

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GIRDER MOMENT TABLE - RAMP 2 FLARE

I_s, S_s : Non-composite moment of inertia and section modulus of the steel section used for computing f_s (Total and Overload) due to non-composite dead loads (in⁴ and in³).
 $I_c(n), S_c(n)$: Composite moment of inertia and section modulus of the steel and deck based upon the modular ratio, "n", used for computing f_s (Total and Overload) due to short-term composite live loads (in⁴ and in³).
 $I_c(3n), S_c(3n)$: Composite moment of inertia and section modulus of the steel and deck based upon 3 times the modular ratio, "3n", used for computing f_s (Total and Overload) due to long-term composite (superimposed) dead loads (in⁴ and in³).
 Z : Plastic Section Modulus of the steel section in non-composite areas (in³).
 Q : Un-factored non-composite dead load (kips/ft.).
 M_Q : Un-factored moment due to non-composite dead load (kip-ft.).
 s_Q : Un-factored long-term composite (superimposed) dead load (kips/ft.).
 M_{sQ} : Un-factored moment due to long-term composite (superimposed) dead load (kip-ft.).
 M_L : Un-factored live load moment (kip-ft.).
 M_I : Un-factored moment due to impact (kip-ft.).
 M_a : Factored design moment (kip-ft.).
 $1.3 [M_Q + M_{sQ} + \frac{5}{8} (M_L + M_I)]$
 M_u : Compact composite moment capacity according to AASHTO LFD 10.50.1.1 or compact non-composite moment capacity according to AASHTO LFD 10.48.1 (kip-ft.).
 f_s (Overload): Sum of stresses as computed from the moments below (ksi).
 $M_Q + M_{sQ} + \frac{5}{8} (M_L + M_I)$
 f_s (Total): Sum of stresses as computed from the moments below on non-compact section (ksi).
 $1.3 [M_Q + M_{sQ} + \frac{5}{8} (M_L + M_I)]$
 VR : Maximum t + impact shear range within the composite portion of the span for stud shear connector design (kips).
 S_f : Section modulus of one flange plate for lateral flange bending (in³).
 M_{bl} : Factored lateral bending moment for flange plate (kip-ft.).
 f_1 : Factored calculated normal stress at the edge of flange due to lateral bending (ksi).
 F_{cr} (Overload): Critical average flange stress at overload computed according to the 2003 AASHTO Guide Specifications for Horizontally Curved Steel Girder Highway Bridges Section 9.5 (ksi).
 F_{cr} : Critical average flange stress (smaller of F_{cr1} or F_{cr2} for partially braced flanges and F_y for continuously braced flanges) computed according to the 2003 AASHTO Guide Specifications for Horizontally Curved Steel Girder Highway Bridges (Sections 5.2, 5.3 and 5.4) (ksi).

	Girder 2.1 & 2.18-2.20		Girder 2.2			Girder 2.3 to 2.8			Girder 2.9	Girder 2.11	Girder 2.17, 2.10, 2.10A & 2.13-2.16	Cross Head Girder	
	0.5 Sp. R2-1	0.5 Sp. R2-2	0.4 Sp. R2-1	R2 Pier	0.6 Sp. R2-2	0.4 Sp. R2-1	R2 Pier	0.6 Sp. R2-2	0.6 Sp. R2-2	0.5 Sp. R2-2	0.5 Sp. R2-2	0.4 Span	at G2.12
I_s (in ⁴)	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	49,795	15,000	9,040	131,400	131,400
I_c (n) (in ⁴)	31,876	31,876	31,876		31,876	31,876		31,876	88,605	29,661			
I_c (3n) (in ⁴)	23,429	23,429	23,429		23,429	23,429		23,429	67,636	21,883			
S_s (in ³)	837	837	837	837	837	837	837	837	1,747	837	504	4,074	4,074
S_c (n) (in ³)	1,096	1,096	1,096		1,096	1,096		1,096	2,110	1,073			
S_c (3n) (in ³)	995	995	995		995	995		995	1,948	971			
Z (in ³)				943							575	4541	4541
Q (k/ft)	1.18	0.98	1.42	1.57	0.89	0.98	1.38	0.98	1.41	1.11	1.29		
M_Q (k)	318.0	705.0	584.0	1,111.0	396.0	340.0	1,243.0	671.0	1,644.0	228.0	357.0	2,758.0	5,970.0
s_Q (k/ft)	0.40	0.40	0.57		0.36	0.40		0.40	0.60	0.80			
M_{sQ} (k)	113.0	288.0	249.0		179.0	157.0		292.0	708.0	147.0			
M_L (k)	329.0	640.0	560.0	348.0	565.0	560.0	413.0	703.0	857.0	270.0	334.0	1,049.0	1,336.0
M_I (k)	95.0	160.0	139.0	87.0	141.0	140.0	103.0	162.0	197.0	81.0	96.0	262.0	347.0
$5_3 [M_L + M_I]$ (k)	706.7	1,333.3	1,165.0	725.0	1,177.0	1,166.7	860.0	1,441.7	1,756.7	585.0	716.7	2,185.0	2,805.0
M_a (k)	1,479.0	3,024.2	2,598.0	2,387.0	2,278.0	2,162.8	2,734.0	3,126.1	5,341.3	1,248.0	1,395.8	6,425.9	11,407.5
M_u (k)	5,073.0	5,073.0	5,073.0	3,929.0	5,073.0	5,073.0		5,073.0	10,286.0	4,897.0	2,397.0	18,920.0	18,920.0
$f_s Q$ (non-comp) (ksi)	4.6	10.1	8.4	16.0	5.7	4.9	17.8	9.6	11.3	3.3	8.5	8.1	17.6
$f_s Q$ (comp) (ksi)	1.4	3.5	3.0	-	2.2	1.9	-	3.5	4.4	1.8	-	-	-
$f_s 5_3 (L + Imp)$ (ksi)	7.7	14.6	12.8	10.4	12.9	12.8	12.3	15.8	10.0	6.5	17.1	6.4	8.3
f_s (Overload) (ksi)	13.7	28.2	24.2	26.4	20.8	19.5	30.1	28.9	25.6	11.6	25.6	14.6	25.8
f_s (Total) (ksi)							39.2						
VR (k)	49.9	52.6	55.5		55.4	56.5		55.0	53.0	46.0			

* Compact section
 ** Braced non-compact and partially braced section

GIRDER REACTION TABLES - RAMP 2 FLARE

	Girder 2.1				Girder 2.2			Girder 2.3 to 2.8			Girder 2.9	Girder 2.11	Girder 2.17	Cross Head Girder			
	Carrier Girder	Pier R2 (West)	Pier R2 (East)	FB 2.2	Carrier Girder	Pier R2	Q Bearing Abutment	Carrier Girder	Pier R2	Q Bearing Abutment	Carrier Girder	Pier R2	Q S. Brg C. Abut 4	G2.9	Carrier Girder & FB2.6	South Bearing	North Bearing
R_{DL} (k)	53.2	53.2	36.0	34.5	41.6	142.2	50.1	52.5	147.6	38.3	88.3	78.5	39.6	39.4	31.1	554.0	1034.0
R_{LL} (k)	41.8	41.8	38.6	38.6	40.8	47.8	40.8	42.0	51.2	41.0	42.8	38.3	35.4	35.4	38.6	100.0	160.0
R_I (k)	10.4	10.4	11.1	11.1	10.3	11.7	10.2	9.6	12.2	10.2	9.8	8.8	10.6	10.6	11.2	25.0	40.0
R_{TOTAL} (k)	105.4	105.4	85.7	84.2	92.7	201.7	101.1	104.1	211.0	89.5	140.9	125.6	85.6	85.4	80.9	679.0	1234.0

	Girder 2.12		
	0.4 Sp. R2-1	R2 Pier	0.6 Span R2-2
I_s (in ⁴)	78,863	78,863	78,863
I_c (n) (in ⁴)	127,048	85,300	127,048
I_c (3n) (in ⁴)	99,626	3,100	99,626
S_s (in ³)	2,719	2,719	2,719
S_c (n) (in ³)	3,154	85,300	3,154
S_c (3n) (in ³)	2,941	3,100	2,941
S_f (in ³)	161	161	161
Q (k/ft)	1.6	2.1	3.1
M_Q (k)	765	1,358	784
s_Q (k/ft)	0.5	0.73	1.3
M_{sQ} (k)	246	497	326
M_L (k)	626.0	470.0	512.0
M_I (k)	150.0	117.0	133.0
$5_3 [M_L + M_I]$ (k)	1,294.0	979.0	1,075.0
M_a (k)	2,997.0	3,685.0	2,841.0
M_{bl} (k)	42.0	73	26.0
$f_s Q$ (non-comp) (ksi)	3.4	6.0	3.5
$f_s Q$ (comp) (ksi)	1.0	2.0	1.4
$f_s 5_3 (L + Imp)$ (ksi)	5.0	3.8	4.1
F_I (ksi)	3.1	5.4	2.0
f_s (Overload) (ksi)	9.4	11.8	9.0
f_s (Total) (ksi)	12.3	15.4	11.7
F_{cr} (Overload) (ksi)	47.5	47.5	47.5
VR (k)	56.3		59.1
F_{cr} (ksi)	44.3	32.3	49.3

MOMENT TABLE
 RAMP 2 FLARE
 STRUCTURE NO. 016-0724

TYLIN INTERNATIONAL	DESIGNED - JPN	REVISIONS		SHEET NO. 131	F.A.I RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.							
	CHECKED - AMD,	NAME	DATE							239 SHEETS	55	0711.2R & 1011.1BR	COOK	741	455	
	DRAWN - MAU															CONTRACT NO. 60999
	CHECKED - AMD,															
DATE - 03/25/2011			FED. ROAD DIST. NO. 1	ILLINOIS	FED. AID PROJECT											

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