URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Shear Design.xls]Web Design (t=1)
Forces Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09
DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1** ***Rating Truck:*** HL-93 ***LL Factor:*** *Inventory*

Material Properties:

Concrete
f'c = ***5.0*** ksi
ϕ_v = ***0.90***

P-T Strands
f_{pu} = ***270*** ksi
f_{pe} = ***176*** ksi

Reinforcement
fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness
b_v = ***12.95*** in

Effective Width of Shear Flow Path
be= ***5.50*** in

Notes:
1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc All RF

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Maximum LL Shear @ t=00																									
1	1	0.001	0.000	0.001	1.003	2487	-103	6	-116	-107	6	-522	N	0	0.00	77.76	439	0	0.13	Not Reqd	0.00	0.06	0.37	545				0.00	0.00
1	2	0.001	-0.001	0.001	1.002	2485	-193	199	-37	-220	225	-421	N	0	65.57	77.76	434	0	0.13	Not Reqd	0.00	0.06	0.37	544	880	113	8.70	0.00	0.00
2	2	-0.254	-0.454	-0.317	1.801	4465	23	122	221	-7	-391	-426	N	352	65.57	77.76	614	0	0.13	Not Reqd	0.00	0.06	0.37	545	1043	196	14.94	0.00	0.00
2	3	-0.256	-0.449	-0.317	1.800	4464	-61	122	221	263	-381	-418	N	351	43.34	77.76	614	0	0.13	Not Reqd	0.00	0.06	0.37	545	1043	191	15.02	0.00	0.00
3	3	-0.255	-0.449	-0.316	1.799	4461	-51	122	219	270	-381	-796	N	351	43.34	77.76	614	0	0.13	Not Reqd	0.00	0.06	0.37	545	1043	190	15.00	0.00	0.00
3	4	-0.278	-0.404	-0.318	1.802	4468	-1124	123	212	3356	-240	-685	N	274	54.64	77.76	565	0	0.13	Not Reqd	0.00	0.06	0.37	543	997	120	15.22	0.00	0.00
4	4	-0.272	-0.405	-0.314	1.795	4451	-1114	124	205	3334	-240	-1060	N	274	54.64	77.76	565	0	0.13	Not Reqd	0.00	0.06	0.37	543	997	120	15.20	0.00	0.00
4	5	-0.286	-0.382	-0.316	1.799	4461	1403	136	-150	8298	-111	-1317	N	200	61.54	77.76	512	0	0.13	Not Reqd	0.00	0.06	0.37	539	947	56	14.07	0.00	0.00
5	5	-0.281	-0.383	-0.313	1.794	4448	1387	134	-101	8262	-113	-1426	Y	200	61.54	77.76	512	0	0.13	0.099	0.00	0.11	0.37	539	947	102	13.02	-4.81	-1.65
5	6	-0.288	-0.376	-0.316	1.798	4459	1732	163	-185	10129	33	-1411	Y	136	66.43	77.76	474	0	0.13	0.098	0.00	0.11	0.37	538	911	61	10.72	-4.76	-1.63
6	6	-0.283	-0.377	-0.313	1.792	4444	1719	160	-105	10094	29	-1388	Y	136	66.43	77.76	474	0	0.13	0.097	0.00	0.11	0.37	538	911	59	11.26	-4.68	-1.60
6	7	-0.281	-0.389	-0.315	1.797	4456	4944	204	-217	13897	191	-1401	Y	70	69.42	77.76	431	0	0.13	0.098	0.00	0.11	0.21	298	656	140	5.74	-4.73	-1.62
7	7	-0.276	-0.390	-0.312	1.791	4440	4953	200	-103	13879	187	-1282	N	70	69.42	77.76	431	0	0.13	Not Reqd	0.00	0.06	0.21	298	656	93	6.63	0.00	0.00
7	8	-0.268	-0.417	-0.315	1.796	4454	5377	250	-162	13938	354	-1243	N	-1	70.39	77.76	392	0	0.13	Not Reqd	0.00	0.06	0.21	297	620	177	4.54	0.00	0.00
8	8	-0.262	-0.418	-0.311	1.789	4437	5398	245	-23	13928	349	-1067	N	-1	70.39	77.76	392	0	0.13	Not Reqd	0.00	0.06	0.21	297	620	175	4.64	0.00	0.00
8	9	-0.247	-0.462	-0.314	1.796	4453	5268	295	-52	12488	516	-998	N	-72	69.34	77.76	429	0	0.13	Not Reqd	0.00	0.06	0.21	297	654	258	3.68	0.00	0.00
9	9	-0.241	-0.463	-0.311	1.788	4435	5301	289	97	12486	511	-808	N	-72	69.34	77.76	429	0	0.13	Not Reqd	0.00	0.06	0.21	297	654	255	3.76	0.00	0.00
9	10	-0.219	-0.521	-0.314	1.795	4450	4641	339	82	9570	678	-724	N	-141	66.33	77.76	470	0	0.13	Not Reqd	0.00	0.06	0.21	298	691	339	3.08	0.00	0.00
10	10	-0.212	-0.523	-0.310	1.787	4431	4685	333	223	9577	673	-555	N	-141	66.33	77.76	470	0	0.13	Not Reqd	0.00	0.06	0.21	298	691	336	3.13	0.00	0.00
10	11	-0.184	-0.595	-0.313	1.793	4447	3510	384	207	5199	840	-472	N	-215	61.32	77.76	517	0	0.13	Not Reqd	0.00	0.06	0.21	299	735	420	2.64	0.00	0.00
11	11	-0.180	-0.596	-0.311	1.789	4437	3545	379	304	5213	836	-372	N	-215	61.32	77.76	517	0	0.13	Not Reqd	0.00	0.06	0.21	299	735	418	2.67	0.00	0.00
11	12	-0.159	-0.649	-0.313	1.793	4447	2504	413	287	1575	946	-325	N	-264	57.03	77.76	551	0	0.13	Not Reqd	0.00	0.06	0.21	300	766	473	2.42	0.00	0.00
12	12	-0.156	-0.650	-0.312	1.790	4439	2532	409	348	1585	946	-313	N	-377	57.03	77.76	610	0	0.13	Not Reqd	0.00	0.06	0.21	301	819	473	2.69	0.00	0.00
12	13	-0.137	-0.619	-0.302	1.770	4337	680	457	304	-4723	1105	-265	N	-444	58.74	77.76	628	0	0.13	Not Reqd	0.00	0.06	0.37	538	1050	553	3.18	0.00	0.00
13	13	-0.132	-0.620	-0.299	1.764	4322	733	453	353	-4706	1102	-280	N	-430	58.74	77.76	621	0	0.13	Not Reqd	0.00	0.06	0.37	538	1043	551	3.17	0.00	0.00
13	14	-0.180	-0.802	-0.408	1.971	4770	-1557	501	284	-12342	1275	-258	N	-890	64.15	77.76	882	0	0.13	Not Reqd	0.00	0.06	0.37	545	1284	638	3.58	0.00	0.00
14	14	-0.175	-0.803	-0.405	1.967	4759	-1503	499	277	-12327	1274	-372	N	-873	64.15	77.76	873	0	0.13	Not Reqd	0.00	0.06	0.37	544	1276	637	3.56	0.00	0.00
14	15	-0.200	-0.687	-0.389	1.937	4628	-4221	548	179	-21418	1470	-378	N	-975	78.68	77.76	895	0	0.13	Not Reqd	0.00	0.06	0.37	538	1290	735	3.03	0.00	0.00
15	15	-0.195	-0.688	-0.386	1.932	4618	-4169	548	91	-21414	1467	-616	N	-850	78.68	77.76	830	0	0.13	Not Reqd	0.00	0.06	0.37	538	1231	733	2.82	0.00	0.00
15	16	-0.181	-0.745	-0.399	1.956	4673	-7553	599	-38	-32845	1679	-647	N	-373	91.75	82.57	583	350	0.46	Not Reqd	0.00	0.23	0.37	563				0.00	0.00
16	16	-0.180	-0.745	-0.399	1.955	4672	-7529	595	-210	-32830	1698	-1527	Y	-373	91.75	82.57	583	361	0.48	0.110	0.00	0.29	0.37	563				-5.28	-1.81
16	17	-0.148	-0.822	-0.409	1.973	4715	-8832	614	-391	-37036	1760	-1677	Y	0	92.92	83.63	388	590	0.77	0.121	0.00	0.45	0.37	567				-5.80	-1.98
17	17	-0.147	-0.823	-0.408	1.972	4714	2954	100	-992	-25261	-1333	-2588	Y	0	92.92	83.63	418	322	0.42	0.187	0.00	0.30	0.37	575				-8.95	-3.06
17	18	-0.223	-0.706	-0.410	1.975	4720	2480	108	-1390	-22093	-1283	-2955	Y	130	92.54	83.28	491	221	0.29	0.214	0.00	0.25	0.41	638				-10.22	-3.49
18	18	-0.223	-0.706	-0.410	1.975	4719	3641	79	46	-20939	-1295	-2113	Y	130	92.54	83.28	494	225	0.29	0.153	0.00	0.22	0.41	639				-7.31	-2.50
18	19	-0.397	-0.447	-0.417	1.987	4749	3053	80	43	-10989	-1163	-2018	Y	489	86.88	78.19	677	0	0.13	0.146	0.00	0.14	0.41	607	1156	645	13.35	-6.98	-2.39
19	19	-0.393	-0.448	-0.414	1.983	4739	3047	80	71	-11028	-1166	-2130	Y	563	86.88	78.19	716	0	0.13	0.154	0.00	0.14	0.41	607	1191	650	13.85	-7.37	-2.52
19	20	-0.481	-0.354	-0.433	2.000	4815	3341	88	-630	-1223	-1029	-2732	Y	798	75.59	77.76	871	0	0.13	0.196	0.00	0.16	0.41	612	1335	601	12.52	-9.40	-3.21
20	20	-0.476	-0.355	-0.430	2.000	4815	3320	85	-503	-1270	-1031	-2678	Y	804	75.59	77.76	873	0	0.13	0.192	0.00	0.16	0.41	612	1337	600	13.58	-9.22	-3.15
20	21	-0.528	-0.314	-0.450	2.000	4852	3600	102	-777	7493	-888	-2853	Y	717	44.46	77.76	815	0	0.13	0.203	0.00	0.17	0.41	609	1282	534	10.93	-9.77	-3.34
21	21	-0.523	-0.314	-0.448	2.000	4852	3587	98	-625	7458	-892	-2710	Y	723	44.46	77.76	819	0	0.13	0.193	0.00	0.16	0.41	609	1285	532	11.97	-9.28	-3.17
21	22	-0.565	-0.277	-0.465	2.000	4887	4050	119	-952	15399	-747	-2938	Y	647	54.98	77.76	760	0	0.13	0.208	0.00	0.17	0.41	605	1229	466	9.49	-10.01	-3.42
22	22	-0.561	-0.277	-0.462	2.000	4887	4034	114	-771	15365	-753	-2705	Y	654	54.98	77.76	764	0	0.13	0.191	0.00	0.16	0.41	605	1232	462	10.48	-9.22	-3.15
22	23	-0.592	-0.244	-0.477	2.000	4924	4426	137	-1095	22252	-609	-2931	Y	593	64.16	77.76	717	0	0.13	0.206	0.00	0.17	0.41	601	1187	397	8.67	-9.94	-3.40
23	23	-0.588	-0.245	-0.474	2.000	4924	4416	129	-884	22226	-617	-2616	Y	601	64.16	77.76	721	0	0.13	0.184	0.00	0.16	0.41	601	1190	391	9.63	-8.87	-3.03
23	24	-0.610	-0.216	-0.486	2.000	4960	4725	153	-1202	28070	-475	-2836	Y	537	72.21	77.76	674	0	0.13	0.198	0.00	0.16	0.41	598	1144	327	8.13	-9.57	-3.27
24	24	-0.607	-0.216	-0.484	2.000	4960	4735	145	-961	28067	-478	-2457	Y	432	72.21	77.76	621	0	0.13	0.171	0.00	0.15	0.41	598	1097	317	8.59	-8.29	-2.84
24	25	-0.627	-0.171	-0.483	2.000	4960	4951	170	-1270	32833	-337	-2668	Y	361	79.06	77.76	573	0	0.13	0.186	0.00	0.16	0.21	297	784	253	5.25	-9.01	-3.08
25	25	-0.623	-0.171	-0.481	2.000	4960	7488	159	-451	35355	-347	-1671	Y	361	79.06	77.76	567	0	0.13	0.116	0.00	0.12	0.21	297	777	226	6.87	-5.64	-1.93
25	26	-0.638	-0.137	-0.480	2.000	4960	8078	192	-645	39554	-198	-1767	Y	286	84.61	77.76	518	0	0.13	0.123	0.00	0.13	0.21	295	732	155	5.97	-5.96	-2.04
26	26	-0.635	-0.138	-0.478	2.000	4960	8116	180	-255	39576	-210	-1172	N	286	84.61	77.76	518	0	0.13	Not Reqd	0.00	0.06	0.21	295	732	105	7.98	0.00	0.00
26	27	-0.643	-0.115	-0.477	2.000	4960	8538	213	-534	42664	-60	-1353	N	212	88.87	79.98	486	0	0.13	Not Reqd	0.00	0.06	0.21	303	710	30	7.39	0.00	0.00
27	27	-0.640	-0.116	-0.475	2.000	4960	8586	200	-100	42696	-73	-694	N	212	88.87	79.98	486	0	0.13	Not Reqd	0.00	0.06	0.21	303	710	36	7.74	0.00	0.00
27	28	-0.643	-0.107	-0.474	2.000	4960	8892	234	-224	44724	78	-720	N	139	91.84	82.66	462	0	0.13	Not Reqd	0.00	0.06	0.21	313	697	39	6.63	0.00	0.00
28	28	-0.640	-0.108	-0.473	2.000	4960	8912	220	97	44727	65	-162	N	139	91.84	82.66	462	0	0.13	Not Reqd	0.00	0.06	0.21	313	697	32	7.04	0.00	0.00
28	29	-0.636	-0.115	-0.472	2.000	4960	9055	255	-9	45650	216	-169	N	65	93.56	84.20	431	0	0.13	Not Reqd	0.00	0.06	0.21	318	674	108	5.44	0.00	0.00
29	29	-0.633	-0.115	-0.470	2.000	4960	9081	240	326	45658	202	406	N	65	93.56	84.20	431	0	0.13	Not Reqd	0.00	0.06	0.21	318	674	101	5.77	0.00	0.00
29	30	-0.623	-0.139	-0.471	2.000	4960	9047	276	236	45460	355	415	N	-10	94.02	84.62	403	0	0.13	Not Reqd	0.00	0.06	0.21	320	650	177	4.42	0.00	0.00
30	30	-0.621	-0.139	-0.469	2.000	4960	9075	263	534	45475	342	922	N	-10	94.02	84.62	403	0	0.13	Not Reqd	0.00	0.06	0.21	320	650	171	4.64	0.00	0.00
30	31	-0.609	-0.169	-0.470	2.000	4960	8920	290	477	44587	456	938	N	-65	93.56	84.20	429	0	0.13	Not Reqd	0.00	0.06	0.21	318	673	228	4.06	0.00	0.00
31	31	-0.607	-0.170	-0.469	2.000	4960	8938	277	772	44591	444	1436	N	-65	93.56	84.20	429	0	0.13	Not Reqd	0.00	0.06	0.21	318	673	222	4.25	0.00	0.00
31	32	-0.584	-0.225	-0.471	2.000	4960	8563	315	701	42407	598	1464	N	-141	91.84	82.66	462	0	0.13	Not Reqd	0.00	0.06	0.21	313	697	299	3.53	0.00	0.00
32	32	-0.581	-0.226	-0.469	2.000	4960	8603	300	1035	42425	583	2018	Y	-141	91.84	82.66	462	0	0.13	0.141	0.00	0.14	0.21	313	697	355	2.87	6.81	2.33

Web Reinforcement Requirements **Load combination: Strength 1** ***Rating Truck:*** HL-93 ***LL Factor:*** *Inventory*

Material Properties:

Concrete
f'c = ***5.0*** ksi
ϕ_v = ***0.90***

P-T Strands
f_{pu} = ***270*** ksi
f_{pe} = ***176*** ksi

Reinforcement
fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness
b_v = ***12.95*** in

Effective Width of Shear Flow Path
be= ***5.50*** in

Notes:
1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc All RF

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Permanent Loads + Maximum LL Shear @ t=00 Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
32	33	-0.552	-0.299	-0.472	2.000	4960	8019	338	969	39086	738	2049	Y	-219	88.87	79.98	492	0	0.13	0.143	0.00	0.14	0.21	303	715	434	2.41	6.92	2.36
33	33	-0.549	-0.299	-0.471	2.000	4960	8063	324	1288	39107	725	2567	Y	-219	88.87	79.98	492	0	0.13	0.179	0.00	0.15	0.21	303	715	443	2.34	8.66	2.96
33	34	-0.514	-0.389	-0.475	2.000	4960	7234	363	1223	34578	881	2600	Y	-298	84.61	77.76	528	0	0.13	0.181	0.00	0.16	0.21	295	741	522	1.99	8.78	3.00
34	34	-0.511	-0.389	-0.473	2.000	4960	7282	349	1520	34600	868	3067	Y	-298	84.61	77.76	528	0	0.13	0.214	0.00	0.17	0.21	295	741	531	1.94	10.35	3.54
34	35	-0.472	-0.493	-0.478	2.000	4960	6199	390	1448	28872	1025	3094	Y	-379	79.06	77.76	581	0	0.13	0.215	0.00	0.17	0.21	297	791	610	1.75	10.44	3.57
35	35	-0.468	-0.494	-0.477	2.000	4960	6251	377	1715	28896	1013	3493	Y	-379	79.06	77.76	581	0	0.13	0.243	0.00	0.19	0.21	297	790	617	1.72	11.79	4.03
35	36	-0.425	-0.611	-0.483	2.000	4960	4891	418	1631	21945	1171	3508	Y	-460	72.29	77.76	639	12	0.13	0.244	0.00	0.19	0.37	539	1060	696	2.39	11.84	4.05
36	36	-0.421	-0.612	-0.481	2.000	4960	4946	407	1842	21966	1168	3797	Y	-594	72.29	77.76	708	0	0.13	0.264	0.00	0.20	0.37	539	1123	704	2.60	12.82	4.38
36	37	-0.387	-0.658	-0.477	2.000	4916	3285	450	1737	13698	1329	3790	Y	-669	64.17	77.76	765	0	0.13	0.266	0.00	0.20	0.37	543	1178	784	2.41	12.87	4.40
37	37	-0.383	-0.659	-0.475	2.000	4916	3350	440	1922	13725	1320	4007	Y	-657	64.17	77.76	759	0	0.13	0.282	0.00	0.21	0.37	543	1172	787	2.37	13.60	4.65
37	38	-0.644	-1.049	-0.787	2.000	4873	1357	484	1792	4094	1501	3975	Y	-1736	49.64	77.76	1356	0	0.13	0.282	0.00	0.21	0.37	553	1718	876	3.82	13.57	4.64
38	38	-0.640	-1.051	-0.785	2.000	4873	1429	477	1913	4125	1494	4065	Y	-1719	49.64	77.76	1347	0	0.13	0.288	0.00	0.21	0.37	553	1711	875	3.80	13.88	4.74
38	39	-0.790	-0.773	-0.783	2.000	4830	-929	522	1753	-7002	1682	4003	Y	-1456	73.80	77.76	1216	0	0.13	0.286	0.00	0.21	0.37	553	1592	967	2.98	13.75	4.70
39	39	-0.786	-0.774	-0.782	2.000	4830	-854	517	1802	-6969	1677	3949	Y	-1440	73.80	77.76	1208	0	0.13	0.282	0.00	0.21	0.37	553	1585	963	2.97	13.56	4.64
39	40	-0.784	-0.769	-0.778	2.000	4787	-3612	563	1610	-19666	1870	3856	Y	-977	82.70	77.76	977	62	0.13	0.278	0.00	0.20	0.37	553	1377	1057	1.96	13.32	4.55
40	40	-0.781	-0.770	-0.777	2.000	4787	-3539	560	1581	-19634	1867	3649	Y	-962	82.70	77.76	969	69	0.13	0.263	0.00	0.20	0.37	553	1370	1049	1.97	12.61	4.31
40	41	-0.700	-0.863	-0.765	2.000	4741	-6720	607	1361	-33950	2064	3528	Y	-717	89.28	80.35	859	288	0.37	0.257	0.00	0.32	0.37	571	1287	1144	1.42	12.27	4.19
41	41	-0.696	-0.863	-0.763	2.000	4741	-6658	607	1235	-33927	2059	3149	Y	-557	89.28	80.35	776	368	0.48	0.229	0.00	0.35	0.37	571	1212	1129	**1.24**	10.95	3.74
41	42	-0.514	-1.156	-0.771	2.000	4741	-10271	653	1000	-49845	2257	3013	Y	-151	92.69	83.42	538	716	0.91	0.220	0.00	0.57	0.37	583				10.48	3.58
42	42	-0.514	-1.156	-0.770	2.000	4741	-10212	649	755	-49791	2279	1890	Y	-151	92.69	83.42	537	729	0.93	0.138	0.00	0.53	0.37	583				6.57	2.25
42	43	-0.430	-1.287	-0.773	2.000	4741	-11608	668	566	-55448	2340	1733	Y	0	92.92	83.63	446	854	1.09	0.126	0.00	0.61	0.37	581				6.03	2.06
43	43	-0.430	-1.287	-0.772	2.000	4741	2369	147	-1612	-41473	-1420	-855	N	0	92.92	83.63	500	289	0.36	Not Reqd	0.00	0.18	0.37	591				0.00	0.00
43	44	-0.511	-1.161	-0.770	2.000	4741	2066	154	-1776	-37787	-1370	-987	N	76	92.80	83.52	551	210	0.26	Not Reqd	0.00	0.13	0.37	593				0.00	0.00
44	44	-0.510	-1.161	-0.770	2.000	4741	4395	111	63	-35461	-1391	34	N	76	92.80	83.52	558	214	0.27	Not Reqd	0.00	0.13	0.37	594				0.00	0.00
44	45	-0.715	-0.843	-0.766	2.000	4741	3556	112	60	-24819	-1238	130	N	313	90.99	81.89	670	18	0.13	Not Reqd	0.00	0.06	0.37	583	1128	619	10.09	0.00	0.00
45	45	-0.714	-0.845	-0.766	2.000	4741	3580	111	97	-24816	-1244	-90	N	474	90.99	81.89	751	0	0.13	Not Reqd	0.00	0.06	0.37	583	1200	622	11.37	0.00	0.00
45	46	-0.848	-0.695	-0.789	2.000	4786	3698	117	-657	-14383	-1088	-745	N	706	87.01	78.31	845	0	0.13	Not Reqd	0.00	0.06	0.37	557	1262	544	13.22	0.00	0.00
46	46	-0.846	-0.695	-0.788	2.000	4786	3395	115	-444	-14702	-1091	-715	N	722	87.01	78.31	852	0	0.13	Not Reqd	0.00	0.06	0.37	557	1269	546	13.60	0.00	0.00
46	47	-0.873	-0.672	-0.798	2.000	4826	3818	132	-795	-5157	-928	-968	N	1332	79.82	77.76	1154	0	0.13	Not Reqd	0.00	0.06	0.37	553	1536	464	17.29	0.00	0.00
47	47	-0.871	-0.672	-0.797	2.000	4826	3839	127	-628	-5147	-932	-912	N	1349	79.82	77.76	1162	0	0.13	Not Reqd	0.00	0.06	0.37	553	1544	466	17.92	0.00	0.00
47	48	-0.740	-0.950	-0.814	2.000	4872	4143	150	-958	3114	-766	-1143	N	1657	42.09	77.76	1316	0	0.13	Not Reqd	0.00	0.06	0.37	553	1683	383	18.33	0.00	0.00
48	48	-0.739	-0.950	-0.813	2.000	4872	4186	144	-760	3148	-773	-990	N	1675	42.09	77.76	1326	0	0.13	Not Reqd	0.00	0.06	0.37	553	1691	386	19.14	0.00	0.00
48	49	-0.487	-0.559	-0.511	2.000	4916	4391	168	-1086	10186	-612	-1217	N	584	50.09	77.76	780	0	0.13	Not Reqd	0.00	0.06	0.37	553	1200	306	11.67	0.00	0.00
49	49	-0.486	-0.559	-0.510	2.000	4916	4480	160	-855	10266	-621	-972	N	597	50.09	77.76	786	0	0.13	Not Reqd	0.00	0.06	0.37	553	1206	310	12.22	0.00	0.00
49	50	-0.520	-0.550	-0.529	2.000	4960	4585	184	-1174	16179	-478	-1193	N	543	56.69	77.76	745	0	0.13	Not Reqd	0.00	0.06	0.37	551	1167	239	11.08	0.00	0.00
50	50	-0.518	-0.550	-0.528	2.000	4960	4654	176	-923	16238	-476	-890	N	401	56.69	77.76	673	0	0.13	Not Reqd	0.00	0.06	0.37	551	1102	238	10.84	0.00	0.00
50	51	-0.553	-0.483	-0.531	2.000	4960	4651	201	-1233	21016	-334	-1101	N	345	62.40	77.76	630	0	0.13	Not Reqd	0.00	0.06	0.37	548	1060	167	9.89	0.00	0.00
51	51	-0.552	-0.483	-0.530	2.000	4960	4943	190	-315	21296	-345	-83	N	345	62.40	77.76	629	0	0.13	Not Reqd	0.00	0.06	0.37	548	1059	172	10.33	0.00	0.00
51	52	-0.577	-0.436	-0.532	2.000	4960	4684	216	-1245	24875	-202	-915	N	288	67.23	77.76	587	0	0.13	Not Reqd	0.00	0.06	0.21	303	801	101	7.48	0.00	0.00
52	52	-0.575	-0.436	-0.531	2.000	4960	5032	205	-197	25209	-213	263	N	288	67.23	77.76	586	0	0.13	Not Reqd	0.00	0.06	0.21	303	800	107	7.77	0.00	0.00
52	53	-0.590	-0.409	-0.533	2.000	4960	8593	233	-447	31666	-69	112	N	231	71.17	77.76	536	0	0.13	Not Reqd	0.00	0.06	0.21	301	753	34	7.18	0.00	0.00
53	53	-0.588	-0.409	-0.532	2.000	4960	8642	220	-7	31698	-82	704	N	231	71.17	77.76	536	0	0.13	Not Reqd	0.00	0.06	0.21	301	753	41	7.49	0.00	0.00
53	54	-0.594	-0.400	-0.533	2.000	4960	8805	254	-126	33817	69	683	N	173	74.23	77.76	502	0	0.13	Not Reqd	0.00	0.06	0.21	300	721	35	6.41	0.00	0.00
54	54	-0.593	-0.401	-0.532	2.000	4960	8828	240	191	33821	56	1167	N	169	74.23	77.76	499	0	0.13	Not Reqd	0.00	0.06	0.21	300	719	28	6.76	0.00	0.00
54	55	-0.590	-0.409	-0.533	2.000	4969	8831	275	89	34835	208	1164	N	111	76.39	77.90	468	0	0.13	Not Reqd	0.00	0.06	0.21	300	692	104	5.28	0.00	0.00
55	55	-0.588	-0.409	-0.532	2.000	4969	8858	261	398	34845	195	1637	Y	99	76.39	77.90	462	0	0.13	0.114	0.00	0.12	0.21	300	686	149	4.75	5.52	1.89
55	56	-0.579	-0.430	-0.532	2.000	5000	8718	293	320	34806	331	1647	Y	46	77.58	78.35	435	0	0.13	0.114	0.00	0.12	0.21	302	663	217	3.85	5.53	1.89
56	56	-0.577	-0.430	-0.531	2.000	5000	8743	279	634	34813	318	2125	Y	39	77.58	78.35	432	0	0.13	0.147	0.00	0.14	0.21	302	660	226	3.72	7.14	2.44
56	57	-0.560	-0.469	-0.531	2.000	5049	8425	315	556	33711	471	2146	Y	-20	78.07	79.07	427	0	0.13	0.147	0.00	0.14	0.21	304	658	303	3.03	7.16	2.45
57	57	-0.558	-0.469	-0.530	2.000	5049	8463	300	887	33728	457	2646	Y	-29	78.07	79.07	431	0	0.13	0.181	0.00	0.16	0.21	304	662	312	2.97	8.83	3.02
57	58	-0.533	-0.521	-0.529	2.000	5116	7968	337	818	31497	611	2675	Y	-89	77.68	80.06	472	0	0.13	0.181	0.00	0.16	0.21	309	703	390	2.61	8.85	3.02
58	58	-0.531	-0.522	-0.528	2.000	5116	8011	322	1141	31518	597	3154	Y	-99	77.68	80.06	477	0	0.13	0.213	0.00	0.17	0.21	309	708	398	2.57	10.43	3.57
58	59	-0.499	-0.588	-0.527	2.000	5206	7321	359	1076	28136	753	3187	Y	-160	76.40	81.36	524	0	0.13	0.211	0.00	0.17	0.21	315	755	477	2.30	10.42	3.56
59	59	-0.497	-0.588	-0.526	2.000	5206	7369	345	1386	28160	739	3633	Y	-169	76.40	81.36	528	0	0.13	0.241	0.00	0.19	0.21	315	759	484	2.27	11.88	4.06
59	60	-0.460	-0.666	-0.525	2.000	5313	6480	383	1321	23617	896	3666	Y	-230	74.24	82.94	580	0	0.13	0.238	0.00	0.18	0.21	323	812	564	2.07	11.84	4.05
60	60	-0.458	-0.667	-0.524	2.000	5313	6532	369	1612	23644	883	4066	Y	-239	74.24	82.94	585	0	0.13	0.264	0.00	0.20	0.21	323	817	570	2.05	13.13	4.49
60	61	-0.416	-0.755	-0.524	2.000	5440	5429	407	1543	17920	1041	4095	Y	-301	71.20	84.78	643	0	0.13	0.260	0.00	0.19	0.21	331	877	650	1.90	13.02	4.45
61	61	-0.414	-0.756	-0.523	2.000	5440	5486	395	1809	17950	1029	4434	Y	-312	71.20	84.78	649	0	0.13	0.282	0.00	0.21	0.21	331	882	655	1.89	14.10	4.82
61	62	-0.369	-0.850	-0.522	2.000	5587	4156	433	1731	11024	1188	4455	Y	-375	67.26	86.94	714	0	0.13	0.275	0.00	0.20	0.21	342	951	735	1.79	13.93	4.76
62	62	-0.367	-0.851	-0.521	2.000	5587	4217	422	1966	11055	1178	4720	Y	-384	67.26	86.94	719	0	0.13	0.292	0.00	0.21	0.21	342	955	738	1.80	14.76	5.05
62	63	-0.320	-0.949	-0.521	2.000	5756	2645	461	1875	2904	1339	4728	Y	-447	62.45	89.42	785	0	0.13	0.284	0.00	0.21	0.37	636	1279	819	2.59	14.52	4.96
63	63	-0.318	-0.950	-0.520	2.000	5756	2710	451	2072	2934	1330	4904	Y	-459	62.45	89.42	791	0	0.13	0.294	0.00	0.21	0.37	636	1284	820	2.60	15.06	5.15
63	64	-0.270	-1.048	-0.520	2.000	5941	879	491	1965	-6468	1492	4896	Y	-522	71.18	92.12	828	1	0.13	0.285	0.00	0.21	0.37	654	1333	901	2.41	14.74	5.04

Web Reinforcement Requirements **Load combination: Strength 1** ***Rating Truck:*** HL-93 ***LL Factor:*** *Inventory*

Material Properties:

Concrete
f'c = ***5.0*** ksi
ϕ_v = ***0.90***

P-T Strands
f_{pu} = ***270*** ksi
f_{pe} = ***176*** ksi

Reinforcement
fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness
b_v = ***12.95*** in

Effective Width of Shear Flow Path
be= ***5.50*** in

Notes:
1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc All RF

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Maximum LL Shear @ t=00																									
64	64	-0.268	-1.050	-0.519	2.000	5941	946	479	2105	-6441	1495	4936	Y	-727	71.18	92.12	936	0	0.13	0.287	0.00	0.21	0.37	655	1432	904	2.73	14.86	5.08
64	65	-0.242	-1.005	-0.504	2.000	6098	-1146	520	1976	-17229	1661	4906	Y	-790	81.99	95.13	940	0	0.13	0.278	0.00	0.20	0.37	668	1448	986	2.43	14.54	4.97
65	65	-0.239	-1.006	-0.503	2.000	6098	-1068	512	2087	-17197	1655	4859	Y	-793	81.99	95.13	942	0	0.13	0.275	0.00	0.20	0.37	668	1449	981	2.45	14.40	4.92
65	66	-0.549	-1.183	-0.780	2.000	6273	-3464	554	1935	-29423	1850	4806	Y	-1954	94.65	98.42	1595	0	0.13	0.265	0.00	0.20	0.37	700	2065	1077	3.93	14.00	4.79
66	66	-0.546	-1.184	-0.778	2.000	6273	-3379	548	1982	-29389	1845	4611	Y	-1958	94.65	98.42	1596	0	0.13	0.254	0.00	0.19	0.37	700	2067	1068	3.97	13.43	4.59
66	67	-0.656	-0.934	-0.762	2.000	6470	-6109	590	1806	-43236	2051	4534	Y	-1678	113.28	102.02	1479	0	0.13	0.242	0.00	0.19	0.37	726	1984	1169	3.32	12.97	4.43
67	67	-0.653	-0.935	-0.761	2.000	6470	-6022	585	1781	-43200	2048	4176	Y	-1690	113.28	102.02	1485	0	0.13	0.223	0.00	0.18	0.37	726	1990	1156	3.39	11.94	4.08
67	68	-0.654	-0.896	-0.751	2.000	6686	-9114	628	1583	-58764	2260	4076	Y	-1113	125.82	113.24	1257	0	0.13	0.211	0.00	0.17	0.37	804	1855	1259	2.64	11.44	3.91
68	68	-0.652	-0.897	-0.750	2.000	6686	-9031	625	1477	-58732	2258	3540	Y	-1128	125.82	113.24	1265	0	0.13	0.183	0.00	0.16	0.37	804	1862	1241	2.73	9.93	3.40
68	69	-0.584	-0.937	-0.730	2.000	6922	-12506	668	1259	-76079	2476	3421	Y	-883	135.76	122.19	1141	234	0.20	0.171	0.00	0.19	0.37	858	1799	1346	2.21	9.41	3.22
69	69	-0.581	-0.936	-0.728	2.000	6922	-12439	670	1031	-76057	2469	2664	Y	-662	135.76	122.19	1025	347	0.30	0.133	0.00	0.22	0.37	857	1694	1319	2.02	7.32	2.50
69	70	-0.465	-1.098	-0.728	2.000	7227	-16331	712	803	-95163	2690	2534	Y	-398	143.83	129.45	888	606	0.50	0.121	0.00	0.31	0.37	899				6.80	2.32
70	70	-0.461	-1.095	-0.725	2.000	7227	-15293	705	-2205	-94145	2685	-1497	N	-87	143.83	129.45	728	764	0.63	Not Reqd	0.00	0.32	0.37	898				0.00	0.00
70	71	-0.404	-1.184	-0.729	2.000	7227	-16870	721	-2401	-100894	2750	-1662	N	0	143.95	129.56	668	859	0.71	Not Reqd	0.00	0.36	0.37	895				0.00	0.00
71	71	-0.448	-1.089	-0.715	2.000	7227	4449	190	-2689	-77236	-2046	-3336	Y	0	143.95	129.56	734	403	0.33	0.159	0.00	0.24	0.37	908				-8.95	-3.06
71	72	-0.516	-0.992	-0.714	2.000	7227	3540	202	-3136	-72437	-1986	-3752	Y	113	143.83	129.44	806	298	0.24	0.179	0.00	0.21	0.37	910				-10.07	-3.44
72	72	-0.519	-0.996	-0.717	2.000	7227	7703	102	-156	-68290	-2104	-1476	N	425	143.83	129.44	978	190	0.16	Not Reqd	0.00	0.08	0.37	913				0.00	0.00
72	73	-0.671	-0.801	-0.725	2.000	6922	6927	103	-158	-52013	-1924	-1379	N	752	135.30	121.77	1140	0	0.13	Not Reqd	0.00	0.06	0.37	866	1806	962	17.37	0.00	0.00
73	73	-0.671	-0.802	-0.725	2.000	6922	6971	101	-100	-51977	-1934	-1804	N	905	135.30	121.77	1216	0	0.13	Not Reqd	0.00	0.06	0.37	866	1875	967	18.92	0.00	0.00
73	74	-0.780	-0.705	-0.750	2.000	6673	6358	105	-766	-36893	-1755	-2373	Y	1185	124.55	112.10	1296	0	0.13	0.123	0.00	0.13	0.37	798	1884	952	13.13	-6.66	-2.28
74	74	-0.779	-0.705	-0.749	2.000	6673	6434	104	-524	-36815	-1755	-2501	Y	1162	124.55	112.10	1284	0	0.13	0.129	0.00	0.13	0.37	798	1874	957	14.43	-7.02	-2.40
74	75	-0.827	-0.678	-0.768	2.000	6442	6562	117	-866	-22396	-1571	-2744	Y	1611	111.30	102.02	1445	0	0.13	0.147	0.00	0.14	0.37	726	1954	872	13.63	-7.87	-2.69
75	75	-0.827	-0.677	-0.768	2.000	6442	6603	114	-696	-22348	-1573	-2834	Y	1590	111.30	102.02	1435	0	0.13	0.152	0.00	0.14	0.37	726	1945	876	14.55	-8.13	-2.78
75	76	-0.811	-0.764	-0.793	2.000	6232	6861	131	-1015	-9168	-1389	-3054	Y	1692	95.03	98.42	1464	0	0.13	0.169	0.00	0.15	0.37	700	1948	791	12.83	-8.93	-3.05
76	76	-0.811	-0.764	-0.793	2.000	6232	6912	127	-820	-9107	-1392	-3013	Y	1679	95.03	98.42	1457	0	0.13	0.167	0.00	0.15	0.37	700	1942	791	13.86	-8.81	-3.01
76	77	-0.688	-0.650	-0.674	2.000	6043	7090	146	-1141	2684	-1217	-3235	Y	1056	49.73	95.13	1125	0	0.13	0.185	0.00	0.16	0.37	677	1622	710	9.36	-9.64	-3.30
77	77	-0.674	-0.635	-0.660	2.000	6043	7142	140	-925	2745	-1222	-3077	Y	1041	49.73	95.13	1118	0	0.13	0.176	0.00	0.15	0.37	677	1615	708	10.13	-9.17	-3.13
77	78	-0.726	-0.620	-0.688	2.000	5870	7239	160	-1246	13291	-1072	-3299	Y	982	56.98	92.12	1069	0	0.13	0.194	0.00	0.16	0.37	655	1552	640	8.64	-10.01	-3.42
78	78	-0.726	-0.619	-0.688	2.000	5870	7310	153	-1005	13371	-1079	-3033	Y	971	56.98	92.12	1064	0	0.13	0.178	0.00	0.15	0.37	655	1547	635	9.44	-9.20	-3.15
78	79	-0.771	-0.611	-0.717	2.000	5721	7329	173	-1324	22801	-932	-3253	Y	920	63.55	89.42	1021	0	0.13	0.196	0.00	0.16	0.37	636	1492	569	8.19	-10.03	-3.43
79	79	-0.771	-0.610	-0.717	2.000	5721	7456	164	-1055	22936	-940	-2887	Y	909	63.55	89.42	1016	0	0.13	0.174	0.00	0.15	0.37	636	1487	561	9.02	-8.90	-3.04
79	80	-0.810	-0.611	-0.747	2.000	5587	7404	185	-1372	31290	-797	-3105	Y	856	69.45	86.94	973	0	0.13	0.192	0.00	0.16	0.37	619	1433	496	7.88	-9.71	-3.32
80	80	-0.811	-0.611	-0.747	2.000	5587	7511	177	-1090	31406	-792	-2703	Y	652	69.45	86.94	872	0	0.13	0.167	0.00	0.15	0.37	619	1341	481	8.00	-8.45	-2.89
80	81	-0.853	-0.557	-0.759	2.000	5440	7382	199	-1402	38596	-650	-2918	Y	594	74.80	84.78	829	0	0.13	0.185	0.00	0.16	0.37	603	1289	417	7.07	-9.28	-3.17
81	81	-0.853	-0.557	-0.759	2.000	5440	7581	188	-1086	38800	-660	-2389	Y	578	74.80	84.78	821	0	0.13	0.152	0.00	0.14	0.37	603	1282	406	7.84	-7.60	-2.60
81	82	-0.890	-0.512	-0.770	2.000	5313	7394	210	-1394	44961	-518	-2598	Y	516	79.50	82.94	767	0	0.13	0.169	0.00	0.15	0.21	327	985	341	5.31	-8.39	-2.87
82	82	-0.890	-0.512	-0.770	2.000	5313	7601	198	-1065	45172	-530	-2011	Y	503	79.50	82.94	759	0	0.13	0.131	0.00	0.13	0.21	327	977	328	5.89	-6.49	-2.22
82	83	-0.920	-0.476	-0.780	2.000	5206	7358	221	-1369	50314	-388	-2217	Y	439	83.54	81.36	698	0	0.13	0.147	0.00	0.14	0.21	319	915	264	5.23	-7.25	-2.48
83	83	-0.921	-0.477	-0.780	2.000	5206	7766	209	-366	50724	-400	-919	N	426	83.54	81.36	690	0	0.13	Not Reqd	0.00	0.06	0.21	319	908	200	7.78	0.00	0.00
83	84	-0.944	-0.449	-0.788	2.000	5116	10357	233	-711	57742	-257	-1166	N	363	86.91	80.06	626	0	0.13	Not Reqd	0.00	0.06	0.21	311	843	129	7.12	0.00	0.00
84	84	-0.945	-0.450	-0.788	2.000	5116	7632	220	-234	55019	-270	-365	N	347	86.91	80.06	627	0	0.13	Not Reqd	0.00	0.06	0.21	312	845	135	7.46	0.00	0.00
84	85	-0.962	-0.431	-0.795	2.000	5049	10513	248	-392	61372	-124	-424	N	284	89.62	80.66	580	0	0.13	Not Reqd	0.00	0.06	0.21	312	803	62	6.97	0.00	0.00
85	85	-0.963	-0.431	-0.795	2.000	5049	10532	232	-17	61389	-140	298	N	271	89.62	80.66	574	0	0.13	Not Reqd	0.00	0.06	0.21	312	797	70	7.28	0.00	0.00
85	86	-0.973	-0.423	-0.800	2.000	5000	10550	263	-167	63929	9	246	N	207	91.68	82.52	548	0	0.13	Not Reqd	0.00	0.06	0.21	319	780	4	6.89	0.00	0.00
86	86	-0.973	-0.423	-0.800	2.000	5000	10573	246	217	63949	-7	994	N	195	91.68	82.52	541	0	0.13	Not Reqd	0.00	0.06	0.21	319	774	4	7.26	0.00	0.00
86	87	-0.977	-0.425	-0.803	2.000	4969	10493	279	81	65442	142	956	N	131	93.10	83.79	519	0	0.13	Not Reqd	0.00	0.06	0.21	324	758	71	5.94	0.00	0.00
87	87	-0.977	-0.425	-0.803	2.000	4969	10519	266	361	65464	130	1501	Y	125	93.10	83.79	516	0	0.13	0.104	0.00	0.12	0.21	324	756	112	5.45	5.06	1.73
87	88	-0.976	-0.430	-0.804	2.000	4960	10459	280	307	65783	193	1489	Y	98	93.50	84.15	502	0	0.13	0.104	0.00	0.12	0.21	325	745	143	5.02	5.02	1.72
88	88	-0.976	-0.430	-0.804	2.000	4960	10457	268	580	65776	182	2025	Y	76	93.50	84.15	491	0	0.13	0.141	0.00	0.14	0.21	325	735	155	4.81	6.83	2.34
88	89	-0.970	-0.447	-0.805	2.000	4969	10231	301	461	65772	332	2004	Y	12	94.01	84.61	459	0	0.13	0.139	0.00	0.13	0.21	327	707	229	3.89	6.76	2.31
89	89	-0.971	-0.446	-0.806	2.000	4969	10261	284	853	65795	315	2770	Y	-3	94.01	84.61	454	0	0.13	0.193	0.00	0.16	0.21	327	703	245	3.71	9.34	3.19
89	90	-0.957	-0.474	-0.805	2.000	5000	9918	317	745	64726	466	2760	Y	-68	93.87	84.49	487	0	0.13	0.191	0.00	0.16	0.21	326	732	320	3.26	9.27	3.17
90	90	-0.958	-0.473	-0.805	2.000	5000	9951	300	1133	64751	450	3517	Y	-81	93.87	84.49	494	0	0.13	0.243	0.00	0.19	0.21	326	738	336	3.17	11.81	4.04
90	91	-0.938	-0.512	-0.804	2.000	5049	9486	334	1034	62609	601	3516	Y	-146	93.10	83.79	525	0	0.13	0.241	0.00	0.19	0.21	324	764	412	2.77	11.73	4.01
91	91	-0.939	-0.511	-0.804	2.000	5049	9522	317	1415	62636	585	4254	Y	-159	93.10	83.79	532	0	0.13	0.291	0.00	0.21	0.21	324	771	427	2.69	14.19	4.85
91	92	-0.912	-0.562	-0.801	2.000	5116	8925	352	1322	59411	737	4259	Y	-225	91.69	82.52	563	0	0.13	0.288	0.00	0.21	0.21	320	794	503	2.34	14.09	4.82
92	92	-0.913	-0.561	-0.802	2.000	5116	8964	335	1692	59439	721	4966	Y	-241	91.69	82.52	571	0	0.13	0.335	0.00	0.23	0.21	320	802	518	2.29	16.42	5.62
92	93	-0.880	-0.622	-0.799	2.000	5206	8224	370	1604	55112	875	4976	Y	-308	89.63	81.36	607	0	0.13	0.330	0.00	0.23	0.21	316	830	594	2.00	16.28	5.56
93	93	-0.881	-0.621	-0.799	2.000	5206	8267	354	1961	55141	859	5644	Y	-322	89.63	81.36	614	0	0.13	0.375	0.00	0.25	0.21	316	837	608	1.96	18.46	6.31
93	94	-0.844	-0.691	-0.796	2.000	5313	7374	390	1875	49701	1014	5657	Y	-390	86.92	82.94	674	0	0.13	0.368	0.00	0.25	0.21	324	898	685	1.84	18.26	6.24
94	94	-0.845	-0.691	-0.796	2.000	5313	7952	375	601	50264	1000	4662	Y	-404	86.92	82.94	680	0	0.13	0.303	0.00	0.22	0.21	324	904	647	2.24	15.05	5.15
94	95	-0.804	-0.768	-0.792	2.000	5440	6365	410	2127	43163	1154	6287	Y	-474	83.55	84.78	750	0	0.13	0.399	0.00	0.26	0.21	333	975	776	1.73	20.00	6.84
95	95	-0.804	-0.768	-0.793	2.000	5440	6663	398	629	43443	1144	5029	Y	-490	83.55	84.78	758	0	0.13	0.319	0.00	0.22	0.21	333	982	731	2.15	16.00	5.47

Web Reinforcement Requirements **Load combination: Strength 1** ***Rating Truck:*** HL-93 ***LL Factor:*** *Inventory*

Material Properties:

Concrete
f'c = ***5.0*** ksi
ϕ_v = ***0.90***

P-T Strands
f_{pu} = ***270*** ksi
f_{pe} = ***176*** ksi

Reinforcement
fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness
b_v = ***12.95*** in

Effective Width of Shear Flow Path
be= ***5.50*** in

Notes:
1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc All RF

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Maximum LL Shear @ t=00																									
95	96	-0.761	-0.850	-0.789	2.000	5587	5185	431	2354	35476	1297	6852	Y	-562	79.52	86.94	826	0	0.13	0.424	0.00	0.28	0.21	344	1053	865	1.65	21.43	7.33
96	96	-0.761	-0.850	-0.789	2.000	5587	5175	423	650	35446	1290	5343	Y	-576	79.52	86.94	834	0	0.13	0.330	0.00	0.23	0.21	344	1060	814	2.06	16.71	5.71
96	97	-0.716	-0.935	-0.786	2.000	5756	3823	454	2549	26622	1443	7340	Y	-647	74.83	89.42	884	0	0.13	0.441	0.00	0.29	0.37	636	1369	953	2.35	22.53	7.70
97	97	-0.716	-0.935	-0.786	2.000	5756	3674	448	617	26450	1437	5549	Y	-664	74.83	89.42	893	0	0.13	0.333	0.00	0.23	0.37	636	1376	894	2.98	17.03	5.82
97	98	-0.671	-1.020	-0.783	2.000	5941	2263	479	2704	16576	1590	7734	Y	-732	69.46	92.12	944	0	0.13	0.450	0.00	0.29	0.37	655	1439	1039	2.23	23.29	7.96
98	98	-0.671	-1.021	-0.783	2.000	5941	1870	473	571	16156	1586	5681	Y	-747	69.46	92.12	952	0	0.13	0.330	0.00	0.23	0.37	655	1446	973	2.86	17.11	5.85
98	99	-0.625	-1.106	-0.780	2.000	6147	490	505	2810	5313	1741	8018	Y	-812	63.56	95.13	1003	0	0.13	0.451	0.00	0.29	0.37	677	1512	1124	2.14	23.65	8.08
99	99	-0.624	-1.107	-0.780	2.000	6147	-347	498	508	4442	1755	5573	Y	-1153	63.56	95.13	1174	0	0.13	0.313	0.00	0.22	0.37	677	1665	1053	3.31	16.44	5.62
99	100	-0.604	-1.034	-0.752	2.000	6326	-1494	529	2842	-7347	1912	8005	Y	-1217	80.14	98.42	1226	0	0.13	0.437	0.00	0.28	0.37	700	1734	1209	2.48	23.20	7.93
100	100	-0.603	-1.035	-0.752	2.000	6326	-2538	526	395	-8426	1909	5492	Y	-1215	80.14	98.42	1225	0	0.13	0.300	0.00	0.21	0.37	700	1733	1128	3.20	15.92	5.44
100	101	-0.578	-0.979	-0.730	2.000	6481	-3729	559	2834	-21306	2075	8028	Y	-1289	90.41	102.02	1284	0	0.13	0.428	0.00	0.28	0.37	726	1809	1291	2.40	22.94	7.84
101	101	-0.578	-0.980	-0.730	2.000	6481	-5143	554	267	-22762	2071	5292	Y	-1295	90.41	102.02	1288	0	0.13	0.282	0.00	0.21	0.37	726	1812	1203	3.14	15.12	5.17
101	102	-0.899	-1.085	-0.972	2.000	6699	-6248	591	2746	-36751	2270	7870	Y	-2516	104.40	105.89	1922	0	0.13	0.406	0.00	0.27	0.37	753	2408	1384	3.68	22.06	7.54
102	102	-0.898	-1.086	-0.972	2.000	6699	-6157	585	2768	-36705	2265	7612	Y	-2530	104.40	105.89	1929	0	0.13	0.393	0.00	0.26	0.37	753	2414	1373	3.74	21.33	7.29
102	103	-1.000	-0.860	-0.943	2.000	6939	-9089	626	2571	-53887	2480	7514	Y	-2277	123.30	110.97	1835	0	0.13	0.374	0.00	0.25	0.37	790	2362	1477	3.25	20.63	7.05
103	103	-0.999	-0.861	-0.942	2.000	6939	-8997	621	2517	-53834	2476	7061	Y	-2292	123.30	110.97	1842	0	0.13	0.352	0.00	0.24	0.37	790	2369	1461	3.33	19.39	6.63
103	104	-0.999	-0.825	-0.925	2.000	7199	-12288	662	2300	-72811	2698	6943	Y	-1564	137.16	123.44	1556	0	0.13	0.333	0.00	0.23	0.37	878	2191	1568	2.54	18.67	6.38
104	104	-0.999	-0.826	-0.925	2.000	7199	-12200	659	2160	-72754	2695	6279	Y	-1582	137.16	123.44	1565	0	0.13	0.301	0.00	0.22	0.37	878	2199	1546	2.64	16.88	5.77
104	105	-0.921	-0.869	-0.898	2.000	7476	-15873	700	1925	-93600	2923	6142	Y	-1279	148.32	133.49	1463	161	0.13	0.284	0.00	0.21	0.37	948	2170	1655	2.25	16.17	5.53
105	105	-0.920	-0.868	-0.897	2.000	7476	-15800	703	1650	-93543	2915	5311	Y	-985	148.32	133.49	1307	312	0.25	0.245	0.00	0.25	0.37	946	2028	1625	2.00	13.98	4.78
105	106	-0.793	-1.024	-0.894	2.000	7821	-19896	744	1405	-116229	3146	5164	Y	-614	157.36	141.63	1112	636	0.48	0.228	0.00	0.35	0.37	993				13.26	4.53
106	106	-0.789	-1.020	-0.890	2.000	7821	-20103	770	-2384	-116448	3163	451	N	-131	157.36	141.63	856	901	0.68	Not Reqd	0.00	0.34	0.37	991				0.00	0.00
106	107	-0.728	-1.108	-0.894	2.000	7821	-21843	787	-2593	-124426	3231	275	N	0	157.58	141.82	771	1024	0.77	Not Reqd	0.00	0.39	0.37	988				0.00	0.00
107	107	-0.695	-1.186	-0.910	2.000	7821	3703	215	-3125	-102245	-2141	1017	N	718	157.58	141.82	1229	0	0.13	Not Reqd	0.00	0.06	0.37	1006				0.00	0.00
107	108	-0.750	-1.157	-0.927	2.000	7821	2712	227	-3583	-97217	-2078	591	N	788	155.99	140.39	1270	0	0.13	Not Reqd	0.00	0.06	0.37	998				0.00	0.00
108	108	-0.750	-1.157	-0.928	2.000	7821	7719	111	-172	-92230	-2191	3046	Y	781	155.99	140.39	1272	0	0.13	0.135	0.00	0.13	0.37	999				7.82	2.67
108	109	-0.878	-1.047	-0.952	2.000	7476	6878	111	-172	-75268	-2004	3143	Y	999	146.32	131.68	1326	0	0.13	0.145	0.00	0.14	0.37	937	2037	1101	16.34	8.28	2.83
109	109	-0.880	-1.047	-0.953	2.000	7476	6875	111	-125	-75260	-2003	2505	Y	967	146.32	131.68	1310	0	0.13	0.116	0.00	0.12	0.37	937	2022	1081	16.90	6.60	2.26
109	110	-0.986	-0.964	-0.977	2.000	7199	6128	113	-704	-59698	-1820	2025	N	1182	137.53	123.78	1368	0	0.13	Not Reqd	0.00	0.06	0.37	881	2024	910	20.80	0.00	0.00
110	110	-0.988	-0.964	-0.978	2.000	7199	6180	111	-285	-59627	-1820	1878	N	1155	137.53	123.78	1354	0	0.13	Not Reqd	0.00	0.06	0.37	881	2011	910	20.83	0.00	0.00
110	111	-1.013	-0.955	-0.989	2.000	6939	6215	122	-860	-44738	-1632	1401	N	2117	126.36	113.72	1772	0	0.13	Not Reqd	0.00	0.06	0.37	809	2323	816	25.64	0.00	0.00
111	111	-1.016	-0.954	-0.990	2.000	6939	6239	119	-702	-44689	-1634	1115	N	2092	126.36	113.72	1759	0	0.13	Not Reqd	0.00	0.06	0.37	809	2312	817	26.06	0.00	0.00
111	112	-0.910	-1.180	-1.017	2.000	6699	6465	136	-1017	-31025	-1445	899	N	2512	108.29	105.89	1920	0	0.13	Not Reqd	0.00	0.06	0.37	753	2406	722	25.74	0.00	0.00
112	112	-0.912	-1.180	-1.018	2.000	6699	6503	132	-835	-30960	-1448	749	N	2486	108.29	105.89	1907	0	0.13	Not Reqd	0.00	0.06	0.37	753	2395	724	26.37	0.00	0.00
112	113	-0.521	-0.964	-0.689	2.000	6481	6656	150	-1152	-18726	-1269	531	N	992	98.96	102.02	1136	0	0.13	Not Reqd	0.00	0.06	0.37	726	1676	634	14.92	0.00	0.00
113	113	-0.514	-0.958	-0.683	2.000	6481	6734	144	-944	-18627	-1273	513	N	976	98.96	102.02	1128	0	0.13	Not Reqd	0.00	0.06	0.37	726	1669	637	15.36	0.00	0.00
113	114	-0.570	-0.951	-0.708	2.000	6279	6813	163	-1261	-7664	-1121	294	N	928	88.34	98.42	1081	0	0.13	Not Reqd	0.00	0.06	0.37	700	1604	561	13.83	0.00	0.00
114	114	-0.572	-0.950	-0.709	2.000	6279	7065	155	-999	-7399	-1128	427	N	918	88.34	98.42	1077	0	0.13	Not Reqd	0.00	0.06	0.37	700	1599	564	14.33	0.00	0.00
114	115	-0.624	-0.950	-0.735	2.000	6101	7071	175	-1315	2430	-979	209	N	871	53.34	95.13	1032	0	0.13	Not Reqd	0.00	0.06	0.37	677	1538	490	12.98	0.00	0.00
115	115	-0.626	-0.949	-0.736	2.000	6101	7261	166	-1050	2627	-987	423	N	858	53.34	95.13	1026	0	0.13	Not Reqd	0.00	0.06	0.37	677	1533	494	13.49	0.00	0.00
115	116	-0.673	-0.957	-0.764	2.000	5941	7201	187	-1365	11361	-842	207	N	810	57.69	92.12	983	0	0.13	Not Reqd	0.00	0.06	0.37	655	1474	421	12.28	0.00	0.00
116	116	-0.675	-0.956	-0.765	2.000	5941	7352	178	-1087	11515	-841	400	N	593	57.69	92.12	875	0	0.13	Not Reqd	0.00	0.06	0.37	655	1377	420	11.75	0.00	0.00
116	117	-0.734	-0.873	-0.778	2.000	5756	7224	199	-1398	19102	-698	187	N	543	62.13	89.42	833	0	0.13	Not Reqd	0.00	0.06	0.37	636	1322	349	10.77	0.00	0.00
117	117	-0.736	-0.872	-0.779	2.000	5756	7455	188	-1091	19333	-708	569	N	527	62.13	89.42	824	0	0.13	Not Reqd	0.00	0.06	0.37	636	1315	354	11.21	0.00	0.00
117	118	-0.790	-0.797	-0.792	2.000	5587	7270	210	-1397	25877	-565	362	N	476	65.98	86.94	783	0	0.13	Not Reqd	0.00	0.06	0.21	344	1014	283	7.97	0.00	0.00
118	118	-0.792	-0.797	-0.793	2.000	5587	7497	198	-1070	26101	-576	813	N	462	65.98	86.94	776	0	0.13	Not Reqd	0.00	0.06	0.21	344	1008	288	8.26	0.00	0.00
118	119	-0.840	-0.732	-0.806	2.000	5440	7257	221	-1372	31616	-434	609	N	410	69.32	84.78	737	0	0.13	Not Reqd	0.00	0.06	0.21	335	965	217	7.78	0.00	0.00
119	119	-0.842	-0.732	-0.807	2.000	5440	7709	208	-423	32063	-446	1722	Y	394	69.32	84.78	729	0	0.13	0.109	0.00	0.12	0.21	335	958	277	6.79	5.48	1.87
119	120	-0.883	-0.679	-0.818	2.000	5313	7215	231	-1337	36356	-304	906	N	342	72.12	82.94	691	0	0.13	Not Reqd	0.00	0.06	0.21	328	917	152	7.62	0.00	0.00
120	120	-0.885	-0.679	-0.820	2.000	5313	7638	219	-291	36772	-316	2151	Y	328	72.12	82.94	685	0	0.13	0.140	0.00	0.13	0.21	328	911	226	6.78	6.94	2.37
120	121	-0.919	-0.638	-0.830	2.000	5206	7064	242	-1295	40024	-174	1246	N	276	74.38	81.36	637	0	0.13	Not Reqd	0.00	0.06	0.21	321	862	87	7.41	0.00	0.00
121	121	-0.921	-0.638	-0.831	2.000	5206	7498	230	-146	40449	-186	2619	Y	262	74.38	81.36	630	0	0.13	0.174	0.00	0.15	0.21	321	855	176	6.69	8.57	2.93
121	122	-0.947	-0.611	-0.841	2.000	5116	10964	256	-309	46788	-41	2555	Y	210	76.10	80.06	570	0	0.13	0.173	0.00	0.15	0.21	313	795	101	6.03	8.45	2.89
122	122	-0.949	-0.611	-0.842	2.000	5116	7394	241	15	43208	-56	3123	Y	194	76.10	80.06	575	0	0.13	0.211	0.00	0.17	0.21	314	800	127	6.57	10.33	3.53
122	123	-0.966	-0.597	-0.850	2.000	5049	10957	271	-66	48692	92	3141	Y	141	77.29	79.07	525	0	0.13	0.215	0.00	0.17	0.21	309	750	145	5.39	10.48	3.58
123	123	-0.968	-0.597	-0.851	2.000	5049	10980	254	325	48705	75	3789	Y	128	77.29	79.07	518	0	0.13	0.259	0.00	0.19	0.21	309	744	157	5.27	12.64	4.32
123	124	-0.977	-0.597	-0.857	2.000	5000	10849	287	200	49549	224	3762	Y	74	77.94	78.35	482	0	0.13	0.260	0.00	0.19	0.21	305	708	231	4.19	12.63	4.32
124	124	-0.979	-0.597	-0.859	2.000	5000	10876	270	594	49566	207	4420	Y	60	77.94	78.35	475	0	0.13	0.305	0.00	0.22	0.21	305	702	243	3.99	14.84	5.07
124	125	-0.979	-0.611	-0.863	2.000	4969	10632	303	481	49353	357	4406	Y	6	78.05	77.90	441	0	0.13	0.306	0.00	0.22	0.21	303	670	318	3.11	14.85	5.08
125	125	-0.980	-0.612	-0.864	2.000	4969	10660	290	764	49368	345	4879	Y	0	78.05	77.90	438	0	0.13	0.339	0.00	0.23	0.21	303	667	327	3.01	16.45	5.62
125	126	-0.977	-0.623	-0.865	2.000	4960	10526	305	720	48966	408	4876	Y	-23	77.94	77.76	449	0	0.13	0.340	0.00	0.23	0.21	303	677	358	2.82	16.46	5.63
126	126	-0.978	-0.623	-0.866	2.000	4960	10526	293	990	48951	398	5316	Y	-67	77.94	77.76	473	0	0.13	0.370	0.00	0.25	0.21	303	698	367	2.86	17.94	6.13
126	127	-0.968	-0.646	-0.867	2.000	5000	10109	327	892	47217	549	5316	Y	-122	77.29	78.35	508	0	0.13	0.367	0.00	0.25	0.21	305	732	442	2.51	17.85	6.10

URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Shear Design.xls]Web Design (t=1)
Forces Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09
DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1** ***Rating Truck:*** HL-93 ***LL Factor:*** *Inventory*

Material Properties:

Concrete
f'c = ***5.0*** ksi
ϕ_v = ***0.90***

P-T Strands
f_{pu} = ***270*** ksi
f_{pe} = ***176*** ksi

Reinforcement
fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness
b_v = ***12.95*** in

Effective Width of Shear Flow Path
be= ***5.50*** in

Notes:
1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc All RF

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Maximum LL Shear @ t=00																											
127	127	-0.970	-0.646	-0.868	2.000	5000	10144	310	1279	47238	532	5959	Y	-129	77.29	78.35	512	0	0.13	0.412	0.00	0.27	0.21	305	736	454	2.44	20.01	6.84
127	128	-0.952	-0.684	-0.867	2.000	5049	9592	345	1188	44427	684	5967	Y	-185	76.10	79.07	552	0	0.13	0.408	0.00	0.27	0.21	309	775	530	2.17	19.91	6.81
128	128	-0.954	-0.684	-0.869	2.000	5049	9629	328	1564	44450	667	6579	Y	-198	76.10	79.07	559	0	0.13	0.450	0.00	0.29	0.21	309	782	541	2.13	21.95	7.50
128	129	-0.928	-0.735	-0.867	2.000	5116	8932	363	1479	40548	820	6591	Y	-254	74.38	80.06	605	0	0.13	0.445	0.00	0.29	0.21	314	827	618	1.92	21.80	7.45
129	129	-0.930	-0.734	-0.868	2.000	5116	8973	347	1840	40573	804	7166	Y	-270	74.38	80.06	614	0	0.13	0.484	0.00	0.31	0.21	314	835	628	1.89	23.70	8.10
129	130	-0.897	-0.796	-0.865	2.000	5206	8118	383	1756	35562	958	7180	Y	-326	72.12	81.36	667	0	0.13	0.476	0.00	0.30	0.21	321	889	706	1.74	23.49	8.03
130	130	-0.899	-0.796	-0.866	2.000	5206	8163	368	2099	35590	943	7708	Y	-340	72.12	81.36	675	0	0.13	0.511	0.00	0.32	0.21	321	896	715	1.72	25.21	8.62
130	131	-0.860	-0.867	-0.862	2.000	5313	7135	404	2014	29451	1098	7722	Y	-397	69.32	82.94	719	0	0.13	0.502	0.00	0.32	0.21	328	942	793	1.56	24.93	8.52
131	131	-0.862	-0.867	-0.864	2.000	5313	7183	389	2334	29481	1084	8191	Y	-411	69.32	82.94	726	0	0.13	0.533	0.00	0.33	0.21	328	949	801	1.55	26.44	9.04
131	132	-0.818	-0.948	-0.859	2.000	5440	5971	427	2246	22197	1240	8202	Y	-469	65.98	84.78	766	0	0.13	0.521	0.00	0.33	0.21	335	991	879	1.40	26.09	8.92
132	132	-0.820	-0.948	-0.860	2.000	5440	6024	413	2539	22230	1227	8600	Y	-486	65.98	84.78	775	0	0.13	0.546	0.00	0.34	0.21	335	999	885	1.40	27.35	9.35
132	133	-0.771	-1.034	-0.855	2.000	5587	4613	450	2444	13781	1384	8603	Y	-544	62.11	86.94	817	0	0.13	0.532	0.00	0.33	0.37	619	1292	964	2.09	26.91	9.20
133	133	-0.773	-1.035	-0.856	2.000	5587	4670	438	2704	13815	1372	8920	Y	-559	62.11	86.94	825	0	0.13	0.551	0.00	0.34	0.37	619	1299	968	2.09	27.90	9.54
133	134	-0.722	-1.126	-0.851	2.000	5756	3049	476	2599	4180	1531	8913	Y	-617	57.74	89.42	869	0	0.13	0.535	0.00	0.33	0.37	636	1355	1047	1.96	27.36	9.35
134	134	-0.723	-1.127	-0.852	2.000	5756	3109	464	2813	4211	1527	9017	Y	-873	57.74	89.42	998	0	0.13	0.541	0.00	0.34	0.37	636	1471	1048	2.32	27.68	9.46
134	135	-0.690	-1.089	-0.825	2.000	5901	1265	502	2693	-6705	1690	8995	Y	-932	75.21	92.12	1044	0	0.13	0.527	0.00	0.33	0.37	655	1530	1129	2.19	27.20	9.30
135	135	-0.691	-1.090	-0.826	2.000	5901	1338	492	2881	-6660	1680	9117	Y	-940	75.21	92.12	1048	0	0.13	0.534	0.00	0.33	0.37	655	1533	1128	2.20	27.57	9.42
135	136	-0.654	-1.063	-0.800	2.000	6067	-753	531	2746	-18839	1847	9081	Y	-998	84.92	95.13	1096	0	0.13	0.517	0.00	0.32	0.37	677	1596	1210	2.09	26.99	9.23
136	136	-0.655	-1.064	-0.800	2.000	6067	-668	522	2883	-18788	1838	9067	Y	-1011	84.92	95.13	1102	0	0.13	0.516	0.00	0.32	0.37	677	1601	1205	2.12	26.95	9.21
136	137	-0.615	-1.044	-0.775	2.000	6252	-3030	562	2731	-32291	2010	9013	Y	-1071	95.57	98.42	1140	0	0.13	0.498	0.00	0.31	0.37	698	1655	1290	1.99	26.31	9.00
137	137	-0.615	-1.045	-0.775	2.000	6252	-2936	555	2811	-32237	2004	8846	Y	-1081	95.57	98.42	1146	0	0.13	0.489	0.00	0.31	0.37	698	1660	1281	2.03	25.83	8.83
137	138	-0.953	-1.223	-1.058	2.000	6456	-5595	595	2641	-47222	2204	8775	Y	-2426	105.18	102.02	1853	0	0.13	0.469	0.00	0.30	0.37	726	2321	1379	3.47	25.13	8.59
138	138	-0.953	-1.224	-1.058	2.000	6456	-5494	589	2659	-47164	2199	8433	Y	-2450	105.18	102.02	1865	0	0.13	0.451	0.00	0.29	0.37	726	2332	1366	3.55	24.15	8.26
138	139	-1.050	-0.997	-1.028	2.000	6681	-8474	629	2472	-63811	2411	8345	Y	-2095	122.50	110.25	1739	0	0.13	0.431	0.00	0.28	0.37	784	2271	1469	3.04	23.42	8.01
139	139	-1.049	-0.997	-1.028	2.000	6681	-8370	625	2421	-63747	2407	7811	Y	-2122	122.50	110.25	1753	0	0.13	0.404	0.00	0.27	0.37	784	2284	1450	3.14	21.92	7.50
139	140	-1.033	-0.996	-1.017	2.000	6927	-11687	666	2221	-82136	2623	7709	Y	-1236	133.75	120.38	1373	84	0.13	0.384	0.00	0.26	0.37	857	2007	1555	2.12	21.19	7.24
140	140	-1.033	-0.996	-1.018	2.000	6927	-11587	663	2092	-82070	2621	6963	Y	-1262	133.75	120.38	1386	70	0.13	0.347	0.00	0.24	0.37	857	2019	1531	2.23	19.14	6.54
140	141	-0.930	-1.069	-0.989	2.000	7190	-15251	703	1883	-102249	2842	6853	Y	-1025	142.64	128.38	1265	314	0.26	0.329	0.00	0.29	0.37	905	1952	1637	1.77	18.44	6.30
141	141	-0.929	-1.069	-0.988	2.000	7190	-15165	704	1625	-102189	2839	5906	Y	-789	142.64	128.38	1140	437	0.36	0.284	0.00	0.32	0.37	903	1839	1606	1.58	15.89	5.43
141	142	-0.794	-1.241	-0.984	2.000	7513	-19192	743	1418	-124159	3063	5797	Y	-545	150.43	135.39	1009	693	0.55	0.267	0.00	0.41	0.37	943				15.22	5.20
142	142	-0.791	-1.236	-0.981	2.000	7513	-18141	702	-1516	-123090	2934	3098	Y	-80	150.43	135.39	770	860	0.68	0.142	0.00	0.41	0.37	942				8.14	2.78
142	143	-0.733	-1.323	-0.985	2.000	7513	-19716	721	-1786	-130488	3003	2860	Y	0	150.51	135.46	713	956	0.76	0.131	0.00	0.44	0.37	939				7.51	2.57
143	143	-0.733	-1.322	-0.985	2.000	7513	-1514	173	-3190	-112275	-2231	-12135	Y	0	150.51	135.46	768	471	0.37	0.558	0.00	0.46	0.37	950				-31.86	-10.89
143	144	-0.798	-1.231	-0.983	2.000	7513	-1822	192	-3617	-106445	-2161	-12529	Y	113	150.43	135.39	842	359	0.28	0.576	0.00	0.43	0.37	953				-32.90	-11.25
144	144	-0.802	-1.235	-0.987	2.000	7513	1623	35	-544	-102986	-2401	-9298	Y	579	150.43	135.39	1091	243	0.19	0.428	0.00	0.31	0.37	955				-24.41	-8.35
144	145	-0.951	-1.061	-0.997	2.000	7190	1023	38	-687	-84700	-2214	-9342	Y	925	142.16	127.94	1265	0	0.13	0.449	0.00	0.29	0.37	910	1958	1402	14.70	-25.14	-8.59
145	145	-0.953	-1.061	-0.999	2.000	7190	989	37	-603	-84663	-2219	-9935	Y	1163	142.16	127.94	1384	0	0.13	0.477	0.00	0.30	0.37	910	2065	1423	18.20	-26.74	-9.14
145	146	-1.059	-1.002	-1.036	2.000	6929	1517	46	-848	-66679	-2028	-10081	Y	1493	132.19	118.97	1493	0	0.13	0.503	0.00	0.32	0.37	847	2105	1333	16.46	-27.71	-9.47
146	146	-1.061	-1.002	-1.036	2.000	6929	1518	43	-724	-66596	-2031	-10554	Y	1467	132.19	118.97	1480	0	0.13	0.526	0.00	0.33	0.37	847	2094	1349	17.72	-29.01	-9.92
146	147	-1.073	-1.038	-1.059	2.000	6682	2046	55	-967	-50058	-1843	-10699	Y	2350	119.41	107.47	1849	0	0.13	0.553	0.00	0.34	0.37	765	2352	1260	19.88	-30.03	-10.27
147	147	-1.075	-1.037	-1.060	2.000	6682	2710	51	-815	-49304	-1847	-11005	Y	2322	119.41	107.47	1835	0	0.13	0.569	0.00	0.35	0.37	765	2340	1271	21.91	-30.89	-10.56
147	148	-0.954	-1.303	-1.089	2.000	6458	3441	66	-1109	-33970	-1660	-11201	Y	2731	100.65	102.02	2006	0	0.13	0.599	0.00	0.36	0.37	726	2459	1184	19.74	-32.07	-10.97
148	148	-0.956	-1.302	-1.090	2.000	6458	3602	61	-940	-33716	-1664	-11360	Y	2707	100.65	102.02	1993	0	0.13	0.608	0.00	0.37	0.37	726	2447	1191	21.88	-32.53	-11.12
148	149	-0.559	-1.123	-0.769	2.000	6252	4300	78	-1249	-19760	-1487	-11571	Y	1204	87.67	98.42	1220	0	0.13	0.639	0.00	0.38	0.37	700	1728	1109	8.91	-33.78	-11.55
149	149	-0.545	-1.107	-0.754	2.000	6252	6477	72	-827	-17494	-1492	-11357	Y	1195	87.67	98.42	1215	0	0.13	0.628	0.00	0.38	0.37	700	1724	1105	10.94	-33.16	-11.34
149	150	-0.584	-1.148	-0.785	2.000	6067	7502	94	-1104	-4397	-1337	-11536	Y	1134	75.77	95.13	1164	0	0.13	0.657	0.00	0.39	0.37	677	1657	1033	8.61	-34.29	-11.72
150	150	-0.586	-1.146	-0.785	2.000	6067	7471	88	-938	-4347	-1343	-11483	Y	1122	75.77	95.13	1158	0	0.13	0.654	0.00	0.39	0.37	677	1651	1034	9.39	-34.13	-11.67
150	151	-0.620	-1.195	-0.814	2.000	5901	8421	111	-1212	7617	-1192	-11658	Y	1060	63.03	92.12	1108	0	0.13	0.682	0.00	0.41	0.37	655	1587	964	7.64	-35.25	-12.05
151	151	-0.621	-1.193	-0.815	2.000	5901	8397	103	-1005	7670	-1199	-11478	Y	1052	63.03	92.12	1104	0	0.13	0.672	0.00	0.40	0.37	655	1583	962	8.47	-34.70	-11.86
151	152	-0.650	-1.248	-0.841	2.000	5756	9275	127	-1271	18541	-1051	-11646	Y	987	69.01	89.42	1055	0	0.13	0.699	0.00	0.41	0.37	636	1522	893	7.06	-35.75	-12.22
152	152	-0.651	-1.246	-0.841	2.000	5756	9260	119	-1044	18605	-1052	-11462	Y	727	69.01	89.42	925	0	0.13	0.688	0.00	0.41	0.37	636	1405	888	6.60	-35.19	-12.03
152	153	-0.701	-1.159	-0.847	2.000	5587	10065	144	-1301	28347	-905	-11621	Y	661	74.31	86.94	876	0	0.13	0.719	0.00	0.42	0.21	344	1098	820	3.46	-36.35	-12.43
153	153	-0.702	-1.158	-0.847	2.000	5587	10055	133	-1021	28409	-915	-11232	Y	646	74.31	86.94	868	0	0.13	0.694	0.00	0.41	0.21	344	1091	812	3.82	-35.13	-12.01
153	154	-0.750	-1.069	-0.851	2.000	5440	10796	159	-1265	37107	-769	-11377	Y	582	78.99	84.78	809	0	0.13	0.723	0.00	0.43	0.21	334	1029	744	3.38	-36.19	-12.37
154	154	-0.752	-1.068	-0.852	2.000	5440	10791	147	-950	37172	-780	-10899	Y	565	78.99	84.78	799	0	0.13	0.692	0.00	0.41	0.21	334	1020	734	3.76	-34.67	-11.85
154	155	-0.797	-0.980	-0.855	2.000	5313	11469	174	-1179	44833	-634	-11030	Y	505	83.07	82.94	733	0	0.13	0.717	0.00	0.42	0.21	324	951	665	3.30	-35.61	-12.17
155	155	-0.799	-0.979	-0.856	2.000	5313	11469	160	-832	44902	-647	-10472	Y	491	83.07	82.94	725	0	0.13	0.681	0.00	0.41	0.21	324	944	654	3.73	-33.81	-11.56
155	156	-0.839	-0.897	-0.858	2.000	5206	12082	188	-1045	51532	-500	-10586	Y	431	86.59	81.36	665	0	0.13	0.703	0.00	0.42	0.21	316	883	584	3.35	-34.63	-11.84
156	156	-0.841	-0.897	-0.859	2.000	5206	12087	173	-670	51604	-514	-9958	Y	416	86.59	81.36	657	0	0.13	0.661	0.00	0.40	0.21	316	876	571	3.83	-32.57	-11.14
156	157	-0.877	-0.823	-0.860	2.000	5116	12631	202	-866	57204	-367	-10056	Y	346	89.48	80.53	602	0	0.13	0.679	0.00	0.40	0.21	311	821	501	3.50	-33.26	-11.37
157	157	-0.879	-0.823	-0.861	2.000	5116	12639	186	-467	57280	-382	-9370	Y	329	89.48	80.53	593	0	0.13	0.633	0.00	0.38	0.21	311	813	487	4.03	-30.99	-10.60
157	158	-0.912	-0.757	-0.863	2.000	5049	13109	216	-646	61848	-234	-9451	Y	248	91.67	82.50	555	0	0.13	0.647	0.00	0.39	0.21	317	785	416	3.88	-31.53	-10.78
158	158	-0.914	-0.757	-0.864	2.000	5049	13161	198	-74	61966	-251	-8564	Y	233	91.67	82.50	548	0	0.13	0.586	0.00	0.36	0.21	317	778	396	4.77	-28.57	-9.77

URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Shear Design.xls]Web Design (t=1)
Forces Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment1\Rating Gdr 1\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09
DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1** ***Rating Truck:*** HL-93 ***LL Factor:*** *Inventory*

Material Properties:

Concrete
$f'c$ = ***5.0*** ksi
ϕ_v = ***0.90***

P-T Strands
f_{pu} = ***270*** ksi
f_{pe} = ***176*** ksi

Reinforcement
fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness
b_v = ***12.95*** in

Effective Width of Shear Flow Path
be= ***5.50*** in

Notes:
1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc All RF

Calc RF

Permanent Loads + Maximum LL Shear @ t=00																	(kip)	(kip)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(kip)	(kip)	(kip)		Total Long.	Equivalent
		(ksi)	(ksi)	(ksi)		(k-ft)	Ultimate	Ultimate	Ultimate				Investigate	Shear from	(in)	(in)	Concrete	Required	Required	Additional	Additional	Total		Provided	Nominal			Mild Steel	PT Steel Req'd
		Perm Load	Perm Load	Dead Load	Stress	Torsional	Corresp.	Max	Corresp.	TOTAL	TOTAL	TOTAL	Torsional	Primary	Depth	Effective	Shear	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Shear	Ultimate	Shear	Required	for Torsion
		Stress	Stress	Stress	Variable	Cracking	Live Load	Live Load	Live Load	Ultimate	Ultimate	Ultimate	Effects?	Post Tensioning	to Tensile	Shear	Resistance	Resistance	Area	Required	Req'd from	Required	Provided	Resistance	Resistance	Shear	Rating	for Torsion	(based on fpe)
Member	Node	(top fiber)	(bott. fiber)	(neutr. axis)	'K'	Moment	Moment	Shear	Torsion	Moment	Shear	Torsion	(Y/N)	Effect	Reinforcement	Depth	per web	per web	per web	for Torsion	Transverse	per leg	per leg	per web	per web	per web	Factor, RF	(Al)	(Al)
Number	Number			(fpc)		(Tcr)				(Mu)	(Vu)	(Tu)		(Vp)	d_e	d_v	(Vc)	(Vs-req'd)	(Av)	(At)	A_v (trans)	(As_req'd)	As_prov'd)	(Vs_prov)	(φVn)	(Vu)		in^2	in^2
158	159	-0.943	-0.701	-0.866	2.000	5000	13510	229	-387	65460	-103	-8778	Y	159	93.09	83.78	510	0	0.13	0.607	0.00	0.37	0.21	321	748	329	4.31	-29.47	-10.08
159	159	-0.945	-0.700	-0.868	2.000	5000	13568	211	223	65584	-120	-7831	Y	144	93.09	83.78	503	0	0.13	0.541	0.00	0.34	0.21	321	742	307	4.87	-26.29	-8.99
159	160	-0.965	-0.661	-0.870	2.000	4969	13870	242	105	68080	28	-7851	Y	99	93.96	84.57	479	0	0.13	0.546	0.00	0.34	0.21	324	722	262	4.70	-26.47	-9.05
160	160	-0.966	-0.661	-0.870	2.000	4969	13893	229	423	68145	16	-7286	Y	75	93.96	84.57	467	0	0.13	0.507	0.00	0.32	0.21	324	712	238	4.70	-24.56	-8.40
160	161	-0.971	-0.652	-0.871	2.000	4969	13996	243	377	68888	79	-7290	Y	65	94.23	84.81	462	0	0.13	0.507	0.00	0.32	0.21	324	708	270	4.29	-24.58	-8.40
161	161	-0.972	-0.651	-0.871	2.000	4969	13988	229	695	68922	67	-6723	Y	41	94.23	84.81	450	0	0.13	0.467	0.00	0.30	0.21	324	697	246	4.31	-22.66	-7.75
161	162	-0.977	-0.646	-0.872	2.000	5000	14148	262	597	69919	216	-6723	Y	-48	94.52	85.07	451	0	0.13	0.465	0.00	0.30	0.21	325	698	320	3.52	-22.57	-7.72
162	162	-0.980	-0.643	-0.874	2.000	5000	14166	242	1059	70006	198	-5900	Y	-63	94.52	85.07	459	0	0.13	0.408	0.00	0.27	0.21	325	705	285	3.72	-19.81	-6.77
162	163	-0.982	-0.628	-0.871	2.000	5049	14207	276	971	69933	348	-5890	Y	-130	93.99	84.59	487	0	0.13	0.403	0.00	0.27	0.21	323	729	360	3.19	-19.65	-6.72
163	163	-0.986	-0.626	-0.873	2.000	5049	14227	256	1438	70022	330	-5065	Y	-144	93.99	84.59	495	0	0.13	0.347	0.00	0.24	0.21	323	736	325	3.37	-16.90	-5.78
163	164	-0.981	-0.629	-0.870	2.000	5116	14130	290	1355	68858	482	-5049	Y	-213	92.84	83.56	523	0	0.13	0.341	0.00	0.24	0.21	319	758	400	2.90	-16.70	-5.71
164	164	-0.985	-0.627	-0.872	2.000	5116	14153	270	1820	68953	463	-4235	Y	-230	92.84	83.56	532	0	0.13	0.286	0.00	0.21	0.21	319	766	365	3.08	-14.01	-4.79
164	165	-0.972	-0.646	-0.869	2.000	5206	13890	306	1735	66666	617	-4221	Y	-299	91.06	81.95	559	0	0.13	0.280	0.00	0.20	0.37	563	1010	442	3.73	-13.81	-4.72
165	165	-0.977	-0.643	-0.872	2.000	5206	17744	290	723	70595	601	-4897	Y	-313	91.06	81.95	558	0	0.13	0.325	0.00	0.23	0.37	561	1007	455	4.29	-16.02	-5.48
165	166	-0.958	-0.676	-0.869	2.000	5313	13448	324	2099	63316	754	-3423	Y	-381	88.63	82.94	615	0	0.13	0.223	0.00	0.18	0.37	572	1068	485	3.55	-11.05	-3.78
166	166	-0.965	-0.673	-0.872	2.000	5313	16930	315	821	66878	745	-4383	Y	-396	88.63	82.94	614	0	0.13	0.285	0.00	0.21	0.37	570	1066	511	4.03	-14.15	-4.84
166	167	-0.940	-0.716	-0.869	2.000	5440	12761	345	2426	58761	895	-2679	Y	-462	85.57	84.78	679	0	0.13	0.170	0.00	0.15	0.37	588	1140	532	3.44	-8.52	-2.91
167	167	-0.947	-0.713	-0.873	2.000	5440	15800	341	894	61889	892	-3913	Y	-480	85.57	84.78	680	0	0.13	0.248	0.00	0.19	0.37	586	1140	570	3.87	-12.45	-4.25
167	168	-0.918	-0.762	-0.869	2.000	5587	14279	373	788	55449	1044	-3921	Y	-545	81.88	86.94	743	0	0.13	0.242	0.00	0.19	0.37	605	1213	646	3.68	-12.26	-4.19
168	168	-0.927	-0.759	-0.874	2.000	5587	14327	370	932	55597	1041	-3496	Y	-561	81.88	86.94	751	0	0.13	0.216	0.00	0.17	0.37	605	1221	631	3.75	-10.93	-3.74
168	169	-0.894	-0.814	-0.868	2.000	5756	12440	404	794	47817	1196	-3535	Y	-624	77.63	89.42	820	0	0.13	0.212	0.00	0.17	0.37	627	1302	710	3.61	-10.85	-3.71
169	169	-0.905	-0.810	-0.874	2.000	5756	12422	401	929	47917	1196	-3127	Y	-800	77.63	89.42	912	0	0.13	0.188	0.00	0.16	0.37	628	1386	697	4.00	-9.60	-3.28
169	170	-0.878	-0.812	-0.857	2.000	5935	10108	438	752	38703	1356	-3206	Y	-859	71.57	92.12	987	0	0.13	0.187	0.00	0.16	0.37	652	1476	779	3.87	-9.66	-3.30
170	170	-0.891	-0.808	-0.864	2.000	5935	10208	436	833	38950	1353	-2835	Y	-874	71.57	92.12	995	0	0.13	0.165	0.00	0.15	0.37	652	1483	766	3.94	-8.54	-2.92
170	171	-0.861	-0.807	-0.842	2.000	6109	7403	474	609	28244	1518	-2960	Y	-939	66.44	95.13	1066	0	0.13	0.167	0.00	0.15	0.37	677	1569	853	3.79	-8.76	-3.00
171	171	-0.877	-0.803	-0.852	2.000	6109	7432	473	672	28458	1516	-2565	Y	-957	66.44	95.13	1075	0	0.13	0.145	0.00	0.14	0.37	677	1577	839	3.86	-7.59	-2.60
171	172	-0.843	-0.799	-0.827	2.000	6295	3083	519	2713	15187	1692	-425	N	-1030	60.87	98.42	1133	0	0.13	Not Reqd	0.00	0.06	0.37	700	1650	846	4.09	0.00	0.00
172	172	-0.863	-0.795	-0.839	2.000	6295	3189	516	2805	15530	1961	58	N	-1044	60.87	98.42	1140	0	0.13	Not Reqd	0.00	0.06	0.37	700	1656	981	3.62	0.00	0.00
172	173	-0.789	-0.858	-0.814	2.000	6515	-790	572	2383	-636	2151	-265	N	-1071	87.58	102.02	1176	20	0.13	Not Reqd	0.00	0.06	0.37	726				0.00	0.00

1.24

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

		Permanent Loads + Minimum LL Shear @ t=00																												
Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment (fpc)	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
1	1	0.001	0.000	0.001	1.003	2487	80	-5	101	76	-6	-305	N	0	0.00	77.76	440	0	0.13	Not Reqd	0.00	0.06	0.37	545				0.00	0.00
1	2	0.001	-0.001	0.001	1.002	2485	94	-5	93	68	21	-291	N	0	42.43	77.76	440	0	0.13	Not Reqd	0.00	0.06	0.37	545	886	10	353.36	0.00	0.00
2	2	-0.254	-0.454	-0.317	1.801	4465	-125	-475	-678	-156	-988	-1325	N	352	65.57	77.76	602	0	0.13	Not Reqd	0.00	0.06	0.37	542	1029	494	3.25	0.00	0.00
2	3	-0.256	-0.449	-0.317	1.800	4464	198	-470	-693	522	-972	-1332	N	351	43.34	77.76	601	0	0.13	Not Reqd	0.00	0.06	0.37	542	1029	486	3.31	0.00	0.00
3	3	-0.255	-0.449	-0.316	1.799	4461	138	-471	-674	459	-974	-1688	Y	351	43.34	77.76	601	0	0.13	0.118	0.00	0.12	0.37	542	1029	540	2.91	-5.70	-1.95
3	4	-0.278	-0.404	-0.318	1.802	4468	3820	-396	-850	8300	-760	-1746	Y	274	54.64	77.76	542	0	0.13	0.122	0.00	0.13	0.37	538	972	435	3.39	-5.89	-2.02
4	4	-0.272	-0.405	-0.314	1.795	4451	3750	-399	-788	8198	-763	-2053	Y	274	54.64	77.76	542	0	0.13	0.143	0.00	0.14	0.37	538	972	446	3.34	-6.93	-2.37
4	5	-0.286	-0.382	-0.316	1.799	4461	5999	-339	-894	12893	-586	-2061	Y	200	61.54	77.76	494	0	0.13	0.144	0.00	0.14	0.37	535	927	358	3.88	-6.96	-2.38
5	5	-0.281	-0.383	-0.313	1.794	4448	5954	-344	-760	12829	-591	-2085	Y	200	61.54	77.76	494	0	0.13	0.145	0.00	0.14	0.37	535	927	361	3.89	-7.04	-2.41
5	6	-0.288	-0.376	-0.316	1.798	4459	7529	-285	-826	15925	-416	-2053	Y	136	66.43	77.76	456	0	0.13	0.143	0.00	0.14	0.37	534	891	273	4.67	-6.93	-2.37
6	6	-0.283	-0.377	-0.313	1.792	4444	7494	-292	-642	15869	-422	-1925	Y	136	66.43	77.76	455	0	0.13	0.134	0.00	0.13	0.37	534	890	272	4.72	-6.50	-2.22
6	7	-0.281	-0.389	-0.315	1.797	4456	8371	-238	-673	17324	-251	-1858	Y	70	69.42	77.76	421	0	0.13	0.129	0.00	0.13	0.21	296	645	184	4.29	-6.27	-2.14
7	7	-0.276	-0.390	-0.312	1.791	4440	8350	-246	-458	17276	-259	-1637	Y	70	69.42	77.76	421	0	0.13	0.114	0.00	0.12	0.21	296	645	181	4.37	-5.53	-1.89
7	8	-0.268	-0.417	-0.315	1.796	4454	8645	-196	-472	17206	-93	-1552	Y	-1	70.39	77.76	388	0	0.13	0.108	0.00	0.12	0.21	297	616	95	5.61	-5.24	-1.79
8	8	-0.262	-0.418	-0.311	1.789	4437	8637	-205	-246	17167	-101	-1290	N	-1	70.39	77.76	388	0	0.13	Not Reqd	0.00	0.06	0.21	297	616	50	6.51	0.00	0.00
8	9	-0.247	-0.462	-0.314	1.796	4453	7205	-163	-211	14424	58	-1157	N	-72	69.34	77.76	432	0	0.13	Not Reqd	0.00	0.06	0.21	298	656	29	8.70	0.00	0.00
9	9	-0.241	-0.463	-0.311	1.788	4435	7187	-170	102	14373	52	-803	N	-72	69.34	77.76	431	0	0.13	Not Reqd	0.00	0.06	0.21	298	656	26	8.41	0.00	0.00
9	10	-0.219	-0.521	-0.314	1.795	4450	6758	-136	46	11687	202	-760	N	-141	66.33	77.76	473	0	0.13	Not Reqd	0.00	0.06	0.21	298	694	101	9.71	0.00	0.00
10	10	-0.212	-0.523	-0.310	1.787	4431	6769	-143	212	11661	197	-566	N	-141	66.33	77.76	472	0	0.13	Not Reqd	0.00	0.06	0.21	298	694	98	9.35	0.00	0.00
10	11	-0.184	-0.595	-0.313	1.793	4447	6089	-111	138	7778	345	-541	N	-215	61.32	77.76	519	0	0.13	Not Reqd	0.00	0.06	0.21	300	737	173	11.16	0.00	0.00
11	11	-0.180	-0.596	-0.311	1.789	4437	6102	-115	253	7770	341	-424	N	-215	61.32	77.76	519	0	0.13	Not Reqd	0.00	0.06	0.21	300	737	171	10.81	0.00	0.00
11	12	-0.159	-0.649	-0.313	1.793	4447	5563	-96	194	4634	437	-418	N	-264	57.03	77.76	552	0	0.13	Not Reqd	0.00	0.06	0.21	301	767	218	12.41	0.00	0.00
12	12	-0.156	-0.650	-0.312	1.790	4439	5571	-99	273	4624	439	-388	N	-377	57.03	77.76	610	0	0.13	Not Reqd	0.00	0.06	0.21	301	820	219	13.16	0.00	0.00
12	13	-0.137	-0.619	-0.302	1.770	4337	4936	-74	477	-467	575	-92	N	-444	58.74	77.76	650	0	0.13	Not Reqd	0.00	0.06	0.37	543	1073	288	22.37	0.00	0.00
13	13	-0.132	-0.620	-0.299	1.764	4322	4924	-76	608	-515	573	-25	N	-430	58.74	77.76	642	0	0.13	Not Reqd	0.00	0.06	0.37	543	1066	287	21.44	0.00	0.00
13	14	-0.180	-0.802	-0.408	1.971	4770	4288	-58	387	-6497	716	-154	N	-890	64.15	77.76	905	0	0.13	Not Reqd	0.00	0.06	0.37	549	1308	358	33.94	0.00	0.00
14	14	-0.175	-0.803	-0.405	1.967	4759	4262	-59	502	-6563	715	-146	N	-873	64.15	77.76	896	0	0.13	Not Reqd	0.00	0.06	0.37	549	1300	358	32.75	0.00	0.00
14	15	-0.200	-0.687	-0.389	1.937	4628	3560	-43	281	-13638	880	-275	N	-975	78.68	77.76	922	0	0.13	Not Reqd	0.00	0.06	0.37	544	1319	440	42.35	0.00	0.00
15	15	-0.195	-0.688	-0.386	1.932	4618	3536	-44	375	-13708	875	-332	N	-850	78.68	77.76	860	0	0.13	Not Reqd	0.00	0.06	0.37	544	1263	438	38.90	0.00	0.00
15	16	-0.181	-0.745	-0.399	1.956	4673	3658	-37	104	-21634	1043	-505	N	-373	91.75	82.57	618	0	0.13	Not Reqd	0.00	0.06	0.37	572				0.00	0.00
16	16	-0.180	-0.745	-0.399	1.955	4672	-87	-91	2067	-25388	1013	749	N	-373	91.75	82.57	610	0	0.13	Not Reqd	0.00	0.06	0.37	570				0.00	0.00
16	17	-0.148	-0.822	-0.409	1.973	4715	318	-81	1756	-27886	1065	470	N	0	92.92	83.63	417	175	0.23	Not Reqd	0.00	0.11	0.37	574				0.00	0.00
17	17	-0.147	-0.823	-0.408	1.972	4714	-9084	-605	-1101	-37299	-2038	-2697	Y	0	92.92	83.63	384	749	0.98	0.195	0.00	0.59	0.37	566				-9.33	-3.19
17	18	-0.223	-0.706	-0.410	1.975	4720	-7846	-588	-1287	-32418	-1978	-2852	Y	130	92.54	83.28	459	640	0.84	0.206	0.00	0.52	0.41	630				-9.86	-3.37
18	18	-0.223	-0.706	-0.410	1.975	4719	-9865	-612	-1663	-34445	-1986	-3823	Y	130	92.54	83.28	454	649	0.85	0.276	0.00	0.56	0.41	628				-13.22	-4.52
18	19	-0.397	-0.447	-0.417	1.987	4749	-6424	-565	-1880	-20466	-1808	-3941	Y	489	86.88	78.19	643	362	0.50	0.285	0.00	0.39	0.41	599	1118	1029	1.26	-13.63	-4.66
19	19	-0.393	-0.448	-0.414	1.983	4739	-6493	-566	-1966	-20568	-1812	-4167	Y	563	86.88	78.19	681	326	0.45	0.301	0.00	0.38	0.41	599	1152	1038	1.33	-14.41	-4.93
19	20	-0.481	-0.354	-0.433	2.000	4815	-2915	-520	-2074	-7479	-1636	-4176	Y	798	75.59	77.76	839	70	0.13	0.300	0.00	0.21	0.41	606	1300	950	2.08	-14.37	-4.91
20	20	-0.476	-0.355	-0.430	2.000	4815	-2986	-523	-2046	-7577	-1640	-4220	Y	804	75.59	77.76	841	70	0.13	0.303	0.00	0.22	0.41	605	1302	953	2.07	-14.52	-4.97
20	21	-0.528	-0.314	-0.450	2.000	4852	-351	-478	-2237	3542	-1468	-4313	Y	717	44.46	77.76	816	0	0.13	0.307	0.00	0.22	0.41	609	1283	870	2.33	-14.77	-5.05
21	21	-0.523	-0.314	-0.448	2.000	4852	-423	-484	-2133	3449	-1474	-4217	Y	723	44.46	77.76	819	0	0.13	0.300	0.00	0.21	0.41	609	1286	870	2.34	-14.44	-4.94
21	22	-0.565	-0.277	-0.465	2.000	4887	1316	-439	-2358	12665	-1306	-4344	Y	647	54.98	77.76	758	0	0.13	0.307	0.00	0.22	0.41	604	1226	790	2.48	-14.80	-5.06
22	22	-0.561	-0.277	-0.462	2.000	4887	1782	-448	-2118	13113	-1315	-4053	Y	654	54.98	77.76	760	0	0.13	0.286	0.00	0.21	0.41	604	1227	785	2.52	-13.81	-4.72
22	23	-0.592	-0.244	-0.477	2.000	4924	3187	-404	-2303	21013	-1150	-4139	Y	593	64.16	77.76	711	0	0.13	0.290	0.00	0.21	0.41	600	1179	706	2.72	-14.04	-4.80
23	23	-0.588	-0.245	-0.474	2.000	4924	3123	-415	-2092	20933	-1161	-3825	Y	601	64.16	77.76	714	0	0.13	0.268	0.00	0.20	0.41	600	1183	701	2.76	-12.97	-4.43
23	24	-0.610	-0.216	-0.486	2.000	4960	4755	-373	-2165	28100	-1001	-3799	Y	537	72.21	77.76	666	0	0.13	0.265	0.00	0.20	0.41	596	1136	620	3.02	-12.82	-4.38
24	24	-0.607	-0.216	-0.484	2.000	4960	4700	-385	-1929	28032	-1008	-3426	Y	432	72.21	77.76	612	0	0.13	0.239	0.00	0.18	0.41	596	1087	612	2.87	-11.56	-3.95
24	25	-0.627	-0.171	-0.483	2.000	4960	6045	-344	-1981	33927	-851	-3380	Y	361	79.06	77.76	563	0	0.13	0.235	0.00	0.18	0.21	296	773	532	2.03	-11.41	-3.90
25	25	-0.623	-0.171	-0.481	2.000	4960	5992	-357	-1696	33860	-864	-2916	Y	361	79.06	77.76	563	0	0.13	0.203	0.00	0.17	0.21	296	773	524	2.07	-9.84	-3.37
25	26	-0.638	-0.137	-0.480	2.000	4960	7071	-318	-1737	38546	-707	-2859	Y	286	84.61	77.76	516	0	0.13	0.199	0.00	0.16	0.21	295	729	444	2.33	-9.65	-3.30
26	26	-0.635	-0.138	-0.478	2.000	4960	7022	-332	-1425	38482	-721	-2342	Y	286	84.61	77.76	515	0	0.13	0.163	0.00	0.15	0.21	295	729	435	2.39	-7.90	-2.70
26	27	-0.643	-0.115	-0.477	2.000	4960	7849	-293	-1463	41974	-566	-2281	Y	212	88.87	79.98	485	0	0.13	0.159	0.00	0.14	0.21	302	708	355	2.83	-7.70	-2.63
27	27	-0.640	-0.116	-0.475	2.000	4960	7804	-308	-1131	41913	-580	-1725	Y	212	88.87	79.98	485	0	0.13	0.120	0.00	0.12	0.21	302	708	345	2.91	-5.82	-1.99
27	28	-0.643	-0.107	-0.474	2.000	4960	8406	-270	-1169	44239	-426	-1665	Y	139	91.84	82.66	460	0	0.13	0.116	0.00	0.12	0.21	312	695	266	3.49	-5.62	-1.92
28	28	-0.640	-0.108	-0.473	2.000	4960	8365	-286	-826	44180	-441	-1085	N	139	91.84	82.66	459	0	0.13	Not Reqd	0.00	0.06	0.21	312	694	220	4.32	0.00	0.00
28	29	-0.636	-0.115	-0.472	2.000	4960	8741	-249	-872	45336	-287	-1033	N	65	93.56	84.20	430	0	0.13	Not Reqd	0.00	0.06	0.21	318	674	144	5.26	0.00	0.00
29	29	-0.633	-0.115	-0.470	2.000	4960	8704	-264	-526	45281	-302	-445	N	65	93.56	84.20	430	0	0.13	Not Reqd	0.00	0.06	0.21	318	673	151	4.96	0.00	0.00
29	30	-0.623	-0.139	-0.471	2.000	4960	8888	-228	-582	45301	-149	-403	N	-10	94.02	84.62	406	0	0.13	Not Reqd	0.00	0.06	0.21	320	654	75	6.08	0.00	0.00
30	30	-0.621	-0.139	-0.469	2.000	4960	8871	-241	-285	45271	-162	104	N	-10	94.02	84.62	406	0	0.13	Not Reqd	0.00	0.06	0.21	320	654	81	5.75	0.00	0.00
30	31	-0.609	-0.169	-0.470	2.000	4960	8894	-215	-335	44561	-49	126	N	-65	93.56	84.20	435	0	0.13	Not Reqd	0.00	0.06	0.21	319	679	25	7.09	0.00	0.00
31	31	-0.607	-0.170	-0.469	2.000	4960	8867	-228	-41	44520	-61	623	N	-65	93.56	84.20	436	0	0.13	Not Reqd	0.00	0.06	0.21	319	679	31	6.69	0.00	0.00
31	32	-0.584	-0.225	-0.471	2.000	4960	8731	-193	-126	42574	90	637	N	-141	91.84	82.66	468	0	0.13	Not Reqd	0.00	0.06	0.21	313	703	45	7.82	0.00	0.00
32	32	-0.581	-0.226	-0.469	2.000	4960	8707	-207	193	42528	77	1175	N	-141	91.84	82.66	468	0	0.13	Not Reqd	0.00	0.06	0.21	313	703	38	7.42	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Minimum LL Shear @ t=00																											
32	33	-0.552	-0.299	-0.472	2.000	4960	8402	-173	87	39469	227	1168	N	-219	88.87	79.98	499	0	0.13	Not Reqd	0.00	0.06	0.21	304	722	113	8.02	0.00	0.00
33	33	-0.549	-0.299	-0.471	2.000	4960	8384	-186	383	39428	215	1662	Y	-219	88.87	79.98	499	0	0.13	0.116	0.00	0.12	0.21	304	722	160	6.35	5.61	1.92
33	34	-0.514	-0.389	-0.475	2.000	4960	8296	-156	418	35641	362	1795	Y	-298	84.61	77.76	533	0	0.13	0.125	0.00	0.13	0.21	296	746	238	6.59	6.06	2.07
34	34	-0.511	-0.389	-0.473	2.000	4960	8169	-166	685	35487	352	2232	Y	-298	84.61	77.76	534	0	0.13	0.155	0.00	0.14	0.21	296	747	247	5.77	7.53	2.58
34	35	-0.472	-0.493	-0.478	2.000	4960	7844	-139	515	30517	496	2161	Y	-379	79.06	77.76	586	0	0.13	0.150	0.00	0.14	0.21	298	795	316	6.57	7.29	2.49
35	35	-0.468	-0.494	-0.477	2.000	4960	7849	-149	745	30494	487	2523	Y	-379	79.06	77.76	586	0	0.13	0.176	0.00	0.15	0.21	298	795	323	5.82	8.52	2.91
35	36	-0.425	-0.611	-0.483	2.000	4960	7285	-123	569	24339	630	2446	Y	-460	72.29	77.76	642	0	0.13	0.170	0.00	0.15	0.37	539	1063	392	9.45	8.26	2.82
36	36	-0.421	-0.612	-0.481	2.000	4960	7294	-130	751	24315	631	2706	Y	-594	72.29	77.76	711	0	0.13	0.188	0.00	0.16	0.37	540	1126	401	9.16	9.13	3.12
36	37	-0.387	-0.658	-0.477	2.000	4916	6619	-105	560	17032	774	2614	Y	-669	64.17	77.76	766	0	0.13	0.184	0.00	0.16	0.37	543	1179	470	11.07	8.87	3.03
37	37	-0.383	-0.659	-0.475	2.000	4916	6635	-112	726	17010	768	2811	Y	-657	64.17	77.76	760	0	0.13	0.198	0.00	0.16	0.37	543	1173	473	9.87	9.54	3.26
37	38	-0.644	-1.049	-0.787	2.000	4873	5856	-88	521	8593	929	2705	Y	-1736	49.64	77.76	1356	0	0.13	0.192	0.00	0.16	0.37	553	1718	550	20.31	9.23	3.16
38	38	-0.640	-1.051	-0.785	2.000	4873	4781	-93	1049	7477	924	3200	Y	-1719	49.64	77.76	1347	0	0.13	0.227	0.00	0.18	0.37	553	1711	563	15.38	10.93	3.74
38	39	-0.790	-0.773	-0.783	2.000	4830	4290	-75	774	-1784	1085	3024	Y	-1456	73.80	77.76	1216	0	0.13	0.216	0.00	0.17	0.37	553	1592	638	16.38	10.39	3.55
39	39	-0.786	-0.774	-0.782	2.000	4830	3883	-80	983	-2232	1081	3130	Y	-1440	73.80	77.76	1208	0	0.13	0.224	0.00	0.18	0.37	553	1585	639	14.33	10.75	3.68
39	40	-0.784	-0.769	-0.778	2.000	4787	3332	-63	707	-12722	1245	2954	Y	-977	82.70	77.76	977	0	0.13	0.213	0.00	0.17	0.37	553	1377	716	13.30	10.20	3.49
40	40	-0.781	-0.770	-0.777	2.000	4787	3010	-66	892	-13085	1241	2960	Y	-962	82.70	77.76	969	0	0.13	0.214	0.00	0.17	0.37	553	1370	714	11.69	10.23	3.50
40	41	-0.700	-0.863	-0.765	2.000	4741	2418	-51	621	-24813	1407	2788	Y	-717	89.28	80.35	863	0	0.13	0.203	0.00	0.17	0.37	572	1291	791	12.10	9.69	3.31
41	41	-0.696	-0.863	-0.763	2.000	4741	2391	-53	724	-24878	1399	2639	Y	-557	89.28	80.35	783	0	0.13	0.192	0.00	0.16	0.37	572	1219	783	9.82	9.18	3.14
41	42	-0.514	-1.156	-0.771	2.000	4741	2834	-48	461	-36740	1556	2474	Y	-151	92.69	83.42	589	276	0.35	0.180	0.00	0.26	0.37	592				8.60	2.94
42	42	-0.514	-1.156	-0.770	2.000	4741	899	-112	2285	-38680	1518	3420	Y	-151	92.69	83.42	583	260	0.33	0.249	0.00	0.29	0.37	591				11.89	4.07
42	43	-0.430	-1.287	-0.773	2.000	4741	1396	-102	1985	-42444	1571	3152	Y	0	92.92	83.63	494	379	0.48	0.230	0.00	0.35	0.37	590				10.96	3.75
43	43	-0.430	-1.287	-0.772	2.000	4741	-11411	-647	-437	-55253	-2214	320	N	0	92.92	83.63	449	781	1.00	Not Reqd	0.00	0.50	0.37	581				0.00	0.00
43	44	-0.511	-1.161	-0.770	2.000	4741	-10029	-629	-628	-49882	-2153	161	N	76	92.80	83.52	502	694	0.89	Not Reqd	0.00	0.44	0.37	584				0.00	0.00
44	44	-0.510	-1.161	-0.770	2.000	4741	-11778	-635	-1371	-51634	-2137	-1400	N	76	92.80	83.52	498	690	0.88	Not Reqd	0.00	0.44	0.37	583				0.00	0.00
44	45	-0.715	-0.843	-0.766	2.000	4741	-7561	-587	-1501	-35936	-1937	-1431	Y	313	90.99	81.89	656	420	0.54	0.104	0.00	0.32	0.37	580	1113	1014	1.29	-4.98	-1.70
45	45	-0.714	-0.845	-0.766	2.000	4741	-7624	-587	-1608	-36020	-1943	-1795	Y	474	90.99	81.89	740	340	0.44	0.131	0.00	0.28	0.37	581	1189	1028	1.47	-6.24	-2.13
45	46	-0.848	-0.695	-0.789	2.000	4786	-4374	-540	-1829	-22455	-1746	-1917	Y	706	87.01	78.31	845	125	0.17	0.138	0.00	0.15	0.37	557	1262	933	2.00	-6.62	-2.26
46	46	-0.846	-0.695	-0.788	2.000	4786	-4447	-543	-1834	-22544	-1749	-2105	Y	722	87.01	78.31	852	119	0.16	0.152	0.00	0.16	0.37	557	1269	941	1.99	-7.27	-2.49
46	47	-0.873	-0.672	-0.798	2.000	4826	-1618	-497	-2024	-10593	-1556	-2196	Y	1332	79.82	77.76	1154	0	0.13	0.157	0.00	0.14	0.37	553	1536	847	3.21	-7.55	-2.58
47	47	-0.871	-0.672	-0.797	2.000	4826	-1693	-502	-1951	-10679	-1562	-2234	Y	1349	79.82	77.76	1162	0	0.13	0.160	0.00	0.14	0.37	553	1544	852	3.21	-7.68	-2.62
47	48	-0.740	-0.950	-0.814	2.000	4872	740	-457	-2107	-288	-1374	-2292	Y	1657	65.91	77.76	1316	0	0.13	0.163	0.00	0.15	0.37	553	1683	759	4.13	-7.83	-2.68
48	48	-0.739	-0.950	-0.813	2.000	4872	669	-465	-1962	-368	-1382	-2192	Y	1675	65.91	77.76	1326	0	0.13	0.155	0.00	0.14	0.37	553	1691	760	4.16	-7.49	-2.56
48	49	-0.487	-0.559	-0.511	2.000	4916	2218	-421	-2147	8013	-1201	-2278	Y	584	50.09	77.76	777	0	0.13	0.160	0.00	0.14	0.37	553	1197	673	2.88	-7.73	-2.64
49	49	-0.486	-0.559	-0.510	2.000	4916	2150	-431	-1963	7936	-1212	-2081	Y	597	50.09	77.76	784	0	0.13	0.146	0.00	0.14	0.37	553	1203	671	2.91	-7.06	-2.41
49	50	-0.520	-0.550	-0.529	2.000	4960	3897	-389	-2033	15491	-1051	-2052	Y	543	56.69	77.76	737	0	0.13	0.143	0.00	0.14	0.37	550	1158	590	3.19	-6.93	-2.37
50	50	-0.518	-0.550	-0.528	2.000	4960	3839	-401	-1825	15423	-1053	-1792	Y	401	56.69	77.76	663	0	0.13	0.125	0.00	0.13	0.37	549	1091	583	2.96	-6.05	-2.07
50	51	-0.553	-0.483	-0.531	2.000	4960	5300	-361	-1876	21665	-896	-1743	Y	345	62.40	77.76	616	0	0.13	0.121	0.00	0.13	0.37	546	1045	503	3.26	-5.88	-2.01
51	51	-0.552	-0.483	-0.530	2.000	4960	5244	-373	-1616	21596	-908	-1384	N	345	62.40	77.76	616	0	0.13	Not Reqd	0.00	0.06	0.37	546	1045	454	4.17	0.00	0.00
51	52	-0.577	-0.436	-0.532	2.000	4960	6437	-334	-1657	26628	-753	-1327	N	288	67.23	77.76	573	0	0.13	Not Reqd	0.00	0.06	0.21	302	788	376	3.46	0.00	0.00
52	52	-0.575	-0.436	-0.531	2.000	4960	6385	-348	-1369	26561	-766	-909	N	288	67.23	77.76	573	0	0.13	Not Reqd	0.00	0.06	0.21	302	787	383	3.33	0.00	0.00
52	53	-0.590	-0.409	-0.533	2.000	4960	7341	-310	-1407	30413	-611	-848	N	231	71.17	77.76	535	0	0.13	Not Reqd	0.00	0.06	0.21	301	752	306	3.88	0.00	0.00
53	53	-0.588	-0.409	-0.532	2.000	4960	7292	-324	-1097	30349	-625	-386	N	231	71.17	77.76	535	0	0.13	Not Reqd	0.00	0.06	0.21	301	752	313	3.71	0.00	0.00
53	54	-0.594	-0.400	-0.533	2.000	4960	8024	-287	-1139	33036	-472	-330	N	173	74.23	77.76	500	0	0.13	Not Reqd	0.00	0.06	0.21	300	720	236	4.37	0.00	0.00
54	54	-0.593	-0.401	-0.532	2.000	4960	7980	-302	-816	32974	-486	161	N	169	74.23	77.76	498	0	0.13	Not Reqd	0.00	0.06	0.21	300	718	243	4.15	0.00	0.00
54	55	-0.590	-0.409	-0.533	2.000	4969	8518	-266	-866	34522	-333	209	N	111	76.39	77.90	467	0	0.13	Not Reqd	0.00	0.06	0.21	300	690	167	4.93	0.00	0.00
55	55	-0.588	-0.409	-0.532	2.000	4969	8487	-280	-556	34474	-346	683	N	99	76.39	77.90	460	0	0.13	Not Reqd	0.00	0.06	0.21	300	684	173	4.65	0.00	0.00
55	56	-0.579	-0.430	-0.532	2.000	5000	8815	-249	-610	34902	-211	716	N	46	77.58	78.35	437	0	0.13	Not Reqd	0.00	0.06	0.21	302	665	106	5.49	0.00	0.00
56	56	-0.577	-0.430	-0.531	2.000	5000	8781	-263	-296	34851	-224	1195	N	39	77.58	78.35	433	0	0.13	Not Reqd	0.00	0.06	0.21	302	662	112	5.18	0.00	0.00
56	57	-0.560	-0.469	-0.531	2.000	5049	8989	-230	-372	34275	-74	1218	N	-20	78.07	79.07	432	0	0.13	Not Reqd	0.00	0.06	0.21	305	664	37	6.46	0.00	0.00
57	57	-0.558	-0.469	-0.530	2.000	5049	8958	-244	-46	34223	-87	1713	Y	-29	78.07	79.07	437	0	0.13	0.117	0.00	0.12	0.21	305	668	98	5.62	5.71	1.95
57	58	-0.533	-0.521	-0.529	2.000	5116	9012	-212	-139	32541	63	1718	Y	-89	77.68	80.06	478	0	0.13	0.116	0.00	0.12	0.21	310	709	86	6.66	5.68	1.94
58	58	-0.531	-0.522	-0.528	2.000	5116	8986	-225	176	32493	50	2189	Y	-99	77.68	80.06	483	0	0.13	0.148	0.00	0.14	0.21	310	714	94	6.24	7.24	2.48
58	59	-0.499	-0.588	-0.527	2.000	5206	8898	-194	63	29712	199	2174	Y	-160	76.40	81.36	530	0	0.13	0.144	0.00	0.14	0.21	316	761	168	6.99	7.11	2.43
59	59	-0.497	-0.588	-0.526	2.000	5206	8877	-207	363	29668	188	2610	Y	-169	76.40	81.36	535	0	0.13	0.173	0.00	0.15	0.21	316	766	176	6.13	8.54	2.92
59	60	-0.460	-0.666	-0.525	2.000	5313	8657	-177	230	25795	336	2575	Y	-230	74.24	82.94	585	0	0.13	0.167	0.00	0.15	0.21	323	818	250	6.95	8.31	2.84
60	60	-0.458	-0.667	-0.524	2.000	5313	8612	-188	595	25725	326	3048	Y	-239	74.24	82.94	591	0	0.13	0.198	0.00	0.16	0.21	323	822	259	5.99	9.84	3.36
60	61	-0.416	-0.755	-0.524	2.000	5440	8367	-159	394	20859	474	2946	Y	-301	71.20	84.78	647	0	0.13	0.187	0.00	0.16	0.21	332	881	330	6.98	9.37	3.20
61	61	-0.414	-0.756	-0.523	2.000	5440	8336	-170	734	20799	465	3359	Y	-312	71.20	84.78	653	0	0.13	0.213	0.00	0.17	0.21	332	886	339	6.07	10.68	3.65
61	62	-0.369	-0.850	-0.522	2.000	5587	6463	-144	911	13331	611	3634	Y	-375	67.26	86.94	721	0	0.13	0.225	0.00	0.18	0.21	343	957	420	6.32	11.37	3.89
62	62	-0.367	-0.851	-0.521	2.000	5587	8127	-153	758	14964	604	3513	Y	-384	67.26	86.94	720	0	0.13	0.217	0.00	0.17	0.21	342	956	413	6.42	10.99	3.76
62	63	-0.320	-0.949	-0.521	2.000	5756	6331	-134	902	6590	743	3755	Y	-447	62.45	89.42	785	0	0.13	0.225	0.00	0.18	0.37	636	1279	490	9.26	11.53	3.94
63	63	-0.318	-0.950	-0.520	2.000	5756	6168	-141	1142	6392	738	3975	Y	-459	62.45	89.42	791	0	0.13	0.239	0.00	0.18	0.37	636	1284	494	8.40	12.20	4.17
63	64	-0.270	-1.048	-0.520	2.000	5941	6076	-124	882	-1271	878	3813	Y	-522	71.18	92.12	839	0	0.13	0.222	0.00	0.18	0.37	655	1345	559	9.77	11.48	3.92

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Permanent Loads + Minimum LL Shear @ t=00 Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
64	64	-0.268	-1.050	-0.519	2.000	5941	5964	-129	1101	-1423	887	3933	Y	-727	71.18	92.12	941	0	0.13	0.229	0.00	0.18	0.37	655	1437	568	9.76	11.84	4.05
64	65	-0.242	-1.005	-0.504	2.000	6098	5810	-112	840	-10274	1029	3769	Y	-790	81.99	95.13	978	0	0.13	0.214	0.00	0.17	0.37	675	1488	634	11.34	11.17	3.82
65	65	-0.239	-1.006	-0.503	2.000	6098	5650	-117	1049	-10479	1025	3821	Y	-793	81.99	95.13	979	0	0.13	0.216	0.00	0.17	0.37	675	1489	633	10.31	11.32	3.87
65	66	-0.549	-1.183	-0.780	2.000	6273	5441	-102	789	-20517	1194	3660	Y	-1954	94.65	98.42	1595	0	0.13	0.202	0.00	0.17	0.37	700	2065	713	18.87	10.66	3.65
66	66	-0.546	-1.184	-0.778	2.000	6273	5307	-106	979	-20703	1191	3608	Y	-1958	94.65	98.42	1596	0	0.13	0.199	0.00	0.16	0.37	700	2067	710	17.20	10.51	3.59
66	67	-0.656	-0.934	-0.762	2.000	6470	5043	-91	722	-32083	1370	3449	Y	-1678	113.28	102.02	1479	0	0.13	0.184	0.00	0.16	0.37	726	1984	794	18.45	9.87	3.37
67	67	-0.653	-0.935	-0.761	2.000	6470	4945	-94	892	-32233	1368	3286	Y	-1690	113.28	102.02	1485	0	0.13	0.175	0.00	0.15	0.37	726	1990	788	16.99	9.40	3.21
67	68	-0.654	-0.896	-0.751	2.000	6686	4633	-80	639	-45018	1552	3131	Y	-1113	125.82	113.24	1267	0	0.13	0.162	0.00	0.15	0.37	806	1865	875	17.43	8.79	3.00
68	68	-0.652	-0.897	-0.750	2.000	6686	4572	-82	786	-45128	1551	2849	Y	-1128	125.82	113.24	1275	0	0.13	0.147	0.00	0.14	0.37	806	1872	865	16.26	7.99	2.73
68	69	-0.584	-0.937	-0.730	2.000	6922	4395	-75	110	-59177	1733	2272	Y	-883	135.76	122.19	1206	0	0.13	0.113	0.00	0.12	0.37	869	1867	938	23.61	6.25	2.14
69	69	-0.581	-0.936	-0.728	2.000	6922	4281	-76	163	-59337	1723	1795	N	-662	135.76	122.19	1088	0	0.13	Not Reqd	0.00	0.06	0.37	868	1760	862	24.65	0.00	0.00
69	70	-0.465	-1.098	-0.728	2.000	7227	4836	-75	162	-73997	1903	1893	N	-398	143.83	129.45	955	102	0.13	Not Reqd	0.00	0.06	0.37	912				0.00	0.00
70	70	-0.461	-1.095	-0.725	2.000	7227	280	-185	3283	-78572	1795	3992	Y	-87	143.83	129.45	783	215	0.18	0.191	0.00	0.18	0.37	909				10.71	3.66
70	71	-0.404	-1.184	-0.729	2.000	7227	972	-172	2945	-83052	1857	3685	Y	0	143.95	129.56	726	306	0.25	0.176	0.00	0.21	0.37	907				9.89	3.38
71	71	-0.448	-1.089	-0.715	2.000	7227	-20941	-748	2299	-102627	-2985	1652	N	0	143.95	129.56	660	998	0.83	Not Reqd	0.00	0.42	0.37	893				0.00	0.00
71	72	-0.516	-0.992	-0.714	2.000	7227	-19267	-732	2101	-95244	-2920	1486	N	113	143.83	129.44	734	889	0.74	Not Reqd	0.00	0.37	0.37	896				0.00	0.00
72	72	-0.519	-0.996	-0.717	2.000	7227	-19278	-706	-1932	-95271	-2912	-3252	Y	425	143.83	129.44	897	721	0.60	0.155	0.00	0.38	0.37	898				-8.73	-2.98
72	73	-0.671	-0.801	-0.725	2.000	6922	-15306	-663	-2176	-74246	-2691	-3397	Y	752	135.30	121.77	1068	427	0.37	0.170	0.00	0.27	0.37	854	1730	1453	1.69	-9.34	-3.19
73	73	-0.671	-0.802	-0.725	2.000	6922	-15397	-662	-2401	-74345	-2697	-4106	Y	905	135.30	121.77	1148	351	0.31	0.205	0.00	0.26	0.37	855	1802	1478	1.80	-11.29	-3.86
73	74	-0.780	-0.705	-0.750	2.000	6673	-14166	-623	32	-57417	-2483	-1574	N	1185	124.55	112.10	1281	99	0.13	Not Reqd	0.00	0.06	0.37	795	1868	1241	3.01	0.00	0.00
74	74	-0.779	-0.705	-0.749	2.000	6673	-14288	-624	-74	-57537	-2483	-2051	Y	1162	124.55	112.10	1268	111	0.13	0.106	0.00	0.12	0.37	795	1857	1306	2.75	-5.76	-1.97
74	75	-0.827	-0.678	-0.768	2.000	6442	-10664	-591	-230	-39622	-2279	-2108	Y	1611	111.30	102.02	1445	0	0.13	0.113	0.00	0.12	0.37	726	1954	1206	3.47	-6.05	-2.07
75	75	-0.827	-0.677	-0.768	2.000	6442	-10870	-592	-302	-39821	-2279	-2440	Y	1590	111.30	102.02	1435	0	0.13	0.131	0.00	0.13	0.37	726	1945	1217	3.38	-7.00	-2.39
75	76	-0.811	-0.764	-0.793	2.000	6232	-7538	-560	-438	-23566	-2081	-2477	Y	1692	95.03	98.42	1464	0	0.13	0.137	0.00	0.13	0.37	700	1948	1118	3.82	-7.24	-2.48
76	76	-0.811	-0.764	-0.793	2.000	6232	-7644	-562	-462	-23662	-2082	-2655	Y	1679	95.03	98.42	1457	0	0.13	0.147	0.00	0.14	0.37	700	1942	1125	3.76	-7.76	-2.65
76	77	-0.688	-0.650	-0.674	2.000	6043	-4583	-531	-577	-8989	-1893	-2672	Y	1056	82.40	95.13	1125	0	0.13	0.153	0.00	0.14	0.37	677	1622	1031	3.08	-7.96	-2.72
77	77	-0.674	-0.635	-0.660	2.000	6043	-4631	-533	-572	-9028	-1894	-2724	Y	1041	82.40	95.13	1118	0	0.13	0.156	0.00	0.14	0.37	677	1615	1033	3.05	-8.12	-2.78
77	78	-0.726	-0.620	-0.688	2.000	5870	-1827	-502	-669	4224	-1734	-2722	Y	982	56.98	92.12	1069	0	0.13	0.160	0.00	0.14	0.37	655	1552	953	3.20	-8.26	-2.82
78	78	-0.726	-0.619	-0.688	2.000	5870	-2134	-504	-660	3926	-1736	-2688	Y	971	56.98	92.12	1064	0	0.13	0.158	0.00	0.14	0.37	655	1547	953	3.18	-8.15	-2.79
78	79	-0.771	-0.611	-0.717	2.000	5721	432	-474	-741	15904	-1579	-2670	Y	920	63.55	89.42	1021	0	0.13	0.161	0.00	0.15	0.37	636	1492	874	3.37	-8.23	-2.81
79	79	-0.771	-0.610	-0.717	2.000	5721	188	-477	-713	15668	-1581	-2544	Y	909	63.55	89.42	1016	0	0.13	0.154	0.00	0.14	0.37	636	1487	871	3.36	-7.84	-2.68
79	80	-0.810	-0.611	-0.747	2.000	5587	2528	-448	-780	26414	-1430	-2513	Y	856	69.45	86.94	973	0	0.13	0.155	0.00	0.14	0.37	619	1433	794	3.57	-7.86	-2.69
80	80	-0.811	-0.611	-0.747	2.000	5587	2295	-452	-734	26190	-1421	-2348	Y	652	69.45	86.94	872	0	0.13	0.145	0.00	0.14	0.37	619	1341	785	3.23	-7.34	-2.51
80	81	-0.853	-0.557	-0.759	2.000	5440	4431	-423	-789	35644	-1272	-2305	Y	594	74.80	84.78	829	0	0.13	0.146	0.00	0.14	0.37	603	1289	709	3.45	-7.33	-2.51
81	81	-0.853	-0.557	-0.759	2.000	5440	4183	-426	-732	35403	-1274	-2034	Y	578	74.80	84.78	821	0	0.13	0.129	0.00	0.13	0.37	603	1282	701	3.46	-6.47	-2.21
81	82	-0.890	-0.512	-0.770	2.000	5313	6111	-398	-780	43678	-1127	-1984	Y	516	79.50	82.94	757	0	0.13	0.129	0.00	0.13	0.21	326	975	626	2.56	-6.41	-2.19
82	82	-0.890	-0.512	-0.770	2.000	5313	5807	-401	-711	43378	-1129	-1657	Y	503	79.50	82.94	751	0	0.13	0.108	0.00	0.12	0.21	326	969	617	2.58	-5.35	-1.83
82	83	-0.920	-0.476	-0.780	2.000	5206	7534	-373	-756	50490	-983	-1604	Y	439	83.54	81.36	686	0	0.13	0.106	0.00	0.12	0.21	317	903	542	2.72	-5.25	-1.79
83	83	-0.921	-0.477	-0.780	2.000	5206	7106	-377	-666	50064	-986	-1219	N	426	83.54	81.36	681	0	0.13	Not Reqd	0.00	0.06	0.21	318	899	493	3.15	0.00	0.00
83	84	-0.944	-0.449	-0.788	2.000	5116	8632	-350	-711	56018	-840	-1166	N	363	86.91	80.06	623	0	0.13	Not Reqd	0.00	0.06	0.21	311	840	420	3.40	0.00	0.00
84	84	-0.945	-0.450	-0.788	2.000	5116	7006	-353	-1850	54392	-843	-1980	Y	347	86.91	80.06	620	0	0.13	0.134	0.00	0.13	0.21	311	838	484	2.51	-6.55	-2.24
84	85	-0.962	-0.431	-0.795	2.000	5049	9696	-326	-642	60554	-699	-674	N	284	89.62	80.66	577	0	0.13	Not Reqd	0.00	0.06	0.21	312	800	349	3.76	0.00	0.00
85	85	-0.963	-0.431	-0.795	2.000	5049	7832	-335	-1553	58690	-706	-1238	N	271	89.62	80.66	576	0	0.13	Not Reqd	0.00	0.06	0.21	312	799	353	3.67	0.00	0.00
85	86	-0.973	-0.423	-0.800	2.000	5000	10443	-304	-564	63822	-558	-151	N	207	91.68	82.52	545	0	0.13	Not Reqd	0.00	0.06	0.21	319	777	279	4.28	0.00	0.00
86	86	-0.973	-0.423	-0.800	2.000	5000	8514	-317	-1252	61891	-570	-475	N	195	91.68	82.52	544	0	0.13	Not Reqd	0.00	0.06	0.21	319	776	285	4.10	0.00	0.00
86	87	-0.977	-0.425	-0.803	2.000	4969	9108	-283	-1324	64057	-420	-449	N	131	93.10	83.79	517	0	0.13	Not Reqd	0.00	0.06	0.21	324	757	210	4.87	0.00	0.00
87	87	-0.977	-0.425	-0.803	2.000	4969	9101	-295	-1064	64046	-431	77	N	125	93.10	83.79	514	0	0.13	Not Reqd	0.00	0.06	0.21	324	754	216	4.65	0.00	0.00
87	88	-0.976	-0.430	-0.804	2.000	4960	9311	-280	-1096	64636	-368	86	N	98	93.50	84.15	502	0	0.13	Not Reqd	0.00	0.06	0.21	325	745	184	5.00	0.00	0.00
88	88	-0.976	-0.430	-0.804	2.000	4960	9277	-293	-827	64596	-379	617	N	76	93.50	84.15	491	0	0.13	Not Reqd	0.00	0.06	0.21	325	734	189	4.72	0.00	0.00
88	89	-0.970	-0.447	-0.805	2.000	4969	9686	-260	-914	65227	-229	629	N	12	94.01	84.61	462	0	0.13	Not Reqd	0.00	0.06	0.21	327	710	114	5.59	0.00	0.00
89	89	-0.971	-0.446	-0.806	2.000	4969	9642	-277	-537	65177	-245	1380	N	-3	94.01	84.61	457	0	0.13	Not Reqd	0.00	0.06	0.21	327	706	122	5.22	0.00	0.00
89	90	-0.957	-0.474	-0.805	2.000	5000	9928	-244	-636	64736	-96	1379	N	-68	93.87	84.49	494	0	0.13	Not Reqd	0.00	0.06	0.21	327	739	48	6.65	0.00	0.00
90	90	-0.958	-0.473	-0.805	2.000	5000	9888	-261	-261	64688	-111	2123	Y	-81	93.87	84.49	501	0	0.13	0.147	0.00	0.14	0.21	327	745	123	5.48	7.13	2.44
90	91	-0.938	-0.512	-0.804	2.000	5049	10061	-230	-373	63184	37	2109	Y	-146	93.10	83.79	530	0	0.13	0.144	0.00	0.14	0.21	324	769	85	6.40	7.04	2.41
91	91	-0.939	-0.511	-0.804	2.000	5049	10025	-246	-4	63139	22	2835	Y	-159	93.10	83.79	537	0	0.13	0.194	0.00	0.16	0.21	324	775	100	6.48	9.46	3.23
91	92	-0.912	-0.562	-0.801	2.000	5116	10091	-215	-131	60576	170	2806	Y	-225	91.69	82.52	569	0	0.13	0.189	0.00	0.16	0.21	320	800	174	6.60	9.28	3.17
92	92	-0.913	-0.561	-0.802	2.000	5116	10060	-231	229	60534	155	3503	Y	-241	91.69	82.52	576	0	0.13	0.236	0.00	0.18	0.21	320	807	188	6.04	11.59	3.96
92	93	-0.880	-0.622	-0.799	2.000	5206	10026	-201	86	56914	303	3458	Y	-308	89.63	81.36	613	0	0.13	0.229	0.00	0.18	0.21	317	836	261	6.57	11.31	3.87
93	93	-0.881	-0.621	-0.799	2.000	5206	9999	-216	434	56874	289	4118	Y	-322	89.63	81.36	619	0	0.13	0.273	0.00	0.20	0.21	317	842	275	5.66	13.47	4.61
93	94	-0.844	-0.691	-0.796	2.000	5313	9870	-188	275	52198	436	4057	Y	-390	86.92	82.94	679	0	0.13	0.264	0.00	0.20	0.21	324	903	346	6.43	13.10	4.48
94	94	-0.845	-0.691	-0.796	2.000	5313	9848	-202	606	52160	423	4668	Y	-404	86.92	82.94	687	0	0.13	0.303	0.00	0.22	0.21	325	910	359	5.59	15.07	5.15
94	95	-0.804	-0.768	-0.792	2.000	5440	9630	-174	430	46428	571	4590	Y	-474	83.55	84.78	753	0	0.13	0.292	0.00	0.21	0.21	334	978	430	6.45	14.60	4.99
95	95	-0.804	-0.768	-0.793	2.000	5440	9582	-187	820	46363	559	5220	Y	-490	83.55	84.78	762	0	0.13	0.332	0.00	0.23	0.21	334	986	444	5.54	16.60	5.68

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Minimum LL Shear @ t=00																									
95	96	-0.761	-0.850	-0.789	2.000	5587	8132	-161	538	38423	705	5036	Y	-562	79.52	86.94	826	0	0.13	0.311	0.00	0.22	0.21	344	1053	511	6.55	15.75	5.38
96	96	-0.761	-0.850	-0.789	2.000	5587	9268	-172	899	39538	695	5592	Y	-576	79.52	86.94	834	0	0.13	0.346	0.00	0.24	0.21	344	1060	524	5.68	17.49	5.98
96	97	-0.716	-0.935	-0.786	2.000	5756	7900	-151	1003	30700	837	5794	Y	-647	74.83	89.42	884	0	0.13	0.348	0.00	0.24	0.37	636	1369	602	8.16	17.79	6.08
97	97	-0.716	-0.935	-0.786	2.000	5756	7742	-160	1281	30518	830	6213	Y	-664	74.83	89.42	893	0	0.13	0.373	0.00	0.25	0.37	636	1376	611	7.36	19.07	6.52
97	98	-0.671	-1.020	-0.783	2.000	5941	7855	-142	1024	22169	970	6054	Y	-732	69.46	92.12	944	0	0.13	0.352	0.00	0.24	0.37	655	1439	676	8.40	18.23	6.23
98	98	-0.671	-1.021	-0.783	2.000	5941	7668	-149	1283	21954	964	6393	Y	-747	69.46	92.12	952	0	0.13	0.372	0.00	0.25	0.37	655	1446	684	7.62	19.25	6.58
98	99	-0.625	-1.106	-0.780	2.000	6147	7673	-132	1013	12496	1104	6222	Y	-812	63.56	95.13	1003	0	0.13	0.350	0.00	0.24	0.37	677	1512	749	8.77	18.35	6.27
99	99	-0.624	-1.107	-0.780	2.000	6147	7566	-138	1247	12355	1119	6311	Y	-1153	63.56	95.13	1174	0	0.13	0.355	0.00	0.24	0.37	677	1665	759	9.38	18.61	6.36
99	100	-0.604	-1.034	-0.752	2.000	6326	7510	-122	976	1657	1262	6139	Y	-1217	56.54	98.42	1226	0	0.13	0.335	0.00	0.23	0.37	700	1734	825	10.93	17.80	6.08
100	100	-0.603	-1.035	-0.752	2.000	6326	7333	-128	1205	1444	1256	6301	Y	-1215	56.54	98.42	1225	0	0.13	0.344	0.00	0.24	0.37	700	1733	827	9.89	18.27	6.24
100	101	-0.578	-0.979	-0.730	2.000	6481	7225	-112	936	-10353	1404	6130	Y	-1289	90.41	102.02	1284	0	0.13	0.327	0.00	0.23	0.37	726	1809	896	11.67	17.52	5.99
101	101	-0.578	-0.980	-0.730	2.000	6481	7078	-117	1149	-10541	1400	6174	Y	-1295	90.41	102.02	1288	0	0.13	0.329	0.00	0.23	0.37	726	1812	895	10.68	17.64	6.03
101	102	-0.899	-1.085	-0.972	2.000	6699	6915	-102	881	-23588	1577	6005	Y	-2516	104.40	105.89	1922	0	0.13	0.310	0.00	0.22	0.37	753	2408	978	19.10	16.83	5.75
102	102	-0.898	-1.086	-0.972	2.000	6699	6801	-106	1076	-23747	1574	5920	Y	-2530	104.40	105.89	1929	0	0.13	0.305	0.00	0.22	0.37	753	2414	974	17.54	16.59	5.67
102	103	-1.000	-0.860	-0.943	2.000	6939	6583	-93	810	-38215	1762	5752	Y	-2277	123.30	110.97	1835	0	0.13	0.286	0.00	0.21	0.37	790	2362	1063	19.09	15.80	5.40
103	103	-0.999	-0.861	-0.942	2.000	6939	6377	-95	984	-38460	1760	5528	Y	-2292	123.30	110.97	1842	0	0.13	0.275	0.00	0.20	0.37	790	2369	1054	17.69	15.18	5.19
103	104	-0.999	-0.825	-0.925	2.000	7199	6110	-83	722	-54414	1953	5365	Y	-1564	137.16	123.44	1556	0	0.13	0.257	0.00	0.19	0.37	878	2191	1146	17.31	14.43	4.93
104	104	-0.999	-0.826	-0.925	2.000	7199	6064	-85	872	-54490	1952	4990	Y	-1582	137.16	123.44	1565	0	0.13	0.239	0.00	0.18	0.37	878	2199	1133	16.27	13.42	4.59
104	105	-0.921	-0.869	-0.898	2.000	7476	6099	-76	201	-71628	2147	4419	Y	-1279	148.32	133.49	1477	0	0.13	0.204	0.00	0.17	0.37	950	2184	1213	22.99	11.63	3.98
105	105	-0.920	-0.868	-0.897	2.000	7476	5995	-77	254	-71747	2135	3915	Y	-985	148.32	133.49	1330	0	0.13	0.181	0.00	0.16	0.37	950	2052	1191	19.48	10.31	3.52
105	106	-0.793	-1.024	-0.894	2.000	7821	6560	-77	253	-89772	2326	4013	Y	-614	157.36	141.63	1196	96	0.13	0.177	0.00	0.15	0.37	1008				10.31	3.52
106	106	-0.789	-1.020	-0.890	2.000	7821	1147	-205	3779	-95197	2187	6614	Y	-131	157.36	141.63	931	284	0.21	0.292	0.00	0.25	0.37	1004				16.99	5.81
106	107	-0.728	-1.108	-0.894	2.000	7821	1988	-191	3426	-100595	2253	6293	Y	0	157.58	141.82	848	404	0.30	0.278	0.00	0.29	0.37	1002				16.16	5.53
107	107	-0.695	-1.186	-0.910	2.000	7821	-22335	-773	2859	-128284	-3128	7001	Y	718	157.58	141.82	1144	594	0.45	0.309	0.00	0.38	0.37	991				17.98	6.15
107	108	-0.750	-1.157	-0.927	2.000	7821	-20593	-757	2661	-120522	-3061	6835	Y	788	155.99	140.39	1188	513	0.39	0.302	0.00	0.34	0.37	984				17.55	6.00
108	108	-0.750	-1.157	-0.928	2.000	7821	-21414	-721	-1620	-121363	-3022	1597	N	781	155.99	140.39	1183	496	0.37	Not Reqd	0.00	0.19	0.37	984				0.00	0.00
108	109	-0.878	-1.047	-0.952	2.000	7476	-17334	-679	-1865	-99481	-2794	1451	N	999	146.32	131.68	1290	262	0.21	Not Reqd	0.00	0.10	0.37	931	1999	1397	2.78	0.00	0.00
109	109	-0.880	-1.047	-0.953	2.000	7476	-17426	-681	-2097	-99560	-2794	533	N	967	146.32	131.68	1273	279	0.22	Not Reqd	0.00	0.11	0.37	931	1984	1397	2.72	0.00	0.00
109	110	-0.986	-0.964	-0.977	2.000	7199	-13735	-639	-2324	-79561	-2571	405	N	1182	137.53	123.78	1368	61	0.13	Not Reqd	0.00	0.06	0.37	881	2024	1285	3.31	0.00	0.00
110	110	-0.988	-0.964	-0.978	2.000	7199	-13839	-642	-2462	-79646	-2573	-299	N	1155	137.53	123.78	1354	75	0.13	Not Reqd	0.00	0.06	0.37	881	2011	1286	3.26	0.00	0.00
110	111	-1.013	-0.955	-0.989	2.000	6939	-12234	-606	-43	-63187	-2360	2218	Y	2117	126.36	113.72	1772	0	0.13	0.110	0.00	0.12	0.37	809	2323	1250	4.53	6.09	2.08
111	111	-1.016	-0.954	-0.990	2.000	6939	-12361	-606	-121	-63290	-2359	1696	N	2092	126.36	113.72	1759	0	0.13	Not Reqd	0.00	0.06	0.37	809	2312	1180	4.74	0.00	0.00
111	112	-0.910	-1.180	-1.017	2.000	6699	-8935	-575	-258	-46425	-2156	1657	N	2512	108.29	105.89	1920	0	0.13	Not Reqd	0.00	0.06	0.37	753	2406	1078	5.62	0.00	0.00
112	112	-0.912	-1.180	-1.018	2.000	6699	-8967	-576	-292	-46431	-2155	1293	N	2486	108.29	105.89	1907	0	0.13	Not Reqd	0.00	0.06	0.37	753	2395	1078	5.58	0.00	0.00
112	113	-0.521	-0.964	-0.689	2.000	6481	-5817	-545	-409	-31199	-1963	1274	N	992	98.96	102.02	1120	0	0.13	Not Reqd	0.00	0.06	0.37	723	1659	981	3.49	0.00	0.00
113	113	-0.514	-0.958	-0.683	2.000	6481	-6180	-546	-452	-31541	-1963	1005	N	976	98.96	102.02	1111	0	0.13	Not Reqd	0.00	0.06	0.37	723	1651	982	3.45	0.00	0.00
113	114	-0.570	-0.951	-0.708	2.000	6279	-3288	-516	-551	-17764	-1800	1004	N	928	88.34	98.42	1081	0	0.13	Not Reqd	0.00	0.06	0.37	700	1604	900	3.73	0.00	0.00
114	114	-0.572	-0.950	-0.709	2.000	6279	-3423	-518	-541	-17886	-1801	885	N	918	88.34	98.42	1077	0	0.13	Not Reqd	0.00	0.06	0.37	700	1599	900	3.70	0.00	0.00
114	115	-0.624	-0.950	-0.735	2.000	6101	-773	-488	-624	-5414	-1642	900	N	871	78.79	95.13	1032	0	0.13	Not Reqd	0.00	0.06	0.37	677	1538	821	3.94	0.00	0.00
115	115	-0.626	-0.949	-0.736	2.000	6101	-1183	-490	-626	-5817	-1644	847	N	858	78.79	95.13	1026	0	0.13	Not Reqd	0.00	0.06	0.37	677	1533	822	3.90	0.00	0.00
115	116	-0.673	-0.957	-0.764	2.000	5941	1237	-461	-696	5398	-1490	876	N	810	57.69	92.12	983	0	0.13	Not Reqd	0.00	0.06	0.37	655	1474	745	4.17	0.00	0.00
116	116	-0.675	-0.956	-0.765	2.000	5941	1025	-463	-667	5188	-1482	820	N	593	57.69	92.12	875	0	0.13	Not Reqd	0.00	0.06	0.37	655	1377	741	3.75	0.00	0.00
116	117	-0.734	-0.873	-0.778	2.000	5756	3224	-435	-723	15102	-1332	862	N	543	62.13	89.42	833	0	0.13	Not Reqd	0.00	0.06	0.37	636	1322	666	4.02	0.00	0.00
117	117	-0.736	-0.872	-0.779	2.000	5756	2838	-437	-692	14715	-1333	968	N	527	62.13	89.42	824	0	0.13	Not Reqd	0.00	0.06	0.37	636	1315	667	3.96	0.00	0.00
117	118	-0.790	-0.797	-0.792	2.000	5587	4826	-409	-740	23434	-1184	1018	N	476	65.98	86.94	783	0	0.13	Not Reqd	0.00	0.06	0.21	344	1014	592	3.06	0.00	0.00
118	118	-0.792	-0.797	-0.793	2.000	5587	4558	-412	-678	23162	-1186	1204	N	462	65.98	86.94	776	0	0.13	Not Reqd	0.00	0.06	0.21	344	1008	593	3.02	0.00	0.00
118	119	-0.840	-0.732	-0.806	2.000	5440	6340	-384	-722	30699	-1039	1259	N	410	69.32	84.78	737	0	0.13	Not Reqd	0.00	0.06	0.21	335	965	519	3.32	0.00	0.00
119	119	-0.842	-0.732	-0.807	2.000	5440	5836	-387	-660	30190	-1041	1485	N	394	69.32	84.78	729	0	0.13	Not Reqd	0.00	0.06	0.21	335	958	521	3.26	0.00	0.00
119	120	-0.883	-0.679	-0.818	2.000	5313	7420	-360	-701	36560	-894	1543	N	342	72.12	82.94	683	0	0.13	Not Reqd	0.00	0.06	0.21	327	909	447	3.57	0.00	0.00
120	120	-0.885	-0.679	-0.820	2.000	5313	6086	-364	-1867	35219	-898	575	N	328	72.12	82.94	680	0	0.13	Not Reqd	0.00	0.06	0.21	327	907	449	3.52	0.00	0.00
120	121	-0.919	-0.638	-0.830	2.000	5206	8519	-336	-648	41479	-752	1892	Y	276	74.38	81.36	623	0	0.13	0.126	0.00	0.13	0.21	319	848	436	3.19	6.19	2.12
121	121	-0.921	-0.638	-0.831	2.000	5206	6957	-344	-1589	39909	-760	1176	N	262	74.38	81.36	621	0	0.13	Not Reqd	0.00	0.06	0.21	320	847	380	3.72	0.00	0.00
121	122	-0.947	-0.611	-0.841	2.000	5116	9339	-313	-582	45162	-611	2281	Y	210	76.10	80.06	570	0	0.13	0.154	0.00	0.14	0.21	313	795	377	3.39	7.55	2.58
122	122	-0.949	-0.611	-0.842	2.000	5116	7666	-325	-1305	43479	-622	1803	Y	194	76.10	80.06	568	0	0.13	0.122	0.00	0.13	0.21	314	793	368	3.09	5.96	2.04
122	123	-0.966	-0.597	-0.850	2.000	5049	8283	-291	-1368	46018	-470	1838	Y	141	77.29	79.07	528	0	0.13	0.126	0.00	0.13	0.21	309	753	293	3.44	6.13	2.10
123	123	-0.968	-0.597	-0.851	2.000	5049	8234	-306	-1017	45959	-486	2447	Y	128	77.29	79.07	521	0	0.13	0.167	0.00	0.15	0.21	309	747	320	3.30	8.16	2.79
123	124	-0.977	-0.597	-0.857	2.000	5000	8710	-273	-1089	47410	-335	2474	Y	74	77.94	78.35	486	0	0.13	0.171	0.00	0.15	0.21	306	713	246	3.73	8.31	2.84
124	124	-0.979	-0.597	-0.859	2.000	5000	8664	-289	-734	47354	-351	3093	Y	60	77.94	78.35	479	0	0.13	0.214	0.00	0.17	0.21	306	706	273	3.59	10.38	3.55
124	125	-0.979	-0.611	-0.863	2.000	4969	9005	-256	-817	47726	-201	3108	Y	6	78.05	77.90	450	0	0.13	0.216	0.00	0.17	0.21	304	678	199	4.12	10.48	3.58
125	125	-0.980	-0.612	-0.864	2.000	4969	9000	-267	-569	47708	-212	3546	Y	0	78.05	77.90	446	0	0.13	0.247	0.00	0.19	0.21	304	675	218	4.02	11.95	4.09
125	126	-0.977	-0.623	-0.865	2.000	4960	9105	-253	-607	47545	-149	3549	Y	-23	77.94	77.76	459	0	0.13	0.247	0.00	0.19	0.21	304	687	187	4.43	11.98	4.10
126	126	-0.978	-0.623	-0.866	2.000	4960	9075	-264	-357	47500	-159	3969	Y	-67	77.94	77.76	482	0	0.13	0.276	0.00	0.20	0.21	304	707	205	4.51	13.40	4.58
126	127	-0.968	-0.646	-0.867	2.000	5000	9232	-232	-458	46340	-10	3967	Y	-122	77.29	78.35	517	0	0.13	0.274	0.00	0.20	0.21	306	741	130	5.68	13.32	4.55

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Minimum LL Shear @ t=00																											
127	127	-0.970	-0.646	-0.868	2.000	5000	9197	-247	-111	46291	-25	4569	Y	-129	77.29	78.35	521	0	0.13	0.316	0.00	0.22	0.21	306	745	157	5.62	15.34	5.25
127	128	-0.952	-0.684	-0.867	2.000	5049	9233	-216	-227	44069	123	4552	Y	-185	76.10	79.07	563	0	0.13	0.311	0.00	0.22	0.21	310	785	205	6.04	15.19	5.19
128	128	-0.954	-0.684	-0.869	2.000	5049	9203	-231	110	44024	109	5125	Y	-198	76.10	79.07	569	0	0.13	0.351	0.00	0.24	0.21	310	791	216	5.84	17.10	5.85
128	129	-0.928	-0.735	-0.867	2.000	5116	9125	-201	-22	40741	256	5091	Y	-254	74.38	80.06	618	0	0.13	0.344	0.00	0.24	0.21	315	840	289	6.46	16.84	5.76
129	129	-0.930	-0.734	-0.868	2.000	5116	9100	-214	300	40700	243	5626	Y	-270	74.38	80.06	625	0	0.13	0.380	0.00	0.25	0.21	315	847	299	5.69	18.61	6.36
129	130	-0.897	-0.796	-0.865	2.000	5206	8915	-185	152	36359	390	5576	Y	-326	72.12	81.36	674	0	0.13	0.370	0.00	0.25	0.21	322	896	371	6.39	18.24	6.24
130	130	-0.899	-0.796	-0.866	2.000	5206	8865	-198	554	36292	377	6163	Y	-340	72.12	81.36	681	0	0.13	0.409	0.00	0.27	0.21	322	902	383	5.45	20.16	6.89
130	131	-0.860	-0.867	-0.862	2.000	5313	6010	-170	284	28326	524	5991	Y	-397	69.32	82.94	719	0	0.13	0.389	0.00	0.26	0.21	328	942	451	6.23	19.34	6.61
131	131	-0.862	-0.867	-0.864	2.000	5313	8568	-182	656	30866	512	6513	Y	-411	69.32	82.94	726	0	0.13	0.423	0.00	0.28	0.21	328	949	462	5.36	21.03	7.19
131	132	-0.818	-0.948	-0.859	2.000	5440	5645	-158	814	21872	655	6769	Y	-469	65.98	84.78	766	0	0.13	0.430	0.00	0.28	0.21	335	991	541	5.29	21.53	7.36
132	132	-0.820	-0.948	-0.860	2.000	5440	5470	-168	1049	21676	646	7110	Y	-486	65.98	84.78	775	0	0.13	0.452	0.00	0.29	0.21	335	999	548	4.86	22.61	7.73
132	133	-0.771	-1.034	-0.855	2.000	5587	5524	-148	855	14691	786	7014	Y	-544	62.11	86.94	817	0	0.13	0.434	0.00	0.28	0.37	619	1292	615	7.72	21.94	7.50
133	133	-0.773	-1.035	-0.856	2.000	5587	5457	-156	1091	14601	779	7307	Y	-559	62.11	86.94	825	0	0.13	0.452	0.00	0.29	0.37	619	1299	620	7.05	22.85	7.81
133	134	-0.722	-1.126	-0.851	2.000	5756	5491	-138	817	6622	918	7131	Y	-617	57.74	89.42	869	0	0.13	0.428	0.00	0.28	0.37	636	1355	684	8.08	21.89	7.48
134	134	-0.723	-1.127	-0.852	2.000	5756	5438	-144	1030	6540	920	7234	Y	-873	57.74	89.42	998	0	0.13	0.434	0.00	0.28	0.37	636	1471	688	8.48	22.21	7.59
134	135	-0.690	-1.089	-0.825	2.000	5901	5384	-127	764	-2587	1060	7067	Y	-932	75.21	92.12	1044	0	0.13	0.414	0.00	0.27	0.37	655	1530	753	9.84	21.37	7.30
135	135	-0.691	-1.090	-0.826	2.000	5901	5279	-133	964	-2719	1054	7200	Y	-940	75.21	92.12	1048	0	0.13	0.421	0.00	0.28	0.37	655	1533	755	9.02	21.77	7.44
135	136	-0.654	-1.063	-0.800	2.000	6067	5174	-117	701	-12913	1199	7035	Y	-998	84.92	95.13	1096	0	0.13	0.401	0.00	0.27	0.37	677	1596	821	10.58	20.91	7.15
136	136	-0.655	-1.064	-0.800	2.000	6067	5016	-122	890	-13103	1194	7074	Y	-1011	84.92	95.13	1102	0	0.13	0.403	0.00	0.27	0.37	677	1601	820	9.75	21.03	7.19
136	137	-0.615	-1.044	-0.775	2.000	6252	4858	-107	629	-24403	1342	6911	Y	-1071	95.57	98.42	1153	0	0.13	0.382	0.00	0.26	0.37	700	1668	889	11.60	20.18	6.90
137	137	-0.615	-1.045	-0.775	2.000	6252	4685	-111	807	-24616	1338	6842	Y	-1081	95.57	98.42	1158	0	0.13	0.378	0.00	0.25	0.37	700	1672	885	10.71	19.98	6.83
137	138	-0.953	-1.223	-1.058	2.000	6456	4478	-97	549	-37149	1512	6683	Y	-2426	105.18	102.02	1853	0	0.13	0.358	0.00	0.24	0.37	726	2321	967	21.54	19.14	6.54
138	138	-0.953	-1.224	-1.058	2.000	6456	4309	-100	714	-37361	1510	6488	Y	-2450	105.18	102.02	1865	0	0.13	0.347	0.00	0.24	0.37	726	2332	960	19.87	18.58	6.35
138	139	-1.050	-0.997	-1.028	2.000	6681	4059	-87	461	-51278	1694	6333	Y	-2095	122.50	110.25	1739	0	0.13	0.327	0.00	0.23	0.37	784	2271	1047	22.05	17.78	6.08
139	139	-1.049	-0.997	-1.028	2.000	6681	3896	-90	616	-51481	1692	6006	Y	-2122	122.50	110.25	1753	0	0.13	0.311	0.00	0.22	0.37	784	2284	1036	20.42	16.86	5.76
139	140	-1.033	-0.996	-1.017	2.000	6927	3479	-78	280	-66969	1880	5768	Y	-1236	133.75	120.38	1373	0	0.13	0.288	0.00	0.21	0.37	857	2007	1122	19.50	15.85	5.42
140	140	-1.033	-0.996	-1.018	2.000	6927	3117	-79	452	-67366	1879	5323	Y	-1262	133.75	120.38	1386	0	0.13	0.265	0.00	0.20	0.37	857	2019	1107	17.87	14.63	5.00
140	141	-0.930	-1.069	-0.989	2.000	7190	3380	-76	-122	-83618	2063	4847	Y	-1025	142.64	128.38	1318	0	0.13	0.233	0.00	0.18	0.37	914	2009	1184	20.62	13.04	4.46
141	141	-0.929	-1.069	-0.988	2.000	7190	3340	-77	-93	-83684	2058	4188	Y	-789	142.64	128.38	1200	0	0.13	0.201	0.00	0.17	0.37	914	1902	1161	18.96	11.27	3.85
141	142	-0.794	-1.241	-0.984	2.000	7513	3907	-76	-93	-101060	2243	4286	Y	-545	150.43	135.39	1082	165	0.13	0.197	0.00	0.16	0.37	957				11.25	3.85
142	142	-0.791	-1.236	-0.981	2.000	7513	-1492	-208	3366	-106441	2023	7980	Y	-80	150.43	135.39	828	296	0.23	0.367	0.00	0.30	0.37	953				20.95	7.16
142	143	-0.733	-1.323	-0.985	2.000	7513	-1150	-189	2940	-111921	2093	7586	Y	0	150.51	135.46	772	390	0.31	0.349	0.00	0.33	0.37	951				19.92	6.81
143	143	-0.733	-1.322	-0.985	2.000	7513	-19824	-710	2233	-130585	-3114	-6711	Y	0	150.51	135.46	710	1020	0.81	0.309	0.00	0.56	0.37	938				-17.62	-6.02
143	144	-0.798	-1.231	-0.983	2.000	7513	-18246	-691	1960	-122869	-3045	-6952	Y	113	150.43	135.39	785	907	0.72	0.320	0.00	0.52	0.37	942				-18.25	-6.24
144	144	-0.802	-1.235	-0.987	2.000	7513	-21264	-724	-1577	-125872	-3161	-10331	Y	579	150.43	135.39	1021	735	0.58	0.475	0.00	0.53	0.37	942				-27.12	-9.27
144	145	-0.951	-1.061	-0.997	2.000	7190	-17224	-684	-1796	-102947	-2936	-10452	Y	925	142.16	127.94	1204	427	0.35	0.502	0.00	0.43	0.37	900	1894	1798	1.24	-28.13	-9.62
145	145	-0.953	-1.061	-0.999	2.000	7190	-17339	-683	-2062	-102991	-2939	-11394	Y	1163	142.16	127.94	1329	303	0.25	0.547	0.00	0.40	0.37	901	2008	1829	1.44	-30.66	-10.48
145	146	-1.059	-1.002	-1.036	2.000	6929	-13666	-642	-2276	-81862	-2717	-11509	Y	1493	132.19	118.97	1493	17	0.13	0.574	0.00	0.35	0.37	847	2105	1722	1.98	-31.63	-10.81
146	146	-1.061	-1.002	-1.036	2.000	6929	-13789	-645	-2407	-81904	-2720	-12237	Y	1467	132.19	118.97	1480	31	0.13	0.610	0.00	0.37	0.37	847	2094	1746	1.87	-33.63	-11.50
146	147	-1.073	-1.038	-1.059	2.000	6682	-10457	-605	-2605	-62562	-2503	-12337	Y	2350	119.41	107.47	1849	0	0.13	0.638	0.00	0.38	0.37	765	2352	1641	2.85	-34.62	-11.84
147	147	-1.075	-1.037	-1.060	2.000	6682	-10581	-609	-2657	-62596	-2507	-12847	Y	2322	119.41	107.47	1835	0	0.13	0.664	0.00	0.40	0.37	765	2340	1659	2.75	-36.06	-12.33
147	148	-0.954	-1.303	-1.089	2.000	6458	-7575	-569	-2836	-44987	-2295	-12927	Y	2731	100.65	102.02	2006	0	0.13	0.691	0.00	0.41	0.37	726	2459	1556	3.41	-37.02	-12.66
148	148	-0.956	-1.302	-1.090	2.000	6458	-7694	-575	-2819	-45012	-2300	-13239	Y	2707	100.65	102.02	1993	0	0.13	0.708	0.00	0.42	0.37	726	2447	1568	3.34	-37.91	-12.96
148	149	-0.559	-1.123	-0.769	2.000	6252	-4938	-537	-492	-28997	-2102	-10814	Y	1204	87.67	98.42	1201	0	0.13	0.598	0.00	0.36	0.37	697	1708	1392	2.11	-31.57	-10.79
149	149	-0.545	-1.107	-0.754	2.000	6252	-5101	-542	-2899	-29072	-2106	-13429	Y	1195	87.67	98.42	1196	0	0.13	0.742	0.00	0.44	0.37	697	1704	1477	1.62	-39.20	-13.40
149	150	-0.584	-1.148	-0.785	2.000	6067	-2353	-509	-600	-14252	-1940	-11032	Y	1134	75.77	95.13	1164	0	0.13	0.628	0.00	0.38	0.37	677	1657	1318	2.24	-32.79	-11.21
150	150	-0.586	-1.146	-0.785	2.000	6067	-2776	-512	-2900	-14594	-1943	-13445	Y	1122	75.77	95.13	1158	0	0.13	0.765	0.00	0.45	0.37	677	1651	1396	1.73	-39.97	-13.66
150	151	-0.620	-1.195	-0.814	2.000	5901	49	-481	-668	-754	-1783	-11115	Y	1060	64.91	92.12	1108	0	0.13	0.651	0.00	0.39	0.37	655	1587	1243	2.32	-33.60	-11.49
151	151	-0.621	-1.193	-0.815	2.000	5901	-694	-484	-2831	-1421	-1786	-13304	Y	1052	64.91	92.12	1104	0	0.13	0.779	0.00	0.45	0.37	655	1583	1313	1.82	-40.22	-13.75
151	152	-0.650	-1.248	-0.841	2.000	5756	2010	-454	-727	11276	-1632	-11102	Y	987	69.01	89.42	1055	0	0.13	0.666	0.00	0.40	0.37	636	1522	1167	2.42	-34.08	-11.65
152	152	-0.651	-1.246	-0.841	2.000	5756	1167	-458	-2719	10512	-1628	-13137	Y	727	69.01	89.42	925	0	0.13	0.788	0.00	0.46	0.37	636	1405	1229	1.56	-40.33	-13.79
152	153	-0.701	-1.159	-0.847	2.000	5587	3945	-428	-746	22227	-1477	-11065	Y	661	74.31	86.94	876	0	0.13	0.684	0.00	0.41	0.21	344	1098	1088	1.04	-34.61	-11.83
153	153	-0.702	-1.158	-0.847	2.000	5587	2814	-433	-2546	21167	-1481	-12757	Y	646	74.31	86.94	868	0	0.13	0.789	0.00	0.46	0.21	344	1091	1143	0.82	-39.90	-13.64
153	154	-0.750	-1.069	-0.851	2.000	5440	5599	-402	-754	31910	-1330	-10867	Y	582	78.99	84.78	813	0	0.13	0.690	0.00	0.41	0.21	334	1033	1008	1.11	-34.56	-11.82
154	154	-0.752	-1.068	-0.852	2.000	5440	4255	-409	-2330	30636	-1336	-12280	Y	565	78.99	84.78	809	0	0.13	0.780	0.00	0.45	0.21	335	1029	1056	0.90	-39.06	-13.35
154	155	-0.797	-0.980	-0.855	2.000	5313	6953	-377	-708	40318	-1184	-10559	Y	505	83.07	82.94	735	0	0.13	0.687	0.00	0.41	0.21	324	954	926	1.13	-34.09	-11.65
155	155	-0.799	-0.979	-0.856	2.000	5313	5503	-388	-2078	38935	-1194	-11718	Y	491	83.07	82.94	732	0	0.13	0.762	0.00	0.45	0.21	325	951	967	0.94	-37.83	-12.93
155	156	-0.839	-0.897	-0.858	2.000	5206	8335	-352	-659	47785	-1040	-10201	Y	431	86.59	81.36	666	0	0.13	0.677	0.00	0.40	0.21	316	883	842	1.21	-33.37	-11.41
156	156	-0.841	-0.897	-0.859	2.000	5206	6564	-367	-1799	46081	-1054	-11087	Y	416	86.59	81.36	663	0	0.13	0.736	0.00	0.43	0.21	316	881	877	1.02	-36.27	-12.40
156	157	-0.877	-0.823	-0.860	2.000	5116	7498	-331	-1855	52071	-900	-11045	Y	346	89.48	80.53	606	0	0.13	0.746	0.00	0.44	0.21	311	826	799	1.12	-36.53	-12.49
157	157	-0.879	-0.823	-0.861	2.000	5116	7441	-347	-1501	52081	-915	-10404	Y	329	89.48	80.53	597	0	0.13	0.702	0.00	0.42	0.21	311	818	786	1.14	-34.41	-11.77
157	158	-0.912	-0.757	-0.863	2.000	5049	8205	-312	-1558	56944	-762	-10363	Y	248	91.67	82.50	559	0	0.13	0.709	0.00	0.42	0.21	318	789	708	1.39	-34.57	-11.82
158	158	-0.914	-0.757	-0.864	2.000	5049	8151	-328	-1191	56956	-777	-9680	Y	233	91.67	82.50	551	0	0.13	0.662	0.00	0.40	0.21	318	782	694	1.43	-32.30	-11.04

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

$f'c$ = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Minimum LL Shear @ t=00																											
158	159	-0.943	-0.701	-0.866	2.000	5000	8746	-293	-1253	60696	-625	-9644	Y	159	93.09	83.78	515	0	0.13	0.666	0.00	0.40	0.21	322	753	617	1.73	-32.38	-11.07
159	159	-0.945	-0.700	-0.868	2.000	5000	8694	-310	-877	60711	-641	-8932	Y	144	93.09	83.78	507	0	0.13	0.617	0.00	0.37	0.21	322	746	603	1.78	-29.99	-10.25
159	160	-0.965	-0.661	-0.870	2.000	4969	9118	-276	-950	63328	-490	-8906	Y	99	93.96	84.57	485	0	0.13	0.619	0.00	0.37	0.21	324	729	526	2.21	-30.02	-10.26
160	160	-0.966	-0.661	-0.870	2.000	4969	9112	-287	-687	63364	-500	-8396	Y	75	93.96	84.57	473	0	0.13	0.584	0.00	0.36	0.21	324	717	515	2.22	-28.30	-9.68
160	161	-0.971	-0.652	-0.871	2.000	4969	9236	-273	-721	64128	-436	-8388	Y	65	94.23	84.81	468	0	0.13	0.583	0.00	0.36	0.21	325	714	483	2.45	-28.28	-9.67
161	161	-0.972	-0.651	-0.871	2.000	4969	9203	-285	-450	64137	-447	-7868	Y	41	94.23	84.81	456	0	0.13	0.547	0.00	0.34	0.21	325	703	472	2.47	-26.53	-9.07
161	162	-0.977	-0.646	-0.872	2.000	5000	9373	-250	-544	65144	-296	-7864	Y	-48	94.52	85.07	461	0	0.13	0.543	0.00	0.34	0.21	326	709	396	3.20	-26.40	-9.03
162	162	-0.980	-0.643	-0.874	2.000	5000	9331	-267	-173	65171	-311	-7133	Y	-63	94.52	85.07	469	0	0.13	0.493	0.00	0.31	0.21	326	715	381	3.41	-23.95	-8.19
162	163	-0.982	-0.628	-0.871	2.000	5049	9313	-232	-288	65038	-160	-7149	Y	-130	93.99	84.59	503	0	0.13	0.489	0.00	0.31	0.21	325	745	306	4.51	-23.85	-8.15
163	163	-0.986	-0.626	-0.873	2.000	5049	9277	-248	68	65072	-174	-6434	Y	-144	93.99	84.59	510	0	0.13	0.440	0.00	0.28	0.21	325	752	290	4.66	-21.47	-7.34
163	164	-0.981	-0.629	-0.870	2.000	5116	9055	-213	-72	63783	-22	-6476	Y	-213	92.84	83.56	537	0	0.13	0.437	0.00	0.28	0.21	321	772	216	6.10	-21.42	-7.32
164	164	-0.985	-0.627	-0.872	2.000	5116	9026	-228	261	63826	-36	-5794	Y	-230	92.84	83.56	546	0	0.13	0.391	0.00	0.26	0.21	321	780	201	5.74	-19.16	-6.55
164	165	-0.972	-0.646	-0.869	2.000	5206	8580	-193	90	61356	117	-5866	Y	-299	91.06	81.95	575	0	0.13	0.389	0.00	0.26	0.37	567	1028	244	8.88	-19.19	-6.56
165	165	-0.977	-0.643	-0.872	2.000	5206	8559	-206	390	61411	105	-5230	Y	-313	91.06	81.95	582	0	0.13	0.347	0.00	0.24	0.37	567	1034	218	8.07	-17.11	-5.85
165	166	-0.958	-0.676	-0.869	2.000	5313	3690	-173	244	53557	256	-5278	Y	-381	88.63	82.94	646	0	0.13	0.343	0.00	0.24	0.37	579	1102	295	9.55	-17.04	-5.83
166	166	-0.965	-0.673	-0.872	2.000	5313	3507	-183	949	53455	248	-4255	Y	-396	88.63	82.94	653	0	0.13	0.277	0.00	0.20	0.37	579	1109	258	8.01	-13.74	-4.70
166	167	-0.940	-0.716	-0.869	2.000	5440	3518	-160	681	49518	390	-4424	Y	-462	85.57	84.78	712	0	0.13	0.281	0.00	0.21	0.37	595	1176	334	9.28	-14.07	-4.81
167	167	-0.947	-0.713	-0.873	2.000	5440	3517	-169	902	49606	382	-3905	Y	-480	85.57	84.78	721	0	0.13	0.248	0.00	0.19	0.37	594	1184	314	8.71	-12.42	-4.25
167	168	-0.918	-0.762	-0.869	2.000	5587	3303	-147	609	44473	524	-4100	Y	-545	81.88	86.94	787	0	0.13	0.253	0.00	0.19	0.37	613	1260	392	10.38	-12.82	-4.38
168	168	-0.927	-0.759	-0.874	2.000	5587	3311	-153	799	44582	518	-3629	Y	-561	81.88	86.94	794	0	0.13	0.224	0.00	0.18	0.37	613	1267	374	9.76	-11.35	-3.88
168	169	-0.894	-0.814	-0.868	2.000	5756	2939	-131	491	38315	661	-3838	Y	-624	77.63	89.42	864	0	0.13	0.230	0.00	0.18	0.37	635	1349	452	12.06	-11.78	-4.03
169	169	-0.905	-0.810	-0.874	2.000	5756	2955	-136	648	38450	659	-3408	Y	-800	77.63	89.42	950	0	0.13	0.205	0.00	0.17	0.37	635	1426	437	12.20	-10.46	-3.58
169	170	-0.878	-0.812	-0.857	2.000	5935	2402	-114	328	30997	804	-3630	Y	-859	71.57	92.12	1008	0	0.13	0.211	0.00	0.17	0.37	655	1497	517	15.58	-10.94	-3.74
170	170	-0.891	-0.808	-0.864	2.000	5935	2423	-117	450	31164	800	-3217	Y	-874	71.57	92.12	1015	0	0.13	0.187	0.00	0.16	0.37	655	1503	502	14.76	-9.69	-3.31
170	171	-0.861	-0.807	-0.842	2.000	6109	1678	-95	121	22519	948	-3448	Y	-939	66.44	95.13	1066	0	0.13	0.195	0.00	0.16	0.37	677	1569	583	20.14	-10.21	-3.49
171	171	-0.877	-0.803	-0.852	2.000	6109	1699	-97	206	22726	945	-3030	Y	-957	66.44	95.13	1075	0	0.13	0.171	0.00	0.15	0.37	677	1577	568	19.31	-8.97	-3.07
171	172	-0.843	-0.799	-0.827	2.000	6295	751	-76	-131	12854	1096	-3269	Y	-1030	60.87	98.42	1133	0	0.13	0.179	0.00	0.15	0.37	700	1650	651	24.73	-9.50	-3.25
172	172	-0.863	-0.795	-0.839	2.000	6295	764	-76	-90	13105	1369	-2836	Y	-1044	60.87	98.42	1140	0	0.13	0.156	0.00	0.14	0.37	700	1656	774	22.47	-8.25	-2.82
172	173	-0.789	-0.858	-0.814	2.000	6515	51	-73	-430	204	1506	-3078	Y	-1071	54.10	102.02	1176	0	0.13	0.163	0.00	0.15	0.37	726				-8.77	-3.00

0.82

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Maximum LL Torsion @ t=00																											
1	1	0.001	0.000	0.001	1.003	2487	76	-5	102	73	-6	-304	N	0	0.00	77.76	440	0	0.13	Not Reqd	0.00	0.06	0.37	545				0.00	0.00
1	2	0.001	-0.001	0.001	1.002	2485	8	91	1134	-19	117	750	Y	0	65.57	77.76	437	0	0.13	0.052	0.00	0.09	0.37	544	883	82	10.84	2.53	0.87
2	2	-0.254	-0.454	-0.317	1.801	4465	87	-202	3308	57	-715	2660	Y	352	42.43	77.76	608	0	0.13	0.185	0.00	0.16	0.37	544	1037	441	3.90	8.98	3.07
2	3	-0.256	-0.449	-0.317	1.800	4464	224	-199	3256	548	-701	2617	Y	351	43.34	77.76	607	0	0.13	0.182	0.00	0.16	0.37	543	1035	433	3.97	8.83	3.02
3	3	-0.255	-0.449	-0.316	1.799	4461	258	-198	3259	579	-701	2245	Y	351	43.34	77.76	606	0	0.13	0.156	0.00	0.14	0.37	543	1035	421	4.04	7.58	2.59
3	4	-0.278	-0.404	-0.318	1.802	4468	1752	-158	2699	6232	-522	1802	Y	274	54.64	77.76	552	0	0.13	0.126	0.00	0.13	0.37	540	983	318	5.05	6.08	2.08
4	4	-0.272	-0.405	-0.314	1.795	4451	1750	-157	2754	6198	-521	1490	Y	274	54.64	77.76	552	0	0.13	0.104	0.00	0.12	0.37	540	983	307	5.08	5.03	1.72
4	5	-0.286	-0.382	-0.316	1.799	4461	2576	-124	2328	9470	-372	1161	N	200	61.54	77.76	507	0	0.13	Not Reqd	0.00	0.06	0.37	538	941	186	13.15	0.00	0.00
5	5	-0.281	-0.383	-0.313	1.794	4448	2558	-124	2392	9434	-372	1068	N	200	61.54	77.76	507	0	0.13	Not Reqd	0.00	0.06	0.37	538	941	186	13.15	0.00	0.00
5	6	-0.288	-0.376	-0.316	1.798	4459	4527	-83	1999	12924	-214	773	N	136	66.43	77.76	467	0	0.13	Not Reqd	0.00	0.06	0.37	537	903	107	20.20	0.00	0.00
6	6	-0.283	-0.377	-0.313	1.792	4444	4448	-82	2094	12823	-212	811	N	136	66.43	77.76	467	0	0.13	Not Reqd	0.00	0.06	0.37	537	903	106	20.48	0.00	0.00
6	7	-0.281	-0.389	-0.315	1.797	4456	4631	-38	1760	13584	-51	576	N	70	69.42	77.76	433	0	0.13	Not Reqd	0.00	0.06	0.21	298	658	26	34.63	0.00	0.00
7	7	-0.276	-0.390	-0.312	1.791	4440	4768	-40	1875	13695	-53	696	N	70	69.42	77.76	433	0	0.13	Not Reqd	0.00	0.06	0.21	298	658	26	32.76	0.00	0.00
7	8	-0.268	-0.417	-0.315	1.796	4454	4442	0	1579	13003	104	498	N	-1	70.39	77.76	399	0	0.13	Not Reqd	0.00	0.06	0.21	298	627	52		0.00	0.00
8	8	-0.262	-0.418	-0.311	1.789	4437	4685	-10	1708	13216	94	663	N	-1	70.39	77.76	398	0	0.13	Not Reqd	0.00	0.06	0.21	298	626	47	117.95	0.00	0.00
8	9	-0.247	-0.462	-0.314	1.796	4453	2529	86	1466	9749	307	520	N	-72	69.34	77.76	440	0	0.13	Not Reqd	0.00	0.06	0.21	299	665	153	12.92	0.00	0.00
9	9	-0.241	-0.463	-0.311	1.788	4435	7161	112	1624	14347	334	720	N	-72	69.34	77.76	427	0	0.13	Not Reqd	0.00	0.06	0.21	297	652	167	9.67	0.00	0.00
9	10	-0.219	-0.521	-0.314	1.795	4450	5984	144	1650	10913	483	844	N	-141	66.33	77.76	470	0	0.13	Not Reqd	0.00	0.06	0.21	298	691	241	7.25	0.00	0.00
10	10	-0.212	-0.523	-0.310	1.787	4431	7765	123	1832	12657	462	1054	N	-141	66.33	77.76	465	0	0.13	Not Reqd	0.00	0.06	0.21	298	686	231	8.42	0.00	0.00
10	11	-0.184	-0.595	-0.313	1.793	4447	6661	158	1869	8350	614	1190	N	-215	61.32	77.76	512	0	0.13	Not Reqd	0.00	0.06	0.21	299	730	307	6.35	0.00	0.00
11	11	-0.180	-0.596	-0.311	1.789	4437	6588	141	2011	8256	598	1334	Y	-215	61.32	77.76	513	0	0.13	0.093	0.00	0.11	0.21	299	730	341	3.91	4.50	1.54
11	12	-0.159	-0.649	-0.313	1.793	4447	5785	163	2039	4857	696	1427	Y	-264	57.03	77.76	546	0	0.13	0.099	0.00	0.11	0.21	300	761	393	3.52	4.82	1.65
12	12	-0.156	-0.650	-0.312	1.790	4439	6325	180	2127	5378	717	1466	Y	-377	57.03	77.76	603	0	0.13	0.102	0.00	0.12	0.21	300	812	405	3.59	4.95	1.69
12	13	-0.137	-0.619	-0.302	1.770	4337	2761	186	2235	-2642	834	1666	Y	-444	58.74	77.76	639	0	0.13	0.117	0.00	0.12	0.37	540	1061	470	4.62	5.67	1.94
13	13	-0.132	-0.620	-0.299	1.764	4322	4867	207	2265	-572	856	1632	Y	-430	58.74	77.76	637	0	0.13	0.115	0.00	0.12	0.37	541	1060	480	4.32	5.55	1.90
13	14	-0.180	-0.802	-0.408	1.971	4770	1928	206	2463	-8856	980	1922	Y	-890	64.15	77.76	899	0	0.13	0.137	0.00	0.13	0.37	548	1302	551	5.15	6.59	2.25
14	14	-0.175	-0.803	-0.405	1.967	4759	1942	205	2391	-8882	980	1743	Y	-873	64.15	77.76	890	0	0.13	0.124	0.00	0.13	0.37	547	1293	545	5.20	5.98	2.04
14	15	-0.200	-0.687	-0.389	1.937	4628	904	227	2635	-16294	1150	2078	Y	-975	78.68	77.76	913	0	0.13	0.150	0.00	0.14	0.37	542	1310	640	4.40	7.19	2.46
15	15	-0.195	-0.688	-0.386	1.932	4618	921	227	2511	-16323	1146	1804	Y	-850	78.68	77.76	848	0	0.13	0.130	0.00	0.13	0.37	542	1250	630	4.22	6.24	2.13
15	16	-0.181	-0.745	-0.399	1.956	4673	-392	250	2763	-25685	1330	2154	Y	-373	91.75	82.57	604	135	0.18	0.156	0.00	0.17	0.37	568				7.45	2.55
16	16	-0.180	-0.745	-0.399	1.955	4672	-3821	169	3394	-29123	1273	2076	Y	-373	91.75	82.57	597	110	0.14	0.150	0.00	0.15	0.37	567				7.18	2.45
16	17	-0.148	-0.822	-0.409	1.973	4715	-4137	183	3351	-32341	1329	2065	Y	0	92.92	83.63	403	335	0.44	0.149	0.00	0.29	0.37	571				7.14	2.44
17	17	-0.147	-0.823	-0.408	1.972	4714	-5520	-293	3967	-33735	-1726	2371	Y	0	92.92	83.63	395	564	0.74	0.171	0.00	0.45	0.37	569				8.20	2.80
17	18	-0.223	-0.706	-0.410	1.975	4720	-4946	-279	3706	-29519	-1670	2141	Y	130	92.54	83.28	469	459	0.60	0.155	0.00	0.38	0.41	632				7.40	2.53
18	18	-0.223	-0.706	-0.410	1.975	4719	-5349	-355	4505	-29929	-1729	2345	Y	130	92.54	83.28	467	493	0.64	0.170	0.00	0.41	0.41	632				8.11	2.77
18	19	-0.397	-0.447	-0.417	1.987	4749	-3240	-330	4110	-17282	-1573	2049	Y	489	86.88	78.19	654	220	0.30	0.148	0.00	0.23	0.41	602	1130	851	1.95	7.09	2.42
19	19	-0.393	-0.448	-0.414	1.983	4739	-3259	-331	4211	-17334	-1576	2010	Y	563	86.88	78.19	692	183	0.25	0.145	0.00	0.20	0.41	602	1165	852	2.05	6.95	2.38
19	20	-0.481	-0.354	-0.433	2.000	4815	-1338	-306	3821	-5902	-1422	1719	Y	798	75.59	77.76	848	0	0.13	0.123	0.00	0.13	0.41	607	1310	765	2.99	5.92	2.02
20	20	-0.476	-0.355	-0.430	2.000	4815	-1385	-307	3920	-5975	-1424	1746	Y	804	75.59	77.76	850	0	0.13	0.125	0.00	0.13	0.41	607	1312	767	2.96	6.01	2.05
20	21	-0.528	-0.314	-0.450	2.000	4852	235	-271	3539	4128	-1261	1463	Y	717	44.46	77.76	818	0	0.13	0.104	0.00	0.12	0.41	610	1285	677	3.46	5.01	1.71
21	21	-0.523	-0.314	-0.448	2.000	4852	272	-284	3632	4144	-1274	1547	Y	723	44.46	77.76	821	0	0.13	0.110	0.00	0.12	0.41	610	1288	686	3.34	5.30	1.81
21	22	-0.565	-0.277	-0.465	2.000	4887	1604	-250	3278	12953	-1116	1292	N	647	54.98	77.76	761	0	0.13	Not Reqd	0.00	0.06	0.41	605	1229	558	6.37	0.00	0.00
22	22	-0.561	-0.277	-0.462	2.000	4887	1599	-250	3345	12930	-1117	1410	N	654	54.98	77.76	764	0	0.13	Not Reqd	0.00	0.06	0.41	605	1232	558	6.38	0.00	0.00
22	23	-0.592	-0.244	-0.477	2.000	4924	2795	-229	3012	20620	-975	1175	N	593	64.16	77.76	715	0	0.13	Not Reqd	0.00	0.06	0.41	601	1184	488	7.08	0.00	0.00
23	23	-0.588	-0.245	-0.474	2.000	4924	2788	-230	3073	20598	-977	1340	N	601	64.16	77.76	719	0	0.13	Not Reqd	0.00	0.06	0.41	601	1188	488	7.07	0.00	0.00
23	24	-0.610	-0.216	-0.486	2.000	4960	3806	-210	2751	27151	-838	1117	N	537	72.21	77.76	672	0	0.13	Not Reqd	0.00	0.06	0.41	597	1142	419	7.89	0.00	0.00
24	24	-0.607	-0.216	-0.484	2.000	4960	4257	-197	2831	27589	-820	1334	N	432	72.21	77.76	616	0	0.13	Not Reqd	0.00	0.06	0.41	597	1092	410	7.94	0.00	0.00
24	25	-0.627	-0.171	-0.483	2.000	4960	4987	-177	2518	32869	-683	1120	N	361	79.06	77.76	568	0	0.13	Not Reqd	0.00	0.06	0.21	297	778	342	5.95	0.00	0.00
25	25	-0.623	-0.171	-0.481	2.000	4960	5259	-174	2584	33127	-680	1363	N	361	79.06	77.76	567	0	0.13	Not Reqd	0.00	0.06	0.21	297	778	340	6.04	0.00	0.00
25	26	-0.638	-0.137	-0.480	2.000	4960	5901	-152	2284	37376	-542	1162	N	286	84.61	77.76	521	0	0.13	Not Reqd	0.00	0.06	0.21	295	735	271	7.09	0.00	0.00
26	26	-0.635	-0.138	-0.478	2.000	4960	7763	-128	2380	39223	-517	1463	N	286	84.61	77.76	517	0	0.13	Not Reqd	0.00	0.06	0.21	295	730	259	8.38	0.00	0.00
26	27	-0.643	-0.115	-0.477	2.000	4960	7988	-101	2102	42114	-374	1284	N	212	88.87	79.98	487	0	0.13	Not Reqd	0.00	0.06	0.21	303	711	187	11.37	0.00	0.00
27	27	-0.640	-0.116	-0.475	2.000	4960	8321	-103	2240	42431	-375	1646	Y	212	88.87	79.98	487	0	0.13	0.115	0.00	0.12	0.21	303	710	240	4.85	5.56	1.90
27	28	-0.643	-0.107	-0.474	2.000	4960	8329	-76	1980	44161	-232	1484	N	139	91.84	82.66	463	0	0.13	Not Reqd	0.00	0.06	0.21	313	698	116	16.23	0.00	0.00
28	28	-0.640	-0.108	-0.473	2.000	4960	8625	-78	2129	44440	-233	1870	Y	139	91.84	82.66	462	0	0.13	0.130	0.00	0.13	0.21	313	697	175	5.92	6.31	2.16
28	29	-0.636	-0.115	-0.472	2.000	4960	8404	-51	1879	44999	-90	1718	Y	65	93.56	84.20	434	0	0.13	0.120	0.00	0.12	0.21	319	678	99	7.81	5.80	1.98
29	29	-0.633	-0.115	-0.470	2.000	4960	8747	-57	2053	45324	-96	2134	Y	65	93.56	84.20	433	0	0.13	0.149	0.00	0.14	0.21	319	677	115	7.00	7.20	2.46
29	30	-0.623	-0.139	-0.471	2.000	4960	6865	93	1967	43279	172	2146	Y	-10	94.02	84.62	411	0	0.13	0.149	0.00	0.14	0.21	321	658	154	5.64	7.24	2.48
30	30	-0.621	-0.139	-0.469	2.000	4960	7986	85	2236	44386	164	2625	Y	-10	94.02	84.62	408	0	0.13	0.183	0.00	0.16	0.21	320	656	165	5.33	8.86	3.03
30	31	-0.609	-0.169	-0.470	2.000	4960	7500	109	2197	43167	275	2658	Y	-65	93.56	84.20	435	0	0.13	0.185	0.00	0.16	0.21	319	679	221	4.69	8.97	3.07
31	31	-0.607	-0.170	-0.469	2.000	4960	8186	84	2472	43838	251	3136	Y	-65	93.56	84.20	434	0	0.13	0.218	0.00	0.17	0.21	319	678	224	4.77	10.59	3.62
31	32	-0.584	-0.225	-0.471	2.000	4960	6960	116	2425	40803	399	3188	Y	-141	91.84	82.66	469	0	0.13	0.222	0.00	0.18	0.21	313	704	300	4.00	10.76	3.68
32	32	-0.581	-0.226	-0.469	2.000	4960	9267	77	2766	43088	361	3748	Y	-141	91.84	82.66	464	0	0.13	0.261	0.00	0.20	0.21	313	699	299	4.18	12.65	4.32

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Maximum LL Torsion @ t=00																									
32	33	-0.552	-0.299	-0.472	2.000	4960	8107	108	2726	39175	509	3807	Y	-219	88.87	79.98	495	0	0.13	0.265	0.00	0.20	0.21	303	718	375	3.45	12.85	4.39
33	33	-0.549	-0.299	-0.471	2.000	4960	9738	86	3082	40782	487	4361	Y	-219	88.87	79.98	491	0	0.13	0.304	0.00	0.22	0.21	303	715	381	3.38	14.72	5.03
33	34	-0.514	-0.389	-0.475	2.000	4960	8527	116	3050	35871	633	4428	Y	-298	84.61	77.76	528	0	0.13	0.308	0.00	0.22	0.21	296	741	457	2.85	14.94	5.11
34	34	-0.511	-0.389	-0.473	2.000	4960	9500	115	3384	36818	633	4931	Y	-298	84.61	77.76	526	0	0.13	0.343	0.00	0.24	0.21	295	739	472	2.62	16.64	5.69
34	35	-0.472	-0.493	-0.478	2.000	4960	8089	144	3360	30762	779	5006	Y	-379	79.06	77.76	580	0	0.13	0.349	0.00	0.24	0.21	297	790	547	2.36	16.89	5.78
35	35	-0.468	-0.494	-0.477	2.000	4960	8384	138	3653	31028	774	5432	Y	-379	79.06	77.76	580	0	0.13	0.378	0.00	0.25	0.21	297	789	558	2.25	18.33	6.27
35	36	-0.425	-0.611	-0.483	2.000	4960	5772	245	3647	22826	998	5524	Y	-460	72.29	77.76	639	0	0.13	0.385	0.00	0.26	0.37	539	1060	673	2.63	18.65	6.37
36	36	-0.421	-0.612	-0.481	2.000	4960	7451	162	3867	24472	923	5822	Y	-594	72.29	77.76	706	0	0.13	0.406	0.00	0.27	0.37	539	1120	646	3.33	19.65	6.72
36	37	-0.387	-0.658	-0.477	2.000	4916	4686	267	3941	15098	1147	5995	Y	-669	64.17	77.76	765	0	0.13	0.421	0.00	0.28	0.37	543	1177	763	2.60	20.35	6.96
37	37	-0.383	-0.659	-0.475	2.000	4916	4723	259	4072	15098	1139	6157	Y	-657	64.17	77.76	758	0	0.13	0.433	0.00	0.28	0.37	543	1171	764	2.58	20.90	7.15
37	38	-0.644	-1.049	-0.787	2.000	4873	3228	285	4231	5965	1301	6414	Y	-1736	49.64	77.76	1356	0	0.13	0.455	0.00	0.29	0.37	553	1718	853	4.14	21.90	7.49
38	38	-0.640	-1.051	-0.785	2.000	4873	3153	272	4291	5848	1289	6443	Y	-1719	49.64	77.76	1347	0	0.13	0.457	0.00	0.29	0.37	553	1711	848	4.18	22.00	7.52
38	39	-0.790	-0.773	-0.783	2.000	4830	1526	298	4439	-4548	1458	6689	Y	-1456	73.80	77.76	1216	0	0.13	0.478	0.00	0.30	0.37	553	1592	940	3.25	22.97	7.85
39	39	-0.786	-0.774	-0.782	2.000	4830	1765	308	4431	-4350	1469	6579	Y	-1440	73.80	77.76	1208	0	0.13	0.471	0.00	0.30	0.37	553	1585	942	3.19	22.60	7.72
39	40	-0.784	-0.769	-0.778	2.000	4787	-183	335	4567	-16237	1642	6813	Y	-977	82.70	77.76	977	0	0.13	0.492	0.00	0.31	0.37	553	1377	1036	2.09	23.54	8.05
40	40	-0.781	-0.770	-0.777	2.000	4787	-288	328	4482	-16384	1636	6550	Y	-962	82.70	77.76	969	0	0.13	0.473	0.00	0.30	0.37	553	1370	1025	2.13	22.63	7.74
40	41	-0.700	-0.863	-0.765	2.000	4741	-2658	349	4608	-29889	1807	6775	Y	-717	89.28	80.35	863	141	0.18	0.494	0.00	0.34	0.37	572	1291	1118	1.54	23.56	8.05
41	41	-0.696	-0.863	-0.763	2.000	4741	-2818	344	4439	-30087	1797	6353	Y	-557	89.28	80.35	783	215	0.28	0.463	0.00	0.37	0.37	572	1219	1099	1.38	22.09	7.55
41	42	-0.514	-1.156	-0.771	2.000	4741	-5066	374	4568	-44641	1978	6581	Y	-151	92.69	83.42	557	542	0.69	0.480	0.00	0.58	0.37	586				22.88	7.82
42	42	-0.514	-1.156	-0.770	2.000	4741	-6129	167	4783	-45708	1797	5919	Y	-151	92.69	83.42	557	441	0.56	0.431	0.00	0.50	0.37	587				20.58	7.04
42	43	-0.430	-1.287	-0.773	2.000	4741	-6658	176	4685	-50498	1849	5852	Y	0	92.92	83.63	467	560	0.71	0.426	0.00	0.57	0.37	585				20.35	6.96
43	43	-0.430	-1.287	-0.772	2.000	4741	-7597	-309	4801	-51439	-1876	5559	Y	0	92.92	83.63	464	578	0.74	0.405	0.00	0.57	0.37	584				19.33	6.61
43	44	-0.511	-1.161	-0.770	2.000	4741	-6907	-301	4676	-46760	-1826	5465	Y	76	92.80	83.52	516	498	0.63	0.398	0.00	0.52	0.37	586				19.00	6.50
44	44	-0.510	-1.161	-0.770	2.000	4741	-6405	-367	4728	-46261	-1869	4699	Y	76	92.80	83.52	516	522	0.66	0.342	0.00	0.50	0.37	587				16.34	5.59
44	45	-0.715	-0.843	-0.766	2.000	4741	-4133	-342	4328	-32508	-1692	4398	Y	313	90.99	81.89	670	270	0.34	0.320	0.00	0.33	0.37	583	1128	985	1.46	15.29	5.23
45	45	-0.714	-0.845	-0.766	2.000	4741	-4311	-344	4417	-32707	-1699	4230	Y	474	90.99	81.89	751	193	0.25	0.308	0.00	0.28	0.37	583	1200	983	1.70	14.71	5.03
45	46	-0.848	-0.695	-0.789	2.000	4786	-2241	-318	4024	-20323	-1524	3936	Y	706	87.01	78.31	845	2	0.13	0.284	0.00	0.21	0.37	557	1262	886	2.31	13.60	4.65
46	46	-0.846	-0.695	-0.788	2.000	4786	-2311	-319	4107	-20408	-1525	3836	Y	722	87.01	78.31	852	0	0.13	0.277	0.00	0.20	0.37	557	1269	884	2.33	13.25	4.53
46	47	-0.873	-0.672	-0.798	2.000	4826	-597	-283	3725	-9572	-1342	3552	Y	1332	79.82	77.76	1154	0	0.13	0.254	0.00	0.19	0.37	553	1536	783	3.91	12.21	4.17
47	47	-0.871	-0.672	-0.797	2.000	4826	-554	-295	3795	-9540	-1355	3512	Y	1349	79.82	77.76	1162	0	0.13	0.251	0.00	0.19	0.37	553	1544	788	3.83	12.07	4.13
47	48	-0.740	-0.950	-0.814	2.000	4872	849	-261	3441	-180	-1177	3256	Y	1657	65.91	77.76	1316	0	0.13	0.231	0.00	0.18	0.37	553	1683	691	5.14	11.12	3.80
48	48	-0.739	-0.950	-0.813	2.000	4872	828	-260	3483	-209	-1177	3254	Y	1675	65.91	77.76	1326	0	0.13	0.231	0.00	0.18	0.37	553	1691	691	5.16	11.11	3.80
48	49	-0.487	-0.559	-0.511	2.000	4916	2109	-239	3149	7904	-1019	3017	Y	584	50.09	77.76	780	0	0.13	0.212	0.00	0.17	0.37	553	1200	605	3.72	10.24	3.50
49	49	-0.486	-0.559	-0.510	2.000	4916	2104	-239	3181	7890	-1019	3064	Y	597	50.09	77.76	786	0	0.13	0.215	0.00	0.17	0.37	553	1206	606	3.72	10.40	3.56
49	50	-0.520	-0.550	-0.529	2.000	4960	3191	-219	2858	14786	-881	2839	Y	543	56.69	77.76	744	0	0.13	0.198	0.00	0.16	0.37	551	1165	530	4.18	9.58	3.28
50	50	-0.518	-0.550	-0.528	2.000	4960	3266	-218	2912	14850	-870	2946	Y	401	56.69	77.76	669	0	0.13	0.205	0.00	0.17	0.37	550	1097	528	3.84	9.94	3.40
50	51	-0.553	-0.483	-0.531	2.000	4960	4159	-198	2597	20524	-733	2729	Y	345	62.40	77.76	623	0	0.13	0.190	0.00	0.16	0.37	547	1053	453	4.32	9.21	3.15
51	51	-0.552	-0.483	-0.530	2.000	4960	4976	-174	2635	21328	-709	2867	Y	345	62.40	77.76	621	0	0.13	0.200	0.00	0.16	0.37	547	1051	445	4.55	9.68	3.31
51	52	-0.577	-0.436	-0.532	2.000	4960	5620	-153	2333	25810	-571	2663	Y	288	67.23	77.76	580	0	0.13	0.185	0.00	0.16	0.21	302	794	370	3.82	8.99	3.07
52	52	-0.575	-0.436	-0.531	2.000	4960	7568	-127	2410	27745	-545	2870	Y	288	67.23	77.76	574	0	0.13	0.200	0.00	0.16	0.21	302	788	363	4.04	9.69	3.31
52	53	-0.590	-0.409	-0.533	2.000	4960	8205	-100	2130	31278	-402	2688	Y	231	71.17	77.76	537	0	0.13	0.187	0.00	0.16	0.21	301	754	286	4.99	9.07	3.10
53	53	-0.588	-0.409	-0.532	2.000	4960	8349	-98	2253	31406	-399	2964	Y	231	71.17	77.76	536	0	0.13	0.206	0.00	0.17	0.21	301	753	293	4.82	10.00	3.42
53	54	-0.594	-0.400	-0.533	2.000	4960	8330	-72	1986	33341	-257	2795	Y	173	74.23	77.76	503	0	0.13	0.195	0.00	0.16	0.21	300	723	217	6.12	9.43	3.23
54	54	-0.593	-0.401	-0.532	2.000	4960	8957	-65	2133	33950	-249	3109	Y	169	74.23	77.76	499	0	0.13	0.217	0.00	0.17	0.21	300	719	223	5.97	10.49	3.59
54	55	-0.590	-0.409	-0.533	2.000	4969	8661	-40	1880	34664	-107	2955	Y	111	76.39	77.90	470	0	0.13	0.205	0.00	0.17	0.21	300	694	147	7.91	9.96	3.41
55	55	-0.588	-0.409	-0.532	2.000	4969	7681	84	2087	33668	18	3326	Y	99	76.39	77.90	466	0	0.13	0.231	0.00	0.18	0.21	301	690	114	6.33	11.21	3.83
55	56	-0.579	-0.430	-0.532	2.000	5000	6639	109	2040	32727	147	3366	Y	46	77.58	78.35	445	0	0.13	0.233	0.00	0.18	0.21	303	673	180	5.14	11.30	3.86
56	56	-0.577	-0.430	-0.531	2.000	5000	7595	93	2320	33665	132	3812	Y	39	77.58	78.35	439	0	0.13	0.263	0.00	0.20	0.21	302	667	186	5.00	12.80	4.38
56	57	-0.560	-0.469	-0.531	2.000	5049	6290	126	2279	31577	282	3869	Y	-20	78.07	79.07	436	0	0.13	0.265	0.00	0.20	0.21	306	668	263	4.00	12.91	4.41
57	57	-0.558	-0.469	-0.530	2.000	5049	7609	107	2581	32875	264	4340	Y	-29	78.07	79.07	437	0	0.13	0.297	0.00	0.21	0.21	305	668	269	3.95	14.48	4.95
57	58	-0.533	-0.521	-0.529	2.000	5116	6198	139	2547	29727	413	4405	Y	-89	77.68	80.06	481	0	0.13	0.297	0.00	0.21	0.21	310	712	346	3.44	14.57	4.98
58	58	-0.531	-0.522	-0.528	2.000	5116	9825	78	2882	33332	353	4895	Y	-99	77.68	80.06	477	0	0.13	0.331	0.00	0.23	0.21	309	707	331	3.90	16.19	5.54
58	59	-0.499	-0.588	-0.527	2.000	5206	8665	108	2855	29480	501	4966	Y	-160	76.40	81.36	525	0	0.13	0.330	0.00	0.23	0.21	315	756	407	3.42	16.24	5.55
59	59	-0.497	-0.588	-0.526	2.000	5206	10071	90	3218	30862	485	5465	Y	-169	76.40	81.36	526	0	0.13	0.363	0.00	0.25	0.21	315	756	415	3.33	17.88	6.11
59	60	-0.460	-0.666	-0.525	2.000	5313	8833	119	3196	25971	632	5541	Y	-230	74.24	82.94	579	0	0.13	0.360	0.00	0.24	0.21	322	811	491	2.99	17.89	6.12
60	60	-0.458	-0.667	-0.524	2.000	5313	9864	117	3543	26976	631	5996	Y	-239	74.24	82.94	580	0	0.13	0.390	0.00	0.26	0.21	322	812	505	2.80	19.36	6.62
60	61	-0.416	-0.755	-0.524	2.000	5440	8444	145	3527	20935	778	6079	Y	-301	71.20	84.78	639	0	0.13	0.386	0.00	0.26	0.21	331	873	581	2.59	19.33	6.61
61	61	-0.414	-0.756	-0.523	2.000	5440	8719	137	3841	21183	772	6466	Y	-312	71.20	84.78	644	0	0.13	0.411	0.00	0.27	0.21	331	878	590	2.51	20.57	7.03
61	62	-0.369	-0.850	-0.522	2.000	5587	5945	246	3860	12813	1000	6584	Y	-375	67.26	86.94	713	0	0.13	0.407	0.00	0.27	0.21	342	949	708	1.98	20.59	7.04
62	62	-0.367	-0.851	-0.521	2.000	5587	7958	160	4113	14795	917	6868	Y	-384	67.26	86.94	713	0	0.13	0.425	0.00	0.28	0.21	341	949	675	2.30	21.48	7.34
62	63	-0.320	-0.949	-0.521	2.000	5756	5038	267	4224	5297	1145	7077	Y	-447	62.45	89.42	785	0	0.13	0.425	0.00	0.28	0.37	636	1279	796	2.81	21.73	7.43
63	63	-0.318	-0.950	-0.520	2.000	5756	5417	252	4396	5641	1131	7228	Y	-459	62.45	89.42	791	0	0.13	0.434	0.00	0.28	0.37	636	1284	794	2.85	22.19	7.59
63	64	-0.270	-1.048	-0.520	2.000	5941	4079	276	4562	-3267	1277	7493	Y	-522	71.18	92.12	839	0	0.13	0.436	0.00	0.28	0.37	655	1345	875	2.67	22.56	7.71

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

		Permanent Loads + Maximum LL Torsion @ t=00															(kip)	(kip)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(kip)	(kip)	(kip)		Total Long.	Equivalent
		(ksi)	(ksi)	(ksi)		(k-ft)	Ultimate	Ultimate	Ultimate				Investigate	Shear from	(in)	(in)	Concrete	Required	Required	Additional	Additional	Total		Provided	Nominal			Mild Steel	PT Steel Req'd
		Perm Load	Perm Load	Dead Load	Stress	Torsional	Corresp.	Max	Corresp.	TOTAL	TOTAL	TOTAL	Torsional	Primary	Depth	Effective	Shear	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Shear	Ultimate	Shear	Required	for Torsion
		Stress	Stress	Stress	Variable	Cracking	Live Load	Live Load	Live Load	Ultimate	Ultimate	Ultimate	Effects?	Post Tensioning	to Tensile	Shear	Resistance	Resistance	Area	Required	Req'd from	Required	Resistance	Resistance	Resistance	Shear	Rating	for Torsion	(based on fpe)
Member	Node	(top fiber)	(bott. fiber)	(neutr. axis)	'K'	Moment	Moment	Shear	Torsion	Moment	Shear	Torsion	(Y/N)	Effect	Reinforcement	Depth	per web	per web	per web	for Torsion	Transverse	per leg	Provided	Resistance	per web	per web	Factor, RF	(Al)	(Al)
Number	Number			(fpc)		(Tcr)				(Mu)	(Vu)	(Tu)		(Vp)	d_e	d_v	(Vc)	(Vs-req'd)	(Av)	(At)	A_v (trans)	(As_req'd)	per leg	(Vs_prov)	(φVn)	(Vu)		in^2	in^2
64	64	-0.268	-1.050	-0.519	2.000	5941	3858	261	4639	-3529	1277	7470	Y	-727	71.18	92.12	941	0	0.13	0.434	0.00	0.28	0.37	655	1437	874	3.03	22.49	7.69
64	65	-0.242	-1.005	-0.504	2.000	6098	2410	286	4792	-13674	1427	7722	Y	-790	81.99	95.13	957	0	0.13	0.437	0.00	0.28	0.37	671	1465	957	2.73	22.88	7.82
65	65	-0.239	-1.006	-0.503	2.000	6098	2670	293	4876	-13459	1436	7649	Y	-793	81.99	95.13	959	0	0.13	0.433	0.00	0.28	0.37	671	1467	959	2.69	22.67	7.75
65	66	-0.549	-1.183	-0.780	2.000	6273	921	318	5019	-25037	1614	7890	Y	-1954	94.65	98.42	1595	0	0.13	0.434	0.00	0.28	0.37	700	2065	1056	4.18	22.99	7.86
66	66	-0.546	-1.184	-0.778	2.000	6273	575	312	5035	-25435	1609	7664	Y	-1958	94.65	98.42	1596	0	0.13	0.422	0.00	0.28	0.37	700	2067	1046	4.24	22.33	7.63
66	67	-0.656	-0.934	-0.762	2.000	6470	-1125	339	5167	-38252	1800	7895	Y	-1678	113.28	102.02	1479	0	0.13	0.421	0.00	0.28	0.37	726	1984	1149	3.51	22.58	7.72
67	67	-0.653	-0.935	-0.761	2.000	6470	-2391	309	5125	-39569	1772	7520	Y	-1690	113.28	102.02	1485	0	0.13	0.401	0.00	0.27	0.37	726	1990	1123	3.74	21.51	7.35
67	68	-0.654	-0.896	-0.751	2.000	6686	-4869	326	5235	-54519	1958	7728	Y	-1113	125.82	113.24	1267	0	0.13	0.399	0.00	0.26	0.37	806	1865	1223	2.96	21.68	7.41
68	68	-0.652	-0.897	-0.750	2.000	6686	-4807	323	5149	-54507	1956	7212	Y	-1128	125.82	113.24	1275	0	0.13	0.373	0.00	0.25	0.37	806	1872	1206	3.06	20.23	6.92
68	69	-0.584	-0.937	-0.730	2.000	6922	-7421	340	5253	-70993	2148	7414	Y	-883	135.76	122.19	1162	31	0.13	0.370	0.00	0.25	0.37	862	1822	1308	2.53	20.39	6.97
69	69	-0.581	-0.936	-0.728	2.000	6922	-7353	341	5060	-70972	2140	6692	Y	-662	135.76	122.19	1046	143	0.13	0.334	0.00	0.23	0.37	861	1716	1281	2.32	18.40	6.29
69	70	-0.465	-1.098	-0.728	2.000	7227	-10134	359	5158	-88967	2337	6889	Y	-398	143.83	129.45	910	388	0.32	0.329	0.00	0.32	0.37	903				18.48	6.32
70	70	-0.461	-1.095	-0.725	2.000	7227	-11041	77	7419	-89892	2058	8127	Y	-87	143.83	129.45	751	392	0.32	0.388	0.00	0.36	0.37	902				21.81	7.46
70	71	-0.404	-1.184	-0.729	2.000	7227	-13080	116	7332	-97104	2145	8072	Y	0	143.95	129.56	689	503	0.42	0.386	0.00	0.40	0.37	899				21.66	7.41
71	71	-0.448	-1.089	-0.715	2.000	7227	-12030	-451	7561	-93716	-2687	6914	Y	0	143.95	129.56	683	809	0.67	0.330	0.00	0.50	0.37	898				18.55	6.34
71	72	-0.516	-0.992	-0.714	2.000	7227	-12212	-403	7399	-88189	-2591	6784	Y	113	143.83	129.44	755	684	0.56	0.324	0.00	0.44	0.37	901				18.20	6.22
72	72	-0.519	-0.996	-0.717	2.000	7227	-12386	-441	5990	-88378	-2647	4670	Y	425	143.83	129.44	918	553	0.46	0.223	0.00	0.34	0.37	902				12.53	4.28
72	73	-0.671	-0.801	-0.725	2.000	6922	-9619	-419	5611	-68559	-2446	4390	Y	752	135.30	121.77	1088	271	0.24	0.219	0.00	0.23	0.37	858	1751	1362	2.01	12.07	4.13
73	73	-0.671	-0.802	-0.725	2.000	6922	-9459	-417	5672	-68408	-2452	3967	Y	905	135.30	121.77	1169	194	0.17	0.198	0.00	0.18	0.37	859	1824	1351	2.22	10.91	3.73
73	74	-0.780	-0.705	-0.750	2.000	6673	-6928	-394	5298	-50179	-2254	3692	Y	1185	124.55	112.10	1296	0	0.13	0.191	0.00	0.16	0.37	798	1884	1244	2.76	10.37	3.55
74	74	-0.779	-0.705	-0.749	2.000	6673	-7200	-401	5387	-50449	-2260	3410	Y	1162	124.55	112.10	1284	0	0.13	0.177	0.00	0.15	0.37	798	1874	1237	2.72	9.58	3.27
74	75	-0.827	-0.678	-0.768	2.000	6442	-4842	-379	5019	-33800	-2067	3140	Y	1611	111.30	102.02	1445	0	0.13	0.168	0.00	0.15	0.37	726	1954	1133	3.36	9.00	3.08
75	75	-0.827	-0.677	-0.768	2.000	6442	-4860	-377	5100	-33810	-2064	2963	Y	1590	111.30	102.02	1435	0	0.13	0.159	0.00	0.14	0.37	726	1945	1126	3.34	8.50	2.90
75	76	-0.811	-0.764	-0.793	2.000	6232	-2811	-343	4751	-18840	-1863	2712	Y	1692	95.03	98.42	1464	0	0.13	0.150	0.00	0.14	0.37	700	1948	1017	3.89	7.93	2.71
76	76	-0.811	-0.764	-0.793	2.000	6232	-2739	-355	4804	-18757	-1874	2612	Y	1679	95.03	98.42	1457	0	0.13	0.145	0.00	0.14	0.37	700	1942	1020	3.80	7.64	2.61
76	77	-0.688	-0.650	-0.674	2.000	6043	-963	-322	4476	-5369	-1685	2382	Y	1056	82.40	95.13	1125	0	0.13	0.136	0.00	0.13	0.37	677	1622	918	3.33	7.10	2.43
77	77	-0.674	-0.635	-0.660	2.000	6043	-1112	-322	4509	-5509	-1684	2357	Y	1041	82.40	95.13	1118	0	0.13	0.135	0.00	0.13	0.37	677	1615	916	3.30	7.02	2.40
77	78	-0.726	-0.620	-0.688	2.000	5870	567	-303	4188	6619	-1535	2134	Y	982	56.98	92.12	1069	0	0.13	0.126	0.00	0.13	0.37	655	1552	835	3.53	6.47	2.21
78	78	-0.726	-0.619	-0.688	2.000	5870	566	-302	4209	6627	-1533	2181	Y	971	56.98	92.12	1064	0	0.13	0.128	0.00	0.13	0.37	655	1547	835	3.51	6.62	2.26
78	79	-0.771	-0.611	-0.717	2.000	5721	2067	-283	3894	17539	-1388	1965	Y	920	63.55	89.42	1021	0	0.13	0.119	0.00	0.12	0.37	636	1492	756	3.78	6.05	2.07
79	79	-0.771	-0.610	-0.717	2.000	5721	1934	-283	3905	17414	-1388	2074	Y	909	63.55	89.42	1016	0	0.13	0.125	0.00	0.13	0.37	636	1487	759	3.75	6.39	2.19
79	80	-0.810	-0.611	-0.747	2.000	5587	3277	-265	3596	27164	-1247	1863	Y	856	69.45	86.94	973	0	0.13	0.115	0.00	0.12	0.37	619	1433	682	4.05	5.83	1.99
80	80	-0.811	-0.611	-0.747	2.000	5587	3147	-265	3632	27041	-1233	2018	Y	652	69.45	86.94	872	0	0.13	0.125	0.00	0.13	0.37	619	1341	680	3.68	6.31	2.16
80	81	-0.853	-0.557	-0.759	2.000	5440	4336	-246	3326	35549	-1095	1810	Y	594	74.80	84.78	829	0	0.13	0.115	0.00	0.12	0.37	603	1289	605	4.00	5.76	1.97
81	81	-0.853	-0.557	-0.759	2.000	5440	5062	-230	3346	36281	-1078	2044	Y	578	74.80	84.78	821	0	0.13	0.130	0.00	0.13	0.37	603	1282	603	4.08	6.50	2.22
81	82	-0.890	-0.512	-0.770	2.000	5313	5969	-212	3046	43537	-940	1841	Y	516	79.50	82.94	762	0	0.13	0.120	0.00	0.12	0.21	326	979	528	3.23	5.94	2.03
82	82	-0.890	-0.512	-0.770	2.000	5313	5914	-211	3079	43485	-939	2132	Y	503	79.50	82.94	755	0	0.13	0.139	0.00	0.13	0.21	326	973	537	3.15	6.88	2.35
82	83	-0.920	-0.476	-0.780	2.000	5206	6673	-194	2782	49630	-803	1934	Y	439	83.54	81.36	693	0	0.13	0.128	0.00	0.13	0.21	318	910	463	3.42	6.33	2.16
83	83	-0.921	-0.477	-0.780	2.000	5206	6930	-187	2828	49889	-796	2275	Y	426	83.54	81.36	685	0	0.13	0.151	0.00	0.14	0.21	318	903	470	3.37	7.44	2.54
83	84	-0.944	-0.449	-0.788	2.000	5116	7167	-169	2536	54552	-660	2082	Y	363	86.91	80.06	631	0	0.13	0.141	0.00	0.14	0.21	311	848	396	3.75	6.89	2.35
84	84	-0.945	-0.450	-0.788	2.000	5116	8786	-151	2608	56172	-641	2477	Y	347	86.91	80.06	619	0	0.13	0.167	0.00	0.15	0.21	311	837	398	3.78	8.19	2.80
84	85	-0.962	-0.431	-0.795	2.000	5049	8739	-133	2323	59597	-505	2291	Y	284	89.62	80.66	584	0	0.13	0.157	0.00	0.14	0.21	312	806	325	4.45	7.64	2.61
85	85	-0.963	-0.431	-0.795	2.000	5049	10926	-103	2472	61783	-475	2787	Y	271	89.62	80.66	571	0	0.13	0.191	0.00	0.16	0.21	312	795	325	4.62	9.30	3.18
85	86	-0.973	-0.423	-0.800	2.000	5000	10809	-81	2198	64187	-335	2612	Y	207	91.68	82.52	548	0	0.13	0.180	0.00	0.15	0.21	319	781	250	5.84	8.77	3.00
86	86	-0.973	-0.423	-0.800	2.000	5000	10779	-84	2380	64156	-338	3157	Y	195	91.68	82.52	542	0	0.13	0.218	0.00	0.17	0.21	319	775	269	5.31	10.60	3.62
86	87	-0.977	-0.425	-0.803	2.000	4969	10576	-61	2114	65525	-198	2989	Y	131	93.10	83.79	517	0	0.13	0.208	0.00	0.17	0.21	324	757	193	6.79	10.08	3.45
87	87	-0.977	-0.425	-0.803	2.000	4969	10477	-66	2257	65422	-203	3397	Y	125	93.10	83.79	514	0	0.13	0.236	0.00	0.18	0.21	324	754	209	6.23	11.45	3.92
87	88	-0.976	-0.430	-0.804	2.000	4960	10541	-55	2144	65865	-143	3325	Y	98	93.50	84.15	503	0	0.13	0.232	0.00	0.18	0.21	325	746	176	6.96	11.22	3.84
88	88	-0.976	-0.430	-0.804	2.000	4960	8711	76	2303	64030	-10	3747	Y	76	93.50	84.15	497	0	0.13	0.261	0.00	0.20	0.21	326	741	123	6.57	12.65	4.32
88	89	-0.970	-0.447	-0.805	2.000	4969	7568	102	2224	63109	133	3767	Y	12	94.01	84.61	470	0	0.13	0.262	0.00	0.20	0.21	328	718	185	5.39	12.70	4.34
89	89	-0.971	-0.446	-0.806	2.000	4969	9096	97	2571	64630	129	4488	Y	-3	94.01	84.61	461	0	0.13	0.312	0.00	0.22	0.21	327	710	206	4.88	15.13	5.17
89	90	-0.957	-0.474	-0.805	2.000	5000	7731	128	2501	62539	277	4516	Y	-68	93.87	84.49	497	0	0.13	0.312	0.00	0.22	0.21	327	742	281	4.22	15.16	5.18
90	90	-0.958	-0.473	-0.805	2.000	5000	8996	108	2853	63796	258	5237	Y	-81	93.87	84.49	500	0	0.13	0.362	0.00	0.25	0.21	327	745	294	4.12	17.58	6.01
90	91	-0.938	-0.512	-0.804	2.000	5049	7528	139	2790	60652	406	5272	Y	-146	93.10	83.79	535	0	0.13	0.361	0.00	0.25	0.21	325	774	369	3.56	17.59	6.01
91	91	-0.939	-0.511	-0.804	2.000	5049	8769	121	3143	61883	389	5981	Y	-159	93.10	83.79	538	0	0.13	0.409	0.00	0.27	0.21	325	777	383	3.47	19.95	6.82
91	92	-0.912	-0.562	-0.801	2.000	5116	7218	151	3084	57704	536	6021	Y	-225	91.69	82.52	572	0	0.13	0.407	0.00	0.27	0.21	321	803	458	3.00	19.92	6.81
92	92	-0.913	-0.561	-0.802	2.000	5116	10454	99	3447	60928	485	6720	Y	-241	91.69	82.52	572	0	0.13	0.454	0.00	0.29	0.21	320	802	455	3.20	22.23	7.60
92	93	-0.880	-0.622	-0.799	2.000	5206	9101	128	3393	55989	632	6765	Y	-308	89.63	81.36	609	0	0.13	0.449	0.00	0.29	0.21	316	833	530	2.77	22.13	7.56
93	93	-0.881	-0.621	-0.799	2.000	5206	10913	104	3796	57788	610	7480	Y	-322	89.63	81.36	611	0	0.13	0.496	0.00	0.31	0.21	316	834	541	2.70	24.47	8.36
93	94	-0.844	-0.691	-0.796	2.000	5313	9544	132	3747	51871	756	7529	Y	-390	86.92	82.94	673	0	0.13	0.489	0.00	0.31	0.21	324	897	616	2.52	24.31	8.31
94	94	-0.845	-0.691	-0.796	2.000	5313	10107	114	4139	52420	740	8200	Y	-404	86.92	82.94	679	0	0.13	0.533	0.00	0.33	0.21	324	902	629	2.46	26.47	9.05
94	95	-0.804	-0.768	-0.792	2.000	5440	8689	142	4095	45487	886	8255	Y	-474	83.55	84.78	748	0	0.13	0.524	0.00	0.33	0.21	333	973	704	2.35	26.25	8.98
95	95	-0.804	-0.768	-0.793	2.000	5440	9656	138	4466	46436	884	8866	Y	-490	83.55	84.78	754	0	0.13	0.563	0.00	0.35	0.21	333	978	722	2.22	28.20	9.64

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Maximum LL Torsion @ t=00																											
95	96	-0.761	-0.850	-0.789	2.000	5587	6144	244	4469	36435	1109	8968	Y	-562	79.52	86.94	826	0	0.13	0.554	0.00	0.34	0.21	344	1053	838	1.82	28.05	9.59
96	96	-0.761	-0.850	-0.789	2.000	5587	9145	154	4767	39416	1021	9460	Y	-576	79.52	86.94	834	0	0.13	0.585	0.00	0.36	0.21	344	1060	809	2.10	29.59	10.12
96	97	-0.716	-0.935	-0.786	2.000	5756	5666	255	4860	28466	1244	9651	Y	-647	74.83	89.42	884	0	0.13	0.579	0.00	0.35	0.37	636	1369	927	2.57	29.63	10.13
97	97	-0.716	-0.935	-0.786	2.000	5756	5792	234	5080	28568	1223	10012	Y	-664	74.83	89.42	893	0	0.13	0.601	0.00	0.37	0.37	636	1376	928	2.62	30.74	10.51
97	98	-0.671	-1.020	-0.783	2.000	5941	4516	259	5237	18829	1371	10267	Y	-732	69.46	92.12	944	0	0.13	0.597	0.00	0.36	0.37	655	1439	1010	2.46	30.91	10.57
98	98	-0.671	-1.021	-0.783	2.000	5941	4939	259	5434	19225	1372	10544	Y	-747	69.46	92.12	952	0	0.13	0.613	0.00	0.37	0.37	655	1446	1019	2.42	31.75	10.85
98	99	-0.625	-1.106	-0.780	2.000	6147	3413	285	5584	8236	1521	10792	Y	-812	63.56	95.13	1003	0	0.13	0.606	0.00	0.37	0.37	677	1512	1101	2.29	31.83	10.88
99	99	-0.624	-1.107	-0.780	2.000	6147	3675	278	5677	8464	1535	10742	Y	-1153	63.56	95.13	1174	0	0.13	0.604	0.00	0.37	0.37	677	1665	1107	2.76	31.68	10.83
99	100	-0.604	-1.034	-0.752	2.000	6326	2002	304	5814	-3852	1687	10978	Y	-1217	80.14	98.42	1226	0	0.13	0.599	0.00	0.36	0.37	700	1734	1190	2.62	31.82	10.88
100	100	-0.603	-1.035	-0.752	2.000	6326	694	276	5933	-5195	1660	11030	Y	-1215	80.14	98.42	1225	0	0.13	0.602	0.00	0.37	0.37	700	1733	1178	2.70	31.97	10.93
100	101	-0.578	-0.979	-0.730	2.000	6481	-354	311	6064	-17932	1827	11259	Y	-1289	90.41	102.02	1284	0	0.13	0.600	0.00	0.36	0.37	726	1809	1269	2.56	32.17	11.00
101	101	-0.578	-0.980	-0.730	2.000	6481	-1662	281	6135	-19281	1798	11161	Y	-1295	90.41	102.02	1288	0	0.13	0.595	0.00	0.36	0.37	726	1812	1251	2.68	31.89	10.90
101	102	-0.899	-1.085	-0.972	2.000	6699	-3999	299	6249	-34502	1978	11373	Y	-2516	104.40	105.89	1922	0	0.13	0.586	0.00	0.36	0.37	753	2408	1348	4.06	31.87	10.90
102	102	-0.898	-1.086	-0.972	2.000	6699	-3353	312	6264	-33900	1992	11108	Y	-2530	104.40	105.89	1929	0	0.13	0.573	0.00	0.35	0.37	753	2414	1347	4.02	31.13	10.64
102	103	-1.000	-0.860	-0.943	2.000	6939	-5943	330	6378	-50741	2185	11321	Y	-2277	123.30	110.97	1835	0	0.13	0.564	0.00	0.35	0.37	790	2362	1450	3.49	31.09	10.63
103	103	-0.999	-0.861	-0.942	2.000	6939	-6011	326	6329	-50848	2182	10873	Y	-2292	123.30	110.97	1842	0	0.13	0.541	0.00	0.34	0.37	790	2369	1434	3.57	29.86	10.21
103	104	-0.999	-0.825	-0.925	2.000	7199	-8629	344	6440	-69153	2379	11083	Y	-1564	137.16	123.44	1556	0	0.13	0.532	0.00	0.33	0.37	878	2191	1539	2.74	29.80	10.19
104	104	-0.999	-0.826	-0.925	2.000	7199	-8563	339	6312	-69117	2376	10431	Y	-1582	137.16	123.44	1565	0	0.13	0.501	0.00	0.32	0.37	878	2199	1517	2.85	28.05	9.59
104	105	-0.921	-0.869	-0.898	2.000	7476	-11314	357	6417	-89040	2580	10635	Y	-1279	148.32	133.49	1477	0	0.13	0.491	0.00	0.31	0.37	950	2184	1626	2.47	28.00	9.57
105	105	-0.920	-0.868	-0.897	2.000	7476	-11239	359	6163	-88981	2571	9824	Y	-985	148.32	133.49	1329	99	0.13	0.454	0.00	0.29	0.37	950	2051	1596	2.22	25.86	8.84
105	106	-0.793	-1.024	-0.894	2.000	7821	-14166	377	6260	-110498	2779	10020	Y	-614	157.36	141.63	1134	410	0.31	0.443	0.00	0.37	0.37	997				25.73	8.80
106	106	-0.789	-1.020	-0.890	2.000	7821	-16230	99	8799	-112574	2491	11635	Y	-131	157.36	141.63	882	502	0.38	0.514	0.00	0.44	0.37	995				29.88	10.22
106	107	-0.728	-1.108	-0.894	2.000	7821	-16491	103	8804	-119075	2547	11671	Y	0	157.58	141.82	799	616	0.46	0.516	0.00	0.49	0.37	993				29.98	10.25
107	107	-0.695	-1.186	-0.910	2.000	7821	-14763	-491	8717	-120711	-2847	12859	Y	718	157.58	141.82	1167	415	0.31	0.568	0.00	0.44	0.37	995				33.03	11.29
107	108	-0.750	-1.157	-0.927	2.000	7821	-14705	-469	8665	-114634	-2773	12839	Y	788	155.99	140.39	1208	333	0.25	0.567	0.00	0.41	0.37	988				32.97	11.27
108	108	-0.750	-1.157	-0.928	2.000	7821	-14820	-458	6206	-114769	-2759	9423	Y	781	155.99	140.39	1205	329	0.25	0.416	0.00	0.33	0.37	988				24.20	8.27
108	109	-0.878	-1.047	-0.952	2.000	7476	-11910	-437	5829	-94056	-2551	9145	Y	999	146.32	131.68	1311	107	0.13	0.423	0.00	0.28	0.37	935	2021	1565	2.13	24.08	8.23
109	109	-0.880	-1.047	-0.953	2.000	7476	-11954	-437	5870	-94088	-2551	8500	Y	967	146.32	131.68	1293	124	0.13	0.393	0.00	0.26	0.37	934	2005	1544	2.14	22.38	7.65
109	110	-0.986	-0.964	-0.977	2.000	7199	-9252	-415	5500	-75078	-2347	8229	Y	1182	137.53	123.78	1368	0	0.13	0.395	0.00	0.26	0.37	881	2024	1434	2.55	22.13	7.56
110	110	-0.988	-0.964	-0.978	2.000	7199	-9539	-421	5570	-75346	-2352	7733	Y	1155	137.53	123.78	1354	0	0.13	0.371	0.00	0.25	0.37	881	2011	1420	2.53	20.79	7.11
110	111	-1.013	-0.955	-0.989	2.000	6939	-7020	-400	5206	-57973	-2154	7467	Y	2117	126.36	113.72	1772	0	0.13	0.372	0.00	0.25	0.37	809	2323	1313	3.77	20.50	7.01
111	111	-1.016	-0.954	-0.990	2.000	6939	-7064	-398	5278	-57992	-2152	7095	Y	2092	126.36	113.72	1759	0	0.13	0.353	0.00	0.24	0.37	809	2312	1300	3.77	19.48	6.66
111	112	-0.910	-1.180	-1.017	2.000	6699	-4852	-364	4929	-42342	-1946	6844	Y	2512	108.29	105.89	1920	0	0.13	0.353	0.00	0.24	0.37	753	2406	1189	4.60	19.18	6.56
112	112	-0.912	-1.180	-1.018	2.000	6699	-4941	-377	4974	-42404	-1957	6558	Y	2486	108.29	105.89	1907	0	0.13	0.338	0.00	0.23	0.37	753	2395	1186	4.50	18.38	6.28
112	113	-0.521	-0.964	-0.689	2.000	6481	-2995	-345	4646	-28377	-1763	6329	Y	992	98.96	102.02	1134	0	0.13	0.337	0.00	0.23	0.37	726	1674	1081	2.86	18.08	6.18
113	113	-0.514	-0.958	-0.683	2.000	6481	-3059	-343	4671	-28420	-1761	6128	Y	976	98.96	102.02	1126	0	0.13	0.327	0.00	0.23	0.37	726	1666	1074	2.86	17.51	5.99
113	114	-0.570	-0.951	-0.708	2.000	6279	-1213	-325	4352	-15689	-1609	5907	Y	928	88.34	98.42	1081	0	0.13	0.325	0.00	0.23	0.37	700	1604	991	3.04	17.20	5.88
114	114	-0.572	-0.950	-0.709	2.000	6279	-1258	-323	4352	-15722	-1606	5777	Y	918	88.34	98.42	1077	0	0.13	0.318	0.00	0.22	0.37	700	1599	985	3.05	16.82	5.75
114	115	-0.624	-0.950	-0.735	2.000	6101	405	-304	4039	-4235	-1459	5563	Y	871	78.79	95.13	1032	0	0.13	0.315	0.00	0.22	0.37	677	1538	905	3.26	16.48	5.63
115	115	-0.626	-0.949	-0.736	2.000	6101	294	-304	4038	-4340	-1458	5511	Y	858	78.79	95.13	1026	0	0.13	0.312	0.00	0.22	0.37	677	1533	903	3.25	16.33	5.58
115	116	-0.673	-0.957	-0.764	2.000	5941	1796	-286	3730	5957	-1315	5301	Y	810	57.69	92.12	983	0	0.13	0.308	0.00	0.22	0.37	655	1474	825	3.49	15.96	5.46
116	116	-0.675	-0.956	-0.765	2.000	5941	1715	-285	3749	5878	-1304	5236	Y	593	57.69	92.12	875	0	0.13	0.304	0.00	0.22	0.37	655	1377	817	3.14	15.76	5.39
116	117	-0.734	-0.873	-0.778	2.000	5756	3058	-267	3444	14936	-1164	5029	Y	543	62.13	89.42	833	0	0.13	0.302	0.00	0.22	0.37	636	1322	741	3.40	15.44	5.28
117	117	-0.736	-0.872	-0.779	2.000	5756	2971	-267	3437	14848	-1163	5097	Y	527	62.13	89.42	824	0	0.13	0.306	0.00	0.22	0.37	636	1315	742	3.37	15.65	5.35
117	118	-0.790	-0.797	-0.792	2.000	5587	3685	-251	3139	22293	-1026	4897	Y	476	65.98	86.94	783	0	0.13	0.303	0.00	0.22	0.21	344	1014	668	2.54	15.32	5.24
118	118	-0.792	-0.797	-0.793	2.000	5587	4949	-231	3140	23553	-1006	5023	Y	462	65.98	86.94	776	0	0.13	0.311	0.00	0.22	0.21	344	1008	661	2.62	15.71	5.37
118	119	-0.840	-0.732	-0.806	2.000	5440	5382	-215	2848	29741	-870	4828	Y	410	69.32	84.78	737	0	0.13	0.307	0.00	0.22	0.21	335	965	587	2.91	15.36	5.25
119	119	-0.842	-0.732	-0.807	2.000	5440	5819	-212	2874	30173	-866	5019	Y	394	69.32	84.78	729	0	0.13	0.319	0.00	0.22	0.21	335	958	591	2.86	15.96	5.46
119	120	-0.883	-0.679	-0.818	2.000	5313	6102	-196	2585	35243	-731	4829	Y	342	72.12	82.94	691	0	0.13	0.314	0.00	0.22	0.21	328	917	518	3.22	15.59	5.33
120	120	-0.885	-0.679	-0.820	2.000	5313	6864	-187	2630	35997	-722	5072	Y	328	72.12	82.94	682	0	0.13	0.330	0.00	0.23	0.21	328	909	521	3.19	16.37	5.60
120	121	-0.919	-0.638	-0.830	2.000	5206	7091	-170	2345	40051	-585	4885	Y	276	74.38	81.36	632	0	0.13	0.324	0.00	0.23	0.21	320	857	447	3.58	15.98	5.46
121	121	-0.921	-0.638	-0.831	2.000	5206	9470	-142	2449	42421	-558	5214	Y	262	74.38	81.36	617	0	0.13	0.346	0.00	0.24	0.21	319	843	444	3.69	17.06	5.83
121	122	-0.947	-0.611	-0.841	2.000	5116	9760	-118	2172	45583	-416	5036	Y	210	76.10	80.06	573	0	0.13	0.340	0.00	0.23	0.21	313	798	367	4.37	16.66	5.69
122	122	-0.949	-0.611	-0.842	2.000	5116	11746	-94	2343	47560	-391	5451	Y	194	76.10	80.06	559	0	0.13	0.368	0.00	0.25	0.21	313	785	368	4.46	18.03	6.16
122	123	-0.966	-0.597	-0.850	2.000	5049	11589	-70	2072	49324	-250	5278	Y	141	77.29	79.07	522	0	0.13	0.361	0.00	0.25	0.21	308	747	292	5.52	17.61	6.02
123	123	-0.968	-0.597	-0.851	2.000	5049	10907	-80	2273	48632	-260	5737	Y	128	77.29	79.07	517	0	0.13	0.393	0.00	0.26	0.21	308	743	311	4.86	19.14	6.54
123	124	-0.977	-0.597	-0.857	2.000	5000	10655	-57	2009	49355	-120	5572	Y	74	77.94	78.35	484	0	0.13	0.385	0.00	0.26	0.21	306	711	236	6.16	18.71	6.40
124	124	-0.979	-0.597	-0.859	2.000	5000	9363	84	2317	48052	22	6144	Y	60	77.94	78.35	482	0	0.13	0.425	0.00	0.28	0.21	306	709	205	5.38	20.63	7.05
124	125	-0.979	-0.611	-0.863	2.000	4969	8809	108	2238	47530	163	6163	Y	6	78.05	77.90	451	0	0.13	0.428	0.00	0.28	0.21	304	680	276	4.23	20.78	7.10
125	125	-0.980	-0.612	-0.864	2.000	4969	9232	102	2492	47940	157	6607	Y	0	78.05	77.90	447	0	0.13	0.459	0.00	0.29	0.21	304	676	287	3.99	22.27	7.61
125	126	-0.977	-0.623	-0.865	2.000	4960	8916	115	2461	47356	219	6617	Y	-23	77.94	77.76	458	0	0.13	0.461	0.00	0.30	0.21	304	686	318	3.71	22.34	7.64
126	126	-0.978	-0.623	-0.866	2.000	4960	9457	104	2704	47882	209	7031	Y	-67	77.94	77.76	480	0	0.13	0.490	0.00	0.31	0.21	303	705	326	3.76	23.73	8.11
126	127	-0.968	-0.646	-0.867	2.000	5000	7985	135	2637	45092	357	7062	Y	-122	77.29	78.35	519	0	0.13	0.488	0.00	0.31	0.21	307	743	401	3.27	23.71	8.11

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Maximum LL Torsion @ t=00																											
127	127	-0.970	-0.646	-0.868	2.000	5000	9293	116	2994	46388	338	7674	Y	-129	77.29	78.35	519	0	0.13	0.530	0.00	0.33	0.21	306	742	411	3.17	25.77	8.81
127	128	-0.952	-0.684	-0.867	2.000	5049	7735	147	2934	42570	486	7712	Y	-185	76.10	79.07	562	0	0.13	0.528	0.00	0.33	0.21	310	785	486	2.80	25.73	8.80
128	128	-0.954	-0.684	-0.869	2.000	5049	9087	130	3287	43908	469	8301	Y	-198	76.10	79.07	565	0	0.13	0.568	0.00	0.35	0.21	310	788	497	2.73	27.70	9.47
128	129	-0.928	-0.735	-0.867	2.000	5116	7444	159	3233	39060	616	8346	Y	-254	74.38	80.06	615	0	0.13	0.563	0.00	0.35	0.21	315	837	571	2.46	27.61	9.44
129	129	-0.930	-0.734	-0.868	2.000	5116	10846	113	3611	42446	570	8937	Y	-270	74.38	80.06	613	0	0.13	0.603	0.00	0.37	0.21	314	834	567	2.57	29.56	10.11
129	130	-0.897	-0.796	-0.865	2.000	5206	9366	141	3563	36810	716	8987	Y	-326	72.12	81.36	668	0	0.13	0.596	0.00	0.36	0.21	321	891	642	2.36	29.40	10.05
130	130	-0.899	-0.796	-0.866	2.000	5206	10329	132	3935	37756	707	9544	Y	-340	72.12	81.36	673	0	0.13	0.633	0.00	0.38	0.21	321	894	655	2.26	31.22	10.67
130	131	-0.860	-0.867	-0.862	2.000	5313	8728	159	3893	31045	853	9601	Y	-397	69.32	82.94	719	0	0.13	0.624	0.00	0.38	0.21	328	942	730	2.05	30.99	10.60
131	131	-0.862	-0.867	-0.864	2.000	5313	9599	153	4238	31897	847	10095	Y	-411	69.32	82.94	726	0	0.13	0.656	0.00	0.39	0.21	328	949	742	1.98	32.59	11.14
131	132	-0.818	-0.948	-0.859	2.000	5440	6136	257	4225	22363	1070	10180	Y	-469	65.98	84.78	766	0	0.13	0.646	0.00	0.39	0.21	335	991	857	1.52	32.38	11.07
132	132	-0.820	-0.948	-0.860	2.000	5440	8537	172	4517	24743	986	10578	Y	-486	65.98	84.78	775	0	0.13	0.672	0.00	0.40	0.21	335	999	827	1.75	33.64	11.50
132	133	-0.771	-1.034	-0.855	2.000	5587	5026	272	4599	14193	1206	10758	Y	-544	62.11	86.94	817	0	0.13	0.665	0.00	0.40	0.37	619	1292	943	2.24	33.65	11.50
133	133	-0.773	-1.035	-0.856	2.000	5587	5804	262	4783	14948	1196	10999	Y	-559	62.11	86.94	825	0	0.13	0.680	0.00	0.40	0.37	619	1299	945	2.26	34.40	11.76
133	134	-0.722	-1.126	-0.851	2.000	5756	4431	285	4945	5562	1340	11259	Y	-617	57.74	89.42	869	0	0.13	0.676	0.00	0.40	0.37	636	1355	1026	2.10	34.57	11.82
134	134	-0.723	-1.127	-0.852	2.000	5756	4466	274	5077	5568	1338	11281	Y	-873	57.74	89.42	998	0	0.13	0.677	0.00	0.40	0.37	636	1471	1025	2.50	34.63	11.84
134	135	-0.690	-1.089	-0.825	2.000	5901	2895	299	5229	-5075	1486	11532	Y	-932	75.21	92.12	1044	0	0.13	0.675	0.00	0.40	0.37	655	1530	1107	2.34	34.86	11.92
135	135	-0.691	-1.090	-0.826	2.000	5901	3178	297	5352	-4821	1484	11588	Y	-940	75.21	92.12	1048	0	0.13	0.678	0.00	0.40	0.37	655	1533	1108	2.34	35.04	11.98
135	136	-0.654	-1.063	-0.800	2.000	6067	1343	322	5495	-16744	1638	11830	Y	-998	84.92	95.13	1096	0	0.13	0.674	0.00	0.40	0.37	677	1596	1193	2.20	35.17	12.02
136	136	-0.655	-1.064	-0.800	2.000	6067	1398	315	5570	-16721	1631	11754	Y	-1011	84.92	95.13	1102	0	0.13	0.669	0.00	0.40	0.37	677	1601	1187	2.24	34.94	11.94
136	137	-0.615	-1.044	-0.775	2.000	6252	-572	340	5705	-29833	1789	11987	Y	-1071	95.57	98.42	1153	0	0.13	0.662	0.00	0.40	0.37	700	1668	1273	2.13	34.99	11.96
137	137	-0.615	-1.045	-0.775	2.000	6252	-1935	311	5725	-31236	1760	11761	Y	-1081	95.57	98.42	1155	0	0.13	0.650	0.00	0.39	0.37	700	1670	1251	2.25	34.33	11.74
137	138	-0.953	-1.223	-1.058	2.000	6456	-3267	346	5849	-44893	1955	11983	Y	-2426	105.18	102.02	1853	0	0.13	0.641	0.00	0.39	0.37	726	2321	1356	3.70	34.32	11.73
138	138	-0.953	-1.224	-1.058	2.000	6456	-4366	336	5831	-46036	1946	11605	Y	-2450	105.18	102.02	1865	0	0.13	0.621	0.00	0.38	0.37	726	2332	1340	3.82	33.24	11.36
138	139	-1.050	-0.997	-1.028	2.000	6681	-7070	354	5945	-62407	2135	11817	Y	-2095	122.50	110.25	1739	0	0.13	0.611	0.00	0.37	0.37	784	2271	1441	3.28	33.17	11.34
139	139	-1.049	-0.997	-1.028	2.000	6681	-7085	350	5883	-62462	2132	11273	Y	-2122	122.50	110.25	1753	0	0.13	0.583	0.00	0.36	0.37	784	2284	1422	3.39	31.64	10.82
139	140	-1.033	-0.996	-1.017	2.000	6927	-9901	368	5993	-80350	2325	11481	Y	-1236	133.75	120.38	1373	0	0.13	0.573	0.00	0.35	0.37	857	2007	1525	2.29	31.56	10.79
140	140	-1.033	-0.996	-1.018	2.000	6927	-9785	364	5870	-80268	2322	10741	Y	-1262	133.75	120.38	1386	0	0.13	0.536	0.00	0.33	0.37	857	2019	1500	2.41	29.53	10.09
140	141	-0.930	-1.069	-0.989	2.000	7190	-12739	382	5975	-99736	2521	10945	Y	-1025	142.64	128.38	1279	121	0.13	0.526	0.00	0.33	0.37	907	1968	1606	1.95	29.45	10.07
141	141	-0.929	-1.069	-0.988	2.000	7190	-12594	383	5728	-99618	2518	10009	Y	-789	142.64	128.38	1155	244	0.20	0.481	0.00	0.34	0.37	906	1855	1575	1.75	26.93	9.21
141	142	-0.794	-1.241	-0.984	2.000	7513	-15716	401	5830	-120683	2720	10209	Y	-545	150.43	135.39	1024	487	0.38	0.469	0.00	0.43	0.37	946				26.80	9.16
142	142	-0.791	-1.236	-0.981	2.000	7513	-16377	100	8212	-121327	2332	12827	Y	-80	150.43	135.39	787	508	0.40	0.590	0.00	0.49	0.37	945				33.68	11.51
142	143	-0.733	-1.323	-0.985	2.000	7513	-17980	119	8149	-128751	2400	12795	Y	0	150.51	135.46	729	604	0.48	0.588	0.00	0.53	0.37	942				33.60	11.49
143	143	-0.733	-1.322	-0.985	2.000	7513	-15237	-417	7542	-125998	-2821	-1402	N	0	150.51	135.46	725	842	0.67	Not Reqd	0.00	0.33	0.37	941				0.00	0.00
143	144	-0.798	-1.231	-0.983	2.000	7513	-15385	-392	7427	-120008	-2746	-1486	N	113	150.43	135.39	798	728	0.57	Not Reqd	0.00	0.29	0.37	944				0.00	0.00
144	144	-0.802	-1.235	-0.987	2.000	7513	-15547	-461	5920	-120156	-2898	-2834	Y	579	150.43	135.39	1039	571	0.45	0.130	0.00	0.29	0.37	946				-7.44	-2.54
144	145	-0.951	-1.061	-0.997	2.000	7190	-12656	-441	5531	-98379	-2693	-3125	Y	925	142.16	127.94	1221	275	0.23	0.150	0.00	0.19	0.37	903	1912	1445	2.18	-8.41	-2.87
145	145	-0.953	-1.061	-0.999	2.000	7190	-12388	-441	5528	-98039	-2697	-3803	Y	1163	142.16	127.94	1348	150	0.13	0.183	0.00	0.16	0.37	904	2027	1469	2.41	-10.23	-3.50
145	146	-1.059	-1.002	-1.036	2.000	6929	-9671	-420	5155	-77868	-2495	-4078	Y	1493	132.19	118.97	1493	0	0.13	0.203	0.00	0.17	0.37	847	2105	1376	2.96	-11.21	-3.83
146	146	-1.061	-1.002	-1.036	2.000	6929	-9648	-420	5163	-77762	-2494	-4667	Y	1467	132.19	118.97	1480	0	0.13	0.233	0.00	0.18	0.37	847	2094	1395	2.87	-12.83	-4.39
146	147	-1.073	-1.038	-1.059	2.000	6682	-7149	-399	4796	-59253	-2297	-4936	Y	2350	119.41	107.47	1849	0	0.13	0.255	0.00	0.19	0.37	765	2352	1305	3.98	-13.85	-4.74
147	147	-1.075	-1.037	-1.060	2.000	6682	-7114	-399	4829	-59129	-2296	-5361	Y	2322	119.41	107.47	1835	0	0.13	0.277	0.00	0.20	0.37	765	2340	1317	3.91	-15.05	-5.14
147	148	-0.954	-1.303	-1.089	2.000	6458	-4884	-364	4472	-42296	-2091	-5619	Y	2731	100.65	102.02	2006	0	0.13	0.301	0.00	0.22	0.37	726	2459	1223	4.82	-16.09	-5.50
148	148	-0.956	-1.302	-1.090	2.000	6458	-5230	-388	4512	-42549	-2113	-5908	Y	2707	100.65	102.02	1993	0	0.13	0.316	0.00	0.22	0.37	726	2447	1243	4.58	-16.92	-5.78
148	149	-0.559	-1.123	-0.769	2.000	6252	-3181	-355	4175	-27240	-1920	-6146	Y	1204	87.67	98.42	1211	0	0.13	0.340	0.00	0.23	0.37	699	1719	1154	2.83	-17.94	-6.13
149	149	-0.545	-1.107	-0.754	2.000	6252	-3305	-355	4214	-27276	-1919	-6316	Y	1195	87.67	98.42	1206	0	0.13	0.349	0.00	0.24	0.37	699	1715	1159	2.79	-18.44	-6.30
149	150	-0.584	-1.148	-0.785	2.000	6067	-1359	-336	3889	-13258	-1768	-6543	Y	1134	75.77	95.13	1164	0	0.13	0.373	0.00	0.25	0.37	677	1657	1090	2.95	-19.45	-6.65
150	150	-0.586	-1.146	-0.785	2.000	6067	-1459	-336	3919	-13277	-1767	-6625	Y	1122	75.77	95.13	1158	0	0.13	0.377	0.00	0.25	0.37	677	1651	1093	2.91	-19.69	-6.73
150	151	-0.620	-1.195	-0.814	2.000	5901	324	-318	3599	-479	-1620	-6848	Y	1060	64.91	92.12	1108	0	0.13	0.401	0.00	0.27	0.37	655	1587	1026	3.06	-20.70	-7.08
151	151	-0.621	-1.193	-0.815	2.000	5901	187	-318	3621	-540	-1620	-6852	Y	1052	64.91	92.12	1104	0	0.13	0.401	0.00	0.27	0.37	655	1583	1026	3.04	-20.72	-7.08
151	152	-0.650	-1.248	-0.841	2.000	5756	1813	-299	3305	11079	-1478	-7070	Y	987	69.01	89.42	1055	0	0.13	0.424	0.00	0.28	0.37	636	1522	962	3.20	-21.70	-7.42
152	152	-0.651	-1.246	-0.841	2.000	5756	1728	-300	3349	11073	-1471	-7069	Y	727	69.01	89.42	925	0	0.13	0.424	0.00	0.28	0.37	636	1405	959	2.74	-21.70	-7.42
152	153	-0.701	-1.159	-0.847	2.000	5587	3207	-282	3036	21488	-1331	-7284	Y	661	74.31	86.94	876	0	0.13	0.450	0.00	0.29	0.21	344	1098	896	1.85	-22.78	-7.79
153	153	-0.702	-1.158	-0.847	2.000	5587	3063	-282	3061	21416	-1330	-7150	Y	646	74.31	86.94	868	0	0.13	0.442	0.00	0.29	0.21	344	1091	891	1.84	-22.36	-7.64
153	154	-0.750	-1.069	-0.851	2.000	5440	4390	-264	2754	30701	-1192	-7359	Y	582	78.99	84.78	821	0	0.13	0.467	0.00	0.30	0.21	335	1041	828	1.97	-23.41	-8.00
154	154	-0.752	-1.068	-0.852	2.000	5440	4243	-257	2790	30623	-1184	-7160	Y	565	78.99	84.78	813	0	0.13	0.455	0.00	0.29	0.21	335	1033	818	1.99	-22.77	-7.79
154	155	-0.797	-0.980	-0.855	2.000	5313	5363	-239	2487	38727	-1047	-7364	Y	505	83.07	82.94	744	0	0.13	0.479	0.00	0.30	0.21	325	962	756	2.04	-23.78	-8.13
155	155	-0.799	-0.979	-0.856	2.000	5313	5327	-236	2537	38760	-1043	-7102	Y	491	83.07	82.94	736	0	0.13	0.462	0.00	0.30	0.21	325	955	746	2.06	-22.93	-7.84
155	156	-0.839	-0.897	-0.858	2.000	5206	6275	-218	2239	45726	-906	-7302	Y	431	86.59	81.36	674	0	0.13	0.485	0.00	0.31	0.21	317	892	684	2.16	-23.89	-8.17
156	156	-0.841	-0.897	-0.859	2.000	5206	8226	-186	2355	47743	-873	-6933	Y	416	86.59	81.36	661	0	0.13	0.460	0.00	0.29	0.21	316	880	655	2.34	-22.68	-7.75
156	157	-0.877	-0.823	-0.860	2.000	5116	9600	-156	2064	54174	-725	-7126	Y	346	89.48	80.53	604	0	0.13	0.481	0.00	0.31	0.21	311	823	588	2.64	-23.57	-8.06
157	157	-0.879	-0.823	-0.861	2.000	5116	9867	-151	2228	54507	-718	-6675	Y	329	89.48	80.53	594	0	0.13	0.451	0.00	0.29	0.21	311	815	570	2.68	-22.08	-7.55
157	158	-0.912	-0.757	-0.863	2.000	5049	10626	-126	1948	59365	-576	-6857	Y	248	91.67	82.50	556	0	0.13	0.469	0.00	0.30	0.21	317	786	505	3.26	-22.88	-7.82
158	158	-0.914	-0.757	-0.864	2.000	5049	12554	-106	2176	61359	-555	-6313	Y	233	91.67	82.50	544	0	0.13	0.432	0.00	0.28	0.21	317	774	477	3.44	-21.06	-7.20

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

$f'c$ = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Permanent Loads + Maximum LL Torsion @ t=00																	(kip)	(kip)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(kip)	(kip)	(kip)		Total Long.	Equivalent
		(ksi)	(ksi)	(ksi)		(k-ft)	Ultimate	Ultimate	Ultimate				Investigate	Shear from	(in)	(in)	Concrete	Required	Required	Additional	Additional	Total		Provided	Nominal			Mild Steel	PT Steel Req'd
		Perm Load	Perm Load	Dead Load	Stress	Torsional	Corresp.	Max	Corresp.	TOTAL	TOTAL	TOTAL	Torsional	Primary	Depth	Effective	Shear	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Shear	Ultimate	Shear	Required	for Torsion
		Stress	Stress	Stress	Variable	Cracking	Live Load	Live Load	Live Load	Ultimate	Ultimate	Ultimate	Effects?	Post Tensioning	to Tensile	Shear	Resistance	Resistance	Area	Required	Req'd from	Required	Provided	Resistance	Resistance	Shear	Rating	for Torsion	(based on fpe)
Member	Node	(top fiber)	(bott. fiber)	(neutr. axis)	'K'	Moment	Moment	Shear	Torsion	Moment	Shear	Torsion	(Y/N)	Effect	Reinforcement	Depth	per web	per web	per web	for Torsion	Transverse	per leg	per leg	per web	per web	per web	Factor, RF	(Al)	(Al)
Number	Number			(fpc)		(Tcr)				(Mu)	(Vu)	(Tu)		(Vp)	d_e	d_v	(Vc)	(Vs-req'd)	(Av)	(At)	A_v (trans)	(As_req'd)	As_prov'd)	(Vs_prov)	(ϕVn)	(Vu)		in^2	in^2
158	159	-0.943	-0.701	-0.866	2.000	5000	12955	-81	1904	64905	-413	-6487	Y	159	93.09	83.78	508	0	0.13	0.448	0.00	0.29	0.21	321	746	411	4.32	-21.78	-7.45
159	159	-0.945	-0.700	-0.868	2.000	5000	12200	-93	2164	64217	-423	-5890	Y	144	93.09	83.78	502	0	0.13	0.407	0.00	0.27	0.21	321	741	398	3.99	-19.78	-6.76
159	160	-0.965	-0.661	-0.870	2.000	4969	11328	16	1939	65537	-198	-6017	Y	99	93.96	84.57	485	0	0.13	0.418	0.00	0.27	0.21	324	728	289	7.33	-20.28	-6.93
160	160	-0.966	-0.661	-0.870	2.000	4969	12170	48	2109	66422	-165	-5600	Y	75	93.96	84.57	471	0	0.13	0.389	0.00	0.26	0.21	324	715	259	6.04	-18.88	-6.45
160	161	-0.971	-0.652	-0.871	2.000	4969	11378	62	2087	66269	-101	-5580	Y	65	94.23	84.81	469	0	0.13	0.388	0.00	0.26	0.21	325	715	227	6.02	-18.81	-6.43
161	161	-0.972	-0.651	-0.871	2.000	4969	12598	47	2364	67532	-115	-5054	Y	41	94.23	84.81	453	0	0.13	0.351	0.00	0.24	0.21	325	700	217	5.91	-17.04	-5.83
161	162	-0.977	-0.646	-0.872	2.000	5000	11481	80	2318	67253	35	-5002	Y	-48	94.52	85.07	460	0	0.13	0.346	0.00	0.24	0.21	326	708	175	5.70	-16.80	-5.74
162	162	-0.980	-0.643	-0.874	2.000	5000	12779	51	2724	68619	6	-4236	Y	-63	94.52	85.07	463	0	0.13	0.293	0.00	0.21	0.21	326	710	137	6.14	-14.22	-4.86
162	163	-0.982	-0.628	-0.871	2.000	5049	11621	83	2684	67346	156	-4177	Y	-130	93.99	84.59	497	0	0.13	0.286	0.00	0.21	0.21	324	739	210	5.19	-13.93	-4.76
163	163	-0.986	-0.626	-0.873	2.000	5049	12964	61	3102	68759	135	-3401	Y	-144	93.99	84.59	501	0	0.13	0.233	0.00	0.18	0.21	324	742	175	5.42	-11.35	-3.88
163	164	-0.981	-0.629	-0.870	2.000	5116	11721	93	3067	66449	284	-3337	Y	-213	92.84	83.56	533	0	0.13	0.225	0.00	0.18	0.21	320	767	247	4.63	-11.04	-3.77
164	164	-0.985	-0.627	-0.872	2.000	5116	12897	75	3484	67697	268	-2570	Y	-230	92.84	83.56	539	0	0.13	0.174	0.00	0.15	0.21	320	773	215	4.77	-8.50	-2.91
164	165	-0.972	-0.646	-0.869	2.000	5206	11535	107	3453	64311	417	-2503	Y	-299	91.06	81.95	569	0	0.13	0.166	0.00	0.15	0.37	565	1020	287	5.52	-8.19	-2.80
165	165	-0.977	-0.643	-0.872	2.000	5206	12607	94	3856	65458	405	-1764	Y	-313	91.06	81.95	574	0	0.13	0.117	0.00	0.12	0.37	565	1025	258	5.54	-5.77	-1.97
165	166	-0.958	-0.676	-0.869	2.000	5313	9367	200	3848	59234	630	-1674	Y	-381	88.63	82.94	627	0	0.13	0.109	0.00	0.12	0.37	575	1082	368	4.22	-5.40	-1.85
166	166	-0.965	-0.673	-0.872	2.000	5313	11749	122	4201	61697	552	-1002	N	-396	88.63	82.94	630	0	0.13	Not Reqd	0.00	0.06	0.37	574	1084	276	14.26	0.00	0.00
166	167	-0.940	-0.716	-0.869	2.000	5440	9125	225	4290	55125	775	-815	N	-462	85.57	84.78	691	0	0.13	Not Reqd	0.00	0.06	0.37	590	1153	388	7.80	0.00	0.00
167	167	-0.947	-0.713	-0.873	2.000	5440	9164	212	4551	55253	763	-256	N	-480	85.57	84.78	700	0	0.13	Not Reqd	0.00	0.06	0.37	590	1162	382	8.35	0.00	0.00
167	168	-0.918	-0.762	-0.869	2.000	5587	8062	237	4704	49232	908	-5	N	-545	81.88	86.94	764	0	0.13	Not Reqd	0.00	0.06	0.37	609	1236	454	7.59	0.00	0.00
168	168	-0.927	-0.759	-0.874	2.000	5587	8556	230	4924	49826	902	496	N	-561	81.88	86.94	771	0	0.13	Not Reqd	0.00	0.06	0.37	609	1242	451	7.87	0.00	0.00
168	169	-0.894	-0.814	-0.868	2.000	5756	7160	257	5062	42536	1050	732	N	-624	77.63	89.42	840	0	0.13	Not Reqd	0.00	0.06	0.37	631	1324	525	7.21	0.00	0.00
169	169	-0.905	-0.810	-0.874	2.000	5756	6594	236	5227	42088	1030	1171	N	-800	77.63	89.42	935	0	0.13	Not Reqd	0.00	0.06	0.37	632	1411	515	8.60	0.00	0.00
169	170	-0.878	-0.812	-0.857	2.000	5935	4770	252	5341	33365	1170	1383	N	-859	71.57	92.12	1008	0	0.13	Not Reqd	0.00	0.06	0.37	655	1497	585	8.24	0.00	0.00
170	170	-0.891	-0.808	-0.864	2.000	5935	4701	238	5520	33442	1156	1852	Y	-874	71.57	92.12	1015	0	0.13	0.108	0.00	0.12	0.37	655	1503	636	3.95	5.58	1.91
170	171	-0.861	-0.807	-0.842	2.000	6109	2852	255	5632	23692	1298	2063	Y	-939	66.44	95.13	1066	0	0.13	0.117	0.00	0.12	0.37	677	1569	714	3.80	6.11	2.09
171	171	-0.877	-0.803	-0.852	2.000	6109	2915	249	5766	23941	1291	2530	Y	-957	66.44	95.13	1075	0	0.13	0.143	0.00	0.14	0.37	677	1577	725	3.78	7.49	2.56
171	172	-0.843	-0.799	-0.827	2.000	6295	933	266	5875	13037	1438	2737	Y	-1030	60.87	98.42	1133	0	0.13	0.150	0.00	0.14	0.37	700	1650	805	3.65	7.96	2.72
172	172	-0.863	-0.795	-0.839	2.000	6295	1090	275	5964	13431	1721	3217	Y	-1044	60.87	98.42	1140	0	0.13	0.177	0.00	0.15	0.37	700	1656	962	3.13	9.35	3.20
172	173	-0.789	-0.858	-0.814	2.000	6515	-1141	288	6067	-988	1867	3418	Y	-1071	87.58	102.02	1176	0	0.13	0.181	0.00	0.16	0.37	726				9.74	3.33

1.38

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Minimum LL Torsion @ t=00																									
1	1	0.001	0.000	0.001	1.003	2487	-108	6	-118	-112	6	-524	N	0	0.00	77.76	439	0	0.13	Not Reqd	0.00	0.06	0.37	545				0.00	0.00
1	2	0.001	-0.001	0.001	1.002	2485	-91	104	-1297	-118	130	-1681	Y	0	65.57	77.76	436	0	0.13	0.117	0.00	0.12	0.37	544	883	118	9.21	-5.67	-1.94
2	2	-0.254	-0.454	-0.317	1.801	4465	-98	-218	-3015	-128	-731	-3662	Y	352	65.57	77.76	607	0	0.13	0.255	0.00	0.19	0.37	543	1035	481	3.71	-12.36	-4.23
2	3	-0.256	-0.449	-0.317	1.800	4464	51	-215	-2989	375	-718	-3627	Y	351	43.34	77.76	607	0	0.13	0.253	0.00	0.19	0.37	543	1035	474	3.78	-12.24	-4.19
3	3	-0.255	-0.449	-0.316	1.799	4461	4	-215	-2986	324	-718	-4000	Y	351	43.34	77.76	607	0	0.13	0.279	0.00	0.20	0.37	543	1035	485	3.72	-13.50	-4.62
3	4	-0.278	-0.404	-0.318	1.802	4468	2458	-259	-2678	6938	-622	-3574	Y	274	54.64	77.76	548	0	0.13	0.249	0.00	0.19	0.37	539	979	424	3.59	-12.06	-4.12
4	4	-0.272	-0.405	-0.314	1.795	4451	1807	-191	-2672	6256	-555	-3936	Y	274	54.64	77.76	551	0	0.13	0.274	0.00	0.20	0.37	540	982	402	4.23	-13.29	-4.54
4	5	-0.286	-0.382	-0.316	1.799	4461	4949	-180	-2435	11843	-428	-3602	Y	200	61.54	77.76	500	0	0.13	0.251	0.00	0.19	0.37	537	933	328	4.63	-12.16	-4.16
5	5	-0.281	-0.383	-0.313	1.794	4448	2891	-164	-2394	9766	-411	-3719	Y	200	61.54	77.76	506	0	0.13	0.259	0.00	0.19	0.37	538	939	323	4.91	-12.55	-4.29
5	6	-0.288	-0.376	-0.316	1.798	4459	6285	-132	-2292	14682	-263	-3518	Y	136	66.43	77.76	461	0	0.13	0.245	0.00	0.19	0.37	535	897	243	5.73	-11.87	-4.06
6	6	-0.283	-0.377	-0.313	1.792	4444	6253	-137	-2138	14627	-268	-3421	Y	136	66.43	77.76	461	0	0.13	0.238	0.00	0.18	0.37	535	897	242	5.81	-11.55	-3.95
6	7	-0.281	-0.389	-0.315	1.797	4456	7555	-95	-2143	16508	-108	-3327	Y	70	69.42	77.76	425	0	0.13	0.232	0.00	0.18	0.21	297	650	159	5.27	-11.23	-3.84
7	7	-0.276	-0.390	-0.312	1.791	4440	7145	-89	-1946	16072	-102	-3125	Y	70	69.42	77.76	426	0	0.13	0.218	0.00	0.17	0.21	297	651	150	5.73	-10.55	-3.61
7	8	-0.268	-0.417	-0.315	1.796	4454	7915	-48	-1947	16476	56	-3027	Y	-1	70.39	77.76	390	0	0.13	0.211	0.00	0.17	0.21	297	619	124	6.80	-10.22	-3.49
8	8	-0.262	-0.418	-0.311	1.789	4437	6866	-33	-1746	15396	72	-2791	Y	-1	70.39	77.76	393	0	0.13	0.194	0.00	0.16	0.21	297	621	124	7.95	-9.42	-3.22
8	9	-0.247	-0.462	-0.314	1.796	4453	7068	7	-1750	14288	228	-2696	Y	-72	69.34	77.76	429	0	0.13	0.188	0.00	0.16	0.21	297	654	199	8.73	-9.10	-3.11
9	9	-0.241	-0.463	-0.311	1.788	4435	4763	35	-1595	11948	257	-2500	Y	-72	69.34	77.76	435	0	0.13	0.174	0.00	0.15	0.21	298	660	207	7.65	-8.44	-2.88
9	10	-0.219	-0.521	-0.314	1.795	4450	5354	126	-1813	10283	465	-2619	Y	-141	66.33	77.76	472	0	0.13	0.182	0.00	0.16	0.21	298	693	315	4.14	-8.84	-3.02
10	10	-0.212	-0.523	-0.310	1.787	4431	4873	135	-1701	9765	474	-2478	Y	-141	66.33	77.76	473	0	0.13	0.173	0.00	0.15	0.21	298	694	315	4.13	-8.36	-2.86
10	11	-0.184	-0.595	-0.313	1.793	4447	4070	169	-2009	5759	625	-2688	Y	-215	61.32	77.76	519	0	0.13	0.187	0.00	0.16	0.21	300	737	397	3.30	-9.07	-3.10
11	11	-0.180	-0.596	-0.311	1.789	4437	4004	168	-1931	5672	625	-2607	Y	-215	61.32	77.76	520	0	0.13	0.182	0.00	0.16	0.21	300	737	395	3.36	-8.80	-3.01
11	12	-0.159	-0.649	-0.313	1.793	4447	3301	191	-2147	2373	723	-2759	Y	-264	57.03	77.76	553	0	0.13	0.192	0.00	0.16	0.21	301	768	449	2.96	-9.31	-3.18
12	12	-0.156	-0.650	-0.312	1.790	4439	3167	191	-2052	2220	729	-2713	Y	-377	57.03	77.76	612	0	0.13	0.189	0.00	0.16	0.21	301	822	450	3.32	-9.16	-3.13
12	13	-0.137	-0.619	-0.302	1.770	4337	1196	234	-2377	-4207	882	-2946	Y	-444	58.74	77.76	633	0	0.13	0.208	0.00	0.17	0.37	539	1055	534	3.72	-10.02	-3.43
13	13	-0.132	-0.620	-0.299	1.764	4322	-204	255	-2343	-5643	905	-2976	Y	-430	58.74	77.76	622	0	0.13	0.210	0.00	0.17	0.37	538	1044	546	3.47	-10.13	-3.46
13	14	-0.180	-0.802	-0.408	1.971	4770	-1635	282	-2698	-12419	1056	-3239	Y	-890	64.15	77.76	886	0	0.13	0.231	0.00	0.18	0.37	545	1289	630	3.91	-11.11	-3.80
14	14	-0.175	-0.803	-0.405	1.967	4759	-1652	283	-2658	-12477	1058	-3307	Y	-873	64.15	77.76	877	0	0.13	0.236	0.00	0.18	0.37	545	1280	633	3.87	-11.34	-3.88
14	15	-0.200	-0.687	-0.389	1.937	4628	-3318	310	-3029	-20516	1232	-3585	Y	-975	78.68	77.76	901	0	0.13	0.259	0.00	0.19	0.37	540	1296	729	3.26	-12.40	-4.24
15	15	-0.195	-0.688	-0.386	1.932	4618	-3403	310	-2999	-20647	1229	-3706	Y	-850	78.68	77.76	835	0	0.13	0.268	0.00	0.20	0.37	539	1237	731	3.03	-12.82	-4.38
15	16	-0.181	-0.745	-0.399	1.956	4673	-5431	338	-3410	-30723	1418	-4019	Y	-373	91.75	82.57	591	196	0.26	0.290	0.00	0.27	0.37	565				-13.90	-4.75
16	16	-0.180	-0.745	-0.399	1.955	4672	-7403	303	-3487	-32704	1407	-4805	Y	-373	91.75	82.57	587	194	0.26	0.347	0.00	0.30	0.37	564				-16.62	-5.68
16	17	-0.148	-0.822	-0.409	1.973	4715	-8100	311	-3612	-36304	1456	-4898	Y	0	92.92	83.63	393	416	0.54	0.354	0.00	0.45	0.37	568				-16.94	-5.79
17	17	-0.147	-0.823	-0.408	1.972	4714	-10356	-374	-4023	-38571	-1807	-5619	Y	0	92.92	83.63	384	620	0.81	0.406	0.00	0.61	0.37	566				-19.43	-6.64
17	18	-0.223	-0.706	-0.410	1.975	4720	-9401	-368	-4000	-33973	-1759	-5565	Y	130	92.54	83.28	459	519	0.68	0.402	0.00	0.54	0.41	630				-19.25	-6.58
18	18	-0.223	-0.706	-0.410	1.975	4719	-8263	-389	-4428	-32842	-1763	-6587	Y	130	92.54	83.28	461	519	0.68	0.476	0.00	0.58	0.41	630				-22.78	-7.79
18	19	-0.397	-0.447	-0.417	1.987	4749	-5574	-367	-4316	-19616	-1611	-6377	Y	489	86.88	78.19	648	247	0.34	0.461	0.00	0.40	0.41	600	1123	1007	1.36	-22.06	-7.54
19	19	-0.393	-0.448	-0.414	1.983	4739	-5530	-370	-4483	-19606	-1615	-6684	Y	563	86.88	78.19	686	211	0.29	0.483	0.00	0.39	0.41	600	1158	1019	1.43	-23.12	-7.90
19	20	-0.481	-0.354	-0.433	2.000	4815	-3211	-343	-4370	-7775	-1459	-6472	Y	798	75.59	77.76	841	0	0.13	0.464	0.00	0.30	0.41	606	1303	934	2.19	-22.27	-7.61
20	20	-0.476	-0.355	-0.430	2.000	4815	-3253	-346	-4449	-7844	-1462	-6624	Y	804	75.59	77.76	844	0	0.13	0.475	0.00	0.30	0.41	606	1305	940	2.16	-22.79	-7.79
20	21	-0.528	-0.314	-0.450	2.000	4852	-1142	-319	-4323	2751	-1309	-6399	Y	717	44.46	77.76	822	0	0.13	0.456	0.00	0.29	0.41	610	1289	857	2.46	-21.91	-7.49
21	21	-0.523	-0.314	-0.448	2.000	4852	-1185	-323	-4327	2686	-1314	-6411	Y	723	44.46	77.76	825	0	0.13	0.456	0.00	0.29	0.41	610	1292	859	2.45	-21.95	-7.51
21	22	-0.565	-0.277	-0.465	2.000	4887	729	-297	-4187	12078	-1164	-6173	Y	647	54.98	77.76	762	0	0.13	0.436	0.00	0.28	0.41	605	1231	777	2.62	-21.04	-7.19
22	22	-0.561	-0.277	-0.462	2.000	4887	555	-295	-4116	11886	-1162	-6051	Y	654	54.98	77.76	766	0	0.13	0.428	0.00	0.28	0.41	605	1235	772	2.67	-20.62	-7.05
22	23	-0.592	-0.244	-0.477	2.000	4924	3665	-196	-4024	21491	-942	-5861	Y	593	64.16	77.76	713	0	0.13	0.411	0.00	0.27	0.41	600	1182	656	3.34	-19.87	-6.79
23	23	-0.588	-0.245	-0.474	2.000	4924	2186	-277	-3842	19996	-1023	-5575	Y	601	64.16	77.76	720	0	0.13	0.391	0.00	0.26	0.41	601	1189	688	2.93	-18.90	-6.46
23	24	-0.610	-0.216	-0.486	2.000	4960	5257	-174	-3874	28602	-802	-5508	Y	537	72.21	77.76	669	0	0.13	0.384	0.00	0.26	0.41	597	1139	575	3.69	-18.59	-6.36
24	24	-0.607	-0.216	-0.484	2.000	4960	5052	-178	-3621	28384	-802	-5117	Y	432	72.21	77.76	615	0	0.13	0.356	0.00	0.24	0.41	596	1090	562	3.59	-17.27	-5.91
24	25	-0.627	-0.171	-0.483	2.000	4960	6449	-146	-3677	34330	-653	-5075	Y	361	79.06	77.76	565	0	0.13	0.353	0.00	0.24	0.21	296	775	487	2.53	-17.13	-5.86
25	25	-0.623	-0.171	-0.481	2.000	4960	6275	-154	-3369	34143	-661	-4589	Y	361	79.06	77.76	565	0	0.13	0.320	0.00	0.22	0.21	296	775	475	2.64	-15.49	-5.30
25	26	-0.638	-0.137	-0.480	2.000	4960	7472	-122	-3424	38947	-512	-4546	Y	286	84.61	77.76	518	0	0.13	0.317	0.00	0.22	0.21	295	731	399	2.96	-15.34	-5.25
26	26	-0.635	-0.138	-0.478	2.000	4960	7608	-143	-3085	39068	-532	-4002	Y	286	84.61	77.76	517	0	0.13	0.279	0.00	0.20	0.21	295	731	392	3.00	-13.51	-4.62
26	27	-0.643	-0.115	-0.477	2.000	4960	8702	-111	-3140	42828	-383	-3959	Y	212	88.87	79.98	486	0	0.13	0.276	0.00	0.20	0.21	302	709	317	3.54	-13.36	-4.57
27	27	-0.640	-0.116	-0.475	2.000	4960	7939	-119	-2780	42049	-391	-3375	Y	212	88.87	79.98	487	0	0.13	0.235	0.00	0.18	0.21	303	711	302	3.78	-11.39	-3.89
27	28	-0.643	-0.107	-0.474	2.000	4960	8834	-87	-2837	44666	-242	-3332	Y	139	91.84	82.66	461	0	0.13	0.232	0.00	0.18	0.21	313	697	226	4.54	-11.25	-3.85
28	28	-0.640	-0.108	-0.473	2.000	4960	8126	-105	-2472	43941	-260	-2731	Y	139	91.84	82.66	463	0	0.13	0.190	0.00	0.16	0.21	313	698	216	4.69	-9.22	-3.15
28	29	-0.636	-0.115	-0.472	2.000	4960	8890	-73	-2532	45485	-111	-2692	Y	65	93.56	84.20	433	0	0.13	0.188	0.00	0.16	0.21	319	676	141	5.60	-9.09	-3.11
29	29	-0.633	-0.115	-0.470	2.000	4960	7919	-84	-2174	44495	-122	-2093	Y	65	93.56	84.20	435	0	0.13	0.146	0.00	0.14	0.21	319	678	127	5.98	-7.07	-2.42
29	30	-0.623	-0.139	-0.471	2.000	4960	8460	-53	-2240	44874	26	-2061	Y	-10	94.02	84.62	409	0	0.13	0.144	0.00	0.14	0.21	320	657	78	6.95	-6.96	-2.38
30	30	-0.621	-0.139	-0.469	2.000	4960	9875	49	-1996	46275	128	-1608	Y	-10	94.02	84.62	404	0	0.13	0.112	0.00	0.12	0.21	320	652	115	7.15	-5.43	-1.86
30	31	-0.609	-0.169	-0.470	2.000	4960	9913	70	-2189	45580	236	-1728	Y	-65	93.56	84.20	431	0	0.13	0.120	0.00	0.12	0.21	318	674	172	5.82	-5.83	-1.99
31	31	-0.607	-0.170	-0.469	2.000	4960	10718	59	-2004	46370	226	-1339	N	-65	93.56	84.20	429	0	0.13	Not Reqd	0.00	0.06	0.21	318	672	113	19.85	0.00	0.00
31	32	-0.584	-0.225	-0.471	2.000	4960	10645	88	-2270	44488	371	-1507	Y	-141	91.84	82.66	461	0	0.13	0.105	0.00	0.12	0.21	312	696	233	5.00	-5.09	-1.74
32	32	-0.581	-0.226	-0.469	2.000	4960	9894	99	-2089	43715	383	-1107	N	-141	91.84	82.66	462	0	0.13	Not Reqd	0.00	0.06	0.21	313	697	192	11.17	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Minimum LL Torsion @ t=00																									
32	33	-0.552	-0.299	-0.472	2.000	4960	9485	128	-2368	40552	529	-1287	N	-219	88.87	79.98	491	0	0.13	Not Reqd	0.00	0.06	0.21	303	715	264	8.02	0.00	0.00
33	33	-0.549	-0.299	-0.471	2.000	4960	8594	138	-2221	39638	539	-942	N	-219	88.87	79.98	493	0	0.13	Not Reqd	0.00	0.06	0.21	303	717	270	7.46	0.00	0.00
33	34	-0.514	-0.389	-0.475	2.000	4960	7849	167	-2513	35194	685	-1136	N	-298	84.61	77.76	529	0	0.13	Not Reqd	0.00	0.06	0.21	296	742	343	5.78	0.00	0.00
34	34	-0.511	-0.389	-0.473	2.000	4960	5688	207	-2422	33006	726	-875	N	-298	84.61	77.76	534	0	0.13	Not Reqd	0.00	0.06	0.21	296	747	363	4.71	0.00	0.00
34	35	-0.472	-0.493	-0.478	2.000	4960	4744	231	-2731	27418	866	-1086	N	-379	79.06	77.76	588	0	0.13	Not Reqd	0.00	0.06	0.21	298	797	433	4.16	0.00	0.00
35	35	-0.468	-0.494	-0.477	2.000	4960	4282	236	-2688	26927	872	-910	N	-379	79.06	77.76	589	0	0.13	Not Reqd	0.00	0.06	0.21	298	798	436	4.07	0.00	0.00
35	36	-0.425	-0.611	-0.483	2.000	4960	3213	258	-3011	20267	1010	-1134	N	-460	72.29	77.76	646	0	0.13	Not Reqd	0.00	0.06	0.37	540	1068	505	5.36	0.00	0.00
36	36	-0.421	-0.612	-0.481	2.000	4960	3155	258	-2941	20176	1020	-986	N	-594	72.29	77.76	716	0	0.13	Not Reqd	0.00	0.06	0.37	541	1131	510	5.81	0.00	0.00
36	37	-0.387	-0.658	-0.477	2.000	4916	1876	281	-3274	12289	1160	-1221	N	-669	64.17	77.76	773	0	0.13	Not Reqd	0.00	0.06	0.37	545	1186	580	5.31	0.00	0.00
37	37	-0.383	-0.659	-0.475	2.000	4916	1858	281	-3231	12233	1161	-1146	N	-657	64.17	77.76	767	0	0.13	Not Reqd	0.00	0.06	0.37	545	1180	580	5.27	0.00	0.00
37	38	-0.644	-1.049	-0.787	2.000	4873	366	304	-3579	3103	1321	-1395	N	-1736	49.64	77.76	1356	0	0.13	Not Reqd	0.00	0.06	0.37	553	1718	660	7.96	0.00	0.00
38	38	-0.640	-1.051	-0.785	2.000	4873	323	303	-3521	3019	1320	-1370	N	-1719	49.64	77.76	1347	0	0.13	Not Reqd	0.00	0.06	0.37	553	1711	660	7.93	0.00	0.00
38	39	-0.790	-0.773	-0.783	2.000	4830	-1388	327	-3885	-7461	1487	-1635	Y	-1456	73.80	77.76	1216	0	0.13	0.117	0.00	0.12	0.37	553	1592	795	3.78	-5.62	-1.92
39	39	-0.786	-0.774	-0.782	2.000	4830	-1268	326	-3816	-7384	1487	-1668	Y	-1440	73.80	77.76	1208	0	0.13	0.119	0.00	0.12	0.37	553	1585	796	3.78	-5.73	-1.96
39	40	-0.784	-0.769	-0.778	2.000	4787	-3211	351	-4195	-19265	1659	-1949	Y	-977	82.70	77.76	977	0	0.13	0.141	0.00	0.14	0.37	553	1377	891	2.58	-6.73	-2.30
40	40	-0.781	-0.770	-0.777	2.000	4787	-3139	350	-4116	-19234	1658	-2048	Y	-962	82.70	77.76	969	0	0.13	0.148	0.00	0.14	0.37	553	1370	894	2.56	-7.07	-2.42
40	41	-0.700	-0.863	-0.765	2.000	4741	-5363	376	-4512	-32593	1834	-2345	Y	-717	89.28	80.35	863	156	0.20	0.171	0.00	0.19	0.37	572	1291	991	1.91	-8.15	-2.79
41	41	-0.696	-0.863	-0.763	2.000	4741	-5278	375	-4425	-32547	1827	-2511	Y	-557	89.28	80.35	783	232	0.30	0.183	0.00	0.24	0.37	572	1219	993	1.69	-8.73	-2.98
41	42	-0.514	-1.156	-0.771	2.000	4741	-7720	401	-4837	-47295	2004	-2824	Y	-151	92.69	83.42	549	565	0.72	0.206	0.00	0.46	0.37	585				-9.82	-3.36
42	42	-0.514	-1.156	-0.770	2.000	4741	-7983	329	-4655	-47562	1959	-3520	Y	-151	92.69	83.42	549	539	0.69	0.256	0.00	0.47	0.37	585				-12.24	-4.18
42	43	-0.430	-1.287	-0.773	2.000	4741	-8731	336	-4780	-52571	2009	-3613	Y	0	92.92	83.63	459	658	0.84	0.263	0.00	0.55	0.37	583				-12.56	-4.29
43	43	-0.430	-1.287	-0.772	2.000	4741	-8324	-178	-4640	-52166	-1745	-3882	Y	0	92.92	83.63	464	505	0.64	0.283	0.00	0.46	0.37	584				-13.50	-4.61
43	44	-0.511	-1.161	-0.770	2.000	4741	-7771	-168	-4750	-47624	-1693	-3961	Y	76	92.80	83.52	516	424	0.54	0.289	0.00	0.41	0.37	586				-13.77	-4.71
44	44	-0.510	-1.161	-0.770	2.000	4741	-7296	-382	-4459	-47153	-1884	-4488	Y	76	92.80	83.52	514	533	0.68	0.327	0.00	0.50	0.37	586				-15.60	-5.33
44	45	-0.715	-0.843	-0.766	2.000	4741	-4658	-360	-4351	-33033	-1710	-4281	Y	313	90.99	81.89	670	280	0.36	0.312	0.00	0.33	0.37	583	1128	990	1.43	-14.89	-5.09
45	45	-0.714	-0.845	-0.766	2.000	4741	-4622	-362	-4514	-33018	-1718	-4701	Y	474	90.99	81.89	751	203	0.26	0.343	0.00	0.30	0.37	583	1200	1007	1.60	-16.34	-5.59
45	46	-0.848	-0.695	-0.789	2.000	4786	-2343	-335	-4401	-20424	-1540	-4489	Y	706	87.01	78.31	845	11	0.13	0.324	0.00	0.23	0.37	557	1262	912	2.14	-15.51	-5.30
46	46	-0.846	-0.695	-0.788	2.000	4786	-2387	-338	-4473	-20484	-1544	-4744	Y	722	87.01	78.31	852	5	0.13	0.342	0.00	0.24	0.37	557	1269	922	2.12	-16.39	-5.60
46	47	-0.873	-0.672	-0.798	2.000	4826	-329	-311	-4345	-9303	-1370	-4517	Y	1332	79.82	77.76	1154	0	0.13	0.323	0.00	0.23	0.37	553	1536	828	3.42	-15.52	-5.31
47	47	-0.871	-0.672	-0.797	2.000	4826	-373	-315	-4339	-9359	-1375	-4623	Y	1349	79.82	77.76	1162	0	0.13	0.331	0.00	0.23	0.37	553	1544	834	3.41	-15.89	-5.43
47	48	-0.740	-0.950	-0.814	2.000	4872	1482	-289	-4196	453	-1205	-4381	Y	1657	42.09	77.76	1316	0	0.13	0.311	0.00	0.22	0.37	553	1683	741	4.40	-14.96	-5.11
48	48	-0.739	-0.950	-0.813	2.000	4872	1301	-288	-4113	263	-1204	-4343	Y	1675	42.09	77.76	1326	0	0.13	0.308	0.00	0.22	0.37	553	1691	739	4.48	-14.83	-5.07
48	49	-0.487	-0.559	-0.511	2.000	4916	4410	-190	-4034	10205	-970	-4165	Y	584	50.09	77.76	775	0	0.13	0.293	0.00	0.21	0.37	552	1194	616	3.60	-14.14	-4.83
49	49	-0.486	-0.559	-0.510	2.000	4916	2872	-270	-3823	8658	-1050	-3940	Y	597	50.09	77.76	785	0	0.13	0.277	0.00	0.20	0.37	553	1204	650	3.17	-13.38	-4.57
49	50	-0.520	-0.550	-0.529	2.000	4960	5968	-167	-3866	17562	-829	-3885	Y	543	56.69	77.76	735	0	0.13	0.271	0.00	0.20	0.37	549	1156	537	4.01	-13.11	-4.48
50	50	-0.518	-0.550	-0.528	2.000	4960	5781	-173	-3607	17365	-825	-3574	Y	401	56.69	77.76	661	0	0.13	0.249	0.00	0.19	0.37	549	1089	525	3.81	-12.06	-4.12
50	51	-0.553	-0.483	-0.531	2.000	4960	7140	-140	-3662	23505	-676	-3530	Y	345	62.40	77.76	615	0	0.13	0.246	0.00	0.19	0.37	545	1044	449	4.20	-11.91	-4.07
51	51	-0.552	-0.483	-0.530	2.000	4960	7281	-158	-3342	23633	-693	-3111	Y	345	62.40	77.76	614	0	0.13	0.217	0.00	0.17	0.37	545	1043	445	4.24	-10.50	-3.59
51	52	-0.577	-0.436	-0.532	2.000	4960	8515	-126	-3397	28706	-545	-3066	Y	288	67.23	77.76	571	0	0.13	0.214	0.00	0.17	0.21	301	785	369	3.44	-10.35	-3.54
52	52	-0.575	-0.436	-0.531	2.000	4960	8168	-135	-3049	28344	-553	-2588	Y	288	67.23	77.76	572	0	0.13	0.180	0.00	0.15	0.21	302	786	358	3.61	-8.74	-2.99
52	53	-0.590	-0.409	-0.533	2.000	4960	9209	-103	-3105	32281	-404	-2547	Y	231	71.17	77.76	534	0	0.13	0.177	0.00	0.15	0.21	300	751	283	4.13	-8.60	-2.94
53	53	-0.588	-0.409	-0.532	2.000	4960	8308	-124	-2739	31364	-425	-2028	Y	231	71.17	77.76	536	0	0.13	0.141	0.00	0.14	0.21	301	753	276	4.21	-6.85	-2.34
53	54	-0.594	-0.400	-0.533	2.000	4960	9247	-92	-2799	34258	-276	-1990	Y	173	74.23	77.76	500	0	0.13	0.139	0.00	0.13	0.21	300	720	201	4.87	-6.72	-2.30
54	54	-0.593	-0.401	-0.532	2.000	4960	7737	-106	-2442	32731	-290	-1466	N	169	74.23	77.76	502	0	0.13	Not Reqd	0.00	0.06	0.21	300	722	145	11.84	0.00	0.00
54	55	-0.590	-0.409	-0.533	2.000	4969	8534	-75	-2508	34538	-142	-1434	N	111	76.39	77.90	470	0	0.13	Not Reqd	0.00	0.06	0.21	300	694	71	17.61	0.00	0.00
55	55	-0.588	-0.409	-0.532	2.000	4969	7634	-98	-2196	33621	-164	-957	N	99	76.39	77.90	466	0	0.13	Not Reqd	0.00	0.06	0.21	301	690	82	13.39	0.00	0.00
55	56	-0.579	-0.430	-0.532	2.000	5000	8216	-72	-2262	34304	-34	-935	N	46	77.58	78.35	442	0	0.13	Not Reqd	0.00	0.06	0.21	302	670	17	19.13	0.00	0.00
56	56	-0.577	-0.430	-0.531	2.000	5000	9954	38	-2019	36024	77	-528	N	39	77.58	78.35	433	0	0.13	Not Reqd	0.00	0.06	0.21	302	661	38	33.67	0.00	0.00
56	57	-0.560	-0.469	-0.531	2.000	5049	10103	66	-2290	35389	222	-700	N	-20	78.07	79.07	427	0	0.13	Not Reqd	0.00	0.06	0.21	304	658	111	17.63	0.00	0.00
57	57	-0.558	-0.469	-0.530	2.000	5049	10958	54	-2090	36223	211	-331	N	-29	78.07	79.07	429	0	0.13	Not Reqd	0.00	0.06	0.21	304	660	105	21.49	0.00	0.00
57	58	-0.533	-0.521	-0.529	2.000	5116	10977	82	-2369	34506	356	-512	N	-89	77.68	80.06	468	0	0.13	Not Reqd	0.00	0.06	0.21	308	699	178	13.74	0.00	0.00
58	58	-0.531	-0.522	-0.528	2.000	5116	9373	109	-2201	32880	385	-188	N	-99	77.68	80.06	478	0	0.13	Not Reqd	0.00	0.06	0.21	309	708	192	10.45	0.00	0.00
58	59	-0.499	-0.588	-0.527	2.000	5206	8944	137	-2489	29758	530	-377	N	-160	76.40	81.36	523	0	0.13	Not Reqd	0.00	0.06	0.21	315	754	265	8.16	0.00	0.00
59	59	-0.497	-0.588	-0.526	2.000	5206	8005	148	-2366	28796	542	-119	N	-169	76.40	81.36	530	0	0.13	Not Reqd	0.00	0.06	0.21	315	761	271	7.65	0.00	0.00
59	60	-0.460	-0.666	-0.525	2.000	5313	5674	196	-2675	22811	709	-330	N	-230	74.24	82.94	587	0	0.13	Not Reqd	0.00	0.06	0.21	323	819	354	5.74	0.00	0.00
60	60	-0.458	-0.667	-0.524	2.000	5313	5377	203	-2625	22489	718	-171	N	-239	74.24	82.94	592	0	0.13	Not Reqd	0.00	0.06	0.21	323	824	359	5.57	0.00	0.00
60	61	-0.416	-0.755	-0.524	2.000	5440	4664	224	-2933	17156	857	-381	N	-301	71.20	84.78	650	0	0.13	Not Reqd	0.00	0.06	0.21	332	884	429	5.07	0.00	0.00
61	61	-0.414	-0.756	-0.523	2.000	5440	3649	245	-2912	16113	880	-286	N	-312	71.20	84.78	659	0	0.13	Not Reqd	0.00	0.06	0.21	332	892	440	4.69	0.00	0.00
61	62	-0.369	-0.850	-0.522	2.000	5587	2590	266	-3226	9458	1021	-502	N	-375	67.26	86.94	724	0	0.13	Not Reqd	0.00	0.06	0.21	343	960	510	4.39	0.00	0.00
62	62	-0.367	-0.851	-0.521	2.000	5587	2638	266	-3221	9475	1023	-466	N	-384	67.26	86.94	729	0	0.13	Not Reqd	0.00	0.06	0.21	343	965	511	4.41	0.00	0.00
62	63	-0.320	-0.949	-0.521	2.000	5756	1397	287	-3544	1656	1165	-691	N	-447	62.45	89.42	785	0	0.13	Not Reqd	0.00	0.06	0.37	636	1279	582	5.85	0.00	0.00
63	63	-0.318	-0.950	-0.520	2.000	5756	1418	288	-3537	1642	1167	-704	N	-459	62.45	89.42	791	0	0.13	Not Reqd	0.00	0.06	0.37	636	1284	583	5.87	0.00	0.00
63	64	-0.270	-1.048	-0.520	2.000	5941	-8	309	-3870	-7355	1310	-939	N	-522	71.18	92.12	830	0	0.13	Not Reqd	0.00	0.06	0.37	654	1335	655	5.40	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
							Permanent Loads + Minimum LL Torsion @ t=00																						
64	64	-0.268	-1.050	-0.519	2.000	5941	-105	310	-3815	-7492	1326	-984	N	-727	71.18	92.12	937	0	0.13	Not Reqd	0.00	0.06	0.37	655	1433	663	5.98	0.00	0.00
64	65	-0.242	-1.005	-0.504	2.000	6098	-1725	331	-4154	-17809	1473	-1224	N	-790	81.99	95.13	943	0	0.13	Not Reqd	0.00	0.06	0.37	669	1451	736	5.31	0.00	0.00
65	65	-0.239	-1.006	-0.503	2.000	6098	-1582	331	-4131	-17712	1474	-1359	N	-793	81.99	95.13	945	0	0.13	Not Reqd	0.00	0.06	0.37	669	1452	737	5.32	0.00	0.00
65	66	-0.549	-1.183	-0.780	2.000	6273	-3399	353	-4479	-29358	1649	-1609	N	-1954	94.65	98.42	1595	0	0.13	Not Reqd	0.00	0.06	0.37	700	2065	825	8.03	0.00	0.00
66	66	-0.546	-1.184	-0.778	2.000	6273	-3371	354	-4437	-29381	1651	-1808	N	-1958	94.65	98.42	1596	0	0.13	Not Reqd	0.00	0.06	0.37	700	2067	825	8.02	0.00	0.00
66	67	-0.656	-0.934	-0.762	2.000	6470	-5397	376	-4795	-42523	1837	-2068	Y	-1678	113.28	102.02	1479	0	0.13	0.110	0.00	0.12	0.37	726	1984	984	3.95	-5.91	-2.02
67	67	-0.653	-0.935	-0.761	2.000	6470	-5343	376	-4731	-42521	1839	-2336	Y	-1690	113.28	102.02	1485	0	0.13	0.125	0.00	0.13	0.37	726	1990	993	3.95	-6.68	-2.28
67	68	-0.654	-0.896	-0.751	2.000	6686	-7586	399	-5096	-57236	2031	-2603	Y	-1113	125.82	113.24	1267	0	0.13	0.135	0.00	0.13	0.37	806	1865	1098	3.13	-7.30	-2.50
68	68	-0.652	-0.897	-0.750	2.000	6686	-7449	398	-5019	-57149	2032	-2956	Y	-1128	125.82	113.24	1275	0	0.13	0.153	0.00	0.14	0.37	806	1872	1109	3.13	-8.30	-2.84
68	69	-0.584	-0.937	-0.730	2.000	6922	-9949	422	-5394	-73521	2230	-3232	Y	-883	135.76	122.19	1154	85	0.13	0.161	0.00	0.15	0.37	860	1813	1217	2.56	-8.89	-3.04
69	69	-0.581	-0.936	-0.728	2.000	6922	-9477	413	-5327	-73095	2212	-3694	Y	-662	135.76	122.19	1038	191	0.17	0.184	0.00	0.17	0.37	859	1708	1223	2.29	-10.16	-3.47
69	70	-0.465	-1.098	-0.728	2.000	7227	-12115	436	-5713	-90948	2414	-3982	Y	-398	143.83	129.45	904	438	0.36	0.190	0.00	0.28	0.37	902				-10.68	-3.65
70	70	-0.461	-1.095	-0.725	2.000	7227	-13194	417	-7440	-92046	2398	-6732	Y	-87	143.83	129.45	738	594	0.49	0.322	0.00	0.41	0.37	900				-18.06	-6.18
70	71	-0.404	-1.184	-0.729	2.000	7227	-12825	468	-7594	-96850	2497	-6855	Y	0	143.95	129.56	682	705	0.58	0.328	0.00	0.46	0.37	898				-18.39	-6.29
71	71	-0.448	-1.089	-0.715	2.000	7227	-15172	-147	-7654	-96857	-2384	-8301	Y	0	143.95	129.56	684	640	0.53	0.397	0.00	0.46	0.37	898				-22.27	-7.61
71	72	-0.516	-0.992	-0.714	2.000	7227	-12671	-105	-7726	-88648	-2293	-8341	Y	113	143.83	129.44	761	513	0.42	0.399	0.00	0.41	0.37	902				-22.38	-7.65
72	72	-0.519	-0.996	-0.717	2.000	7227	-15146	-379	-6053	-91139	-2585	-7372	Y	425	143.83	129.44	913	523	0.43	0.352	0.00	0.39	0.37	901				-19.78	-6.76
72	73	-0.671	-0.801	-0.725	2.000	6922	-12195	-361	-5954	-71135	-2389	-7175	Y	752	135.30	121.77	1083	244	0.21	0.358	0.00	0.29	0.37	857	1746	1421	1.88	-19.73	-6.75
73	73	-0.671	-0.802	-0.725	2.000	6922	-12259	-360	-6183	-71207	-2396	-7888	Y	905	135.30	121.77	1163	168	0.15	0.394	0.00	0.27	0.37	857	1818	1447	1.99	-21.69	-7.42
73	74	-0.780	-0.705	-0.750	2.000	6673	-9479	-343	-6078	-52730	-2203	-7684	Y	1185	124.55	112.10	1296	0	0.13	0.398	0.00	0.26	0.37	798	1884	1344	2.49	-21.58	-7.38
74	74	-0.779	-0.705	-0.749	2.000	6673	-9539	-347	-6198	-52788	-2206	-8175	Y	1162	124.55	112.10	1284	0	0.13	0.423	0.00	0.28	0.37	798	1874	1361	2.39	-22.96	-7.85
74	75	-0.827	-0.678	-0.768	2.000	6442	-6891	-330	-6087	-35849	-2017	-7965	Y	1611	111.30	102.02	1445	0	0.13	0.427	0.00	0.28	0.37	726	1954	1260	2.94	-22.84	-7.81
75	75	-0.827	-0.677	-0.768	2.000	6442	-6613	-333	-6125	-35563	-2020	-8262	Y	1590	111.30	102.02	1435	0	0.13	0.443	0.00	0.29	0.37	726	1945	1271	2.87	-23.69	-8.10
75	76	-0.811	-0.764	-0.793	2.000	6232	-4001	-315	-6011	-20030	-1835	-8050	Y	1692	95.03	98.42	1464	0	0.13	0.446	0.00	0.29	0.37	700	1948	1172	3.23	-23.55	-8.05
76	76	-0.811	-0.764	-0.793	2.000	6232	-3521	-328	-5988	-19540	-1848	-8180	Y	1679	95.03	98.42	1457	0	0.13	0.453	0.00	0.29	0.37	700	1942	1182	3.15	-23.93	-8.18
76	77	-0.688	-0.650	-0.674	2.000	6043	-1523	-303	-5877	-5928	-1666	-7971	Y	1056	82.40	95.13	1125	0	0.13	0.456	0.00	0.29	0.37	677	1622	1085	2.59	-23.75	-8.12
77	77	-0.674	-0.635	-0.660	2.000	6043	-1249	-316	-5801	-5646	-1678	-7953	Y	1041	82.40	95.13	1118	0	0.13	0.455	0.00	0.29	0.37	677	1615	1090	2.54	-23.70	-8.10
77	78	-0.726	-0.620	-0.688	2.000	5870	610	-290	-5678	6662	-1522	-7732	Y	982	56.98	92.12	1069	0	0.13	0.455	0.00	0.29	0.37	655	1552	1005	2.69	-23.45	-8.02
78	78	-0.726	-0.619	-0.688	2.000	5870	401	-293	-5539	6462	-1524	-7567	Y	971	56.98	92.12	1064	0	0.13	0.445	0.00	0.29	0.37	655	1547	1001	2.70	-22.95	-7.85
78	79	-0.771	-0.611	-0.717	2.000	5721	2083	-267	-5406	17555	-1372	-7336	Y	920	63.55	89.42	1021	0	0.13	0.443	0.00	0.29	0.37	636	1492	918	2.89	-22.61	-7.73
79	79	-0.771	-0.610	-0.717	2.000	5721	2022	-278	-5223	17502	-1383	-7054	Y	909	63.55	89.42	1016	0	0.13	0.426	0.00	0.28	0.37	636	1487	914	2.88	-21.74	-7.43
79	80	-0.810	-0.611	-0.747	2.000	5587	5491	-176	-5129	29377	-1158	-6862	Y	856	69.45	86.94	973	0	0.13	0.424	0.00	0.28	0.37	619	1433	796	3.55	-21.46	-7.34
80	80	-0.811	-0.611	-0.747	2.000	5587	3174	-262	-4895	27069	-1231	-6509	Y	652	69.45	86.94	872	0	0.13	0.402	0.00	0.27	0.37	619	1341	821	2.82	-20.36	-6.96
80	81	-0.853	-0.557	-0.759	2.000	5440	6577	-157	-4889	37790	-1006	-6404	Y	594	74.80	84.78	829	0	0.13	0.407	0.00	0.27	0.37	603	1289	705	3.51	-20.37	-6.96
81	81	-0.853	-0.557	-0.759	2.000	5440	6186	-174	-4543	37405	-1022	-5846	Y	578	74.80	84.78	821	0	0.13	0.371	0.00	0.25	0.37	603	1282	696	3.54	-18.59	-6.36
81	82	-0.890	-0.512	-0.770	2.000	5313	7454	-145	-4602	45021	-873	-5806	Y	516	79.50	82.94	758	0	0.13	0.377	0.00	0.25	0.21	326	976	620	2.64	-18.74	-6.41
82	82	-0.890	-0.512	-0.770	2.000	5313	7230	-154	-4228	44802	-882	-5174	Y	503	79.50	82.94	752	0	0.13	0.336	0.00	0.23	0.21	326	970	605	2.74	-16.70	-5.71
82	83	-0.920	-0.476	-0.780	2.000	5206	8348	-124	-4289	51304	-734	-5136	Y	439	83.54	81.36	689	0	0.13	0.341	0.00	0.24	0.21	318	906	529	2.91	-16.80	-5.74
83	83	-0.921	-0.477	-0.780	2.000	5206	8105	-136	-3893	51064	-744	-4446	Y	426	83.54	81.36	683	0	0.13	0.295	0.00	0.21	0.21	318	901	512	3.03	-14.54	-4.97
83	84	-0.944	-0.449	-0.788	2.000	5116	9078	-106	-3955	56463	-596	-4410	Y	363	86.91	80.06	627	0	0.13	0.298	0.00	0.21	0.21	311	844	437	3.29	-14.59	-4.99
84	84	-0.945	-0.450	-0.788	2.000	5116	8735	-119	-3544	56121	-609	-3675	Y	347	86.91	80.06	620	0	0.13	0.248	0.00	0.19	0.21	311	838	421	3.43	-12.16	-4.16
84	85	-0.962	-0.431	-0.795	2.000	5049	9590	-89	-3610	60448	-462	-3642	Y	284	89.62	80.66	582	0	0.13	0.249	0.00	0.19	0.21	312	805	346	3.89	-12.15	-4.15
85	85	-0.963	-0.431	-0.795	2.000	5049	7563	-133	-3211	58421	-505	-2896	Y	271	89.62	80.66	580	0	0.13	0.198	0.00	0.16	0.21	313	804	344	3.74	-9.66	-3.30
85	86	-0.973	-0.423	-0.800	2.000	5000	8539	-103	-3281	61917	-358	-2867	Y	207	91.68	82.52	554	0	0.13	0.198	0.00	0.16	0.21	320	787	269	4.33	-9.63	-3.29
86	86	-0.973	-0.423	-0.800	2.000	5000	7949	-121	-2907	61325	-374	-2131	Y	195	91.68	82.52	549	0	0.13	0.147	0.00	0.14	0.21	320	782	254	4.47	-7.15	-2.45
86	87	-0.977	-0.425	-0.803	2.000	4969	8831	-91	-2984	63779	-227	-2109	Y	131	93.10	83.79	522	0	0.13	0.147	0.00	0.14	0.21	324	761	180	5.17	-7.11	-2.43
87	87	-0.977	-0.425	-0.803	2.000	4969	8361	-101	-2723	63306	-238	-1583	Y	125	93.10	83.79	520	0	0.13	0.110	0.00	0.12	0.21	324	760	169	5.32	-5.34	-1.82
87	88	-0.976	-0.430	-0.804	2.000	4960	8701	-89	-2758	64025	-176	-1576	Y	98	93.50	84.15	508	0	0.13	0.110	0.00	0.12	0.21	326	750	138	5.66	-5.32	-1.82
88	88	-0.976	-0.430	-0.804	2.000	4960	8264	-100	-2491	63584	-186	-1047	N	76	93.50	84.15	497	0	0.13	Not Reqd	0.00	0.06	0.21	326	741	93	14.01	0.00	0.00
88	89	-0.970	-0.447	-0.805	2.000	4969	8936	-71	-2578	64478	-40	-1035	N	12	94.01	84.61	468	0	0.13	Not Reqd	0.00	0.06	0.21	328	716	20	20.67	0.00	0.00
89	89	-0.971	-0.446	-0.806	2.000	4969	8460	-81	-2213	63995	-49	-296	N	-3	94.01	84.61	465	0	0.13	Not Reqd	0.00	0.06	0.21	328	713	25	18.01	0.00	0.00
89	90	-0.957	-0.474	-0.805	2.000	5000	11356	82	-2488	66164	230	-473	N	-68	93.87	84.49	487	0	0.13	Not Reqd	0.00	0.06	0.21	326	732	115	16.09	0.00	0.00
90	90	-0.958	-0.473	-0.805	2.000	5000	12342	68	-2251	67142	218	133	N	-81	93.87	84.49	492	0	0.13	Not Reqd	0.00	0.06	0.21	326	736	109	19.40	0.00	0.00
90	91	-0.938	-0.512	-0.804	2.000	5049	12256	94	-2536	65380	361	-53	N	-146	93.10	83.79	522	0	0.13	Not Reqd	0.00	0.06	0.21	324	761	181	13.29	0.00	0.00
91	91	-0.939	-0.511	-0.804	2.000	5049	12897	84	-2321	66012	352	517	N	-159	93.10	83.79	527	0	0.13	Not Reqd	0.00	0.06	0.21	323	766	176	15.01	0.00	0.00
91	92	-0.912	-0.562	-0.801	2.000	5116	12387	115	-2611	62872	501	326	N	-225	91.69	82.52	558	0	0.13	Not Reqd	0.00	0.06	0.21	319	789	250	10.34	0.00	0.00
92	92	-0.913	-0.561	-0.802	2.000	5116	10757	143	-2421	61232	529	853	N	-241	91.69	82.52	570	0	0.13	Not Reqd	0.00	0.06	0.21	319	801	265	8.51	0.00	0.00
92	93	-0.880	-0.622	-0.799	2.000	5206	10422	164	-2716	57310	668	656	N	-308	89.63	81.36	604	0	0.13	Not Reqd	0.00	0.06	0.21	316	828	334	7.02	0.00	0.00
93	93	-0.881	-0.621	-0.799	2.000	5206	7956	179	-2603	54831	684	1080	N	-322	89.63	81.36	618	0	0.13	Not Reqd	0.00	0.06	0.21	317	841	342	6.59	0.00	0.00
93	94	-0.844	-0.691	-0.796	2.000	5313	7619	213	-2903	49946	837	879	N	-390	86.92	82.94	677	0	0.13	Not Reqd	0.00	0.06	0.21	324	901	419	5.53	0.00	0.00
94	94	-0.845	-0.691	-0.796	2.000	5313	6685	208	-2844	48997	833	1218	N	-404	86.92	82.94	688	0	0.13	Not Reqd	0.00	0.06	0.21	325	911	417	5.75	0.00	0.00
94	95	-0.804	-0.768	-0.792	2.000	5440	6231	241	-3142	43029	986	1018	N	-474	83.55	84.78	754	0	0.13	Not Reqd	0.00	0.06	0.21	334	979	493	5.03	0.00	0.00
95	95	-0.804	-0.768	-0.793	2.000	5440	5806	229	-3106	42587	975	1294	N	-490	83.55	84.78	765	0	0.13	Not Reqd	0.00	0.06	0.21	334	989	487	5.38	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (Al) in^2
				Permanent Loads + Minimum LL Torsion @ t=00																									
95	96	-0.761	-0.850	-0.789	2.000	5587	5154	263	-3404	35445	1129	1094	N	-562	79.52	86.94	826	0	0.13	Not Reqd	0.00	0.06	0.21	344	1053	564	4.72	0.00	0.00
96	96	-0.761	-0.850	-0.789	2.000	5587	3997	264	-3390	34268	1131	1303	N	-576	79.52	86.94	834	0	0.13	Not Reqd	0.00	0.06	0.21	344	1060	565	4.75	0.00	0.00
96	97	-0.716	-0.935	-0.786	2.000	5756	3026	299	-3690	25825	1287	1101	N	-647	74.83	89.42	884	0	0.13	Not Reqd	0.00	0.06	0.37	636	1369	643	5.86	0.00	0.00
97	97	-0.716	-0.935	-0.786	2.000	5756	2774	282	-3690	25550	1272	1242	N	-664	74.83	89.42	893	0	0.13	Not Reqd	0.00	0.06	0.37	636	1376	636	6.25	0.00	0.00
97	98	-0.671	-1.020	-0.783	2.000	5941	1608	318	-3996	15922	1430	1034	N	-732	69.46	92.12	944	0	0.13	Not Reqd	0.00	0.06	0.37	655	1439	715	5.55	0.00	0.00
98	98	-0.671	-1.021	-0.783	2.000	5941	1332	302	-4000	15618	1415	1110	N	-747	69.46	92.12	952	0	0.13	Not Reqd	0.00	0.06	0.37	655	1446	707	5.90	0.00	0.00
98	99	-0.625	-1.106	-0.780	2.000	6147	-42	339	-4315	4781	1575	893	N	-812	63.56	95.13	1003	0	0.13	Not Reqd	0.00	0.06	0.37	677	1512	788	5.28	0.00	0.00
99	99	-0.624	-1.107	-0.780	2.000	6147	-45	320	-4265	4744	1576	800	N	-1153	63.56	95.13	1174	0	0.13	Not Reqd	0.00	0.06	0.37	677	1665	788	6.49	0.00	0.00
99	100	-0.604	-1.034	-0.752	2.000	6326	-1631	358	-4587	-7484	1741	576	N	-1217	80.14	98.42	1226	0	0.13	Not Reqd	0.00	0.06	0.37	700	1734	871	5.82	0.00	0.00
100	100	-0.603	-1.035	-0.752	2.000	6326	-1794	340	-4573	-7683	1723	524	N	-1215	80.14	98.42	1225	0	0.13	Not Reqd	0.00	0.06	0.37	700	1733	862	6.13	0.00	0.00
100	101	-0.578	-0.979	-0.730	2.000	6481	-3619	380	-4908	-21196	1896	287	N	-1289	90.41	102.02	1284	0	0.13	Not Reqd	0.00	0.06	0.37	726	1809	948	5.54	0.00	0.00
101	101	-0.578	-0.980	-0.730	2.000	6481	-3324	379	-4870	-20943	1895	155	N	-1295	90.41	102.02	1288	0	0.13	Not Reqd	0.00	0.06	0.37	726	1812	948	5.57	0.00	0.00
101	102	-0.899	-1.085	-0.972	2.000	6699	-5473	400	-5218	-35977	2079	-95	N	-2516	104.40	105.89	1922	0	0.13	Not Reqd	0.00	0.06	0.37	753	2408	1039	7.85	0.00	0.00
102	102	-0.898	-1.086	-0.972	2.000	6699	-5444	401	-5164	-35992	2081	-320	N	-2530	104.40	105.89	1929	0	0.13	Not Reqd	0.00	0.06	0.37	753	2414	1040	7.86	0.00	0.00
102	103	-1.000	-0.860	-0.943	2.000	6939	-7803	422	-5519	-52601	2277	-577	N	-2277	123.30	110.97	1835	0	0.13	Not Reqd	0.00	0.06	0.37	790	2362	1138	6.79	0.00	0.00
103	103	-0.999	-0.861	-0.942	2.000	6939	-7689	422	-5440	-52526	2277	-895	N	-2292	123.30	110.97	1842	0	0.13	Not Reqd	0.00	0.06	0.37	790	2369	1139	6.83	0.00	0.00
103	104	-0.999	-0.825	-0.925	2.000	7199	-10259	444	-5804	-70783	2480	-1161	N	-1564	137.16	123.44	1556	0	0.13	Not Reqd	0.00	0.06	0.37	878	2191	1240	5.29	0.00	0.00
104	104	-0.999	-0.826	-0.925	2.000	7199	-9749	434	-5734	-70303	2471	-1615	N	-1582	137.16	123.44	1565	0	0.13	Not Reqd	0.00	0.06	0.37	878	2199	1235	5.44	0.00	0.00
104	105	-0.921	-0.869	-0.898	2.000	7476	-12491	457	-6109	-90218	2679	-1892	N	-1279	148.32	133.49	1477	11	0.13	Not Reqd	0.00	0.06	0.37	950	2184	1340	4.70	0.00	0.00
105	105	-0.920	-0.868	-0.897	2.000	7476	-12467	457	-6050	-90209	2669	-2389	Y	-985	148.32	133.49	1323	160	0.13	0.110	0.00	0.12	0.37	949	2044	1410	2.51	-6.29	-2.15
105	106	-0.793	-1.024	-0.894	2.000	7821	-15429	480	-6439	-111762	2882	-2679	Y	-614	157.36	141.63	1129	472	0.35	0.118	0.00	0.24	0.37	996				-6.88	-2.35
106	106	-0.789	-1.020	-0.890	2.000	7821	-15064	475	-8659	-111408	2867	-5823	Y	-131	157.36	141.63	875	718	0.54	0.257	0.00	0.40	0.37	994				-14.96	-5.11
106	107	-0.728	-1.108	-0.894	2.000	7821	-14923	503	-8726	-117506	2946	-5859	Y	0	157.58	141.82	792	845	0.63	0.259	0.00	0.45	0.37	992				-15.05	-5.14
107	107	-0.695	-1.186	-0.910	2.000	7821	-16159	-86	-8639	-122108	-2442	-4496	Y	718	157.58	141.82	1174	182	0.14	0.199	0.00	0.17	0.37	996				-11.55	-3.95
107	108	-0.750	-1.157	-0.927	2.000	7821	-13724	-48	-8644	-113653	-2353	-4470	Y	788	155.99	140.39	1222	85	0.13	0.197	0.00	0.16	0.37	990				-11.48	-3.93
108	108	-0.750	-1.157	-0.928	2.000	7821	-15243	-367	-6133	-115192	-2668	-2915	Y	781	155.99	140.39	1206	276	0.21	0.129	0.00	0.17	0.37	988				-7.49	-2.56
108	109	-0.878	-1.047	-0.952	2.000	7476	-12390	-349	-6035	-94537	-2464	-2719	Y	999	146.32	131.68	1312	57	0.13	0.126	0.00	0.13	0.37	935	2022	1318	2.93	-7.16	-2.45
109	109	-0.880	-1.047	-0.953	2.000	7476	-12452	-352	-6238	-94587	-2465	-3608	Y	967	146.32	131.68	1295	75	0.13	0.167	0.00	0.15	0.37	935	2006	1347	2.77	-9.50	-3.25
109	110	-0.986	-0.964	-0.977	2.000	7199	-9742	-334	-6133	-75568	-2266	-3405	Y	1182	137.53	123.78	1368	0	0.13	0.163	0.00	0.15	0.37	881	2024	1241	3.17	-9.16	-3.13
110	110	-0.988	-0.964	-0.978	2.000	7199	-9800	-338	-6263	-75607	-2269	-4100	Y	1155	137.53	123.78	1354	0	0.13	0.197	0.00	0.16	0.37	881	2011	1264	3.04	-11.03	-3.77
110	111	-1.013	-0.955	-0.989	2.000	6939	-7226	-321	-6152	-58178	-2075	-3891	Y	2117	126.36	113.72	1772	0	0.13	0.194	0.00	0.16	0.37	809	2323	1160	4.28	-10.68	-3.65
111	111	-1.016	-0.954	-0.990	2.000	6939	-7156	-324	-6208	-58084	-2078	-4391	Y	2092	126.36	113.72	1759	0	0.13	0.219	0.00	0.17	0.37	809	2312	1177	4.17	-12.06	-4.12
111	112	-0.910	-1.180	-1.017	2.000	6699	-4614	-306	-6094	-42104	-1887	-4178	Y	2512	108.29	105.89	1920	0	0.13	0.215	0.00	0.17	0.37	753	2406	1076	4.85	-11.71	-4.00
112	112	-0.912	-1.180	-1.018	2.000	6699	-4657	-313	-6079	-42121	-1893	-4495	Y	2486	108.29	105.89	1907	0	0.13	0.232	0.00	0.18	0.37	753	2395	1088	4.75	-12.60	-4.31
112	113	-0.521	-0.964	-0.689	2.000	6481	-2210	-295	-5965	-27592	-1713	-4283	Y	992	98.96	102.02	1136	0	0.13	0.228	0.00	0.18	0.37	726	1676	992	3.04	-12.24	-4.18
113	113	-0.514	-0.958	-0.683	2.000	6481	-1099	-324	-5887	-26460	-1741	-4430	Y	976	98.96	102.02	1128	0	0.13	0.236	0.00	0.18	0.37	726	1669	1010	2.89	-12.66	-4.33
113	114	-0.570	-0.951	-0.708	2.000	6279	273	-290	-5764	-14204	-1574	-4209	Y	928	88.34	98.42	1081	0	0.13	0.232	0.00	0.18	0.37	700	1604	920	3.09	-12.25	-4.19
114	114	-0.572	-0.950	-0.709	2.000	6279	586	-298	-5641	-13878	-1581	-4216	Y	918	88.34	98.42	1077	0	0.13	0.232	0.00	0.18	0.37	700	1599	924	3.07	-12.27	-4.20
114	115	-0.624	-0.950	-0.735	2.000	6101	2294	-271	-5514	-2347	-1426	-3990	Y	871	78.79	95.13	1032	0	0.13	0.226	0.00	0.18	0.37	677	1538	839	3.26	-11.82	-4.04
115	115	-0.626	-0.949	-0.736	2.000	6101	2406	-288	-5332	-2228	-1441	-3859	Y	858	78.79	95.13	1026	0	0.13	0.219	0.00	0.17	0.37	677	1533	843	3.21	-11.43	-3.91
115	116	-0.673	-0.957	-0.764	2.000	5941	4044	-262	-5195	8204	-1291	-3624	Y	810	57.69	92.12	983	0	0.13	0.211	0.00	0.17	0.37	655	1474	760	3.42	-10.91	-3.73
116	116	-0.675	-0.956	-0.765	2.000	5941	3556	-262	-5018	7719	-1281	-3532	Y	593	57.69	92.12	875	0	0.13	0.205	0.00	0.17	0.37	655	1377	752	3.16	-10.63	-3.64
116	117	-0.734	-0.873	-0.778	2.000	5756	7122	-154	-4962	19000	-1051	-3377	Y	543	62.13	89.42	833	0	0.13	0.203	0.00	0.17	0.37	636	1322	632	3.95	-10.37	-3.54
117	117	-0.736	-0.872	-0.779	2.000	5756	4059	-252	-4627	15936	-1148	-2968	Y	527	62.13	89.42	824	0	0.13	0.178	0.00	0.15	0.37	636	1315	668	3.38	-9.11	-3.11
117	118	-0.790	-0.797	-0.792	2.000	5587	7642	-141	-4669	26250	-916	-2911	Y	476	65.98	86.94	783	0	0.13	0.180	0.00	0.15	0.21	344	1014	550	3.13	-9.11	-3.11
118	118	-0.792	-0.797	-0.793	2.000	5587	7626	-156	-4308	26230	-931	-2426	Y	462	65.98	86.94	776	0	0.13	0.150	0.00	0.14	0.21	344	1008	542	3.18	-7.59	-2.59
118	119	-0.840	-0.732	-0.806	2.000	5440	8746	-126	-4364	33105	-781	-2383	Y	410	69.32	84.78	737	0	0.13	0.151	0.00	0.14	0.21	335	965	466	3.48	-7.58	-2.59
119	119	-0.842	-0.732	-0.807	2.000	5440	8404	-134	-3974	32758	-788	-1829	Y	394	69.32	84.78	729	0	0.13	0.116	0.00	0.12	0.21	335	958	452	3.63	-5.82	-1.99
119	120	-0.883	-0.679	-0.818	2.000	5313	9357	-104	-4031	38497	-639	-1787	Y	342	72.12	82.94	682	0	0.13	0.116	0.00	0.12	0.21	327	908	376	3.97	-5.77	-1.97
120	120	-0.885	-0.679	-0.820	2.000	5313	9065	-116	-3625	38198	-651	-1183	N	328	72.12	82.94	676	0	0.13	Not Reqd	0.00	0.06	0.21	327	903	325	10.93	0.00	0.00
120	121	-0.919	-0.638	-0.830	2.000	5206	9882	-86	-3683	42842	-502	-1143	N	276	74.38	81.36	624	0	0.13	Not Reqd	0.00	0.06	0.21	319	849	251	14.85	0.00	0.00
121	121	-0.921	-0.638	-0.831	2.000	5206	9755	-112	-3270	42707	-528	-504	N	262	74.38	81.36	617	0	0.13	Not Reqd	0.00	0.06	0.21	319	843	264	11.34	0.00	0.00
121	122	-0.947	-0.611	-0.841	2.000	5116	10543	-82	-3332	46367	-380	-468	N	210	76.10	80.06	571	0	0.13	Not Reqd	0.00	0.06	0.21	313	796	190	15.78	0.00	0.00
122	122	-0.949	-0.611	-0.842	2.000	5116	7252	-124	-2963	43066	-422	145	N	194	76.10	80.06	573	0	0.13	Not Reqd	0.00	0.06	0.21	314	799	211	10.45	0.00	0.00
122	123	-0.966	-0.597	-0.850	2.000	5049	8150	-94	-3030	45885	-274	176	N	141	77.29	79.07	532	0	0.13	Not Reqd	0.00	0.06	0.21	309	758	137	14.14	0.00	0.00
123	123	-0.968	-0.597	-0.851	2.000	5049	7540	-112	-2674	45265	-292	790	N	128	77.29	79.07	527	0	0.13	Not Reqd	0.00	0.06	0.21	310	753	146	11.85	0.00	0.00
123	124	-0.977	-0.597	-0.857	2.000	5000	8344	-82	-2748	47044	-144	815	N	74	77.94	78.35	491	0	0.13	Not Reqd	0.00	0.06	0.21	306	718	72	16.76	0.00	0.00
124	124	-0.979	-0.597	-0.859	2.000	5000	7797	-98	-2395	46486	-160	1431	N	60	77.94	78.35	486	0	0.13	Not Reqd	0.00	0.06	0.21	306	713	80	13.89	0.00	0.00
124	125	-0.979	-0.611	-0.863	2.000	4969	8403	-70	-2478	47123	-16	1447	N	6	78.05	77.90	455	0	0.13	Not Reqd	0.00	0.06	0.21	305	684	8	20.26	0.00	0.00
125	125	-0.980	-0.612	-0.864	2.000	4969	10631	67	-2251	49339	121	1864	Y	0	78.05	77.90	443	0	0.13	0.130	0.00	0.13	0.21	304	672	120	6.29	6.28	2.15
125	126	-0.977	-0.623	-0.865	2.000	4960	10621	78	-2368	49061	182	1788	Y	-23	77.94	77.76	454	0	0.13	0.125	0.00	0.13	0.21	303	681	147	5.69	6.04	2.06
126	126	-0.978	-0.623	-0.866	2.000	4960	11102	71	-2204	49527	176	2123	Y	-67	77.94	77.76	475	0	0.13	0.148	0.00	0.14	0.21	303	701	155	6.19	7.17	2.45
126	127	-0.968	-0.646	-0.867	2.000	5000	10980	98	-2482	48087	320	1943	Y	-122	77.29	78.35	510	0	0.13	0.134	0.00	0.13	0.21	306	734	221	5.03	6.52	2.23

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

f'c = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Minimum LL Torsion @ t=00																									
127	127	-0.970	-0.646	-0.868	2.000	5000	12049	82	-2273	49143	304	2406	Y	-129	77.29	78.35	510	0	0.13	0.166	0.00	0.15	0.21	305	734	228	5.48	8.08	2.76
127	128	-0.952	-0.684	-0.867	2.000	5049	11839	109	-2559	46675	448	2219	Y	-185	76.10	79.07	549	0	0.13	0.152	0.00	0.14	0.21	309	773	294	4.54	7.40	2.53
128	128	-0.954	-0.684	-0.869	2.000	5049	12311	101	-2366	47132	440	2649	Y	-198	76.10	79.07	555	0	0.13	0.181	0.00	0.16	0.21	309	778	304	4.79	8.84	3.02
128	129	-0.928	-0.735	-0.867	2.000	5116	11652	132	-2658	43268	589	2455	Y	-254	74.38	80.06	601	0	0.13	0.166	0.00	0.15	0.21	314	824	372	4.01	8.12	2.78
129	129	-0.930	-0.734	-0.868	2.000	5116	8194	177	-2520	39794	634	2805	Y	-270	74.38	80.06	621	0	0.13	0.189	0.00	0.16	0.21	315	842	406	3.60	9.28	3.17
129	130	-0.897	-0.796	-0.865	2.000	5206	7575	199	-2821	35019	774	2603	Y	-326	72.12	81.36	674	0	0.13	0.173	0.00	0.15	0.21	322	896	469	3.27	8.51	2.91
130	130	-0.899	-0.796	-0.866	2.000	5206	7114	186	-2742	34541	761	2867	Y	-340	72.12	81.36	681	0	0.13	0.190	0.00	0.16	0.21	322	902	471	3.40	9.38	3.21
130	131	-0.860	-0.867	-0.862	2.000	5313	6857	219	-3046	29173	913	2662	Y	-397	69.32	82.94	719	0	0.13	0.173	0.00	0.15	0.21	328	942	541	2.95	8.59	2.94
131	131	-0.862	-0.867	-0.864	2.000	5313	6286	207	-2986	28584	901	2871	Y	-411	69.32	82.94	726	0	0.13	0.187	0.00	0.16	0.21	328	949	541	3.06	9.27	3.17
131	132	-0.818	-0.948	-0.859	2.000	5440	5826	241	-3291	22053	1054	2664	Y	-469	65.98	84.78	766	0	0.13	0.169	0.00	0.15	0.21	335	991	611	2.70	8.47	2.90
132	132	-0.820	-0.948	-0.860	2.000	5440	5631	223	-3242	21838	1037	2819	Y	-486	65.98	84.78	775	0	0.13	0.179	0.00	0.15	0.21	335	999	608	2.83	8.97	3.07
132	133	-0.771	-1.034	-0.855	2.000	5587	4993	259	-3551	14160	1193	2608	Y	-544	62.11	86.94	817	0	0.13	0.161	0.00	0.15	0.37	619	1292	679	3.54	8.16	2.79
133	133	-0.773	-1.035	-0.856	2.000	5587	3831	257	-3501	12976	1191	2715	Y	-559	62.11	86.94	825	0	0.13	0.168	0.00	0.15	0.37	619	1299	681	3.59	8.49	2.90
133	134	-0.722	-1.126	-0.851	2.000	5756	2873	293	-3817	4004	1349	2497	Y	-617	57.74	89.42	869	0	0.13	0.150	0.00	0.14	0.37	636	1355	753	3.25	7.67	2.62
134	134	-0.723	-1.127	-0.852	2.000	5756	2584	276	-3758	3686	1340	2446	Y	-873	57.74	89.42	998	0	0.13	0.147	0.00	0.14	0.37	636	1471	747	3.82	7.51	2.57
134	135	-0.690	-1.089	-0.825	2.000	5901	1409	314	-4080	-6561	1501	2223	Y	-932	75.21	92.12	1044	0	0.13	0.130	0.00	0.13	0.37	655	1530	821	3.48	6.72	2.30
135	135	-0.691	-1.090	-0.826	2.000	5901	1393	293	-4040	-6606	1481	2197	Y	-940	75.21	92.12	1048	0	0.13	0.129	0.00	0.13	0.37	655	1533	810	3.64	6.64	2.27
135	136	-0.654	-1.063	-0.800	2.000	6067	8	332	-4371	-18079	1648	1963	Y	-998	84.92	95.13	1096	0	0.13	0.112	0.00	0.12	0.37	677	1596	886	3.33	5.84	2.00
136	136	-0.655	-1.064	-0.800	2.000	6067	45	332	-4318	-18075	1648	1866	Y	-1011	84.92	95.13	1102	0	0.13	0.106	0.00	0.12	0.37	677	1601	883	3.38	5.55	1.90
136	137	-0.615	-1.044	-0.775	2.000	6252	-1724	353	-4660	-30985	1802	1622	N	-1071	95.57	98.42	1150	0	0.13	Not Reqd	0.00	0.06	0.37	700	1665	901	5.33	0.00	0.00
137	137	-0.615	-1.045	-0.775	2.000	6252	-1629	353	-4599	-30930	1802	1437	N	-1081	95.57	98.42	1155	0	0.13	Not Reqd	0.00	0.06	0.37	700	1670	901	5.36	0.00	0.00
137	138	-0.953	-1.223	-1.058	2.000	6456	-3583	374	-4946	-45210	1983	1188	N	-2426	105.18	102.02	1853	0	0.13	Not Reqd	0.00	0.06	0.37	726	2321	992	8.11	0.00	0.00
138	138	-0.953	-1.224	-1.058	2.000	6456	-3512	374	-4876	-45182	1984	898	N	-2450	105.18	102.02	1865	0	0.13	Not Reqd	0.00	0.06	0.37	726	2332	992	8.17	0.00	0.00
138	139	-1.050	-0.997	-1.028	2.000	6681	-5662	395	-5230	-60999	2176	643	N	-2095	122.50	110.25	1739	0	0.13	Not Reqd	0.00	0.06	0.37	784	2271	1088	6.99	0.00	0.00
139	139	-1.049	-0.997	-1.028	2.000	6681	-5658	395	-5156	-61036	2177	233	N	-2122	122.50	110.25	1753	0	0.13	Not Reqd	0.00	0.06	0.37	784	2284	1088	7.05	0.00	0.00
139	140	-1.033	-0.996	-1.017	2.000	6927	-8013	417	-5519	-78461	2375	-30	N	-1236	133.75	120.38	1373	0	0.13	Not Reqd	0.00	0.06	0.37	857	2007	1187	4.93	0.00	0.00
140	140	-1.033	-0.996	-1.018	2.000	6927	-7710	410	-5485	-78193	2368	-614	N	-1262	133.75	120.38	1386	0	0.13	Not Reqd	0.00	0.06	0.37	857	2019	1184	5.07	0.00	0.00
140	141	-0.930	-1.069	-0.989	2.000	7190	-10249	432	-5860	-97247	2571	-891	N	-1025	142.64	128.38	1284	144	0.13	Not Reqd	0.00	0.06	0.37	908	1973	1286	4.18	0.00	0.00
141	141	-0.929	-1.069	-0.988	2.000	7190	-10480	432	-5848	-97504	2567	-1567	N	-789	142.64	128.38	1159	267	0.22	Not Reqd	0.00	0.11	0.37	907	1859	1284	3.66	0.00	0.00
141	142	-0.794	-1.241	-0.984	2.000	7513	-13212	454	-6248	-118178	2774	-1868	N	-545	150.43	135.39	1028	513	0.40	Not Reqd	0.00	0.20	0.37	947				0.00	0.00
142	142	-0.791	-1.236	-0.981	2.000	7513	-13612	364	-7537	-118561	2595	-2923	Y	-80	150.43	135.39	787	655	0.52	0.134	0.00	0.32	0.37	945				-7.67	-2.62
142	143	-0.733	-1.323	-0.985	2.000	7513	-13119	392	-7623	-123891	2674	-2977	Y	0	150.51	135.46	733	753	0.59	0.137	0.00	0.37	0.37	943				-7.82	-2.67
143	143	-0.733	-1.322	-0.985	2.000	7513	-16553	-114	-8227	-127314	-2517	-17172	Y	0	150.51	135.46	730	669	0.53	0.790	0.00	0.66	0.37	942				-45.09	-15.41
143	144	-0.798	-1.231	-0.983	2.000	7513	-14685	-92	-8242	-119307	-2446	-17154	Y	113	150.43	135.39	806	552	0.43	0.789	0.00	0.61	0.37	946				-45.04	-15.40
144	144	-0.802	-1.235	-0.987	2.000	7513	-14857	-401	-5827	-119466	-2837	-14581	Y	579	150.43	135.39	1042	534	0.42	0.670	0.00	0.55	0.37	946				-38.28	-13.09
144	145	-0.951	-1.061	-0.997	2.000	7190	-11729	-383	-5726	-97452	-2635	-14381	Y	925	142.16	127.94	1225	239	0.20	0.691	0.00	0.44	0.37	904	1916	1772	1.39	-38.70	-13.23
145	145	-0.953	-1.061	-0.999	2.000	7190	-11883	-382	-5957	-97534	-2638	-15288	Y	1163	142.16	127.94	1351	115	0.13	0.735	0.00	0.43	0.37	905	2030	1802	1.60	-41.14	-14.07
145	146	-1.059	-1.002	-1.036	2.000	6929	-8921	-365	-5852	-77118	-2439	-15085	Y	1493	132.19	118.97	1493	0	0.13	0.752	0.00	0.44	0.37	847	2105	1696	2.12	-41.46	-14.17
146	146	-1.061	-1.002	-1.036	2.000	6929	-9044	-368	-5960	-77158	-2442	-15791	Y	1467	132.19	118.97	1480	0	0.13	0.787	0.00	0.46	0.37	847	2094	1720	2.00	-43.40	-14.84
146	147	-1.073	-1.038	-1.059	2.000	6682	-6219	-351	-5851	-58324	-2249	-15583	Y	2350	119.41	107.47	1849	0	0.13	0.806	0.00	0.47	0.37	765	2352	1617	3.04	-43.73	-14.95
147	147	-1.075	-1.037	-1.060	2.000	6682	-6215	-354	-5901	-58230	-2252	-16091	Y	2322	119.41	107.47	1835	0	0.13	0.832	0.00	0.48	0.37	765	2340	1634	2.94	-45.16	-15.44
147	148	-0.954	-1.303	-1.089	2.000	6458	-3503	-337	-5788	-40915	-2063	-15879	Y	2731	100.65	102.02	2006	0	0.13	0.849	0.00	0.49	0.37	726	2459	1533	3.63	-45.47	-15.54
148	148	-0.956	-1.302	-1.090	2.000	6458	-2894	-353	-5779	-40212	-2078	-16199	Y	2707	100.65	102.02	1993	0	0.13	0.867	0.00	0.50	0.37	726	2447	1551	3.50	-46.39	-15.86
148	149	-0.559	-1.123	-0.769	2.000	6252	-703	-329	-5667	-24763	-1894	-15988	Y	1204	87.67	98.42	1220	0	0.13	0.883	0.00	0.51	0.37	700	1728	1452	1.80	-46.68	-15.96
149	149	-0.545	-1.107	-0.754	2.000	6252	-670	-328	-5613	-24640	-1892	-16144	Y	1195	87.67	98.42	1215	0	0.13	0.892	0.00	0.51	0.37	700	1724	1456	1.78	-47.13	-16.11
149	150	-0.584	-1.148	-0.785	2.000	6067	1282	-302	-5491	-10617	-1734	-15923	Y	1134	75.77	95.13	1164	0	0.13	0.907	0.00	0.52	0.37	677	1657	1370	1.88	-47.33	-16.18
150	150	-0.586	-1.146	-0.785	2.000	6067	1218	-311	-5384	-10599	-1741	-15928	Y	1122	75.77	95.13	1158	0	0.13	0.907	0.00	0.52	0.37	677	1651	1374	1.85	-47.35	-16.19
150	151	-0.620	-1.195	-0.814	2.000	5901	3043	-285	-5251	2239	-1587	-15698	Y	1060	63.03	92.12	1108	0	0.13	0.919	0.00	0.52	0.37	655	1587	1289	1.96	-47.46	-16.23
151	151	-0.621	-1.193	-0.815	2.000	5901	2814	-288	-5085	2087	-1590	-15558	Y	1052	63.03	92.12	1104	0	0.13	0.911	0.00	0.52	0.37	655	1583	1286	1.98	-47.04	-16.08
151	152	-0.650	-1.248	-0.841	2.000	5756	6592	-190	-5021	15858	-1368	-15396	Y	987	69.01	89.42	1055	0	0.13	0.924	0.00	0.53	0.37	636	1522	1170	2.39	-47.27	-16.16
152	152	-0.651	-1.246	-0.841	2.000	5756	4309	-275	-4778	13653	-1445	-15196	Y	727	69.01	89.42	925	0	0.13	0.912	0.00	0.52	0.37	636	1405	1202	1.70	-46.65	-15.95
152	153	-0.701	-1.159	-0.847	2.000	5587	8034	-173	-4802	26315	-1222	-15122	Y	661	74.31	86.94	876	0	0.13	0.935	0.00	0.53	0.21	344	1098	1089	1.04	-47.29	-16.17
153	153	-0.702	-1.158	-0.847	2.000	5587	7446	-185	-4468	25799	-1233	-14679	Y	646	74.31	86.94	868	0	0.13	0.908	0.00	0.52	0.21	344	1091	1080	1.05	-45.91	-15.70
153	154	-0.750	-1.069	-0.851	2.000	5440	8816	-155	-4528	35127	-1083	-14641	Y	582	78.99	84.78	808	0	0.13	0.930	0.00	0.53	0.21	334	1028	1004	1.11	-46.57	-15.92
154	154	-0.752	-1.068	-0.852	2.000	5440	8690	-167	-4167	35070	-1094	-14117	Y	565	78.99	84.78	799	0	0.13	0.897	0.00	0.51	0.21	334	1020	993	1.13	-44.90	-15.35
154	155	-0.797	-0.980	-0.855	2.000	5313	9924	-137	-4229	43288	-945	-14081	Y	505	83.07	82.94	731	0	0.13	0.915	0.00	0.52	0.21	324	949	917	1.16	-45.46	-15.54
155	155	-0.799	-0.979	-0.856	2.000	5313	9655	-146	-3835	43088	-953	-13474	Y	491	83.07	82.94	724	0	0.13	0.876	0.00	0.50	0.21	324	943	902	1.21	-43.50	-14.87
155	156	-0.839	-0.897	-0.858	2.000	5206	10732	-117	-3897	50182	-804	-13438	Y	431	86.59	81.36	663	0	0.13	0.892	0.00	0.51	0.21	315	881	827	1.30	-43.96	-15.03
156	156	-0.841	-0.897	-0.859	2.000	5206	10803	-138	-3480	50320	-825	-12768	Y	416	86.59	81.36	655	0	0.13	0.847	0.00	0.49	0.21	315	873	816	1.32	-41.76	-14.28
156	157	-0.877	-0.823	-0.860	2.000	5116	11815	-108	-3544	56388	-677	-12734	Y	346	89.48	80.53	599	0	0.13	0.860	0.00	0.49	0.21	310	818	741	1.47	-42.12	-14.40
157	157	-0.879	-0.823	-0.861	2.000	5116	10604	-129	-3115	55244	-697	-12018	Y	329	89.48	80.53	593	0	0.13	0.811	0.00	0.47	0.21	311	813	728	1.52	-39.75	-13.59
157	158	-0.912	-0.757	-0.863	2.000	5049	11551	-99	-3183	60289	-549	-11988	Y	248	91.67	82.50	554	0	0.13	0.820	0.00	0.47	0.21	317	784	653	1.87	-40.00	-13.67
158	158	-0.914	-0.757	-0.864	2.000	5049	7698	-133	-2793	56503	-582	-11283	Y	233	91.67	82.50	556	0	0.13	0.772	0.00	0.45	0.21	318	787	647	1.91	-37.64	-12.87

PROJECT: **Cline Avenue Mainline Seg 1 Girder 1** CALCS BY: TSP DATE: 01/21/09

DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

Web Reinforcement Requirements **Load combination: Strength 1**

Material Properties:

Concrete

$f'c$ = ***5.0*** ksi

ϕ_v = ***0.90***

P-T Strands

f_{pu} = ***270*** ksi

f_{pe} = ***176*** ksi

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

1. All shears are vertical unless noted otherwise.
2. Web thickness is horizontal, box depth is vertical.

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Minimum LL Torsion @ t=00																									
158	159	-0.943	-0.701	-0.866	2.000	5000	8670	-103	-2866	60620	-434	-11258	Y	159	93.09	83.78	519	0	0.13	0.778	0.00	0.45	0.21	322	757	573	2.30	-37.80	-12.92
159	159	-0.945	-0.700	-0.868	2.000	5000	7918	-119	-2485	59935	-450	-10539	Y	144	93.09	83.78	513	0	0.13	0.728	0.00	0.43	0.21	323	752	558	2.40	-35.39	-12.10
159	160	-0.965	-0.661	-0.870	2.000	4969	8779	-89	-2566	62989	-303	-10522	Y	99	93.96	84.57	490	0	0.13	0.732	0.00	0.43	0.21	325	733	484	2.98	-35.47	-12.13
160	160	-0.966	-0.661	-0.870	2.000	4969	8208	-99	-2304	62460	-312	-10014	Y	75	93.96	84.57	479	0	0.13	0.696	0.00	0.41	0.21	325	723	472	3.06	-33.76	-11.54
160	161	-0.971	-0.652	-0.871	2.000	4969	11344	39	-2349	66235	-125	-10017	Y	65	94.23	84.81	468	0	0.13	0.696	0.00	0.41	0.21	325	714	379	4.59	-33.77	-11.54
161	161	-0.972	-0.651	-0.871	2.000	4969	12462	33	-2162	67396	-129	-9580	Y	41	94.23	84.81	453	0	0.13	0.666	0.00	0.40	0.21	325	700	367	4.92	-32.30	-11.04
161	162	-0.977	-0.646	-0.872	2.000	5000	12633	60	-2446	68404	14	-9766	Y	-48	94.52	85.07	457	0	0.13	0.675	0.00	0.40	0.21	326	704	316	4.63	-32.79	-11.21
162	162	-0.980	-0.643	-0.874	2.000	5000	13368	52	-2213	69208	7	-9172	Y	-63	94.52	85.07	462	0	0.13	0.634	0.00	0.38	0.21	325	709	293	5.34	-30.80	-10.53
162	163	-0.982	-0.628	-0.871	2.000	5049	13370	79	-2505	69096	151	-9366	Y	-130	93.99	84.59	493	0	0.13	0.641	0.00	0.39	0.21	324	735	371	4.07	-31.25	-10.68
163	163	-0.986	-0.626	-0.873	2.000	5049	13557	75	-2301	69352	149	-8804	Y	-144	93.99	84.59	500	0	0.13	0.602	0.00	0.37	0.21	323	741	353	4.52	-29.37	-10.04
163	164	-0.981	-0.629	-0.870	2.000	5116	12797	111	-2606	67525	303	-9010	Y	-213	92.84	83.56	530	0	0.13	0.608	0.00	0.37	0.21	320	764	436	3.38	-29.80	-10.19
164	164	-0.985	-0.627	-0.872	2.000	5116	11963	124	-2464	66763	317	-8518	Y	-230	92.84	83.56	540	0	0.13	0.575	0.00	0.35	0.21	320	774	427	3.48	-28.18	-9.63
164	165	-0.972	-0.646	-0.869	2.000	5206	11736	146	-2776	64512	456	-8732	Y	-299	91.06	81.95	567	0	0.13	0.579	0.00	0.35	0.37	565	1019	504	4.21	-28.56	-9.77
165	165	-0.977	-0.643	-0.872	2.000	5206	10801	138	-2654	63652	449	-8274	Y	-313	91.06	81.95	578	0	0.13	0.549	0.00	0.34	0.37	566	1029	486	4.56	-27.06	-9.25
165	166	-0.958	-0.676	-0.869	2.000	5313	11038	169	-2972	60905	599	-8494	Y	-381	88.63	82.94	624	0	0.13	0.552	0.00	0.34	0.37	574	1078	568	3.86	-27.42	-9.37
166	166	-0.965	-0.673	-0.872	2.000	5313	9783	159	-2877	59731	590	-8081	Y	-396	88.63	82.94	635	0	0.13	0.525	0.00	0.33	0.37	575	1089	550	4.16	-26.09	-8.92
166	167	-0.940	-0.716	-0.869	2.000	5440	9777	192	-3200	55776	742	-8305	Y	-462	85.57	84.78	690	0	0.13	0.527	0.00	0.33	0.37	590	1152	633	3.63	-26.42	-9.03
167	167	-0.947	-0.713	-0.873	2.000	5440	9200	177	-3122	55289	728	-7929	Y	-480	85.57	84.78	701	0	0.13	0.504	0.00	0.32	0.37	591	1162	614	3.93	-25.22	-8.62
167	168	-0.918	-0.762	-0.869	2.000	5587	8957	212	-3457	50127	883	-8166	Y	-545	81.88	86.94	762	0	0.13	0.505	0.00	0.32	0.37	609	1233	699	3.48	-25.54	-8.73
168	168	-0.927	-0.759	-0.874	2.000	5587	8405	197	-3381	49675	868	-7809	Y	-561	81.88	86.94	772	0	0.13	0.483	0.00	0.31	0.37	609	1243	681	3.74	-24.42	-8.35
168	169	-0.894	-0.814	-0.868	2.000	5756	7874	234	-3738	43250	1027	-8067	Y	-624	77.63	89.42	838	0	0.13	0.484	0.00	0.31	0.37	630	1322	768	3.36	-24.77	-8.47
169	169	-0.905	-0.810	-0.874	2.000	5756	7471	217	-3653	42966	1011	-7710	Y	-800	77.63	89.42	933	0	0.13	0.463	0.00	0.30	0.37	632	1408	749	3.95	-23.67	-8.09
169	170	-0.878	-0.812	-0.857	2.000	5935	6608	257	-4038	35202	1175	-7996	Y	-859	71.57	92.12	1004	0	0.13	0.465	0.00	0.30	0.37	655	1493	840	3.55	-24.09	-8.24
170	170	-0.891	-0.808	-0.864	2.000	5935	6562	256	-3959	35303	1174	-7627	Y	-874	71.57	92.12	1013	0	0.13	0.444	0.00	0.29	0.37	655	1501	828	3.66	-22.98	-7.86
170	171	-0.861	-0.807	-0.842	2.000	6109	4960	283	-4381	25801	1327	-7950	Y	-939	66.44	95.13	1066	0	0.13	0.450	0.00	0.29	0.37	677	1569	914	3.34	-23.53	-8.05
171	171	-0.877	-0.803	-0.852	2.000	6109	4988	283	-4317	26014	1325	-7554	Y	-957	66.44	95.13	1075	0	0.13	0.427	0.00	0.28	0.37	677	1577	901	3.43	-22.36	-7.65
171	172	-0.843	-0.799	-0.827	2.000	6295	2983	311	-4775	15086	1484	-7913	Y	-1030	60.87	98.42	1133	0	0.13	0.434	0.00	0.28	0.37	700	1650	992	3.15	-23.01	-7.87
172	172	-0.863	-0.795	-0.839	2.000	6295	2996	312	-4743	15337	1757	-7489	Y	-1044	60.87	98.42	1140	0	0.13	0.411	0.00	0.27	0.37	700	1656	1115	2.77	-21.77	-7.44
172	173	-0.789	-0.858	-0.814	2.000	6515	534	342	-5241	687	1921	-7889	Y	-1071	54.10	102.02	1176	0	0.13	0.418	0.00	0.27	0.37	726				-22.47	-7.68

1.04