0.55(Fy)<sup>2</sup>/(Iry)<sup>2</sup>\*1.8/10<sup>9</sup> = 27162.72914 Psi **187.151 .Mpa** Allowable compression stress

10,500,000/(Id/Af)= 29761.90476 <= 2.79E+04 **192.5 .Mpa**  
 Ld= 2940 115.7480315 Inch  
 Af=450\*50= 22500 34.87506975 Inch<sup>2</sup>  
 .d= 2700 106.2992126 Inch  
 Allowable Shear pressure, as per Table 15.1.11.  
 .35 Fy= 122.5 **122.5 .Mpa**

STRESS TABLE (forces per girder)					
	END REACTION (KN)	SHEAR STRESS, MPA	BENDING MOMENT, KN-M	BENDING STRESSES, COMPRESSION, MPA	BENDING STRESSES, TENSION, MPA
Dead load, 46.83kN/m	541.5373567	13.01772492	3131.439765	41.46683219	43.3700075
LIVE LOAD E90	1200.8812	28.86733654	6079.641	80.50720182	84.2021868
IMPACT 29.2%	350.6875117	8.429988262	1775.408071	23.51012763	24.5891562
TOTAL GROUP "A"	2093.106068	50.31504972	10986.48884	145.4841616	152.16135
ALLOWABLE STRESSES (per AREMA)		<b>122.5</b>		<b>187.1512038</b>	<b>192.5</b>
STRESS RATIO (demand/capacity)		<b>0.4107351</b>		<b>0.777361613</b>	<b>0.790449</b>

**.6.3.2.**

KNEE BRACE-AS TO BE LATERAL SUPPORT

§ 1.3.11. Bracing between compression members

The bracing has to resist the shear force equal to the 2.5% of total compression force in flanges of both members + any shear in the panel

Structural depth= 2650 .mm = 2.65 .m  
 Compression force due to dl+sdl= 3131.439765 : 2.65 = 1181.675383 KN  
 Compression force due to LL+IMPACTI= 7855.049071 : 2.65 = 2964.169461 KN  
 Total compression force from bending = 2964.169461 X 2 = **5928.339 KN**  
 = 2.50% X 5928.3389 = **148.2085 KN**

Cross section of a knee-brace (minimum) T-section- 225x16 web+240x16 flange

Area= 7440 Mm<sup>2</sup>  
 yc.g.= 174.6935484 .mm  
 I= 15187500  
 81920  
 13924934.86  
 16882734.82

I1= 46077089.68 .r1/1= 78.696615 .mm  
 I2= 18508800 .r2/2= 49.877269 .mm

KL/rmin 2020 : 49.87726873 = 40.499411  
 Cr/A= 275 Mpa  
 Cr= **2046 KN GOOD**

AREMA, CHAPTER 15



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FATIGUE

§ 1.3.13., Table 15-1-7 Number of Stress Cycles, N, Classification I  
**N > 2000000**

§ 1.3.13., Table 15-1-8 Mean impact load percentage  
 65% of impact

**18.98% Impact**

Table 15-1-9 Construction Details

General Condition: Built-up member, Situation: base metal and weld metal in members without (welded) attachments built-up  
 Of plates and connected by continuous groove or fillet weld

**Stress category B**

§ 1.14.6., Table 15-1-15 Allowable fatigue stress range is

**Srfat= 16 Ksi = 110.24 .Mpa**

**Mmax, live= 6079.641 .kN-m**

**Impact= 18.98%**

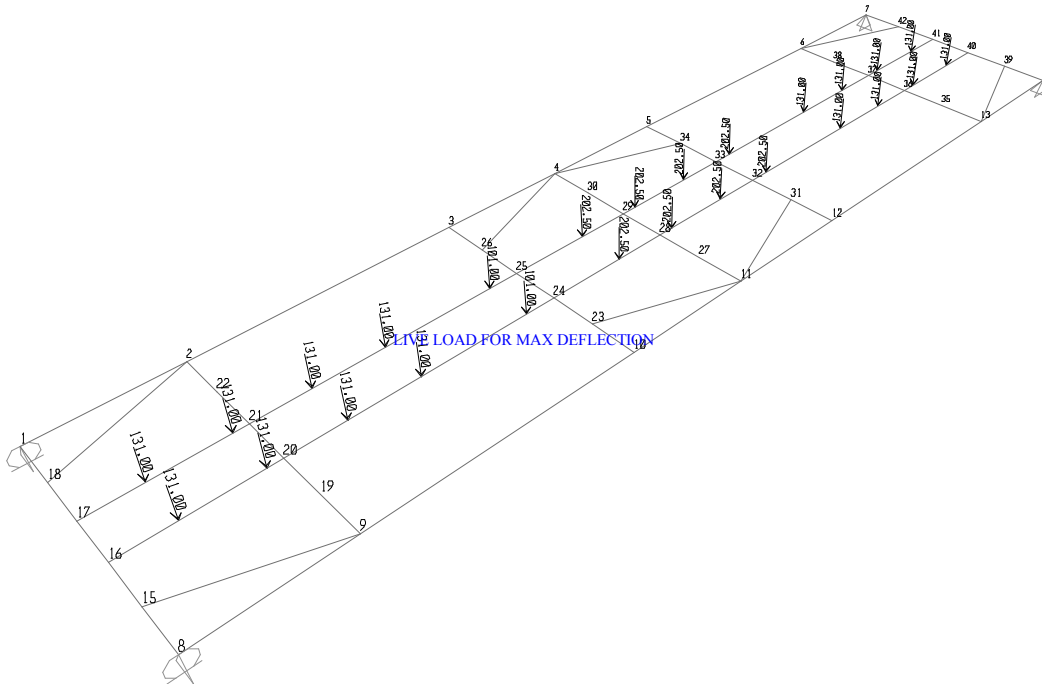
**Mmax, I(1+imp\_fat)= 7233.656246 .kN-m**

**Sr=Mmax, I(1+imp\_fat)/Sbott= 100.18514 .Mpa < 110.2 GOOD**

§ 1.2.5. DEFLECTIONS

( DUE TO LIVE LOAD + IMPACT PRODUCING MAX MOMENT)

(b) DEFLECTION LIMIT 1/640

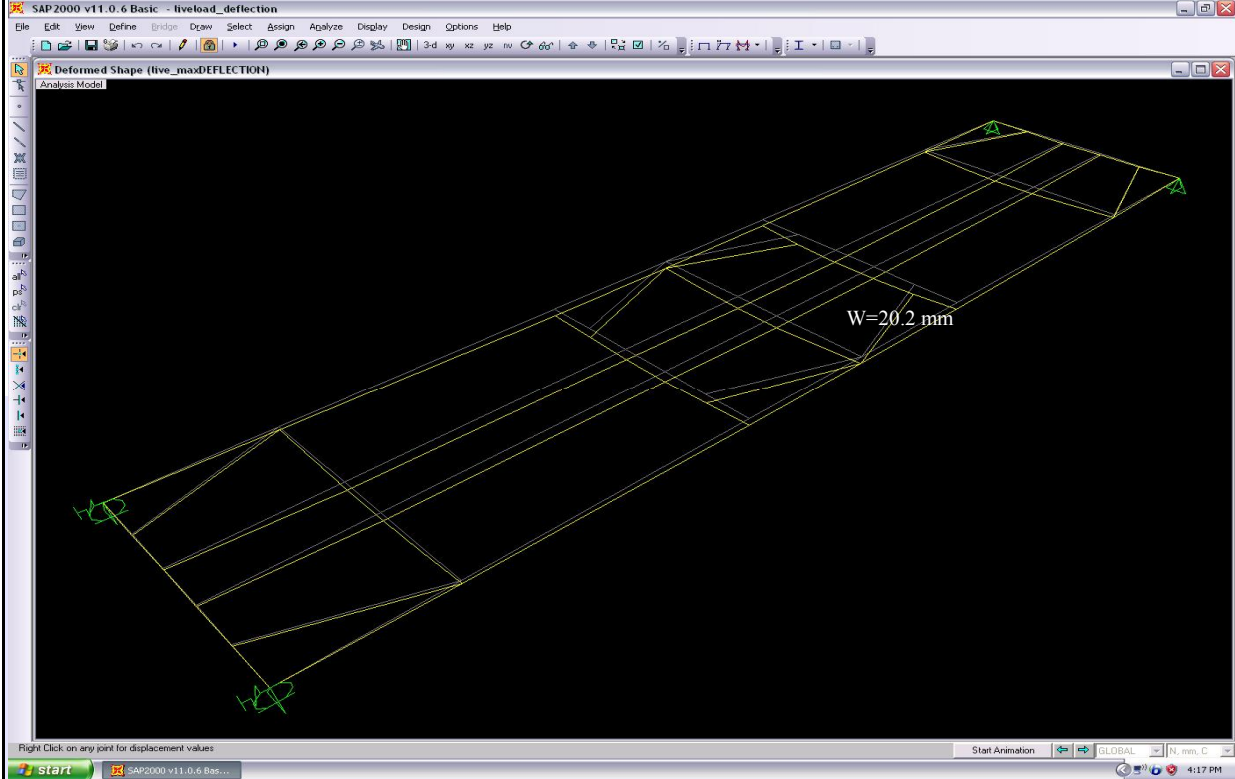




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deflection due to live load= 20.2 mm  
 (DEFLECTION+IMACTY)/L= 26.10 mm 23130 = 0.0011 =1/ 886.2439757 O.K.

(c) lateral defelection is limited to 10mm  
 Deflecteion is calculated at the truck level due to applicable lateral loads

§ 1.2.10. CAMBER

The camber of plate girder more than 90 feet in length shall be cambered for dead deflection only. Spans under 90 feet need not to be cambered.

§ 17.