FORM DQP 2.01-1
LEVEL 1 CHECK PRINT SIGN-OFF SHEET

Client Name:	**Ohio Department of Transportation**
Job Title:	**Cleveland Innerbelt Design-Build Contract**
Job Number:	**CUY-90-14.90**
Document Title:	RFI 167 Unit 1 End Diaphragm Oversized Holes

Check Level (Mark One):

- [X] 1A 100% Document Check
- [ ] 1B 100% Input Check

Enter description below:

	Print Name	Signature	Date
[X] Originator	Kolbe Gravatt		Dec. 14, 2011
[X] Checker	Larry Rolwes		12/15/11
[X] Backchecker	Kolbe Gravatt		12-15-11
[X] Updater	Kolbe Gravatt		12-15-11
[X] Validater	Larry Rolwes		12/16/11

Insert an "X" in the box to indicate a required QC activity.

HNTB The HNTB Companies Engineers Architects Planners	Made KDG	Date 12/14/2011	Job Number
	Checked LER	Date 12/15/11	
For Cleveland Innerbelt	Backchk'd KDG	Date 12-15-11	Sheet No.

RFI 00167

The RFI requests the use of oversized holes for all of the connections of the Unit 1, Girder 4 and Girder 5 End Diaphragms.

(and Girder 6)

From BDGS at the ends of Girders 4 and 5 connected to the end diaphragm

Girder 4

	V (k)	M (k*ft)
DC	173.9	2
DW	61.6	5
LL truck	72.2	9
LL lane	42.6	7

Importance Factor = 1.05

Service 2

Vu = 1.05*[1.0*(173.9+61.6) + 1.3*(1.33*(72.2)+42.6)]

Vu = 436 kips

Mu = 1.05*[1.0*(2+5) + 1.3*(1.33*(9)+7)]

Mu = 33.2 k*ft

Girder 5

	V (k)	M (k*ft)
DC	437.8	1
DW	140.3	2
LL truck	37.5	1
LL lane	68.1	2

Importance Factor = 1.05

Service 2

Vu = 1.05*[1.0*(437.8+140.3) + 1.3*(1.33*(37.5)+68.1)]

Vu = 768 kips

Mu = 1.05*[1.0*(1+2) + 1.3*(1.33*(1)+2)]

Mu = 7.7 k*ft

Girder 5 Shear Controls

and Girder 4 Moment Controls

6

$S_{min} = 3.5"$ 3.25"

$S_{edge} = 2.0"$

$S_{max} = (4 + 4t)$ $\frac{30g}{40}$ < 7.0

$= 4 + 4(0.75) = 7"$ OK

Vu = 307 K

Mu = 37.5 K.ft

Girder 6

	V(k)	M(K.ft)
DC	86.4	2
DW	35.7	6
LLT	69.2	10
LLL	38.9	8

For	Cleveland Innerbelt	Job no.	49633	Sheet no.	
Made by	KDG	Checked by	LER	Backchecked by	KDG
Date	Dec. 14, 2011	Date	12/15/11	Date	12-15-11

HNTB

RFI 00167 (Cont.)

These calculations are to Revise the Bolt slip Resistance to include oversized holes

All other checks from the original design are still valid.

At the End of the Stub Girder

$R_n = K_h \cdot K_s \cdot N_s \cdot P_t$ (6.13.2.8-1)

OK (Class A)

$R_n = (0.85)(0.33)(2)(51) = 28.61$ k/bolt

$P_t = 51$ k (1" bolt table 6.13.2.8-1)

$\phi_s = 0.80$ ~~1.0~~

There are 50 bolts in the end of the Stub Girder

$\phi R_n = 0.80(28.61)(50) = 1144$ k ~~1430.5~~

1.0

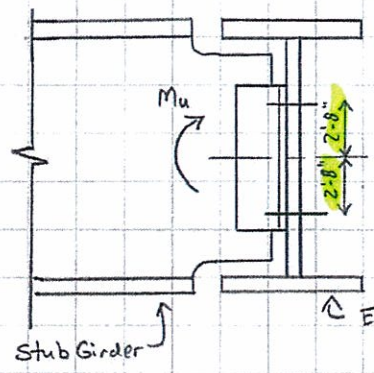
1430.5

1144 > 768

∴ Oversized holes are OK

Connection to End Diaphragm Web - (4)

Find Axial Tension in Bolts



$M_u = 33.2$ k-ft ~~37.5~~ OK

Conservative

$T_u = 33.2$ k-ft ÷ ~~2.667~~ 5.333 ft ÷ 4 bolts = ~~3.11~~ 1.76 k/bolt

Reduction in Slip Resistance for Combine Shear and Axial

$1 - \frac{3.11}{51} = 0.94$ ~~0.97~~ $\frac{1.76}{}$ (6.13.2.11-3)

$R_n = 0.94(K_h \cdot K_s \cdot N_s \cdot P_t)$ ~~0.97~~

$R_n = 0.94(0.85)(0.33)(1)(51) = 13.45$ k/bolt ~~13.88~~

~~0.97~~

There are 68 bolts connecting to the web of the end Diaphragm

$\phi R_n = 0.80(13.45)(68) = 732$ k ~~944 K~~

1.0 13.88

944 > 768 — Conservative

732 > 436 OK

∴ all checks should be OK

∴ oversized holes are OK for Connection to End Diaphragm web ~~on Girder & End Diaphragm~~

ME101-1204

For	Cleveland Innerbelt	Job no.	49633	Sheet no.	
Made by	KDG	Checked by	LER	Backchecked by	KDG
Date	Dec. 14, 2011	Date	12/15/11	Date	12-15-11

HNTB

RFI 00167 (cont.)

Connection to End Diaph. Web - G5

M_u = 7.7 k.ft

T_u = 7.7 ÷ 2.667 ÷ 4 = 0.72 (0.36) k/bolt

Reduction Factor

$1 - \frac{0.72}{51} = 0.99$

$R_n = 0.99\,(0.85)(0.33)(1)(51) = 14.16$ k/bolt

$\phi R_n = 0.80(14.16)(68 \text{ bolts}) = 770$ (963) k

~~770~~ 963 > 768

∴ Oversized holes are OK for connection to End Diaph. web on Girder 5 End Diaph.

Check on previous page covers All Girders this is no longer needed ✓

Connection of End Diaphragm to Adjacent Girder Stiffener

Over sized holes were included in the Original Design
No additional calculations need to be provided.

ME101-1204

BDGS Output – Unit 1 G4

----- CAMBER DATA -----

* * * GIRDER 11 DEAD LOAD CAMBER VALUES: (Positive Values Upward) * * *

Note: Displacements due to removable forms are not included.

	A-DC DEAD LOAD					B-DC DEAD LOAD			DW DEAD LOAD		
	STEEL		CONCRETE						INTEGRAL	FUTURE	
SPAN.LOC		USER		USER	USER	BARR	SDWALK	USER	WEARING	WEARING	UTILS
FRAC	GIRDER	STEEL	SLAB	CONC	ADD.			ADD.	SURFACE	SURFACE	
	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
1.031	0.106	0.000	0.214	0.001	0.000	0.011	0.000	0.000	0.000	0.066	0.000
1.050	0.169	0.000	0.343	0.001	0.000	0.017	0.000	0.000	0.000	0.105	0.000
1.052	0.176	0.000	0.358	0.001	0.000	0.018	0.000	0.000	0.000	0.110	0.000
1.100	0.336	0.000	0.681	0.002	0.000	0.034	0.000	0.000	0.000	0.210	0.000
1.104	0.350	0.000	0.710	0.002	0.000	0.035	0.000	0.000	0.000	0.218	0.000
1.150	0.497	0.000	1.008	0.003	0.000	0.050	0.000	0.000	0.000	0.311	0.000
1.200	0.653	0.000	1.322	0.004	0.000	0.066	0.000	0.000	0.000	0.408	0.000
1.216	0.701	0.000	1.420	0.004	0.000	0.071	0.000	0.000	0.000	0.439	0.000
1.250	0.799	0.000	1.617	0.005	0.000	0.080	0.000	0.000	0.000	0.501	0.000
1.300	0.936	0.000	1.891	0.005	0.000	0.094	0.000	0.000	0.000	0.587	0.000
1.328	1.008	0.000	2.036	0.006	0.000	0.101	0.000	0.000	0.000	0.633	0.000
1.350	1.061	0.000	2.141	0.006	0.000	0.107	0.000	0.000	0.000	0.666	0.000
1.400	1.172	0.000	2.363	0.007	0.000	0.118	0.000	0.000	0.000	0.738	0.000
1.440	1.253	0.000	2.522	0.007	0.000	0.126	0.000	0.000	0.000	0.790	0.000
1.445	1.262	0.000	2.541	0.007	0.000	0.127	0.000	0.000	0.000	0.796	0.000
1.450	1.271	0.000	2.558	0.007	0.000	0.127	0.000	0.000	0.000	0.801	0.000
1.500	1.355	0.000	2.724	0.008	0.000	0.136	0.000	0.000	0.000	0.856	0.000
1.550	1.427	0.000	2.865	0.008	0.000	0.143	0.000	0.000	0.000	0.902	0.000
1.552	1.430	0.000	2.870	0.008	0.000	0.143	0.000	0.000	0.000	0.904	0.000
1.567	1.448	0.000	2.905	0.009	0.000	0.145	0.000	0.000	0.000	0.916	0.000
1.595	1.479	0.000	2.966	0.009	0.000	0.148	0.000	0.000	0.000	0.936	0.000
1.597	1.482	0.000	2.970	0.009	0.000	0.148	0.000	0.000	0.000	0.938	0.000
1.600	1.484	0.000	2.975	0.009	0.000	0.148	0.000	0.000	0.000	0.940	0.000
1.600	1.485	0.000	2.976	0.009	0.000	0.148	0.000	0.000	0.000	0.940	0.000
1.601	1.485	0.000	2.977	0.009	0.000	0.148	0.000	0.000	0.000	0.940	0.000
1.650	1.529	0.000	3.060	0.009	0.000	0.152	0.000	0.000	0.000	0.969	0.000
1.664	1.539	0.000	3.079	0.009	0.000	0.153	0.000	0.000	0.000	0.976	0.000
1.700	1.560	0.000	3.118	0.009	0.000	0.155	0.000	0.000	0.000	0.989	0.000
1.750	1.578	0.000	3.151	0.010	0.000	0.156	0.000	0.000	0.000	1.001	0.000
1.776	1.583	0.000	3.159	0.010	0.000	0.156	0.000	0.000	0.000	1.004	0.000
1.800	1.583	0.000	3.158	0.010	0.000	0.156	0.000	0.000	0.000	1.005	0.000
1.850	1.576	0.000	3.141	0.010	0.000	0.155	0.000	0.000	0.000	1.001	0.000
1.900	1.561	0.000	3.107	0.010	0.000	0.153	0.000	0.000	0.000	0.991	0.000
1.950	1.540	0.000	3.063	0.011	0.000	0.150	0.000	0.000	0.000	0.977	0.000
2.000	1.516	0.000	3.013	0.011	0.000	0.147	0.000	0.000	0.000	0.961	0.000

----- UNFACTORED MOMENT SUMMARY -----

* * * GIRDER 11, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

	DEAD LOAD			HL93		HL93		DOUBLE	COMBINED		FATIGUE	
				TRUCK		LANE		TRUCK	TRUCK+LANE		TRUCK	
SPAN.LOC	A-DC	B-DC	DW									
FRAC	MOMENT	MOMENT	MOMENT	MAX	MIN	MAX	MIN	MIN	MAX	MIN	MAX	MIN
	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)
0.000	0	0	0	2	-1	2	-1	-2	4	-3	1	-1
0.110	0	0	0	2	-6	2	-1	-6	4	-10	1	-5
0.736	-1	0	-1	2	-41	2	-2	-41	5	-56	1	-34
0.890	-2	0	-1	2	-49	2	-2	-49	5	-68	1	-41
1.000	-3	0	-2	2	-56	2	-2	-56	5	-76	1	-46
1.000	-3	0	-2	1	-55	1	-2	-56	1	-76	0	-46
1.000	0	0	-1	1	-55	1	-1	-55	2	-75	0	-46
1.002	30	1	8	14	-55	7	-2	0	26	-74	8	-45
1.010	123	6	37	53	-53	27	-3	0	98	-74	29	-44
1.025	322	17	99	141	-50	71	-7	0	258	-74	76	-42
1.031	396	21	122	165	-49	86	-9	0	306	-73	86	-41
1.050	628	33	194	262	-45	136	-13	0	484	-73	138	-37
1.052	655	34	202	268	-44	137	-14	0	493	-72	140	-37
1.100	1216	63	373	448	-40	251	-26	0	847	-78	230	-29
1.104	1265	66	388	464	-39	257	-27	0	875	-79	237	-28
1.150	1733	91	536	586	-40	353	-39	0	1132	-92	294	-23
1.200	2207	116	683	694	-45	441	-52	0	1364	-112	349	-22
1.216	2353	124	728	744	-49	466	-56	0	1455	-121	373	-24
1.250	2639	139	814	791	-57	515	-65	0	1567	-142	395	-28
1.300	3032	158	929	852	-69	574	-79	0	1706	-171	418	-34
1.328	3238	168	988	884	-76	601	-86	0	1777	-188	430	-38
1.350	3342	175	1030	908	-82	627	-93	0	1834	-202	445	-41
1.400	3557	190	1115	961	-95	677	-107	0	1955	-233	472	-47
1.440	3703	199	1172	989	-105	708	-118	0	2023	-257	489	-52
1.445	3719	200	1178	990	-106	711	-119	0	2028	-260	489	-53
1.445	3719	200	1178	990	-106	711	-119	0	2028	-260	489	-53
1.450	3734	201	1185	988	-108	714	-121	0	2028	-264	485	-54
1.500	3874	209	1238	1006	-120	740	-134	0	2078	-294	488	-60
1.550	3976	214	1275	1015	-132	756	-148	0	2106	-324	491	-66
1.552	3980	214	1276	1018	-133	756	-148	0	2111	-325	493	-66
1.567	3963	213	1279	1023	-135	761	-150	0	2122	-330	498	-67
1.595	3923	212	1282	1024	-138	767	-155	0	2129	-339	494	-69
1.597	3918	212	1282	1023	-139	768	-155	0	2128	-340	492	-69
1.600	3914	212	1282	1022	-139	768	-155	0	2127	-340	491	-69
1.600	3914	212	1283	1017	-140	769	-156	0	2121	-342	488	-70
1.601	3913	212	1282	1017	-140	769	-156	0	2121	-342	488	-70
1.650	3809	208	1274	1021	-146	773	-163	0	2130	-357	490	-73
1.664	3772	206	1268	1036	-147	772	-165	0	2149	-360	504	-73
1.700	3668	201	1249	1016	-150	765	-169	0	2117	-369	487	-75
1.750	3492	193	1207	984	-153	745	-173	0	2054	-376	461	-76
1.776	3385	187	1176	971	-153	726	-173	0	2017	-376	462	-75
1.800	3058	171	1077	921	-142	677	-161	0	1901	-350	442	-70
1.850	2344	134	848	773	-116	550	-131	0	1578	-285	372	-57
1.900	1596	93	594	586	-84	398	-95	0	1177	-208	287	-42

1.950	815	49	313	332	-47	213	-53	0	655	-115	164	-23
2.000	1	1	5	9	-3	7	-4	0	18	-8	4	-2

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 11, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

	DEAD LOAD			HL93		HL93		COMBINED		FATIGUE	
SPAN.LOC	A-DC	B-DC	DW	TRUCK		LANE		TRUCK+LANE		TRUCK	
FRAC	SHEAR (kips)	SHEAR (kips)	SHEAR (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)
0.000	0.0	0.0	0.0	0.2	-24.1	0.2	-0.2	0.4	-32.2	0.1	-20.1
0.110	-0.1	0.0	-0.2	0.2	-24.2	0.2	-0.6	0.4	-32.8	0.1	-20.2
0.736	-1.8	-0.2	-1.0	0.2	-24.2	0.2	-0.6	0.4	-32.8	0.1	-20.2
0.890	-2.4	-0.2	-1.2	0.2	-24.2	0.2	-0.6	0.4	-32.8	0.1	-20.2
1.000	-2.8	-0.3	-1.3	0.2	-34.3	0.2	-1.0	0.4	-46.7	0.1	-22.9
1.000	129.2	6.8	40.1	59.1	-2.2	28.7	-2.5	107.3	-5.4	32.2	-1.1
1.000	129.2	6.8	40.1	58.6	-2.2	28.6	-2.5	106.5	-5.4	31.9	-1.1
1.002	128.8	6.8	40.0	59.0	-2.2	28.6	-2.5	107.1	-5.4	31.9	-1.1
1.010	127.6	6.7	39.5	55.3	-2.2	27.8	-2.5	101.3	-5.4	29.7	-1.1
1.025	124.8	6.6	38.6	55.4	-2.2	27.8	-2.5	101.4	-5.4	29.7	-1.1
1.031	123.8	6.5	38.3	51.7	-3.3	26.2	-2.5	94.9	-6.9	27.4	-2.2
1.050	120.6	6.3	37.1	52.0	-3.3	26.2	-2.5	95.3	-6.9	27.4	-2.2
1.052	120.2	6.3	37.0	51.6	-4.7	25.4	-2.6	94.0	-8.8	27.2	-3.6
1.100	112.1	5.8	34.1	45.0	-8.7	22.9	-3.0	82.8	-14.6	23.3	-5.8
1.104	111.4	5.7	33.8	46.8	-10.1	23.3	-3.2	85.4	-16.5	25.5	-6.5
1.150	97.7	5.3	30.7	40.6	-8.2	21.0	-3.4	75.0	-14.4	21.8	-5.2
1.200	89.6	4.7	27.6	36.1	-11.5	18.9	-4.2	67.0	-19.5	19.3	-7.1
1.216	87.0	4.5	26.4	32.9	-14.8	17.1	-5.2	60.8	-24.9	17.0	-9.2
1.250	81.7	4.2	24.5	33.3	-14.8	17.2	-5.2	61.4	-24.9	17.4	-9.2
1.300	73.9	3.6	21.4	30.0	-17.4	15.6	-6.2	55.5	-29.3	15.5	-10.6
1.328	69.6	3.3	19.8	33.9	-21.9	16.0	-7.6	61.1	-36.8	19.8	-12.9
1.350	46.2	3.1	18.5	32.7	-16.3	15.3	-6.4	58.8	-28.0	19.0	-8.6
1.400	38.7	2.5	15.4	28.2	-19.6	13.3	-7.4	50.9	-33.4	16.2	-10.4
1.440	32.8	2.0	12.8	26.6	-21.3	12.4	-8.1	47.7	-36.5	14.9	-11.8
1.445	32.1	2.0	12.5	23.9	-21.5	11.4	-8.5	43.3	-37.1	12.8	-11.9
1.445	32.1	2.0	12.5	23.9	-21.5	11.4	-8.5	43.3	-37.1	12.8	-11.9
1.450	31.4	1.9	12.2	24.3	-21.5	11.5	-8.5	43.8	-37.1	13.3	-11.9
1.500	23.9	1.3	9.0	22.6	-24.1	10.5	-9.4	40.6	-41.4	12.3	-13.4
1.550	16.6	0.6	5.9	21.7	-26.1	9.8	-10.2	38.7	-44.9	11.8	-14.9
1.552	16.2	0.5	5.6	25.6	-26.3	9.8	-10.1	43.8	-45.0	16.2	-15.0
1.567	-12.4	-0.4	1.7	24.7	-20.8	9.4	-7.6	42.2	-35.2	15.4	-10.5
1.595	-16.5	-0.6	0.1	21.5	-21.7	8.3	-8.1	36.9	-37.0	13.0	-11.1
1.597	-16.8	-0.6	0.0	21.5	-21.7	8.3	-8.1	36.9	-37.0	13.0	-11.1
1.600	-17.2	-0.6	-0.2	21.5	-21.7	8.3	-8.1	36.9	-37.0	13.0	-11.1
1.600	-17.2	-0.7	-0.5	22.4	-21.4	8.3	-8.1	38.0	-36.6	13.5	-11.1
1.601	-17.3	-0.7	-0.5	22.4	-20.5	8.3	-7.7	38.0	-35.0	13.5	-10.5
1.650	-24.4	-1.1	-3.8	19.3	-23.6	7.1	-8.8	32.7	-40.3	11.6	-12.4
1.664	-26.4	-1.2	-4.5	18.5	-24.7	6.5	-9.0	31.1	-41.9	11.0	-13.2
1.700	-31.4	-1.6	-7.3	17.0	-25.3	5.9	-9.5	28.5	-43.1	9.6	-13.6
1.750	-38.3	-2.1	-11.1	13.2	-27.7	4.3	-10.3	21.9	-47.2	7.4	-14.9
1.776	-134.7	-6.8	-41.0	11.3	-38.2	6.2	-22.5	21.2	-73.3	6.8	-18.4
1.800	-137.9	-7.2	-44.0	6.8	-41.6	6.6	-25.5	15.7	-80.8	3.8	-19.9
1.850	-144.7	-7.9	-48.9	6.2	-45.3	7.3	-29.4	15.6	-89.6	3.1	-21.4
1.900	-151.3	-8.6	-54.1	7.3	-55.8	8.3	-35.3	18.1	-109.5	3.6	-27.7
1.950	-157.9	-9.2	-58.9	8.1	-60.8	9.3	-39.8	20.2	-120.7	4.0	-30.3
2.000	-164.3	-9.6	-61.6	8.1	-72.2	9.3	-42.6	20.2	-138.6	4.0	-37.3

----- LOAD COMBINATION TABLES -----

COMBINATION TABLE: 1 LRFD2009 (Default)

#	NAME	CATEGORY	A-DL	B-DL	DW-DL	LL	NU	IMPACT FACT-TRK	IMPACT FACT-LN	ENVELOPE-MOM	ENVELOPE-SHR
1	DC CONSTRUCTIBILITY	STRENGTH-IV	1.500	0.000	0.000	0.000	1.050	0.000	0.000	NONE	
2	DC+DW CONSTRUCTIBILITY	STRENGTH-IV	1.500	1.500	1.500	0.000	1.050	0.000	0.000	NONE	
3	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	MOM-MAX	
4	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	MOM-MIN	

----- LOAD COMBINATION TABLES -----

COMBINATION TABLE: 1 LRFD2009 (Default) (CONTD)

#	NAME	CATEGORY	A-DL	B-DL	DW-DL	LL	NU	IMPACT FACT-TRK	IMPACT FACT-LN	ENVELOPE-MOM	ENVELOPE-SHR
5	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000		SHR-MAX
6	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000		SHR-MIN
7	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000	MOM-MAX	
8	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000	MOM-MIN	
9	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000		SHR-MAX
10	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000		SHR-MIN
11	SERVICE-II	SERVICE-II	1.000	1.000	1.000	1.300	1.000	1.330	1.000	MOM-MAX	
12	SERVICE-II	SERVICE-II	1.000	1.000	1.000	1.300	1.000	1.330	1.000	MOM-MIN	
13	SERVICE-II	SERVICE-II	1.000	1.000	1.000	1.300	1.000	1.330	1.000		SHR-MAX
14	SERVICE-II	SERVICE-II	1.000	1.000	1.000	1.300	1.000	1.330	1.000		SHR-MIN
15	FATIGUE I	FATIGUE-I LL M	1.000	1.000	1.000	1.500	1.000	1.150	1.000	MOM-MAX	
16	FATIGUE I	FATIGUE-I LL M	1.000	1.000	1.000	1.500	1.000	1.150	1.000	MOM-MIN	
17	FATIGUE I	FATIGUE-I LL V	1.000	1.000	1.000	1.500	1.000	1.150	1.000		SHR-MAX
18	FATIGUE I	FATIGUE-I LL V	1.000	1.000	1.000	1.500	1.000	1.150	1.000		SHR-MIN
19	FATIGUE WEB	FATIGUE-LL V WEB	1.000	1.000	1.000	1.500	1.000	1.150	1.000		SHR-MAX
20	FATIGUE WEB	FATIGUE-LL V WEB	1.000	1.000	1.000	1.500	1.000	1.150	1.000		SHR-MIN
21	FATIGUE II	FATIGUE-II LL M	1.000	1.000	1.000	0.750	1.000	1.150	1.000	MOM-MAX	
22	FATIGUE II	FATIGUE-II LL M	1.000	1.000	1.000	0.750	1.000	1.150	1.000	MOM-MIN	
23	FATIGUE II	FATIGUE-II LL V	1.000	1.000	1.000	0.750	1.000	1.150	1.000		SHR-MAX
24	FATIGUE II	FATIGUE-II LL V	1.000	1.000	1.000	0.750	1.000	1.150	1.000		SHR-MIN

BDGS Output – Unit 1 G5

1.767	0.743	0.000	1.433	-0.009	0.000	0.067	0.000	0.000	0.000	0.464	0.000
1.790	0.648	0.000	1.245	-0.008	0.000	0.057	0.000	0.000	0.000	0.401	0.000
1.796	0.623	0.000	1.196	-0.008	0.000	0.055	0.000	0.000	0.000	0.385	0.000
1.800	0.609	0.000	1.168	-0.008	0.000	0.054	0.000	0.000	0.000	0.376	0.000
1.809	0.575	0.000	1.102	-0.008	0.000	0.051	0.000	0.000	0.000	0.354	0.000
1.814	0.557	0.000	1.065	-0.008	0.000	0.049	0.000	0.000	0.000	0.341	0.000
1.826	0.508	0.000	0.971	-0.007	0.000	0.044	0.000	0.000	0.000	0.310	0.000
1.837	0.468	0.000	0.893	-0.007	0.000	0.040	0.000	0.000	0.000	0.284	0.000
1.850	0.420	0.000	0.798	-0.006	0.000	0.036	0.000	0.000	0.000	0.252	0.000
1.856	0.399	0.000	0.757	-0.006	0.000	0.034	0.000	0.000	0.000	0.238	0.000
1.860	0.384	0.000	0.728	-0.006	0.000	0.032	0.000	0.000	0.000	0.229	0.000
1.883	0.303	0.000	0.572	-0.005	0.000	0.025	0.000	0.000	0.000	0.177	0.000
1.886	0.296	0.000	0.558	-0.005	0.000	0.024	0.000	0.000	0.000	0.172	0.000
1.900	0.249	0.000	0.468	-0.005	0.000	0.020	0.000	0.000	0.000	0.143	0.000
1.907	0.228	0.000	0.428	-0.004	0.000	0.018	0.000	0.000	0.000	0.130	0.000
1.915	0.201	0.000	0.378	-0.004	0.000	0.016	0.000	0.000	0.000	0.113	0.000
1.930	0.158	0.000	0.296	-0.003	0.000	0.012	0.000	0.000	0.000	0.087	0.000
1.945	0.118	0.000	0.220	-0.003	0.000	0.009	0.000	0.000	0.000	0.063	0.000
1.950	0.105	0.000	0.196	-0.003	0.000	0.008	0.000	0.000	0.000	0.056	0.000
1.953	0.097	0.000	0.180	-0.002	0.000	0.007	0.000	0.000	0.000	0.051	0.000
1.973	0.052	0.000	0.097	-0.001	0.000	0.004	0.000	0.000	0.000	0.026	0.000
1.977	0.043	0.000	0.081	-0.001	0.000	0.003	0.000	0.000	0.000	0.021	0.000
1.999	0.002	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.011	-0.001	0.000	-0.002	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
2.050	-0.005	0.000	-0.010	0.000	0.000	-0.001	0.000	0.000	0.000	-0.004	0.000
2.100	-0.010	0.000	-0.019	0.001	0.000	-0.001	0.000	0.000	0.000	-0.008	0.000
2.150	-0.013	0.000	-0.027	0.001	0.000	-0.001	0.000	0.000	0.000	-0.011	0.000
2.200	-0.017	0.000	-0.033	0.002	0.000	-0.002	0.000	0.000	0.000	-0.013	0.000
2.250	-0.019	0.000	-0.038	0.002	0.000	-0.002	0.000	0.000	0.000	-0.015	0.000
2.259	-0.019	0.000	-0.039	0.002	0.000	-0.002	0.000	0.000	0.000	-0.016	0.000
2.300	-0.021	0.000	-0.042	0.002	0.000	-0.002	0.000	0.000	0.000	-0.017	0.000
2.350	-0.022	0.000	-0.045	0.003	0.000	-0.002	0.000	0.000	0.000	-0.018	0.000
2.400	-0.023	0.000	-0.047	0.003	0.000	-0.002	0.000	0.000	0.000	-0.018	0.000
2.450	-0.024	0.000	-0.049	0.004	0.000	-0.002	0.000	0.000	0.000	-0.018	0.000
2.500	-0.024	0.000	-0.049	0.004	0.000	-0.002	0.000	0.000	0.000	-0.018	0.000
2.518	-0.024	0.000	-0.049	0.004	0.000	-0.002	0.000	0.000	0.000	-0.018	0.000
2.550	-0.023	0.000	-0.048	0.004	0.000	-0.002	0.000	0.000	0.000	-0.018	0.000

HNTB BRIDGE DESIGN PROGRAM BDGS VERSION 2.9.1.0 PAGE 42
RUN TIME: 05/03/2011 13:25:17.893 OUTPUT
Filename: N:\49633\Bridges\Design\Final Design\Unit 1\BDGS\Revised041411\Clean\2010 LRFD\G5.OUT

----- CAMBER DATA -----

* * * GIRDER 12 DEAD LOAD CAMBER VALUES: (Positive Values Upward) * * *

Note: Displacements due to removable forms are not included.

	A-DC DEAD LOAD					B-DC DEAD LOAD			DW DEAD LOAD		
	STEEL		CONCRETE					INTEGRAL	FUTURE		
SPAN.LOC FRAC	GIRDER	USER STEEL	SLAB	USER CONC	USER ADD.	BARR	SDWALK	USER ADD.	WEARING SURFACE	WEARING SURFACE	UTILS
	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(in)
2.600	-0.022	0.000	-0.045	0.005	0.000	-0.002	0.000	0.000	0.000	-0.017	0.000
2.650	-0.020	0.000	-0.042	0.005	0.000	-0.002	0.000	0.000	0.000	-0.016	0.000
2.700	-0.018	0.000	-0.039	0.006	0.000	-0.001	0.000	0.000	0.000	-0.014	0.000
2.750	-0.016	0.000	-0.035	0.006	0.000	-0.001	0.000	0.000	0.000	-0.013	0.000
2.800	-0.014	0.000	-0.030	0.007	0.000	-0.001	0.000	0.000	0.000	-0.011	0.000
2.850	-0.012	0.000	-0.026	0.007	0.000	0.000	0.000	0.000	0.000	-0.009	0.000
2.900	-0.009	0.000	-0.021	0.008	0.000	0.000	0.000	0.000	0.000	-0.007	0.000
2.950	-0.006	0.000	-0.016	0.008	0.000	0.000	0.000	0.000	0.000	-0.005	0.000
3.000	-0.004	0.000	-0.011	0.009	0.000	0.001	0.000	0.000	0.000	-0.003	0.000

HNTB BRIDGE DESIGN PROGRAM BDGS VERSION 2.9.1.0 PAGE 43
RUN TIME: 05/03/2011 13:25:17.893 OUTPUT
Filename: N:\49633\Bridges\Design\Final Design\Unit 1\BDGS\Revised041411\Clean\2010 LRFD\G5.OUT

----- UNFACTORED MOMENT SUMMARY -----

* * * GIRDER 12, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

	DEAD LOAD			HL93 TRUCK		HL93 LANE		DOUBLE TRUCK	COMBINED TRUCK+LANE		FATIGUE TRUCK	
SPAN.LOC FRAC	A-DC MOMENT (ft-k)	B-DC MOMENT (ft-k)	DW MOMENT (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)
0.000	0	0	0	0	0	0	0	0	0	0	0	0
0.109	0	0	0	0	-6	0	0	-6	0	-8	0	-5
0.891	-2	0	-1	0	-51	0	-1	-51	0	-69	0	-42
0.914	-2	0	-1	0	-52	0	-1	-52	0	-70	0	-43
1.000	-3	0	-2	0	-57	0	-1	-57	0	-77	0	-47
1.000	-3	0	-1	2	-57	2	-2	-57	5	-78	1	-47
1.000	0	0	0	3	-57	2	-2	0	6	-78	1	-47
1.010	227	12	75	107	-53	50	-5	0	192	-76	57	-44
1.020	459	25	152	203	-49	100	-10	0	370	-75	107	-41
1.027	599	32	199	267	-46	131	-13	0	486	-74	140	-39
1.031	684	37	227	287	-44	144	-14	0	526	-73	146	-37
1.034	753	41	250	314	-43	158	-16	0	575	-73	161	-36
1.034	767	42	254	320	-43	161	-16	0	587	-73	164	-36
1.050	1088	59	361	439	-41	227	-23	0	810	-77	223	-31
1.053	1156	62	383	462	-40	240	-25	0	855	-78	234	-30
1.068	1435	77	475	542	-39	291	-31	0	1013	-83	270	-25
1.080	1657	90	551	600	-39	338	-37	0	1136	-88	295	-23
1.100	1995	108	665	699	-39	404	-45	0	1334	-98	346	-20
1.107	2104	114	702	712	-42	424	-48	0	1371	-104	346	-21
1.126	2398	130	801	791	-49	478	-56	0	1530	-122	393	-24
1.133	2506	135	838	799	-52	497	-60	0	1559	-129	386	-26
1.150	2734	147	914	850	-58	534	-67	0	1665	-144	416	-29
1.160	2865	154	958	855	-62	554	-71	0	1691	-154	408	-31
1.184	3152	169	1053	912	-71	596	-81	0	1808	-176	439	-35
1.187	3177	170	1061	913	-72	601	-82	0	1815	-178	437	-36

BDGS Output – Unit 1 G5

1.200	3298	176	1103	939	-76	625	-87	0	1873	-188	452	-38
1.214	3412	182	1141	952	-80	648	-92	0	1914	-199	463	-40
1.233	3554	188	1189	997	-86	675	-99	0	2001	-214	486	-43
1.233	3554	188	1189	997	-86	675	-99	0	2001	-214	486	-43
1.240	3605	191	1206	1012	-89	684	-102	0	2030	-220	495	-44
1.243	3619	191	1211	1012	-89	684	-103	0	2030	-221	494	-44
1.250	3665	193	1226	1009	-92	691	-105	0	2033	-227	487	-46
1.267	3755	197	1255	1028	-97	706	-112	0	2072	-241	497	-48
1.294	3864	200	1289	1030	-106	715	-121	0	2085	-261	492	-52
1.300	3883	200	1295	1026	-107	714	-123	0	2078	-266	488	-53
1.301	3886	200	1296	1029	-107	714	-123	0	2082	-266	490	-53
1.320	3917	200	1306	1031	-113	723	-130	0	2094	-281	491	-56
1.323	3919	199	1306	1026	-114	721	-130	0	2086	-281	487	-56
1.326	3922	199	1307	1019	-115	722	-132	0	2078	-284	480	-57
1.330	3924	199	1307	1023	-116	723	-133	0	2083	-287	488	-57
1.331	3925	199	1307	1025	-116	723	-133	0	2087	-288	491	-58
1.347	3924	198	1306	1021	-121	724	-139	0	2081	-300	488	-60
1.350	3922	197	1305	1014	-121	721	-139	0	2070	-301	476	-60
1.359	3914	196	1302	1024	-124	721	-143	0	2083	-308	493	-62
1.374	3891	194	1293	1003	-129	714	-148	0	2048	-319	470	-64
1.400	3818	189	1267	969	-137	695	-158	0	1983	-340	452	-68
1.400	3817	189	1267	968	-137	695	-158	0	1982	-340	452	-68
1.417	3750	184	1243	957	-143	680	-164	0	1953	-355	451	-71
1.427	3792	186	1258	956	-150	687	-173	0	1959	-373	453	-74
1.450	3870	189	1287	957	-169	700	-194	0	1973	-418	449	-83
1.454	3881	190	1291	960	-172	702	-198	0	1979	-426	455	-85
1.476	3924	192	1312	982	-192	715	-221	0	2021	-476	472	-94
1.480	3931	193	1316	977	-196	716	-226	0	2016	-487	464	-97
1.500	3943	195	1332	992	-218	727	-251	0	2046	-540	465	-107
1.502	3943	195	1333	996	-220	728	-253	0	2053	-546	468	-108
1.507	3942	195	1337	1009	-226	731	-260	0	2073	-561	476	-111
1.533	3919	197	1348	1048	-257	747	-296	0	2141	-638	476	-126

----- UNFACTORED MOMENT SUMMARY ----------

* * * GIRDER 12, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

	DEAD LOAD			HL93		HL93		DOUBLE	COMBINED		FATIGUE	
SPAN.LOC	A-DC	B-DC	DW	TRUCK		LANE		TRUCK	TRUCK+LANE		TRUCK	
FRAC	MOMENT (ft-k)	MOMENT (ft-k)	MOMENT (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)
1.534	3917	197	1351	1056	-260	752	-299	0	2157	-644	480	-128
1.550	3663	185	1272	1049	-268	749	-309	0	2144	-666	482	-132
1.557	3546	179	1236	1056	-272	747	-313	0	2152	-675	491	-134
1.580	3139	159	1110	1046	-284	733	-328	0	2124	-706	494	-140
1.592	2924	148	1043	1038	-291	722	-335	0	2102	-722	492	-143
1.600	2772	141	995	1022	-295	712	-340	0	2071	-733	483	-146
1.604	2699	137	972	1021	-297	708	-342	0	2066	-738	487	-147
1.627	2224	114	823	984	-310	672	-357	0	1981	-770	468	-154
1.650	1724	90	666	937	-323	625	-372	0	1871	-802	440	-160
1.650	1718	90	664	937	-323	624	-372	0	1870	-802	440	-161
1.650	1716	90	664	937	-323	625	-372	0	1871	-802	441	-161
1.674	1201	65	500	899	-336	581	-387	0	1776	-835	429	-167
1.697	652	39	326	853	-350	527	-402	0	1662	-867	410	-174
1.700	578	36	302	845	-351	519	-404	0	1643	-871	403	-175
1.709	369	26	235	831	-356	497	-410	0	1601	-883	400	-178
1.716	189	17	177	809	-360	476	-415	0	1551	-893	389	-180
1.716	189	17	177	809	-360	476	-415	0	1551	-893	389	-180
1.720	71	12	140	797	-363	463	-418	0	1523	-900	383	-181
1.723	0	8	117	783	-364	455	-419	0	1496	-904	373	-182
1.744	-542	-18	-57	734	-376	393	-435	-617	1370	-1130	347	-187
1.750	-716	-26	-113	704	-379	373	-442	-624	1309	-1145	321	-189
1.767	-1183	-48	-263	670	-389	323	-463	-640	1214	-1183	306	-194
1.767	-1187	-48	-264	670	-389	324	-463	-640	1215	-1183	306	-195
1.790	-1853	-79	-479	612	-403	270	-504	-663	1084	-1247	275	-202
1.796	-2037	-88	-538	599	-407	256	-516	-669	1052	-1265	270	-204
1.800	-2142	-93	-573	581	-409	248	-524	-672	1021	-1276	257	-205
1.809	-2404	-105	-658	561	-414	229	-545	-680	975	-1305	249	-207
1.814	-2551	-112	-705	545	-417	219	-558	-685	945	-1322	240	-209
1.826	-2944	-130	-832	510	-424	193	-592	-697	871	-1368	222	-213
1.837	-3279	-147	-944	476	-431	175	-624	-708	807	-1409	207	-216
1.850	-3705	-167	-1086	429	-439	151	-665	-722	721	-1462	187	-221
1.856	-3899	-176	-1150	419	-443	142	-685	-727	699	-1487	190	-222
1.860	-4040	-183	-1197	402	-446	135	-700	-732	669	-1506	183	-224
1.883	-4837	-221	-1462	325	-461	97	-788	-756	530	-1614	156	-231
1.886	-4913	-225	-1486	320	-462	94	-796	-761	520	-1627	156	-232
1.900	-5418	-251	-1668	272	-472	73	-859	-814	435	-1748	137	-237
1.907	-5660	-263	-1755	254	-476	64	-891	-843	402	-1810	129	-239
1.915	-5972	-279	-1867	231	-482	53	-931	-878	361	-1888	122	-242
1.930	-6519	-307	-2062	184	-493	50	-1008	-942	294	-2035	96	-248
1.945	-7089	-337	-2266	138	-514	54	-1093	-1011	237	-2193	79	-262
1.950	-7279	-347	-2340	121	-530	55	-1124	-1036	216	-2252	72	-273
1.953	-7410	-355	-2391	109	-545	56	-1146	-1053	201	-2292	63	-281
1.973	-8165	-397	-2685	91	-632	62	-1278	-1156	183	-2533	44	-326
1.977	-8332	-406	-2750	91	-653	63	-1308	-1179	184	-2589	44	-337
1.999	-9234	-456	-3100	90	-763	70	-1478	-1307	189	-2896	45	-394
2.000	-9288	-459	-3121	90	-770	70	-1489	-1316	190	-2915	45	-397
2.000	-9288	-459	-3121	89	-770	70	-1489	-1316	189	-2915	44	-397
2.011	-9195	-455	-3090	89	-763	70	-1473	-1303	187	-2886	44	-393
2.050	-8850	-438	-2974	86	-737	67	-1416	-1256	181	-2777	43	-380
2.100	-8415	-416	-2828	82	-703	64	-1344	-1196	173	-2641	41	-362
2.150	-7982	-395	-2682	78	-669	61	-1273	-1137	165	-2507	39	-345
2.200	-7552	-374	-2538	74	-636	58	-1204	-1078	157	-2374	38	-327
2.250	-7124	-352	-2393	74	-602	55	-1135	-1018	154	-2241	50	-310
2.259	-7045	-349	-2367	76	-596	55	-1123	-1007	156	-2216	50	-307
2.300	-6698	-331	-2250	87	-569	52	-1067	-959	168	-2108	54	-292
2.350	-6274	-310	-2107	100	-535	49	-999	-899	182	-1976	61	-275
2.400	-5853	-289	-1964	110	-502	46	-931	-839	193	-1843	66	-257

BDGS Output – Unit 1 G5

----- UNFACTORED MOMENT SUMMARY -----

* * * GIRDER 12, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

SPAN.LOC FRAC	DEAD LOAD A-DC MOMENT (ft-k)	DEAD LOAD B-DC MOMENT (ft-k)	DW MOMENT (ft-k)	HL93 TRUCK MAX (ft-k)	HL93 TRUCK MIN (ft-k)	HL93 LANE MAX (ft-k)	HL93 LANE MIN (ft-k)	DOUBLE TRUCK MIN (ft-k)	COMBINED TRUCK+LANE MAX (ft-k)	COMBINED TRUCK+LANE MIN (ft-k)	FATIGUE TRUCK MAX (ft-k)	FATIGUE TRUCK MIN (ft-k)
2.450	-5434	-268	-1822	118	-468	43	-864	-781	200	-1712	69	-239
2.500	-5017	-247	-1680	124	-433	40	-795	-722	205	-1581	72	-223
2.518	-4864	-240	-1628	129	-421	39	-770	-701	210	-1532	74	-216
2.550	-4538	-224	-1520	127	-394	36	-721	-656	205	-1435	73	-202
2.600	-4025	-199	-1351	127	-352	33	-643	-586	201	-1280	72	-181
2.650	-3514	-174	-1181	123	-309	29	-565	-515	193	-1124	71	-159
2.700	-3006	-149	-1012	117	-266	25	-486	-443	180	-967	68	-137
2.750	-2499	-124	-843	106	-223	21	-406	-371	162	-810	63	-114
2.800	-1995	-99	-674	92	-179	17	-326	-298	140	-650	56	-92
2.850	-1493	-75	-506	75	-135	13	-246	-225	113	-490	45	-69
2.900	-994	-50	-338	54	-91	9	-165	-151	81	-329	33	-47
2.950	-496	-25	-170	29	-46	5	-84	-76	44	-167	18	-24
3.000	-1	0	-2	1	-1	0	-2	-2	1	-4	0	-1

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 12, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

SPAN.LOC FRAC	DEAD LOAD A-DC SHEAR (kips)	DEAD LOAD B-DC SHEAR (kips)	DW SHEAR (kips)	HL93 TRUCK MAX (kips)	HL93 TRUCK MIN (kips)	HL93 LANE MAX (kips)	HL93 LANE MIN (kips)	COMBINED TRUCK+LANE MAX (kips)	COMBINED TRUCK+LANE MIN (kips)	FATIGUE TRUCK MAX (kips)	FATIGUE TRUCK MIN (kips)
0.000	0.0	0.0	0.0	0.0	-24.6	0.0	-0.2	0.0	-32.8	0.0	-20.5
0.109	-0.1	0.0	-0.1	0.0	-24.7	0.0	-0.6	0.0	-33.5	0.0	-20.6
0.891	-2.7	-0.2	-1.2	0.0	-24.7	0.0	-0.6	0.0	-33.5	0.0	-20.6
0.914	-2.8	-0.2	-1.3	0.0	-24.7	0.0	-0.6	0.0	-33.5	0.0	-20.6
1.000	-3.1	-0.3	-1.4	0.0	-33.4	0.0	-1.0	0.0	-45.5	0.0	-22.7
1.000	121.0	6.6	40.2	58.9	-2.1	27.0	-2.4	105.4	-5.2	32.0	-1.0
1.000	121.0	6.6	40.2	58.8	-2.1	26.9	-2.4	105.2	-5.2	31.7	-1.0
1.010	117.7	6.4	39.1	55.4	-2.1	26.1	-2.4	99.8	-5.2	29.5	-1.0
1.020	114.3	6.2	38.0	51.7	-3.2	24.5	-2.4	93.2	-6.7	27.1	-2.2
1.027	112.1	6.1	37.2	51.7	-3.2	24.5	-2.4	93.3	-6.7	27.2	-2.2
1.031	110.8	6.0	36.8	48.7	-4.9	23.1	-2.4	87.8	-8.9	25.1	-3.8
1.034	109.8	5.9	36.4	48.7	-4.9	23.1	-2.4	87.8	-8.9	25.1	-3.8
1.034	109.6	5.9	36.4	48.7	-4.9	23.1	-2.4	87.8	-8.9	25.1	-3.8
1.050	104.5	5.6	34.6	45.9	-8.7	21.7	-2.8	82.7	-14.3	23.4	-5.8
1.053	103.4	5.5	34.2	45.5	-10.1	21.4	-3.0	81.9	-16.4	23.3	-6.6
1.068	98.7	5.3	32.5	45.8	-12.7	21.4	-3.4	82.3	-20.4	24.7	-7.9
1.080	90.7	5.0	30.8	39.9	-10.1	19.4	-3.3	72.5	-16.7	21.2	-6.0
1.100	84.3	4.6	28.6	39.7	-12.8	18.7	-3.9	71.5	-21.0	21.1	-7.9
1.107	82.2	4.4	27.8	36.1	-13.0	17.5	-4.1	65.6	-21.4	18.9	-8.0
1.126	76.1	4.1	25.6	32.7	-16.4	15.9	-5.1	59.4	-26.9	16.6	-10.0
1.133	73.7	3.9	24.8	33.4	-16.4	16.0	-5.1	60.4	-26.9	17.1	-10.0
1.150	68.5	3.6	22.9	29.5	-19.3	14.4	-6.1	53.7	-31.7	14.7	-11.5
1.160	65.3	3.4	21.8	30.1	-19.3	14.5	-6.1	54.6	-31.7	15.2	-11.5
1.184	57.9	2.9	19.1	35.6	-24.7	15.0	-7.6	62.3	-40.4	20.2	-13.9
1.187	49.6	2.5	17.0	35.0	-17.1	14.7	-5.5	61.2	-28.3	19.8	-8.5
1.200	45.5	2.2	15.5	30.9	-18.0	13.1	-6.0	54.2	-29.9	17.0	-9.1
1.214	41.4	2.0	14.0	31.6	-18.0	13.3	-6.0	55.3	-29.9	17.6	-9.1
1.233	35.6	1.6	11.9	28.6	-21.8	11.7	-7.2	49.8	-36.3	15.5	-11.7
1.233	35.6	1.6	11.9	28.6	-21.8	11.7	-7.2	49.8	-36.3	15.5	-11.7
1.240	33.3	1.4	11.1	29.0	-23.2	11.6	-7.6	50.2	-38.5	15.9	-12.7
1.243	32.5	1.4	10.8	28.8	-22.7	11.5	-7.5	49.7	-37.8	15.7	-12.3
1.250	30.2	1.2	10.0	25.5	-23.0	10.4	-7.9	44.3	-38.5	13.5	-12.5
1.267	25.0	0.9	8.2	26.1	-22.8	10.6	-7.9	45.3	-38.2	14.1	-12.5

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 12, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

SPAN.LOC FRAC	DEAD LOAD A-DC SHEAR (kips)	DEAD LOAD B-DC SHEAR (kips)	DW SHEAR (kips)	HL93 TRUCK MAX (kips)	HL93 TRUCK MIN (kips)	HL93 LANE MAX (kips)	HL93 LANE MIN (kips)	COMBINED TRUCK+LANE MAX (kips)	COMBINED TRUCK+LANE MIN (kips)	FATIGUE TRUCK MAX (kips)	FATIGUE TRUCK MIN (kips)
1.294	16.9	0.4	5.2	22.5	-28.8	8.8	-10.2	38.7	-48.4	11.8	-16.6
1.300	15.0	0.2	4.5	22.5	-28.0	8.8	-9.9	38.7	-47.1	11.8	-16.0
1.301	14.7	0.2	4.4	28.2	-29.1	10.0	-10.3	47.4	-48.9	16.9	-16.8
1.320	5.4	-0.2	1.7	24.1	-24.1	8.6	-9.3	40.6	-41.4	14.1	-12.7
1.323	4.7	-0.2	1.5	24.1	-23.4	8.6	-9.1	40.6	-40.2	14.1	-12.1
1.326	3.6	-0.3	1.1	24.1	-23.2	8.6	-9.1	40.6	-40.0	14.1	-12.1
1.330	2.6	-0.3	0.7	24.1	-23.2	8.6	-9.1	40.6	-40.0	14.1	-12.1
1.331	2.2	-0.3	0.6	24.1	-23.2	8.6	-9.1	40.6	-40.0	14.1	-12.1
1.347	-2.5	-0.5	-1.1	21.6	-26.4	7.6	-10.3	36.3	-45.4	12.5	-14.2
1.350	-3.4	-0.6	-1.3	21.6	-25.1	7.6	-10.2	36.3	-43.5	12.5	-13.5
1.359	-6.1	-0.7	-2.3	20.9	-27.9	7.2	-11.0	35.0	-48.1	11.9	-15.2
1.374	-10.4	-0.9	-3.8	19.9	-28.6	7.0	-11.5	33.4	-49.6	11.4	-15.7
1.400	-18.0	-1.2	-6.3	16.3	-30.8	5.8	-12.9	27.4	-53.9	8.9	-17.2
1.400	-18.1	-1.2	-6.3	17.5	-30.8	6.3	-12.9	29.6	-53.9	9.8	-17.2
1.417	23.7	1.0	8.2	30.5	-33.0	11.8	-14.0	52.3	-57.8	17.4	-18.9
1.427	20.9	1.0	8.0	31.1	-20.6	12.3	-12.6	53.7	-40.0	17.3	-11.3
1.450	14.5	0.7	5.6	27.9	-20.8	10.8	-13.3	47.9	-40.9	14.2	-11.8
1.454	13.4	0.8	6.5	30.8	-20.8	12.1	-13.3	53.0	-40.9	15.5	-11.8
1.476	7.3	0.5	4.2	28.5	-22.4	11.1	-14.4	48.9	-44.2	14.1	-13.4
1.480	6.0	0.7	5.2	30.8	-22.5	12.3	-14.5	53.3	-44.5	14.8	-13.4

BDGS Output – Unit 1 G5

1.500	0.6	0.4	3.2	28.0	-20.7	11.6	-14.6	48.9	-42.2	13.0	-12.6
1.502	0.0	0.4	2.9	28.0	-20.7	11.6	-14.6	48.9	-42.2	13.0	-12.6
1.507	-1.4	0.5	3.7	31.2	-20.7	13.1	-14.6	54.7	-42.2	14.6	-12.6
1.533	-8.3	0.1	1.1	28.5	-22.5	12.6	-15.4	50.6	-45.3	13.7	-14.4
1.534	-78.5	-4.0	-24.2	32.6	-25.8	12.6	-15.7	56.0	-50.1	19.5	-15.2
1.550	-83.9	-4.2	-26.0	28.8	-27.4	9.3	-14.3	47.5	-50.7	16.9	-13.8
1.557	-86.2	-4.3	-26.8	27.3	-28.5	8.7	-14.9	45.0	-52.8	16.0	-14.7
1.580	-93.9	-4.6	-29.3	24.6	-30.4	7.5	-15.9	40.2	-56.4	14.2	-16.2
1.592	-97.7	-4.8	-30.5	22.9	-31.3	6.9	-16.5	37.3	-58.1	13.1	-16.9
1.600	-100.3	-4.9	-31.3	22.9	-31.3	6.9	-16.5	37.3	-58.1	13.1	-16.9
1.604	-101.5	-4.9	-31.8	21.2	-32.7	6.3	-17.3	34.6	-60.8	12.1	-18.1
1.627	-109.0	-5.3	-34.3	17.5	-35.1	5.1	-19.0	28.3	-65.6	9.6	-19.9
1.650	-116.2	-5.6	-36.7	17.4	-37.6	4.9	-20.0	28.0	-70.1	9.5	-21.7
1.650	-116.3	-5.6	-36.7	22.7	-37.7	6.2	-20.1	36.5	-70.2	14.3	-21.8
1.650	-110.7	-5.3	-35.1	20.8	-31.4	5.8	-18.6	33.4	-60.3	13.2	-16.3
1.674	-118.0	-5.6	-37.5	16.8	-33.6	4.5	-20.1	26.9	-64.7	10.7	-17.8
1.697	-125.2	-6.0	-40.0	16.2	-35.9	4.2	-21.2	25.8	-68.9	10.5	-19.4
1.700	-126.1	-6.0	-40.3	16.4	-35.3	4.2	-21.1	26.1	-68.0	10.5	-18.9
1.709	-128.7	-6.1	-41.2	15.0	-36.8	3.8	-21.9	23.8	-70.8	9.6	-20.1
1.716	-130.9	-6.2	-42.0	14.3	-37.5	3.6	-22.3	22.6	-72.2	9.1	-20.7
1.716	-130.9	-6.2	-42.0	14.3	-37.5	3.6	-22.3	22.6	-72.2	9.1	-20.7
1.720	-132.3	-6.3	-42.5	12.4	-38.1	3.0	-23.1	19.5	-73.7	7.6	-21.2
1.723	-133.2	-6.3	-42.7	12.4	-37.4	3.0	-22.9	19.5	-72.7	7.6	-20.6
1.744	-139.6	-6.6	-44.9	11.2	-40.0	2.5	-24.5	17.4	-77.8	6.6	-22.8
1.750	-141.5	-6.7	-45.6	11.2	-39.4	2.5	-24.4	17.4	-76.8	6.6	-22.3
1.767	-146.6	-6.9	-47.3	15.6	-42.1	3.5	-25.7	24.2	-81.7	9.9	-24.7
1.767	-144.1	-6.8	-46.5	13.1	-36.0	2.9	-24.2	20.2	-72.1	8.3	-19.4
1.790	-151.2	-7.1	-49.0	12.6	-38.0	2.6	-25.2	19.3	-75.8	8.0	-20.8
1.796	-153.0	-7.2	-49.6	11.1	-38.4	2.3	-25.7	17.0	-76.7	7.1	-21.0
1.800	-154.1	-7.2	-50.0	11.1	-38.4	2.3	-25.7	17.0	-76.7	7.1	-21.0
1.809	-156.7	-7.4	-50.9	10.5	-39.6	2.1	-26.3	16.0	-79.0	6.8	-22.0
1.814	-158.4	-7.4	-51.4	9.3	-40.1	1.8	-26.9	14.1	-80.2	6.0	-22.4
1.826	-162.8	-7.8	-53.8	13.4	-41.1	2.7	-27.4	20.5	-82.1	8.7	-23.2
1.837	-164.6	-7.9	-55.0	10.1	-37.9	1.8	-27.5	15.3	-77.9	6.6	-20.4
1.850	-169.2	-8.1	-56.4	10.1	-37.5	1.8	-27.4	15.3	-77.3	6.6	-20.0
1.856	-171.2	-8.2	-57.0	9.7	-39.8	1.6	-28.4	14.6	-81.3	6.3	-21.8
1.860	-172.7	-8.3	-57.5	7.4	-40.0	1.5	-29.1	11.3	-82.3	4.8	-22.0
1.883	-180.6	-8.6	-60.1	7.2	-41.9	1.5	-30.3	11.1	-86.0	4.7	-23.8
1.886	-181.4	-9.3	-64.6	9.1	-42.1	1.7	-31.1	13.8	-87.1	6.2	-23.9
1.900	-184.1	-9.5	-66.1	8.0	-40.2	1.7	-31.5	12.3	-84.9	5.1	-21.5

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 12, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

SPAN.LOC FRAC	DEAD LOAD A-DC SHEAR (kips)	DEAD LOAD B-DC SHEAR (kips)	DEAD LOAD DW SHEAR (kips)	HL93 TRUCK MAX (kips)	HL93 TRUCK MIN (kips)	HL93 LANE MAX (kips)	HL93 LANE MIN (kips)	COMBINED TRUCK+LANE MAX (kips)	COMBINED TRUCK+LANE MIN (kips)	FATIGUE TRUCK MAX (kips)	FATIGUE TRUCK MIN (kips)
1.907	-186.4	-9.6	-67.0	6.6	-42.4	1.7	-32.8	10.5	-89.1	4.3	-23.1
1.915	-189.3	-9.8	-67.9	5.0	-43.4	1.7	-33.6	8.4	-91.4	3.4	-23.9
1.930	-194.2	-10.0	-69.6	3.4	-44.8	1.8	-34.9	6.3	-94.4	2.3	-25.0
1.945	-199.1	-11.1	-77.3	4.1	-46.7	2.0	-37.6	7.4	-99.7	2.8	-26.2
1.950	-199.5	-11.2	-77.8	4.1	-47.1	2.0	-38.0	7.5	-100.7	2.5	-26.0
1.953	-200.6	-11.3	-78.4	2.9	-47.3	2.0	-39.0	5.9	-101.9	1.6	-26.1
1.973	-206.9	-11.5	-80.4	2.7	-49.2	2.0	-40.0	5.6	-105.4	1.4	-27.8
1.977	-208.2	-11.6	-81.0	2.0	-49.5	2.1	-41.2	4.7	-107.0	1.1	-28.0
1.999	-215.3	-11.9	-83.3	2.0	-51.7	2.1	-42.3	4.7	-111.1	1.1	-29.8
2.000	-215.8	-12.0	-83.4	2.0	-51.8	2.1	-42.4	4.7	-111.4	1.1	-29.9
2.000	370.2	18.3	124.5	40.1	-3.2	62.4	-2.6	115.8	-6.8	25.8	-1.5
2.011	369.8	18.3	124.4	40.0	-3.2	62.4	-2.6	115.6	-6.8	25.7	-1.5
2.050	368.2	18.2	123.9	38.9	-3.2	61.9	-2.6	113.7	-6.8	24.9	-1.5
2.100	366.3	18.1	123.3	37.1	-3.2	61.5	-2.6	110.8	-6.8	23.5	-1.5
2.150	364.3	18.0	122.8	35.9	-3.2	61.0	-2.6	108.7	-6.8	22.5	-1.5
2.200	362.4	18.0	122.3	34.6	-3.2	60.7	-2.6	106.7	-6.8	21.6	-2.0
2.250	360.4	17.9	121.8	33.7	-3.3	60.3	-2.6	105.1	-7.0	20.8	-2.7
2.259	360.1	17.9	121.7	33.7	-3.3	60.3	-2.6	105.1	-7.0	20.8	-2.7
2.300	358.5	17.8	121.3	32.9	-4.1	60.1	-2.6	103.9	-8.0	19.9	-3.2
2.350	356.6	17.8	120.9	32.2	-5.2	59.9	-2.6	102.7	-9.5	19.0	-3.8
2.400	354.7	17.7	120.5	31.4	-6.3	59.7	-2.6	101.5	-11.0	18.1	-4.4
2.450	352.8	17.7	120.2	30.7	-7.4	59.6	-2.6	100.5	-12.5	17.2	-5.0
2.500	350.8	17.6	119.8	30.3	-8.6	59.7	-2.7	100.0	-14.1	16.6	-5.6
2.518	435.2	21.1	143.6	35.5	-10.9	67.1	-3.3	114.3	-17.8	18.2	-6.4
2.550	434.0	21.1	143.5	35.7	-11.5	67.1	-3.3	114.6	-18.6	18.3	-6.7
2.600	432.1	21.1	143.2	36.0	-13.0	67.2	-3.3	115.0	-20.6	18.4	-7.5
2.650	430.2	21.1	143.0	36.2	-14.5	67.3	-3.4	115.5	-22.7	18.6	-8.4
2.700	428.3	21.0	142.7	36.5	-16.0	67.4	-3.4	116.0	-24.7	18.8	-9.4
2.750	426.4	21.0	142.4	36.8	-17.6	67.7	-3.4	116.6	-26.8	18.9	-10.5
2.800	424.5	20.9	142.2	37.0	-19.2	67.8	-3.4	117.0	-28.9	19.0	-11.6
2.850	422.7	20.9	141.8	37.2	-20.8	67.9	-3.5	117.4	-31.1	19.1	-12.6
2.900	420.8	20.8	141.4	37.4	-22.4	68.1	-3.6	117.8	-33.5	19.2	-13.6
2.950	418.9	20.8	140.9	37.5	-24.1	68.1	-4.1	117.9	-36.1	19.2	-14.6
3.000	417.1	20.7	140.3	37.5	-25.7	68.1	-4.4	117.9	-38.6	19.2	-15.6

----- LOAD COMBINATION TABLES -----

COMBINATION TABLE: 1 LRFD2009 (Default)

#	NAME	CATEGORY	LOAD FACTORS A-DL	B-DL	DW-DL	LL	NU	IMPACT FACT- TRK	LN	ENVELOPE- MOM	SHR
1	DC CONSTRUCTIBILITY	STRENGTH-IV	1.500	0.000	0.000	0.000	1.050	0.000	0.000	NONE	
2	DC+DW CONSTRUCTIBILITY	STRENGTH-IV	1.500	1.500	1.500	0.000	1.050	0.000	0.000	NONE	
3	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	MOM-MAX	
4	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	MOM-MIN	
5	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	SHR-MAX	
6	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	SHR-MIN	
7	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000	MOM-MAX	
8	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000	MOM-MIN	
9	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000	SHR-MAX	
10	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000	SHR-MIN	
11	SERVICE-II	SERVICE-II	1.000	1.000	1.000	1.300	1.000	1.330	1.000	MOM-MAX	

BDGS Output – Unit 1 G6

2.200	-0.011	0.000	-0.027	0.005	0.000	0.001	0.000	0.000	0.000	-0.009	0.000
2.205	-0.009	0.000	-0.023	0.005	0.000	0.001	0.000	0.000	0.000	-0.007	0.000
2.205	-0.008	0.000	-0.022	0.005	0.000	0.001	0.000	0.000	0.000	-0.007	0.000
2.245	0.020	0.000	0.036	0.006	0.000	0.004	0.000	0.000	0.000	0.012	0.000
2.250	0.024	0.000	0.044	0.006	0.000	0.005	0.000	0.000	0.000	0.015	0.000
2.255	0.029	0.000	0.053	0.007	0.000	0.005	0.000	0.000	0.000	0.017	0.000
2.285	0.056	0.000	0.109	0.007	0.000	0.008	0.000	0.000	0.000	0.036	0.000
2.300	0.071	0.000	0.140	0.008	0.000	0.010	0.000	0.000	0.000	0.047	0.000
2.305	0.076	0.000	0.150	0.008	0.000	0.010	0.000	0.000	0.000	0.050	0.000
2.322	0.095	0.000	0.189	0.008	0.000	0.013	0.000	0.000	0.000	0.063	0.000
2.324	0.097	0.000	0.194	0.008	0.000	0.013	0.000	0.000	0.000	0.065	0.000
2.350	0.127	0.000	0.257	0.009	0.000	0.016	0.000	0.000	0.000	0.086	0.000
2.354	0.133	0.000	0.268	0.009	0.000	0.017	0.000	0.000	0.000	0.090	0.000
2.364	0.145	0.000	0.295	0.010	0.000	0.018	0.000	0.000	0.000	0.099	0.000
2.400	0.196	0.000	0.400	0.011	0.000	0.024	0.000	0.000	0.000	0.134	0.000
2.404	0.202	0.000	0.412	0.011	0.000	0.024	0.000	0.000	0.000	0.138	0.000
2.444	0.263	0.000	0.543	0.012	0.000	0.031	0.000	0.000	0.000	0.181	0.000
2.450	0.274	0.000	0.565	0.012	0.000	0.032	0.000	0.000	0.000	0.188	0.000
2.479	0.323	0.000	0.669	0.013	0.000	0.037	0.000	0.000	0.000	0.222	0.000
2.483	0.330	0.000	0.684	0.014	0.000	0.038	0.000	0.000	0.000	0.226	0.000
2.500	0.359	0.000	0.746	0.014	0.000	0.041	0.000	0.000	0.000	0.246	0.000
2.503	0.365	0.000	0.758	0.014	0.000	0.042	0.000	0.000	0.000	0.250	0.000
2.523	0.401	0.000	0.834	0.015	0.000	0.045	0.000	0.000	0.000	0.274	0.000
2.550	0.450	0.000	0.940	0.016	0.000	0.050	0.000	0.000	0.000	0.308	0.000
2.563	0.474	0.000	0.991	0.017	0.000	0.053	0.000	0.000	0.000	0.324	0.000
2.600	0.543	0.000	1.141	0.018	0.000	0.060	0.000	0.000	0.000	0.370	0.000
2.603	0.548	0.000	1.151	0.018	0.000	0.060	0.000	0.000	0.000	0.374	0.000
2.614	0.570	0.000	1.199	0.019	0.000	0.063	0.000	0.000	0.000	0.388	0.000
2.642	0.622	0.000	1.311	0.020	0.000	0.068	0.000	0.000	0.000	0.423	0.000
2.650	0.636	0.000	1.342	0.020	0.000	0.069	0.000	0.000	0.000	0.432	0.000
2.682	0.695	0.000	1.469	0.022	0.000	0.075	0.000	0.000	0.000	0.471	0.000
2.700	0.727	0.000	1.539	0.022	0.000	0.078	0.000	0.000	0.000	0.492	0.000
2.702	0.730	0.000	1.547	0.023	0.000	0.079	0.000	0.000	0.000	0.494	0.000
2.722	0.765	0.000	1.623	0.024	0.000	0.082	0.000	0.000	0.000	0.517	0.000
2.750	0.813	0.000	1.730	0.025	0.000	0.087	0.000	0.000	0.000	0.549	0.000
2.762	0.833	0.000	1.772	0.025	0.000	0.089	0.000	0.000	0.000	0.561	0.000
2.800	0.895	0.000	1.910	0.027	0.000	0.094	0.000	0.000	0.000	0.601	0.000
2.801	0.897	0.000	1.914	0.028	0.000	0.095	0.000	0.000	0.000	0.602	0.000
2.841	0.953	0.000	2.042	0.030	0.000	0.100	0.000	0.000	0.000	0.640	0.000
2.850	0.966	0.000	2.070	0.030	0.000	0.101	0.000	0.000	0.000	0.648	0.000
2.881	1.007	0.000	2.162	0.032	0.000	0.105	0.000	0.000	0.000	0.674	0.000
2.900	1.031	0.000	2.218	0.033	0.000	0.108	0.000	0.000	0.000	0.690	0.000
2.921	1.057	0.000	2.277	0.034	0.000	0.110	0.000	0.000	0.000	0.706	0.000
2.950	1.093	0.000	2.359	0.036	0.000	0.114	0.000	0.000	0.000	0.729	0.000
2.960	1.105	0.000	2.388	0.036	0.000	0.115	0.000	0.000	0.000	0.737	0.000
3.000	1.152	0.000	2.496	0.038	0.000	0.119	0.000	0.000	0.000	0.766	0.000

HNTB BRIDGE DESIGN PROGRAM BDGS VERSION 2.9.1.0 PAGE 45
RUN TIME: 05/03/2011 13:25:17.893 OUTPUT
Filename: N:\49633\Bridges\Design\Final Design\Unit 1\BDGS\Revised041411\Clean\2010 LRFD\G6.OUT

----- UNFACTORED MOMENT SUMMARY -----

* * * GIRDER 13, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

	DEAD LOAD			HL93		HL93		DOUBLE	COMBINED		FATIGUE	
SPAN.LOC	A-DC	B-DC	DW	TRUCK		LANE		TRUCK	TRUCK+LANE		TRUCK	
FRAC	MOMENT (ft-k)	MOMENT (ft-k)	MOMENT (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)
0.000	0	0	0	2	-1	1	-1	-1	4	-3	1	-1
0.108	0	0	0	2	-8	2	-1	-8	4	-12	1	-5
0.892	-2	0	-1	2	-62	2	-2	-62	4	-84	1	-43
1.000	-3	0	-1	2	-69	2	-2	-70	4	-95	1	-48
1.000	-3	0	-1	4	-70	4	-4	-71	10	-96	2	-48
1.000	0	0	0	5	-69	4	-3	0	11	-96	2	-48
1.012	270	14	90	128	-64	59	-6	0	230	-91	68	-44
1.024	537	29	179	242	-59	117	-11	0	438	-89	127	-41
1.027	609	32	203	273	-57	132	-13	0	495	-89	143	-39
1.035	780	41	260	328	-54	163	-16	0	599	-87	169	-37
1.040	887	47	295	375	-52	185	-18	0	684	-86	192	-35
1.046	1016	54	338	409	-49	211	-21	0	754	-86	206	-33
1.050	1094	58	364	443	-47	226	-22	0	816	-85	224	-32
1.050	1102	58	367	447	-47	228	-22	0	822	-85	226	-32
1.054	1174	62	391	474	-46	242	-24	0	873	-85	239	-31
1.080	1674	88	556	614	-38	333	-35	0	1150	-85	301	-22
1.081	1691	89	562	617	-38	337	-36	0	1157	-86	302	-22
1.100	2018	106	672	669	-38	397	-43	0	1287	-94	331	-19
1.108	2148	113	715	729	-41	423	-47	0	1393	-101	360	-20
1.135	2558	133	852	823	-51	496	-58	0	1591	-125	409	-25
1.137	2594	135	864	829	-51	498	-59	0	1601	-127	411	-25
1.150	2768	144	922	837	-56	527	-64	0	1640	-139	412	-28
1.162	2923	151	973	882	-61	553	-69	0	1725	-150	430	-30
1.189	3242	166	1077	916	-70	596	-80	0	1814	-174	435	-35
1.195	3307	169	1098	933	-72	601	-83	0	1842	-179	446	-36
1.200	3362	172	1117	934	-74	613	-85	0	1856	-184	447	-37
1.216	3520	179	1170	965	-81	646	-92	0	1930	-200	457	-40
1.230	3646	184	1212	1008	-86	670	-98	0	2010	-212	488	-42
1.230	3646	184	1212	1008	-86	670	-98	0	2010	-212	488	-42
1.243	3754	188	1248	1028	-91	691	-104	0	2058	-226	496	-45
1.250	3809	190	1266	1040	-94	698	-107	0	2081	-232	504	-46
1.252	3826	191	1272	1043	-95	701	-108	0	2089	-234	505	-47
1.270	3943	195	1311	1033	-102	721	-116	0	2094	-252	496	-50
1.297	4086	199	1357	1066	-113	741	-129	0	2159	-278	512	-56
1.300	4101	199	1361	1058	-113	740	-130	0	2148	-281	507	-56
1.310	4140	200	1374	1065	-118	745	-135	0	2161	-291	509	-58
1.324	4198	201	1395	1074	-124	762	-142	0	2191	-307	516	-61
1.332	4226	202	1405	1076	-127	767	-146	0	2198	-315	512	-63
1.336	4240	202	1410	1072	-130	772	-148	0	2198	-320	511	-64
1.341	4252	202	1415	1084	-132	776	-151	0	2218	-326	523	-65
1.342	4257	202	1417	1092	-133	778	-152	0	2230	-328	527	-65
1.350	4275	203	1424	1096	-136	784	-156	0	2241	-337	529	-67
1.351	4276	203	1424	1095	-137	784	-156	0	2240	-338	528	-67
1.367	4303	203	1434	1100	-144	792	-165	0	2254	-357	532	-71
1.378	4311	203	1438	1093	-150	794	-171	0	2248	-370	524	-74

BDGS Output – Unit 1 G6

1.386	4313	203	1439	1087	-153	795	-175	0	2241	-379	520	-76
1.400	4307	202	1438	1087	-161	795	-183	0	2241	-397	519	-79
1.405	4302	202	1436	1079	-163	794	-186	0	2229	-402	510	-80
1.425	4268	200	1426	1075	-173	789	-197	0	2218	-427	509	-85
1.432	4243	199	1419	1070	-177	792	-201	0	2215	-436	502	-87
1.450	4166	196	1398	1079	-186	798	-212	0	2234	-460	509	-92
1.459	4123	194	1386	1076	-191	800	-218	0	2231	-472	502	-94
1.482	3984	188	1344	1087	-204	803	-232	0	2248	-504	519	-101
1.486	3960	187	1337	1078	-206	802	-235	0	2236	-508	514	-102
1.500	3856	182	1304	1066	-214	798	-243	0	2217	-528	503	-106
1.513	3756	177	1272	1070	-221	794	-251	0	2217	-545	505	-110
1.538	3523	166	1195	1047	-235	780	-268	0	2172	-581	491	-117

HNTB BRIDGE DESIGN PROGRAM BDGS VERSION 2.9.1.0 PAGE 46
RUN TIME: 05/03/2011 13:25:17.893 OUTPUT
Filename: N:\49633\Bridges\Design\Final Design\Unit 1\BDGS\Revised041411\Clean\2010 LRFD\G6.OUT

----- UNFACTORED MOMENT SUMMARY -----

* * * GIRDER 13, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

	DEAD LOAD			HL93		HL93		DOUBLE	COMBINED		FATIGUE	
SPAN.LOC	A-DC	B-DC	DW	TRUCK		LANE		TRUCK	TRUCK+LANE		TRUCK	
FRAC	MOMENT	MOMENT	MOMENT	MAX	MIN	MAX	MIN	MIN	MAX	MIN	MAX	MIN
	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)
1.540	3509	166	1190	1048	-236	779	-268	0	2172	-582	492	-118
1.550	3364	159	1147	1030	-241	763	-274	0	2132	-594	485	-120
1.563	3181	151	1091	1015	-246	743	-280	0	2093	-608	484	-123
1.586	2823	135	981	977	-257	700	-292	0	1999	-633	469	-128
1.597	2635	126	922	957	-262	677	-298	0	1950	-646	460	-131
1.600	2584	124	906	941	-263	670	-300	0	1921	-650	450	-131
1.609	2436	117	859	931	-267	652	-304	0	1890	-660	447	-133
1.632	2019	97	725	880	-278	599	-317	0	1769	-687	417	-139
1.650	1665	81	610	832	-287	552	-327	0	1659	-710	389	-144
1.654	1577	76	582	825	-289	541	-330	0	1638	-715	388	-145
1.655	1572	76	580	825	-290	542	-330	0	1640	-716	388	-145
1.678	1064	54	428	790	-304	498	-346	0	1548	-750	375	-152
1.700	543	31	269	753	-318	447	-362	0	1448	-784	358	-159
1.701	527	30	264	750	-318	447	-363	0	1445	-786	357	-160
1.712	257	18	180	734	-325	420	-371	0	1397	-804	349	-163
1.719	74	10	124	714	-330	402	-377	0	1351	-816	338	-165
1.719	74	10	124	714	-330	402	-377	0	1351	-816	338	-165
1.722	0	7	101	712	-332	395	-380	-541	1342	-990	337	-166
1.724	-39	5	89	705	-333	392	-382	-543	1329	-993	333	-167
1.747	-634	-22	-98	653	-348	337	-408	-567	1205	-1046	304	-175
1.750	-721	-26	-125	639	-350	328	-412	-571	1178	-1054	293	-176
1.769	-1244	-49	-291	600	-363	283	-443	-593	1081	-1108	273	-183
1.770	-1259	-50	-295	599	-364	283	-444	-593	1079	-1110	273	-183
1.793	-1930	-80	-504	547	-380	239	-490	-620	967	-1184	246	-192
1.799	-2103	-87	-558	538	-384	228	-502	-627	944	-1203	243	-194
1.800	-2146	-89	-572	532	-385	225	-506	-629	933	-1208	238	-194
1.811	-2485	-105	-678	504	-393	204	-533	-641	874	-1247	223	-199
1.816	-2630	-111	-724	491	-396	196	-546	-647	849	-1266	216	-201
1.828	-3010	-128	-844	463	-405	175	-579	-660	791	-1312	201	-204
1.839	-3368	-144	-952	432	-413	158	-611	-673	732	-1356	186	-209
1.850	-3740	-160	-1065	398	-421	140	-645	-688	669	-1404	169	-214
1.857	-3984	-170	-1139	386	-426	130	-669	-696	643	-1435	173	-216
1.862	-4144	-177	-1188	368	-430	123	-684	-702	613	-1457	165	-219
1.885	-4955	-212	-1434	303	-447	91	-767	-743	494	-1580	143	-228
1.887	-5014	-215	-1452	299	-448	88	-772	-747	487	-1589	144	-229
1.900	-5510	-234	-1592	260	-457	80	-823	-789	427	-1686	128	-234
1.908	-5807	-246	-1676	239	-463	79	-855	-816	397	-1747	120	-237
1.916	-6108	-258	-1760	222	-469	76	-887	-843	371	-1807	116	-240
1.931	-6693	-282	-1926	178	-480	74	-954	-898	310	-1933	91	-247
1.945	-7257	-304	-2085	141	-490	71	-1020	-950	259	-2055	78	-253
1.950	-7454	-311	-2136	127	-493	71	-1043	-968	240	-2097	72	-255
1.954	-7616	-317	-2178	123	-499	71	-1062	-982	235	-2132	63	-256
1.973	-8390	-345	-2378	126	-543	70	-1158	-1052	236	-2301	63	-282
1.977	-8576	-352	-2426	126	-558	69	-1182	-1070	237	-2344	63	-288
1.999	-9513	-386	-2669	129	-632	69	-1309	-1160	240	-2566	65	-330
2.000	-9569	-388	-2684	129	-637	69	-1317	-1165	241	-2580	65	-332
2.000	-9569	-388	-2683	129	-636	68	-1316	-1165	240	-2578	65	-331
2.002	-9532	-387	-2673	127	-635	67	-1309	-1160	237	-2566	64	-330
2.010	-9395	-381	-2638	123	-630	64	-1284	-1142	227	-2523	62	-328
2.021	-9223	-375	-2593	116	-624	60	-1253	-1120	214	-2469	58	-324
2.031	-9054	-369	-2549	110	-617	55	-1223	-1099	201	-2417	55	-320
2.041	-8886	-363	-2505	103	-611	53	-1195	-1079	191	-2367	52	-316
2.050	-8742	-357	-2468	98	-606	53	-1171	-1062	183	-2325	49	-313
2.051	-8721	-356	-2463	97	-605	53	-1167	-1060	182	-2319	49	-313
2.053	-8695	-355	-2456	96	-604	52	-1163	-1056	180	-2311	48	-312
2.062	-8558	-350	-2421	91	-600	52	-1141	-1041	173	-2273	51	-309
2.072	-8397	-345	-2380	103	-594	51	-1116	-1023	188	-2229	59	-306

HNTB BRIDGE DESIGN PROGRAM BDGS VERSION 2.9.1.0 PAGE 47
RUN TIME: 05/03/2011 13:25:17.893 OUTPUT
Filename: N:\49633\Bridges\Design\Final Design\Unit 1\BDGS\Revised041411\Clean\2010 LRFD\G6.OUT

----- UNFACTORED MOMENT SUMMARY -----

* * * GIRDER 13, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

	DEAD LOAD			HL93		HL93		DOUBLE	COMBINED		FATIGUE	
SPAN.LOC	A-DC	B-DC	DW	TRUCK		LANE		TRUCK	TRUCK+LANE		TRUCK	
FRAC	MOMENT	MOMENT	MOMENT	MAX	MIN	MAX	MIN	MIN	MAX	MIN	MAX	MIN
	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)	(ft-k)
2.082	-8239	-339	-2340	121	-589	50	-1093	-1006	211	-2187	66	-303
2.092	-8083	-333	-2301	139	-583	49	-1071	-989	234	-2147	74	-299
2.100	-7967	-329	-2272	152	-579	49	-1055	-977	252	-2119	82	-297
2.103	-7929	-328	-2263	156	-578	49	-1050	-973	256	-2109	82	-296

BDGS Output – Unit 1 G6

2.106	-7881	-326	-2251	162	-576	49	-1043	-968	264	-2098	86	-295
2.113	-7826	-325	-2241	174	-577	48	-1035	-963	280	-2084	90	-294
2.123	-7747	-323	-2226	193	-578	48	-1024	-956	305	-2065	98	-294
2.133	-7671	-321	-2212	212	-579	48	-1014	-949	330	-2049	106	-295
2.144	-7598	-319	-2200	231	-581	55	-1005	-946	362	-2037	114	-295
2.150	-7553	-318	-2193	239	-582	60	-1000	-948	378	-2034	117	-295
2.154	-7526	-317	-2188	250	-583	62	-997	-949	395	-2033	121	-295
2.155	-7515	-317	-2187	253	-583	64	-996	-949	400	-2033	123	-295
2.164	-7456	-316	-2178	271	-585	70	-991	-953	430	-2032	128	-295
2.174	-7389	-315	-2169	290	-588	78	-986	-957	464	-2032	138	-295
2.185	-7324	-314	-2161	310	-591	85	-981	-960	497	-2033	148	-296
2.195	-7261	-313	-2154	328	-594	93	-978	-964	529	-2034	158	-298
2.200	-7231	-312	-2151	337	-596	97	-976	-966	545	-2035	161	-299
2.205	-7203	-312	-2148	348	-598	100	-975	-969	564	-2037	168	-300
2.205	-7201	-312	-2148	349	-598	101	-976	-969	565	-2039	169	-300
2.245	-6260	-269	-1853	422	-559	137	-852	-902	698	-1847	194	-280
2.250	-6142	-263	-1815	426	-553	141	-837	-893	707	-1823	192	-277
2.255	-6031	-258	-1781	439	-548	146	-823	-886	730	-1801	199	-274
2.285	-5358	-227	-1570	488	-520	175	-743	-840	824	-1674	215	-259
2.300	-5020	-212	-1464	503	-504	190	-705	-815	859	-1610	219	-251
2.305	-4921	-207	-1433	516	-500	195	-694	-809	880	-1592	227	-249
2.322	-4565	-190	-1320	539	-485	214	-655	-785	932	-1529	239	-242
2.324	-4525	-189	-1307	545	-484	217	-651	-781	941	-1520	243	-241
2.350	-4028	-165	-1149	575	-462	244	-600	-745	1009	-1431	256	-230
2.354	-3947	-162	-1123	586	-459	250	-592	-739	1028	-1418	263	-228
2.364	-3759	-153	-1064	597	-451	261	-574	-726	1056	-1386	269	-224
2.400	-3095	-122	-855	631	-421	301	-515	-679	1141	-1277	286	-209
2.404	-3025	-119	-833	640	-418	306	-509	-674	1157	-1266	293	-208
2.444	-2382	-88	-626	690	-392	359	-460	-632	1276	-1170	324	-194
2.450	-2282	-84	-593	690	-387	366	-453	-625	1284	-1155	322	-192
2.479	-1834	-62	-450	724	-369	405	-423	-594	1368	-1092	343	-183
2.479	-1834	-62	-450	724	-369	405	-423	-594	1368	-1092	343	-183
2.483	-1771	-59	-431	733	-366	410	-419	-589	1385	-1083	351	-181
2.500	-1525	-48	-352	749	-356	431	-405	-571	1427	-1048	359	-176
2.503	-1477	-46	-337	753	-354	435	-402	-568	1436	-1042	361	-175
2.523	-1191	-32	-247	769	-341	460	-387	-548	1482	-1004	369	-169
2.550	-814	-15	-130	777	-325	490	-368	-521	1523	-955	363	-160
2.563	-639	-7	-76	796	-317	505	-359	-509	1563	-933	381	-157
2.600	-151	15	72	812	-295	540	-335	-474	1619	-869	387	-145
2.603	-117	16	83	818	-294	542	-333	-472	1630	-865	390	-145
2.614	0	22	122	819	-288	553	-326	0	1642	-709	388	-142
2.642	266	35	212	850	-274	578	-311	0	1708	-676	409	-135
2.650	337	39	235	849	-270	584	-307	0	1713	-666	406	-133
2.682	621	53	328	873	-255	607	-289	0	1767	-629	423	-125
2.700	772	60	375	877	-246	617	-280	0	1783	-607	425	-121
2.702	789	60	380	881	-246	618	-279	0	1790	-605	427	-121
2.722	949	68	430	887	-237	628	-269	0	1808	-583	429	-116
2.750	1164	77	494	886	-223	636	-253	0	1814	-550	425	-110
2.762	1248	81	519	892	-218	640	-248	0	1826	-538	429	-107
2.800	1511	91	589	880	-199	638	-226	0	1808	-491	420	-98
2.801	1520	92	592	884	-200	641	-227	0	1816	-492	422	-98
2.841	1269	80	518	800	-166	558	-188	0	1622	-409	384	-81
2.850	1209	77	498	760	-157	534	-179	0	1545	-388	365	-77
2.881	991	66	424	677	-130	456	-147	0	1356	-320	331	-64

HNTB BRIDGE DESIGN PROGRAM BDGS VERSION 2.9.1.0 PAGE 48
RUN TIME: 05/03/2011 13:25:17.893 OUTPUT
Filename: N:\49633\Bridges\Design\Final Design\Unit 1\BDGS\Revised041411\Clean\2010 LRFD\G6.OUT

----- UNFACTORED MOMENT SUMMARY -----

* * * GIRDER 13, UNFACTORED MOMENT SUMMARY (Based on Input Section) * * *

Notes: Values do not include impact, except for COMBINED TRUCK+LANE.

MIN COMBINED TRUCK+LANE is the larger of: (1.33×TRK+LANE) and 0.9×(1.33×DTRK+LANE)

	DEAD LOAD			HL93 TRUCK		HL93 LANE		DOUBLE TRUCK	COMBINED TRUCK+LANE		FATIGUE TRUCK	
SPAN.LOC FRAC	A-DC MOMENT (ft-k)	B-DC MOMENT (ft-k)	DW MOMENT (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)	MAX (ft-k)	MIN (ft-k)
2.900	848	57	369	602	-110	395	-125	0	1195	-272	296	-54
2.921	687	48	308	516	-90	330	-103	0	1016	-222	256	-44
2.950	445	32	205	341	-58	217	-66	0	670	-143	165	-28
2.960	357	26	168	294	-47	178	-53	0	569	-116	148	-23
3.000	1	1	6	10	-3	8	-3	0	21	-7	5	-2

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 13, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

	DEAD LOAD			HL93 TRUCK		HL93 LANE		COMBINED TRUCK+LANE		FATIGUE TRUCK	
SPAN.LOC FRAC	A-DC SHEAR (kips)	B-DC SHEAR (kips)	DW SHEAR (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)
0.000	0.0	0.0	0.0	0.2	-29.8	0.2	-0.3	0.4	-39.8	0.1	-20.8
0.108	-0.1	0.0	-0.1	0.2	-29.8	0.2	-0.4	0.4	-39.9	0.1	-20.9
0.892	-2.4	-0.3	-1.2	0.2	-29.9	0.2	-0.8	0.4	-40.6	0.1	-22.5
1.000	-2.9	-0.3	-1.4	0.2	-34.0	0.2	-1.2	0.4	-46.5	0.1	-22.6
1.000	120.3	6.5	40.2	59.0	-2.0	26.9	-2.3	105.4	-4.9	32.1	-1.0
1.000	120.3	6.5	40.2	58.9	-2.0	26.8	-2.3	105.2	-4.9	31.9	-1.0
1.012	116.4	6.2	38.8	55.5	-2.0	26.0	-2.3	99.8	-4.9	29.8	-1.0
1.024	112.4	6.0	37.5	52.1	-3.1	24.4	-2.3	93.7	-6.4	27.4	-2.1
1.027	111.3	5.9	37.1	51.6	-4.5	23.7	-2.3	92.4	-8.4	27.1	-3.6
1.035	108.6	5.7	36.2	48.8	-4.8	22.9	-2.4	87.7	-8.8	25.3	-3.7
1.040	107.0	5.6	35.6	48.5	-7.2	22.3	-2.6	86.8	-12.1	25.0	-5.0
1.046	104.9	5.5	34.9	45.8	-7.5	21.6	-2.6	82.6	-12.6	23.3	-5.2
1.050	103.7	5.4	34.5	45.8	-7.5	21.6	-2.6	82.6	-12.6	23.3	-5.2
1.050	103.5	5.4	34.4	45.8	-7.5	21.6	-2.6	82.6	-12.6	23.3	-5.2
1.054	102.3	5.3	34.0	45.5	-10.2	21.1	-2.9	81.6	-16.5	23.1	-6.6
1.080	93.8	4.8	31.0	44.3	-15.0	20.1	-3.8	79.1	-23.8	23.7	-9.3
1.081	90.8	4.7	30.7	43.0	-10.3	19.8	-3.2	76.9	-16.9	23.0	-6.1
1.100	84.6	4.4	28.5	38.7	-11.2	18.2	-3.5	69.7	-18.4	20.4	-6.6
1.108	82.0	4.2	27.5	39.3	-11.2	18.4	-3.5	70.7	-18.4	20.9	-6.6
1.135	73.3	3.7	24.4	35.6	-13.9	16.7	-4.3	64.0	-22.9	18.7	-8.4
1.137	72.5	3.6	24.1	32.0	-16.9	15.0	-5.3	57.7	-27.8	16.4	-10.2

BDGS Output – Unit 1 G6

1.150	68.5	3.3	22.7	32.0	-16.9	15.0	-5.3	57.7	-27.8	16.4	-10.2
1.162	64.7	3.1	21.4	29.1	-20.7	13.7	-6.5	52.4	-34.1	14.6	-12.1
1.189	56.2	2.6	18.3	28.3	-23.9	13.1	-7.5	50.7	-39.3	14.1	-13.6
1.195	55.1	2.5	18.7	37.1	-25.2	16.0	-7.9	65.4	-41.4	20.8	-14.4
1.200	53.5	2.4	18.1	35.8	-17.0	15.5	-6.0	63.1	-28.7	19.9	-8.3
1.216	48.5	2.1	16.4	32.6	-18.6	14.3	-6.6	57.7	-31.4	17.7	-9.4
1.230	44.2	1.8	14.8	32.6	-17.8	14.3	-6.4	57.7	-30.2	17.7	-8.8
1.230	44.2	1.8	14.8	32.6	-17.8	14.3	-6.4	57.7	-30.2	17.7	-8.8
1.243	40.0	1.6	13.4	30.7	-22.6	13.0	-7.9	53.9	-37.9	16.5	-12.0
1.250	37.7	1.4	12.6	30.4	-23.0	12.8	-8.1	53.2	-38.7	16.3	-12.3
1.252	37.0	1.4	12.3	30.2	-23.3	12.6	-8.2	52.8	-39.2	16.1	-12.5
1.270	31.4	1.0	10.4	27.8	-23.6	11.9	-8.6	48.9	-39.9	14.6	-12.7
1.297	22.9	0.5	7.5	25.5	-28.4	10.7	-10.5	44.7	-48.2	13.3	-16.2
1.300	21.9	0.4	7.2	25.5	-27.4	10.7	-10.2	44.7	-46.7	13.3	-15.5
1.310	23.4	0.6	8.5	31.9	-29.2	13.1	-10.9	55.6	-49.7	18.5	-16.9
1.324	19.0	0.4	7.0	30.6	-22.0	12.6	-9.3	53.4	-38.6	17.7	-11.4
1.332	16.6	0.3	6.2	28.2	-22.0	11.7	-9.6	49.1	-38.8	16.0	-11.3
1.336	15.2	0.3	5.7	28.2	-22.0	11.7	-9.6	49.1	-38.8	16.0	-11.3
1.341	13.8	0.3	5.2	28.2	-22.0	11.7	-9.6	49.1	-38.8	16.0	-11.3
1.342	13.3	0.2	5.0	28.2	-22.0	11.7	-9.6	49.1	-38.8	16.0	-11.3

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 13, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

SPAN.LOC FRAC	DEAD LOAD A-DC SHEAR (kips)	DEAD LOAD B-DC SHEAR (kips)	DW SHEAR (kips)	HL93 TRUCK MAX (kips)	HL93 TRUCK MIN (kips)	HL93 LANE MAX (kips)	HL93 LANE MIN (kips)	COMBINED TRUCK+LANE MAX (kips)	COMBINED TRUCK+LANE MIN (kips)	FATIGUE TRUCK MAX (kips)	FATIGUE TRUCK MIN (kips)
1.350	10.9	0.2	4.2	25.0	-24.8	10.3	-10.8	43.6	-43.8	13.7	-13.4
1.351	10.7	0.2	4.1	26.0	-24.8	10.7	-10.8	45.2	-43.8	14.5	-13.4
1.367	5.6	0.1	2.4	25.3	-25.8	10.2	-11.3	43.8	-45.6	14.0	-14.3
1.378	2.4	0.0	1.3	24.3	-26.5	9.9	-11.7	42.2	-46.9	13.3	-14.9
1.386	0.0	-0.1	0.4	24.3	-25.4	9.9	-11.4	42.2	-45.2	13.3	-14.0
1.400	-4.4	-0.3	-1.1	20.9	-28.1	8.5	-12.9	36.3	-50.3	10.8	-16.3
1.405	-5.8	-0.3	-1.6	21.9	-28.1	8.8	-12.9	38.0	-50.3	11.5	-16.3
1.425	-16.6	-0.7	-4.1	30.2	-30.5	11.7	-13.8	51.8	-54.3	17.8	-18.1
1.432	-18.7	-0.8	-4.9	29.6	-22.3	11.6	-11.2	51.0	-40.9	17.4	-11.7
1.450	-24.2	-1.1	-6.8	25.6	-23.7	10.0	-12.0	44.0	-43.4	14.5	-12.5
1.459	-26.8	-1.2	-7.9	26.6	-23.7	10.3	-12.0	45.6	-43.4	15.3	-12.5
1.482	-33.8	-1.5	-10.4	24.7	-27.3	9.2	-13.2	42.1	-49.6	13.9	-15.1
1.486	-34.8	-1.6	-10.9	24.5	-27.4	9.1	-13.4	41.7	-49.9	13.8	-15.1
1.500	-39.0	-1.8	-12.5	21.6	-27.5	8.2	-13.8	36.9	-50.4	11.7	-15.2
1.513	-42.7	-2.0	-14.0	22.3	-27.5	8.3	-13.8	37.9	-50.4	12.3	-15.2
1.538	-50.2	-2.3	-16.6	19.6	-31.0	7.2	-15.4	33.3	-56.7	10.3	-17.7
1.540	-69.4	-3.1	-20.6	21.5	-32.2	7.2	-16.0	35.8	-58.7	13.4	-18.6
1.550	-72.4	-3.3	-21.8	19.8	-28.7	6.0	-16.1	32.3	-54.3	12.3	-14.6
1.563	-76.0	-3.5	-23.2	17.6	-31.0	5.2	-17.3	28.6	-58.6	10.8	-16.5
1.586	-82.6	-3.8	-25.8	16.1	-32.6	4.7	-18.3	26.1	-61.6	9.7	-17.8
1.597	-85.9	-4.0	-27.1	14.8	-32.7	4.3	-18.6	24.0	-62.1	8.9	-18.0
1.600	-86.8	-4.0	-27.4	14.8	-32.7	4.3	-18.6	24.0	-62.1	8.9	-18.0
1.609	-89.2	-4.1	-28.4	14.1	-33.9	4.0	-19.3	22.8	-64.4	8.4	-19.0
1.632	-95.7	-4.5	-30.9	12.0	-35.1	3.4	-20.5	19.3	-67.2	6.8	-20.2
1.650	-100.9	-4.7	-32.9	12.2	-34.0	3.4	-20.0	19.5	-65.3	6.8	-19.4
1.654	-109.4	-4.8	-33.4	18.5	-36.5	5.0	-21.0	29.6	-69.6	11.8	-21.5
1.655	-109.4	-4.8	-32.6	17.4	-28.7	4.8	-18.3	27.9	-56.5	11.1	-15.1
1.678	-115.9	-5.1	-35.1	14.7	-30.0	3.9	-19.3	23.4	-59.2	9.2	-16.1
1.700	-122.1	-5.4	-37.6	13.9	-31.6	3.5	-20.0	22.0	-62.1	8.6	-17.3
1.701	-122.3	-5.4	-37.6	14.7	-31.6	3.7	-20.0	23.2	-62.1	9.1	-17.3
1.712	-125.3	-5.6	-38.8	13.7	-32.1	3.3	-20.4	21.5	-63.1	8.4	-17.6
1.719	-127.4	-5.7	-39.6	13.0	-32.8	3.1	-20.8	20.4	-64.3	7.9	-18.1
1.719	-127.4	-5.7	-39.6	13.0	-32.8	3.1	-20.8	20.4	-64.3	7.9	-18.1
1.722	-128.2	-5.7	-39.9	13.0	-32.8	3.1	-20.8	20.5	-64.3	7.9	-18.1
1.724	-128.6	-5.8	-40.1	11.4	-33.2	2.7	-21.4	17.9	-65.6	6.7	-18.5
1.747	-135.1	-6.1	-42.6	10.4	-34.9	2.3	-22.4	16.1	-68.9	5.9	-19.7
1.750	-136.1	-6.1	-42.9	10.4	-34.2	2.3	-22.2	16.1	-67.8	5.9	-19.2
1.769	-145.5	-6.5	-45.0	13.7	-36.8	3.2	-23.4	21.4	-72.3	8.6	-21.1
1.770	-145.6	-6.5	-45.1	11.5	-32.5	2.7	-22.9	18.0	-66.1	7.2	-17.2
1.793	-152.1	-6.8	-47.6	11.2	-34.0	2.5	-23.7	17.3	-69.0	7.0	-18.4
1.799	-153.7	-6.9	-48.2	9.9	-34.2	2.1	-24.1	15.3	-69.6	6.3	-18.6
1.800	-154.1	-6.9	-48.3	9.9	-34.2	2.1	-24.1	15.3	-69.6	6.3	-18.6
1.811	-157.1	-7.1	-49.5	9.4	-35.2	1.9	-24.6	14.4	-71.5	6.0	-19.5
1.816	-158.7	-7.1	-50.0	8.3	-35.6	1.7	-25.1	12.8	-72.5	5.4	-19.8
1.828	-164.7	-7.3	-51.2	12.0	-36.5	2.6	-25.5	18.5	-74.0	7.7	-20.5
1.839	-168.3	-7.3	-51.1	9.1	-34.3	1.8	-25.6	14.0	-71.2	5.9	-18.2
1.850	-172.0	-7.4	-52.2	9.1	-33.6	1.8	-25.5	14.0	-70.2	5.9	-17.9
1.857	-174.4	-7.5	-53.0	8.8	-35.8	1.6	-26.3	13.3	-73.9	5.7	-19.4
1.862	-175.9	-7.6	-53.5	6.9	-35.9	1.3	-26.9	10.5	-74.7	4.5	-19.5
1.885	-183.4	-7.9	-55.8	6.8	-37.6	1.3	-27.7	10.4	-77.7	4.4	-21.0
1.887	-185.8	-7.9	-55.9	8.8	-37.7	1.6	-27.8	13.3	-77.9	5.7	-21.0
1.900	-190.2	-7.6	-53.7	7.6	-35.6	1.3	-27.0	11.5	-74.4	4.9	-18.8
1.908	-192.8	-7.7	-54.6	6.5	-37.3	1.3	-28.0	10.0	-77.6	4.2	-20.2
1.916	-195.4	-7.8	-55.2	5.2	-38.0	1.3	-28.5	8.2	-79.1	3.3	-20.8
1.931	-200.2	-8.0	-56.8	3.6	-39.1	1.3	-29.4	6.2	-81.4	2.5	-21.8
1.945	-206.4	-8.2	-58.0	4.1	-40.6	1.5	-29.9	7.0	-83.9	3.1	-23.0
1.950	-207.9	-7.5	-53.7	4.3	-40.1	1.5	-28.9	7.2	-82.3	2.8	-22.4
1.954	-209.2	-7.6	-54.1	2.6	-40.2	1.5	-29.6	5.0	-83.0	1.6	-22.5
1.973	-215.1	-7.8	-55.8	2.4	-42.2	1.5	-30.2	4.8	-86.4	1.4	-24.1
1.977	-216.6	-7.9	-56.3	2.3	-42.6	1.6	-31.1	4.7	-87.7	1.0	-24.4

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 13, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

SPAN.LOC	DEAD LOAD A-DC	DEAD LOAD B-DC	DW	HL93 TRUCK	HL93 LANE	COMBINED TRUCK+LANE	FATIGUE TRUCK

BDGS Output – Unit 1 G6

FRAC	SHEAR (kips)	SHEAR (kips)	SHEAR (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)	MAX (kips)	MIN (kips)
1.999	-223.5	-8.2	-58.4	2.3	-45.3	1.6	-32.1	4.7	-92.3	1.0	-26.5
2.000	-223.9	-8.2	-58.5	2.3	-45.4	1.6	-32.2	4.7	-92.5	1.0	-26.5
2.000	148.9	5.6	38.9	44.5	-7.0	28.0	-5.6	87.2	-14.9	25.6	-3.3
2.002	148.4	5.5	38.7	44.3	-7.0	27.9	-5.6	86.9	-14.9	25.5	-3.3
2.010	146.9	5.5	38.2	43.8	-7.0	27.6	-5.6	85.8	-14.9	25.0	-3.3
2.021	145.0	5.4	37.6	42.7	-7.0	27.1	-5.6	83.9	-14.9	24.1	-3.3
2.031	143.1	5.3	36.9	42.0	-7.0	26.6	-5.7	82.4	-14.9	23.5	-3.3
2.041	141.2	5.2	36.3	41.2	-7.0	26.1	-5.7	80.9	-15.0	22.9	-3.3
2.050	139.6	5.1	35.7	40.5	-7.0	25.5	-5.7	79.4	-15.0	22.2	-3.3
2.051	139.3	5.1	35.6	40.6	-7.0	25.5	-5.7	79.5	-15.0	22.2	-3.3
2.053	139.0	5.1	35.4	40.6	-7.0	25.4	-5.7	79.4	-15.0	22.2	-3.3
2.062	137.4	5.0	34.9	39.9	-7.0	25.1	-5.7	78.2	-15.1	21.6	-3.3
2.072	135.5	4.9	34.1	39.3	-7.1	24.5	-5.8	76.8	-15.2	21.0	-3.3
2.082	133.7	4.8	33.4	38.5	-7.1	24.0	-5.8	75.3	-15.3	20.5	-3.3
2.092	131.8	4.7	32.6	37.8	-7.2	23.4	-5.9	73.7	-15.4	19.9	-3.3
2.100	130.4	4.6	31.9	37.3	-7.2	23.0	-5.9	72.6	-15.4	19.5	-3.3
2.103	129.9	4.6	31.8	37.4	-7.2	23.0	-6.0	72.7	-15.6	19.6	-3.3
2.106	129.3	4.5	31.4	40.3	-9.2	22.7	-9.1	76.2	-21.4	20.6	-4.6
2.113	67.4	1.8	12.8	39.1	-9.4	18.3	-9.2	70.3	-21.7	19.9	-4.6
2.123	65.6	1.6	11.9	38.4	-9.4	17.8	-9.4	68.9	-22.0	19.4	-4.7
2.133	63.7	1.5	11.1	37.7	-9.5	17.4	-9.6	67.6	-22.3	18.8	-4.8
2.144	61.8	1.4	10.2	37.1	-9.6	16.9	-9.8	66.3	-22.6	18.4	-4.8
2.150	60.6	1.3	9.5	37.2	-9.6	16.9	-9.8	66.4	-22.6	18.4	-4.8
2.154	59.9	1.3	9.3	37.0	-9.7	16.7	-10.0	66.0	-23.0	18.4	-4.9
2.155	59.6	1.2	9.0	36.5	-9.7	16.4	-10.0	65.0	-23.0	18.1	-4.9
2.164	58.1	1.1	8.4	35.9	-9.8	16.1	-10.3	63.9	-23.3	17.9	-5.0
2.174	56.2	1.0	7.6	35.4	-9.9	15.8	-10.5	62.9	-23.7	17.7	-5.0
2.185	54.3	0.9	6.7	35.0	-10.0	15.4	-10.7	61.9	-24.0	17.6	-5.1
2.195	52.5	0.8	5.9	34.6	-10.1	15.1	-10.8	61.1	-24.3	17.5	-5.2
2.200	51.5	0.7	5.4	34.6	-10.1	15.1	-10.8	61.1	-24.3	17.5	-5.2
2.205	50.7	0.7	5.2	34.6	-10.1	15.1	-10.8	61.1	-24.3	17.5	-5.2
2.205	210.7	9.7	66.1	46.4	-10.1	37.2	-10.8	98.8	-24.3	27.0	-5.6
2.245	202.1	9.3	63.5	42.8	-11.6	35.2	-1.8	92.1	-17.2	24.6	-7.6
2.250	201.0	9.2	62.9	42.1	-11.1	34.7	-1.8	90.7	-16.6	24.0	-7.3
2.255	200.0	9.2	62.5	39.4	-11.8	33.7	-2.0	86.1	-17.7	22.0	-7.7
2.285	193.6	8.9	60.6	38.2	-14.4	32.8	-2.6	83.5	-21.8	21.1	-9.3
2.300	190.3	8.7	59.4	38.2	-13.8	32.5	-2.5	83.3	-20.9	21.1	-8.9
2.305	189.3	8.7	59.1	41.0	-15.7	32.3	-2.9	86.8	-23.8	24.2	-10.0
2.322	171.9	8.1	54.8	39.2	-11.5	30.2	-2.2	82.3	-17.5	22.9	-7.5
2.324	171.5	8.0	54.7	38.9	-12.3	29.9	-2.3	81.6	-18.7	22.8	-7.9
2.350	167.0	7.8	52.9	36.9	-12.2	29.0	-2.4	78.1	-18.7	21.3	-7.9
2.354	166.2	7.7	52.6	36.0	-14.3	28.5	-2.8	76.4	-21.9	20.6	-9.1
2.364	164.5	7.6	52.0	33.3	-15.2	27.4	-3.2	71.6	-23.4	18.6	-9.6
2.400	158.2	7.3	49.5	33.3	-14.4	27.2	-3.0	71.5	-22.2	18.6	-9.1
2.404	157.5	7.3	49.3	38.9	-18.2	26.8	-3.8	78.5	-28.0	23.6	-11.3
2.444	137.4	6.5	44.1	33.6	-14.1	23.8	-3.4	68.5	-22.1	19.8	-8.5
2.450	136.3	6.4	43.6	33.6	-13.4	23.8	-3.2	68.5	-21.1	19.8	-7.9
2.479	131.3	6.2	41.7	32.5	-15.2	23.2	-3.7	66.4	-23.9	19.0	-9.2
2.479	131.3	6.2	41.7	32.5	-15.2	23.2	-3.7	66.4	-23.9	19.0	-9.2
2.483	130.6	6.1	41.4	31.9	-16.1	22.6	-4.0	65.0	-25.4	18.6	-9.9
2.500	127.9	6.0	40.3	31.9	-15.3	22.6	-3.8	65.0	-24.2	18.6	-9.2
2.503	127.3	5.9	40.1	30.0	-16.7	21.9	-4.2	61.8	-26.5	17.2	-10.2
2.523	124.1	5.7	38.8	30.8	-18.1	21.7	-4.6	62.6	-28.7	17.8	-11.3
2.550	119.7	5.5	37.0	28.0	-17.3	20.8	-4.6	58.0	-27.6	15.6	-10.6
2.563	117.6	5.3	36.2	27.3	-20.1	20.0	-5.4	56.3	-32.1	15.1	-12.5
2.600	111.7	5.0	33.7	26.3	-20.7	19.5	-5.7	54.4	-33.2	14.2	-12.9
2.603	111.3	5.0	33.5	31.0	-21.9	19.4	-6.0	60.6	-35.1	19.2	-13.7
2.614	85.4	4.2	28.6	27.7	-15.1	17.5	-4.5	54.3	-24.6	16.7	-8.1
2.642	81.0	4.0	26.9	26.3	-17.3	16.5	-5.2	51.5	-28.3	15.7	-9.8

----- UNFACTORED SHEAR SUMMARY -----

* * * GIRDER 13, UNFACTORED SHEAR SUMMARY (Based on Input Section) * * *

Note: Values do not include impact, except for COMBINED TRUCK+LANE.

SPAN.LOC FRAC	DEAD LOAD A-DC SHEAR (kips)	B-DC SHEAR (kips)	DW SHEAR (kips)	HL93 TRUCK MAX (kips)	HL93 TRUCK MIN (kips)	HL93 LANE MAX (kips)	HL93 LANE MIN (kips)	COMBINED TRUCK+LANE MAX (kips)	COMBINED TRUCK+LANE MIN (kips)	FATIGUE TRUCK MAX (kips)	FATIGUE TRUCK MIN (kips)
2.650	79.8	3.9	26.1	26.3	-16.5	16.4	-5.0	51.4	-27.0	15.7	-9.1
2.682	74.8	3.6	24.1	24.3	-18.9	15.5	-5.8	47.8	-30.9	14.3	-10.8
2.700	72.0	3.3	22.5	24.3	-18.1	15.3	-5.6	47.6	-29.7	14.3	-10.1
2.702	71.7	3.3	22.4	23.0	-19.3	14.7	-6.1	45.4	-31.7	13.2	-11.0
2.722	68.7	3.1	21.1	21.1	-20.5	14.0	-6.6	42.1	-33.9	11.8	-11.9
2.750	64.4	2.8	18.7	21.0	-19.8	13.6	-6.4	41.6	-32.7	11.8	-11.3
2.762	62.6	2.7	18.0	18.4	-22.2	12.7	-7.5	37.2	-37.0	9.8	-13.1
2.800	56.8	2.2	14.6	17.5	-22.0	12.0	-7.5	35.3	-36.8	9.6	-12.7
2.801	56.6	-2.4	-15.1	17.5	-33.9	11.8	-19.2	35.1	-64.3	9.6	-16.0
2.841	-57.9	-3.0	-19.4	8.2	-39.3	9.6	-23.4	20.4	-75.7	4.0	-18.8
2.850	-59.3	-3.1	-19.9	8.2	-39.3	9.6	-23.4	20.4	-75.7	4.0	-18.8
2.881	-63.8	-3.8	-24.1	8.8	-46.2	10.1	-27.7	21.9	-89.1	4.3	-22.9
2.900	-66.6	-3.9	-25.3	8.8	-46.2	10.1	-27.7	21.9	-89.1	4.3	-22.9
2.921	-69.5	-4.5	-29.0	9.6	-54.5	10.9	-32.6	23.6	-105.1	4.7	-27.3
2.950	-73.8	-4.8	-30.8	9.6	-54.9	10.9	-33.4	23.6	-106.4	4.7	-27.5
2.960	-75.2	-5.1	-33.3	10.2	-63.3	11.6	-38.1	25.2	-122.3	5.0	-32.1
3.000	-80.9	-5.5	-35.7	10.2	-69.2	11.6	-38.9	25.2	-131.0	5.0	-36.1

----- LOAD COMBINATION TABLES -----

COMBINATION TABLE: 1 LRFD2009 (Default)

#	NAME	CATEGORY	LOAD FACTORS A-DL	B-DL	DW-DL	LL	NU	IMPACT FACT- TRK	LN	ENVELOPE- MOM	SHR
1	DC CONSTRUCTIBILITY	STRENGTH-IV	1.500	0.000	0.000	0.000	1.050	0.000	0.000	NONE	
2	DC+DW CONSTRUCTIBILITY	STRENGTH-IV	1.500	1.500	1.500	0.000	1.050	0.000	0.000	NONE	
3	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	MOM-MAX	
4	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	MOM-MIN	
5	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	SHR-MAX	
6	STRENGTH-I MAX-LF	STRENGTH-I	1.250	1.250	1.500	1.750	1.050	1.330	1.000	SHR-MIN	
7	STRENGTH-I MIN-LF	STRENGTH-I	0.900	0.900	0.650	1.750	0.952	1.330	1.000	MOM-MAX	

HNTB	The HNTB Companies Engineers Architects Planners	Made	DSB	Date	5/22/2011	Job Number	49633
		Checked	MPM	Date	5/27/2011		
For	Cleveland Innerbelt	Backchk'd	DSB	Date	5/27/2011	Sheet No.	

End Diaphragm Design G4
Unit 1

The end diaphragm at the end of stub girder will be an I-section and will be designed as a simple span beam in between the adjacent girders. Design as a non-composite section.

Stub Girder End Shear

DC =	173.9	kip
DW =	61.6	kip
LL truck (no impact) =	72.2	kip
LL truck range (no impact) =	41.3	kip
LL lane =	42.6	kip
Importance Factor =	1.05	
V_u =	580.0	kip (Strength I)
V_u =	436.5	kip (Service II)
V_u =	74.8	kip (Fatigue I)

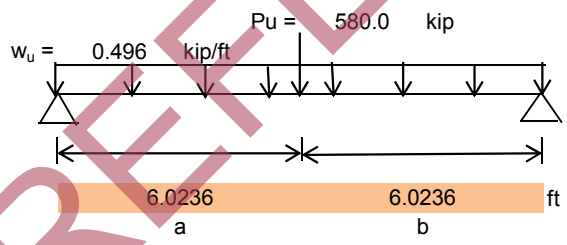
End Diaphragm Section Properties

	b (in)	t (in)	A (in^2)	y (in)	Ay (in^3)
Top	24.0	1.00	24.00	85.50	2052.0
Web	0.750	84	63.00	43.00	2709.0
Bottom	24.0	1.00	24.00	0.50	12.0

	d (in)	Io (in^4)	A*d^2 (in^4)
Top	42.50	2.0	43350.0
Web	0.00	37044.0	0.0
Bottom	-42.50	2.0	43350.0

A =	111.00	in^2
y_{bot} =	43.00	in
I =	123748	in^4
S_{bot} =	2877.9	in^3
S_{top} =	2877.9	in^3
w =	0.378	k/ft

Design Moment and Stress



$M_u = P_u*a*b/(a+b) + w_u*(a+b)^2/8$ =	1755.8	kip-ft
$f_{bu\ top}$ =	7.32	ksi (compression)
$f_{bu\ bot}$ =	7.32	ksi (tension)
$V_{u\ max}$ =	293.0	kip (Strength I)
$V_{u\ max}$ =	220.6	kip (Service II)
$V_{u\ max}$ =	37.4	kip (Fatigue I)

Material Properties

F_y =	50	ksi	
E =	29000	ksi	
Fu =	65	ksi	(6.4.1-1)

Tension Flange Flexural Resistance (6.10.8.1.2, 6.10.8.3)

$F_{nt} = R_h*F_{yt}$

R_h =	1.0		(6.10.1.10)
F_{nt} =	50.0	ksi	
ϕ_f =	1.00		(6.5.4.2)
$\phi_f F_{nt}$ =	50.0	ksi	
$f_{bu} + 1/3*f_l$ =	7.32	ksi	

Factored Stress < Capacity, OK

Compression Flange Flexural Resistance (6.10.8.1.1, 6.10.8.2)

Local Buckling Resistance (10.8.2.2)

$\lambda_{pf} = 0.38*(E/F_{yc})^{0.5}$ =	9.15		(6.10.8.2.2-4)
$\lambda_{rf} = 0.56*(E/F_{yc})^{0.5}$ =	13.49		(6.10.8.2.2-5)
$\lambda_f = b_{fc}/(2t_{fc})$ =	12.0		(6.10.8.2.2-3)

If $\lambda_f <= \lambda_{pf}$

$F_{nc} = R_b*R_h*F_{yc}$ (6.10.8.2.2-1)

Otherwise

$F_{nc} = [1 - (1 - F_{yr}/(R_h*F_{yc}))*(\lambda_f - \lambda_{pf})/(\lambda_{rf} - \lambda_{pf})]*R_b*R_h*F_{yc}$ (6.10.8.2.2-2)

R_b =	1.0		(6.10.1.10)
$F_{yr} = 0.7*F_{yc}$ =	35.0	ksi	
F_{nc} =	40.14	ksi	

Lateral Torsional Buckling Resistance (10.8.2.3)

D_c =	42.00	in	
$r_t = b_{fc}/((12*(1 + 1/3*D_c*t_w/(b_{fc}*t_{fc})))^{0.5})$ =	5.78	in	(6.10.8.2.3-9)
$L_p = 1.0*r_t*(E/F_{yc})^{0.5}$ =	139.2	in	(6.10.8.2.3-4)
$L_r = \pi*r_t*(E/F_{yc})^{0.5}$ =	437.2	in	(6.10.8.2.3-5)
L_b =	72.3	in	

If $L_b <= L_p$

$F_{nc} = R_b*R_h*F_{yc}$ (6.10.8.2.3-1)

If $L_p < L_b <= L_r$

$F_{nc} = C_b*[1 - (1 - F_{yr}/(R_h*F_{yc}))(L_b - L_p)/(L_r - L_p)]*R_b*R_h*F_{yc}$

$<= R_b*R_h*F_{yc}$ (6.10.8.2.3-2)

If $L_b > L_r$

$F_{nc} = F_{cr} <= Rb*R_h*F_{yc}$ (6.10.8.2.3-3)

C_b =	1.0		(conservative assumption)
$F_{cr} = C_b*R_b*\pi^2*E/(L_b/r_t)^2$ =	1829.2	ksi	(6.10.8.2.3-8)
F_{nc} =	50.0	ksi	

End Diaphragm Design G4
Unit 1

Controlling Compressive Resistance

F_{nc} = 40.14 ksi

ϕ_f = 1.00 (6.5.4.2)

$\phi_f F_{nc}$ = 40.1 ksi

$f_{bu} + 1/3*f_l$ = 7.32 ksi

Factored Stress < Capacity, OK

CONNECTION DESIGN
Stub Girder End

Design Force (6.13.1)

ϕ_v = 1.00 (6.5.4.2)

Stub girder t_w = 0.69 in
Stub girder D = 84.0 in
Stiffener spacing, do = 90.5 in
k = 9.31
D/t_w = 122.2
$1.12*(E*k/F_{yw})^{0.5}$ = 82.3
$1.40*(E*k/F_{yw})^{0.5}$ = 102.9

C = 0.568
$V_p = 0.58*F_{yw}*D*t_w$ = 1674.8 kip (6.10.9.2-2)
$V_n = C*V_p$ = 950.8 kip (6.10.9.2-1)
ϕVn = 950.8 kip

Strength I Case Only

If $V_u < 0.75\phi_v V_n$

$V_{uw} = 0.75*\phi_v V_n$ (6.13.6.1.4b-1)

Otherwise

$V_{uw} = (V_u + \phi_v V_n)/2$ (6.13.6.1.4b-2)

V_{uw} = 713.1 kip (Strength I)
V_{uw} = 436.5 kip (Service II)
V_{uw} = 74.8 kip (Fatigue I)

Bolt Properties

A325 Bolt diameter, D_b = 1.00 in
Hole diameter = 1.125 in
A325 Bolt area, A_b = 0.79 in^2
F_{ub} = 120.00 ksi

Girder Web Connection

n_{col} = 5
n_{row} = 10
d_{edge} = 2.00 in
spa_{col} = 4.00 in
spa_{row} = 7.00 in
Connecting angle thickness = 0.75 in

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane
Angles on either side of the connection gives 2 shear planes.

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s = 2
R_n (per bolt)= 71.63 kip
Number of bolts = 50
R_n (entire connection) = 3581.4 kip

ϕ_s = 0.80 (6.5.4.2)
$\phi_s R_n$ = 2865.1 kip

R_u = 713.12 kip

Factored Load < Capacity, OK

Bolt Slip Resistance (6.13.2.8)

Assume standard holes and Class B surface.

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h = 1.00 (Table 6.13.2.8-2)
K_s = 0.50 (Table 6.13.2.8-3)
N_s = 2
P_t = 51 kip (Table 6.13.2.8-1)
R_n (per bolt)= 51.00 kip
Number of bolts = 50.00
R_n (entire connection) = 2550.00 kip
ϕ_s = 0.80 (6.5.4.2)
$\phi_s R_n$ = 2040.0 kip

R_u = 436.50 kip

Factored Load < Capacity, OK

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.
Conservatively designed per 6.13.6.1.4b rather than actual loads.

ksi (Table 6.6.1.2.5-3)

$(\Delta F)_n = (\Delta F)_{TH}$ = 16.0
A_b = 0.79 in^2
Number of bolts = 50.00
N_s = 2
R_u = 74.8 kip

$\gamma(\Delta f)$ = 0.95 ksi

Factored Load < Capacity, OK

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End Diaphragm Design G4
Unit 1

Bolt Bearing Resistance (6.13.2.9)

-With bolts spaced at a clear distance between holes not less than 2.0d and with a clear end distance not less than 2.0d:

$R_n = 2.4*d*t*F_u$ (6.13.2.9-1)

-With either the clear distance between holes is less than 2.0d, or the clear end distance is less than 2.0d:

$R_n = 1.2*L_c*t*F_u$ (6.13.2.9-2)

$L_{c\ int}$ =	5.875	in >=2.0d
$L_{c\ end}$ =	1.438	in < 2.0d

Equation to use: 6.13.2.9-2

Controlling thickness, t = 0.688 in (web)

R_n = 5211.68 kip

ϕ_{bb} = 0.80 (6.5.4.2)

$\phi_{bb}R_n$ = 4169.3 kip

R_u = 713.12 kip

Factored Load < Capacity, OK

Connecting Angle Shear (6.13.5.3)

Shear Yielding

$R_r = \phi_v*0.58*F_y*A_g$ (6.13.5.3-1)

Length =	67.0	in
A_g (2 angles) =	100.5	in^2
ϕ_v =	1.00	(6.5.4.2)
R_r =	2914.5	kip
R_u =	713.12	kip

Factored Load < Capacity, OK

Shear Rupture

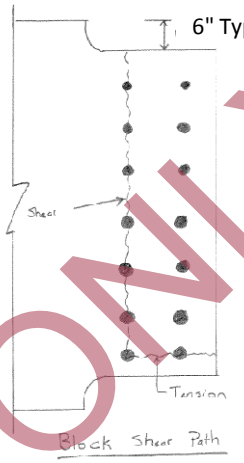
$R_r = \phi_{vu}*0.58*R_p*F_u*A_{vn}$ (6.13.5.3-2)

R_p =	0.90	Assume punched full sized
A_{vn} =	83.6	in^2
ϕ_{vu} =	0.80	(6.5.4.2)
R_r =	2269.9	kip
R_u =	713.12	kip

Factored Load < Capacity, OK

Coped Beam End Block Shear (6.13.4)

Consider beam end and connecting plates



$R_r = \phi_{bs}*R_p*(0.58*F_u*A_{vn} + U_{bs}*F_u*A_{tn})$
$<= \varphi_{bs}*R_p*(0.58*Fy*A_{vg} + U_{bs}*F_u*A_{tn})$ (6.13.4-1)

A_{vg} =	46.41	in^2
A_{vn} =	39.06	in^2
A_{tn} =	8.89	in^2
U_{bs} =	0.5	
ϕ_{bs} =	0.80	(6.5.4.2)

$\phi_{bs}*R_p*(0.58*F_u*A_{vn} + U_{bs}*F_u*A_{tn})$ =	1268.3	kip
$\varphi_{bs}*R_p*(0.58*Fy*A_{vg} + U_{bs}*F_u*A_{tn})$ =	1177.1	kip
R_r =	1177.1	kip
R_u =	713.12	kip

Factored Load < Capacity, OK

Diaphragm Web Connection

Determine number of bolts required based on bolt shear resistance. Each connection will take 1/2 of the design force. Detail bolts in 2 rows. The row closest to the stub girder web will have no bolts in the outside thirds of the connecting angles to allow flexibility in the joint.

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	1	
R_n (per bolt)=	35.81	kip
ϕ_s =	0.80	(6.5.4.2)
$\phi_s R_n$ (per bolt)=	28.7	kip
R_u =	356.6	kip

Min. Number of bolts required = 13

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End Diaphragm Design G4
Unit 1

Bolt Slip Resistance (6.13.2.8)

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	1.00		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	1		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	25.50	kip	
ϕ_s =	0.80		
$\phi_s R_n$ (per bolt)=	20.40	kip	
R_u =	218.2	kip	

Min. Number of bolts required = 11

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	ksi	(Table 6.6.1.2.5-3)
A_b =	0.79	in^2	
R_u =	37.4	kip	

Min. Number of bolts required = 3

Stub girder span length, L = 101.10 ft

Required gage = $(L*t/8)^{0.5}$ = 10.66 in

End Diaphragm Connection to Girder Web

Design Force (6.13.1)

ϕ_v = 1.00 (6.5.4.2)

Diaphragm t_w = 0.75 in

Diaphragm D = 84.0 in

k = 5.0 (assume unstiffened web)

D/t_w = 112.0

$1.12*(E*k/F_{yw})^{0.5}$ = 60.3

$1.40*(E*k/F_{yw})^{0.5}$ = 75.4

C = 0.363

$V_p = 0.58*F_{yw}*D*t_w$ =	1827.0	kip	(6.10.9.2-2)
$V_n = C*V_p$ =	663.1	kip	(6.10.9.2-1)
ϕV_n =	663.1	kip	

Strength I Case Only

If $V_u < 0.75\phi_v V_n$

$V_{uw} = 0.75*\phi_v V_n$ (6.13.6.1.4b-1)

Otherwise

$V_{uw} = (V_u + \phi_v V_n)/2$ (6.13.6.1.4b-2)

V_{uw} =	497.3	kip (Strength I)
V_{uw} =	220.6	kip (Strength I)
V_{uw} =	37.4	kip (Fatigue I)

Determine number of bolts based on bolt shear resistance

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	1		
R_n (per bolt)=	35.81	kip	
ϕ_s =	0.80		(6.5.4.2)
$\phi_s R_n$ (per bolt)=	28.7	kip	
R_u =	497.3	kip	

Min. Number of bolts required = 18

Bolt Slip Resistance (6.13.2.8)

Assume oversized holes and Class B surface.

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	0.85		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	1		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	21.68	kip	
ϕ_s =	0.80		
$\phi_s R_n$ (per bolt)=	17.34	kip	
R_u =	220.6	kip	

Min. Number of bolts required = 13

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	ksi	(Table 6.6.1.2.5-3)
A_b =	0.79	in^2	

Min. number of bolts required = 3

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End Diaphragm Design G5
Unit 1

The end diaphragm at the end of stub girder will be an I-section and will be designed as a simple span beam in between the adjacent girders. Design as a non-composite section.

Stub Girder End Shear

DC =	437.8	kip
DW =	140.3	kip
LL truck (no impact) =	37.5	kip
LL truck range (no impact) =	34.8	kip
LL lane =	68.1	kip
Importance Factor =	1.05	
V_u =	1012.4	kip (Strength I)
V_u =	768.0	kip (Service II)
V_u =	63.0	kip (Fatigue I)

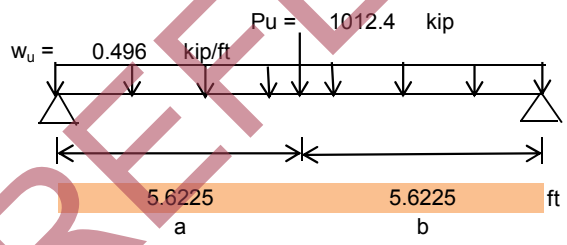
End Diaphragm Section Properties

	b (in)	t (in)	A (in^2)	y (in)	Ay (in^3)
Top	24.0	1.00	24.00	85.50	2052.0
Web	0.750	84	63.00	43.00	2709.0
Bottom	24.0	1.00	24.00	0.50	12.0

	d (in)	Io (in^4)	A*d^2 (in^4)
Top	42.50	2.0	43350.0
Web	0.00	37044.0	0.0
Bottom	-42.50	2.0	43350.0

A =	111.00	in^2
y_{bot} =	43.00	in
I =	123748	in^4
S_{bot} =	2877.9	in^3
S_{top} =	2877.9	in^3
w =	0.378	k/ft

Design Moment and Stress



$M_u = P_u*a*b/(a+b) + w_u*(a+b)^2/8$ =	2853.8	kip-ft
$f_{bu\ top}$ =	11.90	ksi (compression)
$f_{bu\ bot}$ =	11.90	ksi (tension)
$V_{u\ max}$ =	509.0	kip (Strength I)
$V_{u\ max}$ =	386.3	kip (Service II)
$V_{u\ max}$ =	31.5	kip (Fatigue I)

Material Properties

F_y =	50	ksi	
E =	29000	ksi	
Fu =	65	ksi	(6.4.1-1)

Tension Flange Flexural Resistance (6.10.8.1.2, 6.10.8.3)

$F_{nt} = R_h*F_{yt}$

R_h =	1.0		(6.10.1.10)
F_{nt} =	50.0	ksi	
ϕ_f =	1.00		(6.5.4.2)
$\phi_f F_{nt}$ =	50.0	ksi	
$f_{bu} + 1/3*f_l$ =	11.90	ksi	

Factored Stress < Capacity, OK

Compression Flange Flexural Resistance (6.10.8.1.1, 6.10.8.2)

Local Buckling Resistance (10.8.2.2)

$\lambda_{pf} = 0.38*(E/F_{yc})^{0.5}$ =	9.15		(6.10.8.2.2-4)
$\lambda_{rf} = 0.56*(E/F_{yc})^{0.5}$ =	13.49		(6.10.8.2.2-5)
$\lambda_f = b_{fc}/(2t_{fc})$ =	12.0		(6.10.8.2.2-3)

If $\lambda_f <= \lambda_{pf}$

$F_{nc} = R_b*R_h*F_{yc}$ (6.10.8.2.2-1)

Otherwise

$F_{nc} = [1 - (1 - F_{yr}/(R_h*F_{yc}))*(\lambda_f - \lambda_{pf})/(\lambda_{rf} - \lambda_{pf})]*R_b*R_h*F_{yc}$ (6.10.8.2.2-2)

R_b =	1.0		(6.10.1.10)
$F_{yr} = 0.7*F_{yc}$ =	35.0	ksi	
F_{nc} =	40.14	ksi	

Lateral Torsional Buckling Resistance (10.8.2.3)

D_c =	42.00	in	
$r_t = b_{fc}/((12*(1 + 1/3*D_c*t_w/(b_{fc}*t_{fc})))^{0.5})$ =	5.78	in	(6.10.8.2.3-9)
$L_p = 1.0*r_t*(E/F_{yc})^{0.5}$ =	139.2	in	(6.10.8.2.3-4)
$L_r = \pi*r_t*(E/F_{yc})^{0.5}$ =	437.2	in	(6.10.8.2.3-5)
L_b =	67.5	in	

If $L_b <= L_p$

$F_{nc} = R_b*R_h*F_{yc}$ (6.10.8.2.3-1)

If $L_p < L_b <= L_r$

$F_{nc} = C_b*[1 - (1 - F_{yr}/(R_h*F_{yc}))(L_b - L_p)/(L_r - L_p)]*R_b*R_h*F_{yc}$

$<= R_b*R_h*F_{yc}$ (6.10.8.2.3-2)

If $L_b > L_r$

$F_{nc} = F_{cr} <= Rb*R_h*F_{yc}$ (6.10.8.2.3-3)

C_b =	1.0		(conservative assumption)
$F_{cr} = C_b*R_b*\pi^2*E/(L_b/r_t)^2$ =	2099.5	ksi	(6.10.8.2.3-8)
F_{nc} =	50.0	ksi	

End Diaphragm Design G5
Unit 1

Controlling Compressive Resistance

F_{nc} =	40.14	ksi	
ϕ_f =	1.00		(6.5.4.2)
$\phi_f F_{nc}$ =	40.1	ksi	
$f_{bu} + 1/3*f_l$ =	11.90	ksi	

Factored Stress < Capacity, OK

CONNECTION DESIGN
Stub Girder End

Design Force (6.13.1)

ϕ_v =	1.00		(6.5.4.2)
Stub girder t_w =	0.69	in	
Stub girder D =	84.0	in	
Stiffener spacing, do =	68.5	in	
k =	12.52		
D/t_w =	122.2		
$1.12*(E*k/F_{yw})^{0.5}$ =	95.4		
$1.40*(E*k/F_{yw})^{0.5}$ =	119.3		
C =	0.764		
$V_p = 0.58*F_{yw}*D*t_w$ =	1674.8	kip	(6.10.9.2-2)
$V_n = C*V_p$ =	1278.9	kip	(6.10.9.2-1)
ϕVn =	1278.9	kip	

Strength I Case Only

If $V_u < 0.75\phi_v V_n$

$V_{uw} = 0.75*\phi_v V_n$ (6.13.6.1.4b-1)

Otherwise

$V_{uw} = (V_u + \phi_v V_n)/2$ (6.13.6.1.4b-2)

V_{uw} =	1145.6	kip (Strength I)
V_{uw} =	768.0	kip (Service II)
V_{uw} =	63.0	kip (Fatigue I)

Bolt Properties

A325 Bolt diameter, D_b =	1.00	in
Hole diameter =	1.125	in
A325 Bolt area, A_b =	0.79	in^2
F_{ub} =	120.00	ksi

Girder Web Connection

n_{col} =	5	
n_{row} =	10	
d_{edge} =	2.00	in
spa_{col} =	4.00	in
spa_{row} =	7.00	in
Connecting angle thickness =	0.75	in

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

Angles on either side of the connection gives 2 shear planes.

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	2		
R_n (per bolt)=	71.63	kip	
Number of bolts =	50		
R_n (entire connection) =	3581.4	kip	
ϕ_s =	0.80		(6.5.4.2)
$\phi_s R_n$ =	2865.1	kip	
R_u =	1145.62	kip	

Factored Load < Capacity, OK

Bolt Slip Resistance (6.13.2.8)

Assume standard holes and Class B surface.

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	1.00		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	2		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	51.00	kip	
Number of bolts =	50.00		
R_n (entire connection) =	2550.00	kip	
ϕ_s =	0.80		(6.5.4.2)
$\phi_s R_n$ =	2040.0	kip	
R_u =	768.04	kip	

Factored Load < Capacity, OK

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

Conservatively designed per 6.13.6.1.4b rather than actual loads.

ksi (Table 6.6.1.2.5-3)

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	
A_b =	0.79	in^2
Number of bolts =	50.00	
N_s =	2	
R_u =	63.0	kip
$\gamma(\Delta f)$ =	0.80	ksi

Factored Load < Capacity, OK

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End Diaphragm Design G5
Unit 1

Bolt Bearing Resistance (6.13.2.9)

-With bolts spaced at a clear distance between holes not less than 2.0d and with a clear end distance not less than 2.0d:

$R_n = 2.4*d*t*F_u$ (6.13.2.9-1)

-With either the clear distance between holes is less than 2.0d, or the clear end distance is less than 2.0d:

$R_n = 1.2*L_c*t*F_u$ (6.13.2.9-2)

$L_{c\ int}$ =	5.875	in >=2.0d
$L_{c\ end}$ =	1.438	in < 2.0d

Equation to use: 6.13.2.9-2

Controlling thickness, t = 0.688 in (web)

R_n = 5211.68 kip

ϕ_{bb} = 0.80 (6.5.4.2)

$\phi_{bb}R_n$ = 4169.3 kip

R_u = 1145.62 kip

Factored Load < Capacity, OK

Connecting Angle Shear (6.13.5.3)

Shear Yielding

$R_r = \phi_v*0.58*F_y*A_g$ (6.13.5.3-1)

Length =	67.0	in
A_g (2 angles) =	100.5	in^2
ϕ_v =	1.00	(6.5.4.2)
R_r =	2914.5	kip
R_u =	1145.62	kip

Factored Load < Capacity, OK

Shear Rupture

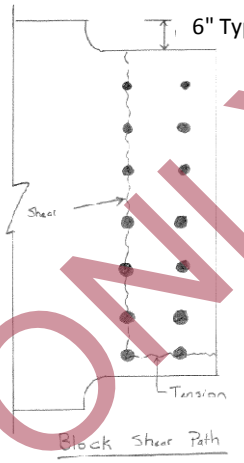
$R_r = \phi_{vu}*0.58*R_p*F_u*A_{vn}$ (6.13.5.3-2)

R_p =	0.90	Assume punched full sized
A_{vn} =	83.6	in^2
ϕ_{vu} =	0.80	(6.5.4.2)
R_r =	2269.9	kip
R_u =	1145.62	kip

Factored Load < Capacity, OK

Coped Beam End Block Shear (6.13.4)

Consider beam end and connecting plates



$R_r = \phi_{bs}*R_p*(0.58*F_u*A_{vn} + U_{bs}*F_u*A_{tn})$
$<= \varphi_{bs}*R_p*(0.58*Fy*A_{vg} + U_{bs}*F_u*A_{tn})$ (6.13.4-1)

A_{vg} =	46.41	in^2
A_{vn} =	39.06	in^2
A_{tn} =	8.89	in^2
U_{bs} =	0.5	
ϕ_{bs} =	0.80	(6.5.4.2)

$\phi_{bs}*R_p*(0.58*F_u*A_{vn} + U_{bs}*F_u*A_{tn})$ =	1268.3	kip
$\varphi_{bs}*R_p*(0.58*Fy*A_{vg} + U_{bs}*F_u*A_{tn})$ =	1177.1	kip

R_r = 1177.1 kip

R_u = 1145.62 kip

Factored Load < Capacity, OK

Diaphragm Web Connection

Determine number of bolts required based on bolt shear resistance. Each connection will take 1/2 of the design force. Detail bolts in 2 rows. The row closest to the stub girder web will have no bolts in the outside thirds of the connecting angles to allow flexibility in the joint.

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	1	
R_n (per bolt)=	35.81	kip
ϕ_s =	0.80	(6.5.4.2)
$\phi_s R_n$ (per bolt)=	28.7	kip

R_u = 572.8 kip

Min. Number of bolts required = 20

End Diaphragm Design G5
Unit 1

Bolt Slip Resistance (6.13.2.8)

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	1.00		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	1		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	25.50	kip	
ϕ_s =	0.80		
$\phi_s R_n$ (per bolt)=	20.40	kip	
R_u =	384.0	kip	

Min. Number of bolts required = 19

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	ksi	(Table 6.6.1.2.5-3)
A_b =	0.79	in^2	
R_u =	31.5	kip	

Min. Number of bolts required = 3

Stub girder span length, L =	23.69	ft
Required gage = $(L*t/8)^{0.5}$ =	5.16	in

End Diaphragm Connection to Girder Web

Design Force (6.13.1)

ϕ_v = 1.00 (6.5.4.2)

Diaphragm t_w =	0.75	in	
Diaphragm D =	84.0	in	
k =	5.0		(assume unstiffened web)
D/t_w =	112.0		
$1.12*(E*k/F_{yw})^{0.5}$ =	60.3		
$1.40*(E*k/F_{yw})^{0.5}$ =	75.4		
C =	0.363		
$V_p = 0.58*F_{yw}*D*t_w$ =	1827.0	kip	(6.10.9.2-2)
$V_n = C*V_p$ =	663.1	kip	(6.10.9.2-1)
ϕVn =	663.1	kip	

Strength I Case Only

If $V_u < 0.75\phi_v V_n$

$V_{uw} = 0.75*\phi_v V_n$ (6.13.6.1.4b-1)

Otherwise

$V_{uw} = (V_u + \phi_v V_n)/2$ (6.13.6.1.4b-2)

V_{uw} =	586.1	kip (Strength I)
V_{uw} =	386.3	kip (Strength I)
V_{uw} =	31.5	kip (Fatigue I)

Determine number of bolts based on bolt shear resistance

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	1		
R_n (per bolt)=	35.81	kip	
ϕ_s =	0.80		(6.5.4.2)
$\phi_s R_n$ (per bolt)=	28.7	kip	
R_u =	586.1	kip	

Min. Number of bolts required = 21

Bolt Slip Resistance (6.13.2.8)

Assume oversized holes and Class B surface.

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	0.85		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	1		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	21.68	kip	
ϕ_s =	0.80		
$\phi_s R_n$ (per bolt)=	17.34	kip	
R_u =	386.3	kip	

Min. Number of bolts required = 23

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	ksi	(Table 6.6.1.2.5-3)
A_b =	0.79	in^2	

Min. number of bolts required = 3

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End Diaphragm Design G6
Unit 1

The end diaphragm at the end of stub girder will be an I-section and will be designed as a simple span beam in between the adjacent girders. Design as a non-composite section.

Stub Girder End Shear

DC =	86.4	kip
DW =	35.7	kip
LL truck (no impact) =	69.2	kip
LL truck range (no impact) =	41.1	kip
LL lane =	38.9	kip
Importance Factor =	1.05	
V_u =	410.2	kip (Strength I)
V_u =	306.9	kip (Service II)
V_u =	74.4	kip (Fatigue I)

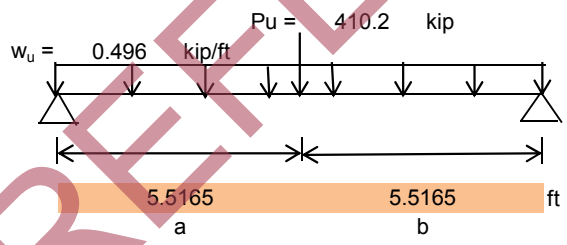
End Diaphragm Section Properties

	b (in)	t (in)	A (in^2)	y (in)	Ay (in^3)
Top	24.0	1.00	24.00	85.50	2052.0
Web	0.750	84	63.00	43.00	2709.0
Bottom	24.0	1.00	24.00	0.50	12.0

	d (in)	Io (in^4)	A*d^2 (in^4)
Top	42.50	2.0	43350.0
Web	0.00	37044.0	0.0
Bottom	-42.50	2.0	43350.0

A =	111.00	in^2
y_{bot} =	43.00	in
I =	123748	in^4
S_{bot} =	2877.9	in^3
S_{top} =	2877.9	in^3
w =	0.378	k/ft

Design Moment and Stress



$M_u = P_u*a*b/(a+b) + w_u*(a+b)^2/8$ =	1139.0	kip-ft
$f_{bu\ top}$ =	4.75	ksi (compression)
$f_{bu\ bot}$ =	4.75	ksi (tension)
$V_{u\ max}$ =	207.8	kip (Strength I)
$V_{u\ max}$ =	155.7	kip (Service II)
$V_{u\ max}$ =	37.2	kip (Fatigue I)

Material Properties

F_y =	50	ksi	
E =	29000	ksi	
Fu =	65	ksi	(6.4.1-1)

Tension Flange Flexural Resistance (6.10.8.1.2, 6.10.8.3)

$F_{nt} = R_h*F_{yt}$

R_h =	1.0		(6.10.1.10)
F_{nt} =	50.0	ksi	
ϕ_f =	1.00		(6.5.4.2)
$\phi_f F_{nt}$ =	50.0	ksi	
$f_{bu} + 1/3*f_l$ =	4.75	ksi	

Factored Stress < Capacity, OK

Compression Flange Flexural Resistance (6.10.8.1.1, 6.10.8.2)

Local Buckling Resistance (10.8.2.2)

$\lambda_{pf} = 0.38*(E/F_{yc})^{0.5}$ =	9.15		(6.10.8.2.2-4)
$\lambda_{rf} = 0.56*(E/F_{yc})^{0.5}$ =	13.49		(6.10.8.2.2-5)
$\lambda_f = b_{fc}/(2t_{fc})$ =	12.0		(6.10.8.2.2-3)

If $\lambda_f <= \lambda_{pf}$

$F_{nc} = R_b*R_h*F_{yc}$ (6.10.8.2.2-1)

Otherwise

$F_{nc} = [1 - (1 - F_{yr}/(R_h*F_{yc}))*(\lambda_f - \lambda_{pf})/(\lambda_{rf} - \lambda_{pf})]*R_b*R_h*F_{yc}$ (6.10.8.2.2-2)

R_b =	1.0		(6.10.1.10)
$F_{yr} = 0.7*F_{yc}$ =	35.0	ksi	
F_{nc} =	40.14	ksi	

Lateral Torsional Buckling Resistance (10.8.2.3)

D_c =	42.00	in	
$r_t = b_{fc}/((12*(1 + 1/3*D_c*t_w/(b_{fc}*t_{fc})))^{0.5})$ =	5.78	in	(6.10.8.2.3-9)
$L_p = 1.0*r_t*(E/F_{yc})^{0.5}$ =	139.2	in	(6.10.8.2.3-4)
$L_r = \pi*r_t*(E/F_{yc})^{0.5}$ =	437.2	in	(6.10.8.2.3-5)
L_b =	66.2	in	

If $L_b <= L_p$

$F_{nc} = R_b*R_h*F_{yc}$ (6.10.8.2.3-1)

If $L_p < L_b <= L_r$

$F_{nc} = C_b*[1 - (1 - F_{yr}/(R_h*F_{yc}))(L_b - L_p)/(L_r - L_p)]*R_b*R_h*F_{yc}$

$<= R_b*R_h*F_{yc}$ (6.10.8.2.3-2)

If $L_b > L_r$

$F_{nc} = F_{cr} <= Rb*R_h*F_{yc}$ (6.10.8.2.3-3)

C_b =	1.0		(conservative assumption)
$F_{cr} = C_b*R_b*\pi^2*E/(L_b/r_t)^2$ =	2180.9	ksi	(6.10.8.2.3-8)
F_{nc} =	50.0	ksi	

End Diaphragm Design G6
Unit 1

Controlling Compressive Resistance

F_{nc} =	40.14	ksi	
ϕ_f =	1.00		(6.5.4.2)
$\phi_f F_{nc}$ =	40.1	ksi	
$f_{bu} + 1/3*f_l$ =	4.75	ksi	

Factored Stress < Capacity, OK

CONNECTION DESIGN
Stub Girder End

Design Force (6.13.1)

ϕ_v =	1.00		(6.5.4.2)
Stub girder t_w =	0.69	in	
Stub girder D =	84.0	in	
Stiffener spacing, do =	273.6	in	
k =	5.00	(Unstiffened web)	
D/t_w =	122.2		
$1.12*(E*k/F_{yw})^{0.5}$ =	60.3		
$1.40*(E*k/F_{yw})^{0.5}$ =	75.4		
C =	0.305		
$V_p = 0.58*F_{yw}*D*t_w$ =	1674.8	kip	(6.10.9.2-2)
$V_n = C*V_p$ =	510.8	kip	(6.10.9.2-1)
ϕVn =	510.8	kip	

Strength I Case Only

If $V_u < 0.75\phi_v V_n$

$V_{uw} = 0.75*\phi_v V_n$ (6.13.6.1.4b-1)

Otherwise

$V_{uw} = (V_u + \phi_v V_n)/2$ (6.13.6.1.4b-2)

V_{uw} =	460.5	kip (Strength I)
V_{uw} =	306.9	kip (Service II)
V_{uw} =	74.4	kip (Fatigue I)

Bolt Properties

A325 Bolt diameter, D_b =	1.00	in
Hole diameter =	1.125	in
A325 Bolt area, A_b =	0.79	in^2
F_{ub} =	120.00	ksi

Girder Web Connection

n_{col} =	5	
n_{row} =	10	
d_{edge} =	2.00	in
spa_{col} =	4.00	in
spa_{row} =	7.00	in
Connecting angle thickness =	0.75	in

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

Angles on either side of the connection gives 2 shear planes.

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	2		
R_n (per bolt)=	71.63	kip	
Number of bolts =	50		
R_n (entire connection) =	3581.4	kip	
ϕ_s =	0.80		(6.5.4.2)
$\phi_s R_n$ =	2865.1	kip	
R_u =	460.50	kip	

Factored Load < Capacity, OK

Bolt Slip Resistance (6.13.2.8)

Assume standard holes and Class B surface.

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	1.00		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	2		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	51.00	kip	
Number of bolts =	50.00		
R_n (entire connection) =	2550.00	kip	
ϕ_s =	0.80		(6.5.4.2)
$\phi_s R_n$ =	2040.0	kip	
R_u =	306.93	kip	

Factored Load < Capacity, OK

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

Conservatively designed per 6.13.6.1.4b rather than actual loads.

ksi (Table 6.6.1.2.5-3)

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	
A_b =	0.79	in^2
Number of bolts =	50.00	
N_s =	2	
R_u =	74.4	kip
$\gamma(\Delta f)$ =	0.95	ksi

Factored Load < Capacity, OK

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End Diaphragm Design G6
Unit 1

Bolt Bearing Resistance (6.13.2.9)

-With bolts spaced at a clear distance between holes not less than 2.0d and with a clear end distance not less than 2.0d:

$R_n = 2.4*d*t*F_u$ (6.13.2.9-1)

-With either the clear distance between holes is less than 2.0d, or the clear end distance is less than 2.0d:

$R_n = 1.2*L_c*t*F_u$ (6.13.2.9-2)

$L_{c\ int}$ =	5.875	in >=2.0d
$L_{c\ end}$ =	1.438	in < 2.0d

Equation to use: 6.13.2.9-2

Controlling thickness, t = 0.688 in (web)

R_n = 5211.68 kip

ϕ_{bb} = 0.80 (6.5.4.2)

$\phi_{bb}R_n$ = 4169.3 kip

R_u = 460.50 kip

Factored Load < Capacity, OK

Connecting Angle Shear (6.13.5.3)

Shear Yielding

$R_r = \phi_v*0.58*F_y*A_g$ (6.13.5.3-1)

Length =	67.0	in
A_g (2 angles) =	100.5	in^2
ϕ_v =	1.00	(6.5.4.2)
R_r =	2914.5	kip
R_u =	460.50	kip

Factored Load < Capacity, OK

Shear Rupture

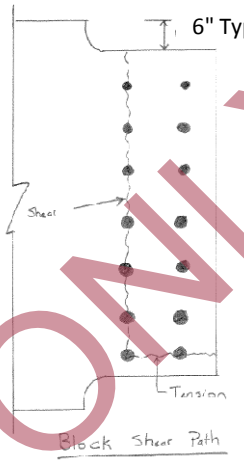
$R_r = \phi_{vu}*0.58*R_p*F_u*A_{vn}$ (6.13.5.3-2)

R_p =	0.90	Assume punched full sized
A_{vn} =	83.6	in^2
ϕ_{vu} =	0.80	(6.5.4.2)
R_r =	2269.9	kip
R_u =	460.50	kip

Factored Load < Capacity, OK

Coped Beam End Block Shear (6.13.4)

Consider beam end and connecting plates



$R_r = \phi_{bs}*R_p*(0.58*F_u*A_{vn} + U_{bs}*F_u*A_{tn})$
$<= \varphi_{bs}*R_p*(0.58*Fy*A_{vg} + U_{bs}*F_u*A_{tn})$ (6.13.4-1)

A_{vg} =	46.41	in^2
A_{vn} =	39.06	in^2
A_{tn} =	8.89	in^2
U_{bs} =	0.5	
ϕ_{bs} =	0.80	(6.5.4.2)

$\phi_{bs}*R_p*(0.58*F_u*A_{vn} + U_{bs}*F_u*A_{tn})$ =	1268.3	kip
$\varphi_{bs}*R_p*(0.58*Fy*A_{vg} + U_{bs}*F_u*A_{tn})$ =	1177.1	kip
R_r =	1177.1	kip
R_u =	460.50	kip

Factored Load < Capacity, OK

Diaphragm Web Connection

Determine number of bolts required based on bolt shear resistance. Each connection will take 1/2 of the design force. Detail bolts in 2 rows. The row closest to the stub girder web will have no bolts in the outside thirds of the connecting angles to allow flexibility in the joint.

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	1	
R_n (per bolt)=	35.81	kip
ϕ_s =	0.80	(6.5.4.2)
$\phi_s R_n$ (per bolt)=	28.7	kip
R_u =	230.3	kip

Min. Number of bolts required = 9

End Diaphragm Design G6
Unit 1

Bolt Slip Resistance (6.13.2.8)

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	1.00		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	1		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	25.50	kip	
ϕ_s =	0.80		
$\phi_s R_n$ (per bolt)=	20.40	kip	
R_u =	153.5	kip	

Min. Number of bolts required = 8

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	ksi	(Table 6.6.1.2.5-3)
A_b =	0.79	in^2	
R_u =	37.2	kip	

Min. Number of bolts required = 3

Stub girder span length, L = 114.76 ft

Required gage = $(L*t/8)^{0.5}$ = 11.36 in

End Diaphragm Connection to Girder Web

Design Force (6.13.1)

ϕ_v = 1.00 (6.5.4.2)

Diaphragm t_w =	0.75	in	
Diaphragm D =	84.0	in	
k =	5.0		(assume unstiffened web)
D/t_w =	112.0		
$1.12*(E*k/F_{yw})^{0.5}$ =	60.3		
$1.40*(E*k/F_{yw})^{0.5}$ =	75.4		
C =	0.363		
$V_p = 0.58*F_{yw}*D*t_w$ =	1827.0	kip	(6.10.9.2-2)
$V_n = C*V_p$ =	663.1	kip	(6.10.9.2-1)
ϕVn =	663.1	kip	

Strength I Case Only

If $V_u < 0.75\phi_v V_n$

$V_{uw} = 0.75*\phi_v V_n$ (6.13.6.1.4b-1)

Otherwise

$V_{uw} = (V_u + \phi_v V_n)/2$ (6.13.6.1.4b-2)

V_{uw} =	497.3	kip (Strength I)
V_{uw} =	155.7	kip (Strength I)
V_{uw} =	37.2	kip (Fatigue I)

Determine number of bolts based on bolt shear resistance

Bolt Shear Resistance (6.13.2.7)

Assume threads are included in the shear plane

$R_n = 0.38*A_b*F_{ub}*N_s$ (6.13.2.7-2)

N_s =	1		
R_n (per bolt)=	35.81	kip	
ϕ_s =	0.80		(6.5.4.2)
$\phi_s R_n$ (per bolt)=	28.7	kip	
R_u =	497.3	kip	

Min. Number of bolts required = 18

Bolt Slip Resistance (6.13.2.8)

Assume oversized holes and Class B surface.

$R_n = K_h*K_s*N_s*P_t$ (6.13.2.8-1)

K_h =	0.85		(Table 6.13.2.8-2)
K_s =	0.50		(Table 6.13.2.8-3)
N_s =	1		
P_t =	51	kip	(Table 6.13.2.8-1)
R_n (per bolt)=	21.68	kip	
ϕ_s =	0.80		
$\phi_s R_n$ (per bolt)=	17.34	kip	
R_u =	155.7	kip	

Min. Number of bolts required = 9

Fatigue Resistance (6.6.1.2.2)

Bolted connections are a Class B fatigue detail. Fatigue I loading.

$(\Delta F)_n = (\Delta F)_{TH}$ =	16.0	ksi	(Table 6.6.1.2.5-3)
A_b =	0.79	in^2	

Min. number of bolts required = 3