URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[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\Segment4\Rating WB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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 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																									
1	1	-0.645	-0.674	-0.657	2.000	13359	-1	75	-273	8	-1932	3795	N	1560	57.58	98.42	1137	0	0.13	Not Reqd	0.00	0.06	0.37	700				0.00	0.00
1	2	-0.689	-0.685	-0.687	2.000	12965	-515	76	-276	14628	-1722	3734	N	1540	64.73	95.13	1110	0	0.13	Not Reqd	0.00	0.06	0.37	677	1608	574	41.68	0.00	0.00
2	2	-0.689	-0.684	-0.687	2.000	12965	-517	76	-273	14648	-1722	3655	N	1529	64.73	95.13	1107	0	0.13	Not Reqd	0.00	0.06	0.37	677	1605	574	41.55	0.00	0.00
2	3	-0.725	-0.711	-0.719	2.000	12557	-877	78	-273	27805	-1519	3596	N	1464	73.21	92.12	1066	0	0.13	Not Reqd	0.00	0.06	0.21	364	1287	506	30.93	0.00	0.00
3	3	-0.725	-0.710	-0.719	2.000	12557	-878	78	-269	27822	-1518	3461	N	1615	73.21	92.12	1116	0	0.13	Not Reqd	0.00	0.06	0.21	364	1332	506	32.70	0.00	0.00
3	4	-0.743	-0.771	-0.753	2.000	12301	5002	83	-105	43320	-1360	3579	N	1532	76.35	89.42	1072	0	0.13	Not Reqd	0.00	0.06	0.21	353	1283	453	30.91	0.00	0.00
4	4	-0.743	-0.770	-0.753	2.000	12301	5001	83	-128	43336	-1362	3386	N	1004	76.35	89.42	896	0	0.13	Not Reqd	0.00	0.06	0.21	353	1124	454	25.14	0.00	0.00
4	5	-0.778	-0.732	-0.762	2.000	11939	6699	102	-133	53696	-1194	3334	N	913	80.63	86.94	845	0	0.13	Not Reqd	0.00	0.06	0.21	343	1070	398	20.78	0.00	0.00
5	5	-0.778	-0.732	-0.762	2.000	11939	6698	102	-166	53711	-1194	3071	N	847	80.63	86.94	822	0	0.13	Not Reqd	0.00	0.06	0.21	343	1049	398	20.17	0.00	0.00
5	6	-0.822	-0.676	-0.771	2.000	11623	9164	128	-141	65747	-982	3038	N	737	85.29	84.78	746	0	0.13	Not Reqd	0.00	0.06	0.21	332	970	327	16.08	0.00	0.00
6	6	-0.823	-0.676	-0.771	2.000	11623	9163	128	-191	65763	-982	2679	N	714	85.29	84.78	738	0	0.13	Not Reqd	0.00	0.06	0.21	332	963	327	15.90	0.00	0.00
6	7	-0.864	-0.624	-0.780	2.000	11354	11364	155	-183	76056	-770	2629	N	610	89.15	82.94	671	0	0.13	Not Reqd	0.00	0.06	0.21	323	894	257	13.34	0.00	0.00
7	7	-0.864	-0.624	-0.780	2.000	11354	11363	155	-245	76070	-770	2215	N	590	89.15	82.94	664	0	0.13	Not Reqd	0.00	0.06	0.21	323	888	257	13.22	0.00	0.00
7	8	-0.900	-0.579	-0.789	2.000	11124	13269	183	-252	84600	-558	2150	N	487	92.23	83.01	616	0	0.13	Not Reqd	0.00	0.06	0.21	322	844	186	11.79	0.00	0.00
8	8	-0.901	-0.579	-0.789	2.000	11124	13267	183	-324	84611	-558	1688	N	468	92.23	83.01	609	0	0.13	Not Reqd	0.00	0.06	0.21	321	838	186	11.68	0.00	0.00
8	9	-0.932	-0.543	-0.797	2.000	10933	14860	212	-345	91369	-346	1609	N	366	94.56	85.11	580	0	0.13	Not Reqd	0.00	0.06	0.21	329	818	115	10.95	0.00	0.00
9	9	-0.932	-0.543	-0.797	2.000	10933	14858	212	-426	91376	-346	1111	N	343	94.56	85.11	573	0	0.13	Not Reqd	0.00	0.06	0.21	329	811	115	10.85	0.00	0.00
9	10	-0.957	-0.515	-0.804	2.000	10788	16121	242	-460	96350	-134	1019	N	241	96.16	86.54	539	0	0.13	Not Reqd	0.00	0.06	0.21	334	786	45	10.20	0.00	0.00
10	10	-0.957	-0.516	-0.804	2.000	10788	16119	242	-548	96354	-134	494	N	222	96.16	86.54	533	0	0.13	Not Reqd	0.00	0.06	0.21	334	780	45	10.13	0.00	0.00
10	11	-0.976	-0.497	-0.810	2.000	10683	17038	272	-593	99537	78	391	N	117	97.00	87.30	499	0	0.13	Not Reqd	0.00	0.06	0.21	336	751	26	9.00	0.00	0.00
11	11	-0.976	-0.497	-0.810	2.000	10683	17034	272	-686	99537	78	-152	N	97	97.00	87.30	493	0	0.13	Not Reqd	0.00	0.06	0.21	336	746	26	8.94	0.00	0.00
11	12	-0.989	-0.487	-0.815	2.000	10683	17599	303	-740	100919	291	-264	N	-27	97.26	87.54	465	0	0.13	Not Reqd	0.00	0.06	0.21	336	722	97	7.18	0.00	0.00
12	12	-0.989	-0.487	-0.815	2.000	10683	17594	303	-836	100916	291	-815	N	-50	97.26	87.54	473	0	0.13	Not Reqd	0.00	0.06	0.21	337	729	97	7.25	0.00	0.00
12	13	-0.996	-0.486	-0.820	2.000	10598	17793	335	-899	100490	504	-936	N	-136	96.31	86.68	495	0	0.13	Not Reqd	0.00	0.06	0.21	333	746	168	6.17	0.00	0.00
13	13	-0.996	-0.486	-0.820	2.000	10598	17790	335	-960	100486	504	-1278	N	-146	96.31	86.68	499	0	0.13	Not Reqd	0.00	0.06	0.21	333	749	168	6.20	0.00	0.00
13	14	-0.997	-0.487	-0.820	2.000	10598	17790	343	-977	100106	557	-1310	N	-170	96.03	86.43	505	0	0.13	Not Reqd	0.00	0.06	0.21	332	754	186	5.97	0.00	0.00
14	14	-0.997	-0.487	-0.820	2.000	10598	17787	343	-1037	100101	557	-1651	N	-170	96.03	86.43	505	0	0.13	Not Reqd	0.00	0.06	0.21	332	754	186	5.97	0.00	0.00
14	15	-0.995	-0.501	-0.824	2.000	10598	17519	375	-1108	97407	771	-1779	N	-278	94.46	85.01	535	0	0.13	Not Reqd	0.00	0.06	0.21	327	775	257	5.14	0.00	0.00
15	15	-0.995	-0.501	-0.824	2.000	10598	17513	375	-1204	97396	771	-2310	N	-278	94.46	85.01	535	0	0.13	Not Reqd	0.00	0.06	0.21	327	775	257	5.14	0.00	0.00
15	16	-0.986	-0.525	-0.827	2.000	10598	16874	408	-1280	92889	985	-2444	N	-396	92.08	82.87	565	0	0.13	Not Reqd	0.00	0.06	0.21	319	795	328	4.44	0.00	0.00
16	16	-0.986	-0.526	-0.827	2.000	10598	16867	408	-1371	92874	985	-2950	N	-396	92.08	82.87	565	0	0.13	Not Reqd	0.00	0.06	0.21	319	795	328	4.44	0.00	0.00
16	17	-0.972	-0.560	-0.830	2.000	10598	15855	441	-1451	86553	1199	-3088	N	-510	88.90	80.01	592	0	0.13	Not Reqd	0.00	0.06	0.21	308	810	400	3.79	0.00	0.00
17	17	-0.972	-0.560	-0.830	2.000	10598	15847	441	-1537	86535	1199	-3559	Y	-510	88.90	80.01	592	0	0.13	0.116	0.00	0.12	0.21	308	810	452	3.11	-9.80	-3.35
17	18	-0.952	-0.606	-0.832	2.000	10598	14464	474	-1619	78400	1414	-3699	Y	-620	84.95	77.76	626	0	0.13	0.121	0.00	0.13	0.21	301	834	526	2.69	-10.18	-3.48
18	18	-0.952	-0.606	-0.832	2.000	10598	14455	474	-1698	78379	1414	-4126	Y	-620	84.95	77.76	626	0	0.13	0.134	0.00	0.13	0.21	301	834	532	2.65	-11.36	-3.88
18	19	-0.925	-0.664	-0.835	2.000	10598	12705	508	-1781	68436	1629	-4267	Y	-728	80.26	77.76	680	0	0.13	0.139	0.00	0.13	0.21	302	884	606	2.42	-11.75	-4.02
19	19	-0.925	-0.664	-0.835	2.000	10598	12695	508	-1850	68412	1629	-4639	Y	-728	80.26	77.76	680	0	0.13	0.151	0.00	0.14	0.21	302	884	611	2.39	-12.77	-4.37
19	20	-0.892	-0.734	-0.837	2.000	10598	10588	541	-1933	56670	1843	-4781	Y	-838	74.89	77.76	739	0	0.13	0.156	0.00	0.14	0.21	305	939	685	2.22	-13.16	-4.50
20	20	-0.891	-0.735	-0.837	2.000	10598	10576	541	-1992	56642	1843	-5099	Y	-1183	74.89	77.76	859	0	0.13	0.166	0.00	0.15	0.21	305	1048	690	2.71	-14.04	-4.80
20	21	-0.866	-0.724	-0.814	2.000	10519	8121	575	-2073	43098	2061	-5239	Y	-1294	68.71	77.76	919	0	0.13	0.172	0.00	0.15	0.21	307	1104	764	2.53	-14.51	-4.96
21	21	-0.866	-0.725	-0.814	2.000	10519	8110	575	-2118	43069	2061	-5473	Y	-1261	68.71	77.76	908	0	0.13	0.180	0.00	0.15	0.21	307	1094	768	2.46	-15.16	-5.18
21	22	-0.834	-0.723	-0.791	2.000	10440	5350	608	-557	27730	2285	-3970	Y	-1378	61.76	77.76	947	0	0.13	0.131	0.00	0.13	0.21	307	1129	820	2.46	-11.06	-3.78
22	22	-0.834	-0.724	-0.791	2.000	10440	5347	608	-586	27708	2285	-4121	Y	-1349	61.76	77.76	937	0	0.13	0.136	0.00	0.13	0.21	307	1120	822	2.41	-11.48	-3.93
22	23	-0.795	-0.730	-0.769	2.000	10361	2224	642	-552	10467	2515	-4145	Y	-1472	54.02	77.76	979	0	0.13	0.138	0.00	0.13	0.21	307	1157	899	2.16	-11.62	-3.97
23	23	-0.795	-0.730	-0.769	2.000	10361	2221	642	-564	10444	2515	-4202	Y	-1445	54.02	77.76	970	0	0.13	0.140	0.00	0.13	0.21	307	1149	900	2.12	-11.78	-4.03
23	24	-0.750	-0.743	-0.747	2.000	10282	-1222	675	-524	-8704	2751	-4220	Y	-1568	62.53	77.76	1011	8	0.13	0.142	0.00	0.14	0.41	615	1463	979	3.08	-11.90	-4.07
24	24	-0.750	-0.744	-0.747	2.000	10282	-1224	675	-517	-8727	2751	-4173	Y	-1544	62.53	77.76	1003	16	0.13	0.140	0.00	0.13	0.41	615	1456	979	3.05	-11.77	-4.02
24	25	-0.925	-0.902	-0.915	2.000	10203	-4976	708	-472	-29939	3022	-4186	Y	-2718	71.34	77.76	1394	0	0.13	0.142	0.00	0.14	0.41	615	1808	1069	4.04	-11.88	-4.06
25	25	-0.925	-0.903	-0.915	2.000	10203	-4978	708	-445	-29961	3022	-4023	Y	-2690	71.34	77.76	1385	0	0.13	0.136	0.00	0.13	0.41	615	1799	1067	4.02	-11.42	-3.90
25	26	-0.981	-0.800	-0.899	2.000	10124	-9027	741	-394	-53405	3303	-4030	Y	-2170	83.88	77.76	1211	12	0.13	0.138	0.00	0.13	0.41	615	1643	1161	2.91	-11.51	-3.94
26	26	-0.981	-0.800	-0.899	2.000	10124	-9029	741	-345	-53427	3303	-3740	Y	-2144	83.88	77.76	1203	21	0.13	0.128	0.00	0.13	0.41	615	1636	1156	2.90	-10.68	-3.65
26	27	-0.873	-0.904	-0.887	2.000	10046	-13361	773	-288	-79150	3590	-3741	Y	-1077	90.17	81.16	844	485	0.63	0.129	0.00	0.38	0.41	637	1333	1252	1.31	-10.75	-3.68
27	27	-0.872	-0.904	-0.887	2.000	10046	-13363	773	-217	-79168	3590	-3321	Y	-821	90.17	81.16	755	574	0.75	0.114	0.00	0.43	0.41	637	1253	1246	1.03	-9.54	-3.26
27	28	-0.640	-1.194	-0.896	2.000	10046	-17963	806	-155	-107191	3879	-3316	Y	-203	92.83	83.55	515	922	1.18	0.114	0.00	0.65	0.41	645				-9.53	-3.26
28	28	-0.639	-1.194	-0.896	2.000	10046	-17964	806	-90	-107202	3879	-2931	N	-203	92.83	83.55	515	922	1.18	Not Reqd	0.00	0.59	0.41	645				0.00	0.00
28	29	-0.545	-1.312	-0.901	2.000	10046	-19485	816	-69	-116647	3961	-2929	N	0	93.00	83.70	433	1035	1.33	Not Reqd	0.00	0.67	0.41	643				0.00	0.00
29	29	-0.545	-1.312	-0.901	2.000	10046	3930	83	-65	-93233	-2774	950	N	0	93.00	83.70	478	550	0.70	Not Reqd	0.00	0.35	0.41	653				0.00	0.00
29	30	-0.635	-1.203	-0.898	2.000	10046	3725	83	-66	-86249	-2702	930	N	202	92.83	83.55	558	443	0.56	Not Reqd	0.00	0.28	0.41	654				0.00	0.00
30	30	-0.635	-1.203	-0.898	2.000	10046	3725	83	-80	-86245	-2702	1241	N	202	92.83	83.55	558	443	0.56	Not Reqd	0.00	0.28	0.41	654				0.00	0.00
30	31	-0.852	-0.941	-0.893	2.000	10046	3149	83	-81	-65690	-2445	1181	N	769	90.31	81.28	766	139	0.18	Not Reqd	0.00	0.09	0.41	643	1268	815	17.30	0.00	0.00
31	31	-0.853	-0.942	-0.894	2.000	10046	3149	83	-97	-65683	-2445	1530	N	1028	90.31	81.28	853	53	0.13	Not Reqd	0.00	0.06	0.41	643	1346	815	20.10	0.00	0.00
31	32	-0.935	-0.873	-0.907	2.000	10124	2664	85	-97	-47069	-2190	1472	N	2400	84.11	77.76	1288	0	0.13	Not Reqd	0.00	0.06	0.41	615	1713	730	35.85	0.00	0.00
32	32	-0.935	-0.873	-0.907	2.000	10124	2663	85	-111	-47060	-2190	1728	N	2426	84.11	77.76	1297	0	0.13	Not Reqd	0.00	0.06	0.41	615	1720	730	36.13	0.00	0.00

URS

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Forces Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																									
32	33	-0.781	-1.098	-0.920	2.000	10203	2260	87	-111	-30359	-1940	1670	N	3317	68.62	77.76	1594	0	0.13	Not Reqd	0.00	0.06	0.41	615	1988	647	47.48	0.00	0.00
33	33	-0.781	-1.097	-0.919	2.000	10203	2260	87	-123	-30349	-1940	1835	N	3345	68.62	77.76	1603	0	0.13	Not Reqd	0.00	0.06	0.41	615	1996	647	47.77	0.00	0.00
33	34	-0.411	-0.822	-0.585	2.000	10282	3161	90	213	-14279	-1698	2113	N	1221	58.17	77.76	895	0	0.13	Not Reqd	0.00	0.06	0.41	615	1359	566	27.55	0.00	0.00
34	34	-0.406	-0.816	-0.579	2.000	10282	3162	90	196	-14267	-1698	2191	N	1239	58.17	77.76	901	0	0.13	Not Reqd	0.00	0.06	0.41	615	1364	566	27.74	0.00	0.00
34	35	-0.462	-0.806	-0.602	2.000	10361	8401	107	-84	4386	-1478	1853	N	1134	58.59	77.76	866	0	0.13	Not Reqd	0.00	0.06	0.21	307	1056	493	16.84	0.00	0.00
35	35	-0.462	-0.806	-0.602	2.000	10361	8400	107	-129	4396	-1478	1828	N	1154	58.59	77.76	873	0	0.13	Not Reqd	0.00	0.06	0.21	307	1062	493	17.02	0.00	0.00
35	36	-0.507	-0.812	-0.626	2.000	10440	9909	127	144	17731	-1262	2044	N	1061	66.43	77.76	842	0	0.13	Not Reqd	0.00	0.06	0.21	307	1034	421	15.55	0.00	0.00
36	36	-0.507	-0.812	-0.626	2.000	10440	9909	127	91	17742	-1262	1947	N	1084	66.43	77.76	849	0	0.13	Not Reqd	0.00	0.06	0.21	307	1041	421	15.71	0.00	0.00
36	37	-0.541	-0.837	-0.650	2.000	10519	11301	148	146	29421	-1050	1945	N	983	73.37	77.76	811	0	0.13	Not Reqd	0.00	0.06	0.21	307	1006	350	14.29	0.00	0.00
37	37	-0.541	-0.836	-0.650	2.000	10519	11301	148	85	29432	-1050	1784	N	1009	73.37	77.76	820	0	0.13	Not Reqd	0.00	0.06	0.21	307	1014	350	14.46	0.00	0.00
37	38	-0.566	-0.881	-0.675	2.000	10598	12556	171	135	39484	-842	1777	N	899	79.25	77.76	766	0	0.13	Not Reqd	0.00	0.06	0.21	305	964	281	12.98	0.00	0.00
38	38	-0.566	-0.881	-0.675	2.000	10598	12557	171	64	39493	-843	1561	N	624	79.25	77.76	672	0	0.13	Not Reqd	0.00	0.06	0.21	305	879	281	11.49	0.00	0.00
38	39	-0.599	-0.828	-0.679	2.000	10598	13647	196	109	47926	-637	1548	N	510	84.18	77.76	617	0	0.13	Not Reqd	0.00	0.06	0.21	304	828	212	10.43	0.00	0.00
39	39	-0.599	-0.828	-0.679	2.000	10598	13647	196	35	47934	-637	1287	N	510	84.18	77.76	617	0	0.13	Not Reqd	0.00	0.06	0.21	304	828	212	10.43	0.00	0.00
39	40	-0.626	-0.787	-0.682	2.000	10598	14541	222	75	54729	-429	1268	N	395	88.09	79.28	577	0	0.13	Not Reqd	0.00	0.06	0.21	308	796	143	9.83	0.00	0.00
40	40	-0.626	-0.787	-0.682	2.000	10598	14541	222	-5	54735	-429	970	N	395	88.09	79.28	577	0	0.13	Not Reqd	0.00	0.06	0.21	308	796	143	9.83	0.00	0.00
40	41	-0.647	-0.756	-0.685	2.000	10598	15211	250	30	59865	-220	947	N	281	91.00	81.90	546	0	0.13	Not Reqd	0.00	0.06	0.21	318	778	73	9.46	0.00	0.00
41	41	-0.647	-0.756	-0.685	2.000	10598	15211	250	-52	59870	-220	621	N	281	91.00	81.90	546	0	0.13	Not Reqd	0.00	0.06	0.21	318	778	73	9.46	0.00	0.00
41	42	-0.662	-0.736	-0.688	2.000	10598	15629	279	-22	63306	-10	594	N	167	92.92	83.63	513	0	0.13	Not Reqd	0.00	0.06	0.21	324	753	3	9.07	0.00	0.00
42	42	-0.662	-0.735	-0.688	2.000	10598	15629	279	-107	63308	-10	249	N	167	92.92	83.63	513	0	0.13	Not Reqd	0.00	0.06	0.21	324	753	3	9.07	0.00	0.00
42	43	-0.671	-0.726	-0.690	2.000	10598	15768	309	-80	65024	201	218	N	53	93.86	84.47	477	0	0.13	Not Reqd	0.00	0.06	0.21	327	724	67	7.38	0.00	0.00
43	43	-0.671	-0.726	-0.690	2.000	10598	15768	309	-162	65024	201	-121	N	53	93.86	84.47	477	0	0.13	Not Reqd	0.00	0.06	0.21	327	724	67	7.38	0.00	0.00
43	44	-0.674	-0.726	-0.692	2.000	10598	15631	337	-141	65067	396	-153	N	-44	93.88	84.49	472	0	0.13	Not Reqd	0.00	0.06	0.21	327	719	132	6.21	0.00	0.00
44	44	-0.674	-0.726	-0.692	2.000	10598	15630	337	-222	65066	396	-492	N	-44	93.88	84.49	472	0	0.13	Not Reqd	0.00	0.06	0.21	327	719	132	6.21	0.00	0.00
44	45	-0.670	-0.738	-0.694	2.000	10598	15176	370	-201	63427	609	-529	N	-162	93.03	83.73	507	0	0.13	Not Reqd	0.00	0.06	0.21	324	748	203	5.42	0.00	0.00
45	45	-0.670	-0.738	-0.694	2.000	10598	15175	370	-283	63423	609	-875	N	-162	93.03	83.73	507	0	0.13	Not Reqd	0.00	0.06	0.21	324	748	203	5.42	0.00	0.00
45	46	-0.663	-0.759	-0.696	2.000	10598	14390	403	-263	60011	824	-913	N	-308	91.07	81.96	550	0	0.13	Not Reqd	0.00	0.06	0.21	317	780	275	4.77	0.00	0.00
46	46	-0.663	-0.759	-0.696	2.000	10598	14389	403	-342	60005	824	-1239	N	-308	91.07	81.96	550	0	0.13	Not Reqd	0.00	0.06	0.21	317	780	275	4.77	0.00	0.00
46	47	-0.654	-0.782	-0.698	2.000	10598	13258	436	-323	54806	1039	-1278	N	-453	87.84	79.05	587	0	0.13	Not Reqd	0.00	0.06	0.21	307	804	346	4.15	0.00	0.00
47	47	-0.654	-0.782	-0.698	2.000	10598	13256	436	-395	54798	1039	-1577	N	-453	87.84	79.05	587	0	0.13	Not Reqd	0.00	0.06	0.21	307	804	346	4.15	0.00	0.00
47	48	-0.640	-0.816	-0.701	2.000	10598	11776	471	-375	47808	1254	-1615	N	-531	83.68	77.76	616	0	0.13	Not Reqd	0.00	0.06	0.21	303	827	418	3.61	0.00	0.00
48	48	-0.640	-0.816	-0.701	2.000	10598	11774	471	-439	47799	1254	-1876	N	-531	83.68	77.76	616	0	0.13	Not Reqd	0.00	0.06	0.21	303	827	418	3.61	0.00	0.00
48	49	-0.610	-0.881	-0.704	2.000	10598	9942	506	-419	39015	1470	-1913	N	-539	79.27	77.76	634	0	0.13	Not Reqd	0.00	0.06	0.21	304	845	490	3.11	0.00	0.00
49	49	-0.610	-0.882	-0.704	2.000	10598	9940	505	-474	39004	1470	-2115	N	-828	79.27	77.76	735	0	0.13	Not Reqd	0.00	0.06	0.21	305	936	490	3.65	0.00	0.00
49	50	-0.590	-0.852	-0.687	2.000	10519	7760	541	-451	28418	1689	-2151	N	-1071	73.84	77.76	834	0	0.13	Not Reqd	0.00	0.06	0.21	306	1027	563	3.57	0.00	0.00
50	50	-0.590	-0.853	-0.687	2.000	10519	7757	541	-494	28406	1689	-2307	N	-1044	73.84	77.76	825	0	0.13	Not Reqd	0.00	0.06	0.21	306	1018	563	3.52	0.00	0.00
50	51	-0.576	-0.816	-0.669	2.000	10440	5232	576	-469	15985	1915	-2340	N	-1211	66.67	77.76	892	0	0.13	Not Reqd	0.00	0.06	0.21	307	1079	638	3.30	0.00	0.00
51	51	-0.576	-0.816	-0.669	2.000	10440	5230	576	-497	15972	1915	-2428	N	-1186	66.67	77.76	883	0	0.13	Not Reqd	0.00	0.06	0.21	307	1072	638	3.26	0.00	0.00
51	52	-0.557	-0.793	-0.653	2.000	10361	2366	611	-468	1673	2147	-2458	N	-1271	58.56	77.76	911	0	0.13	Not Reqd	0.00	0.06	0.41	615	1374	716	4.23	0.00	0.00
52	52	-0.556	-0.794	-0.653	2.000	10361	2364	611	-481	1659	2147	-2469	N	-1248	58.56	77.76	904	0	0.13	Not Reqd	0.00	0.06	0.41	615	1367	716	4.20	0.00	0.00
52	53	-0.527	-0.786	-0.636	2.000	10282	-831	646	-449	-14558	2385	-2494	N	-1369	58.30	77.76	939	0	0.13	Not Reqd	0.00	0.06	0.41	614	1397	795	3.80	0.00	0.00
53	53	-0.527	-0.786	-0.636	2.000	10282	-833	646	-444	-14572	2385	-2416	N	-1349	58.30	77.76	932	0	0.13	Not Reqd	0.00	0.06	0.41	614	1391	795	3.77	0.00	0.00
53	54	-0.754	-0.943	-0.837	2.000	10203	-4349	681	-408	-32867	2659	-2438	N	-2676	68.53	77.76	1380	0	0.13	Not Reqd	0.00	0.06	0.41	615	1795	886	5.00	0.00	0.00
54	54	-0.754	-0.943	-0.837	2.000	10203	-4351	681	-384	-32880	2659	-2260	N	-2650	68.53	77.76	1371	0	0.13	Not Reqd	0.00	0.06	0.41	615	1788	886	4.97	0.00	0.00
54	55	-0.849	-0.796	-0.825	2.000	10124	-8175	716	-342	-53422	2942	-2277	N	-2188	82.46	77.76	1217	0	0.13	Not Reqd	0.00	0.06	0.41	615	1649	981	3.80	0.00	0.00
55	55	-0.849	-0.796	-0.825	2.000	10124	-8177	716	-298	-53433	2942	-1988	N	-2165	82.46	77.76	1209	0	0.13	Not Reqd	0.00	0.06	0.41	615	1642	981	3.77	0.00	0.00
55	56	-0.783	-0.857	-0.817	2.000	10046	-12290	750	-252	-76263	3231	-2000	N	-1110	89.61	80.65	837	360	0.47	Not Reqd	0.00	0.24	0.41	630	1320	1077	1.97	0.00	0.00
56	56	-0.783	-0.856	-0.817	2.000	10046	-12291	751	-187	-76273	3231	-1608	N	-876	89.61	80.65	756	441	0.58	Not Reqd	0.00	0.29	0.41	630	1247	1077	1.68	0.00	0.00
56	57	-0.587	-1.101	-0.825	2.000	10046	-16672	784	-136	-101405	3522	-1615	N	-231	92.79	83.51	515	790	1.02	Not Reqd	0.00	0.51	0.41	643				0.00	0.00
57	57	-0.587	-1.101	-0.825	2.000	10046	-16672	784	-76	-101411	3522	-1250	N	-231	92.79	83.51	515	790	1.02	Not Reqd	0.00	0.51	0.41	643				0.00	0.00
57	58	-0.502	-1.207	-0.829	2.000	10046	-18121	795	-59	-109928	3605	-1252	N	0	93.00	83.70	425	910	1.17	Not Reqd	0.00	0.59	0.41	641				0.00	0.00
58	58	-0.542	-1.145	-0.822	2.000	10046	8432	114	75	-79675	-2726	1690	N	0	93.00	83.70	476	533	0.68	Not Reqd	0.00	0.34	0.41	652				0.00	0.00
58	59	-0.632	-1.038	-0.820	2.000	10046	8148	114	74	-72815	-2654	1671	N	197	92.82	83.54	555	428	0.54	Not Reqd	0.00	0.27	0.41	654				0.00	0.00
59	59	-0.632	-1.038	-0.820	2.000	10046	8148	114	45	-72809	-2654	1933	N	197	92.82	83.54	555	428	0.54	Not Reqd	0.00	0.27	0.41	654				0.00	0.00
59	60	-0.850	-0.778	-0.817	2.000	10046	7315	114	43	-52653	-2396	1873	N	750	90.13	81.12	759	128	0.17	Not Reqd	0.00	0.08	0.41	641	1260	799	13.11	0.00	0.00
60	60	-0.851	-0.779	-0.817	2.000	10046	7315	114	2	-52643	-2398	2138	N	987	90.13	81.12	838	50	0.13	Not Reqd	0.00	0.06	0.41	641	1332	799	15.04	0.00	0.00
60	61	-0.942	-0.697	-0.831	2.000	10124	6567	115	1	-34425	-2142	2079	N	2200	83.68	77.76	1221	0	0.13	Not Reqd	0.00	0.06	0.41	615	1652	714	25.50	0.00	0.00
61	61	-0.942	-0.696	-0.831	2.000	10124	6567	115	-34	-34413	-2143	2265	N	2224	83.68	77.76	1229	0	0.13	Not Reqd	0.00	0.06	0.41	615	1660	714	25.70	0.00	0.00
61	62	-0.827	-0.871	-0.846	2.000	10203	5894	117	-35	-18118	-1892	2206	N	2962	68.57	77.76	1475	0	0.13	Not Reqd	0.00	0.06	0.41	615	1881	631	33.16	0.00	0.00
62	62	-0.827	-0.870	-0.846	2.000	10203	5893	117	-67	-18106	-1893	2303	N	2988	68.57	77.76	1484	0	0.13	Not Reqd	0.00	0.06	0.41	615	1889	631	33.38	0.00	0.00
62	63	-0.526	-0.623	-0.567	2.000	10282	5285	119	-68	-3682	-1651	2244	N	1191	58.17	77.76	885	0	0.13	Not Reqd	0.00	0.06	0.41	615	1350	550	21.14	0.00	0.00
63	63	-0.522	-0.617	-0.562	2.000	10282	5285	119	-97	-3670	-1651	2261	N	1209	58.17	77.76	891	0	0.13	Not Reqd	0.00	0.06	0.41	615	1355	550	21.29	0.00	0.00
63	64	-0.579	-0.595	-0.585	2.000	10361	8775	124	524	13097	-1443	2825	N	1106	58.59	77.76	857	0	0.13	Not Reqd	0.00	0.06	0.21	307	1048	481	14.68	0.00	0.00

URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[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\Segment4\Rating WB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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 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	-0.579	-0.594	-0.585	2.000	10361	8777	124	476	13112	-1444	2751	N	1126	58.59	77.76	863	0	0.13	Not Reqd	0.00	0.06	0.21	307	1054	481	14.82	0.00	0.00
64	65	-0.625	-0.586	-0.610	2.000	10440	11293	143	158	27318	-1228	2375	N	1035	66.43	77.76	819	0	0.13	Not Reqd	0.00	0.06	0.21	306	1013	409	13.66	0.00	0.00
65	65	-0.625	-0.585	-0.609	2.000	10440	11294	143	97	27331	-1229	2225	N	1058	66.43	77.76	827	0	0.13	Not Reqd	0.00	0.06	0.21	306	1020	410	13.81	0.00	0.00
65	66	-0.660	-0.592	-0.635	2.000	10519	12399	163	150	38590	-1018	2220	N	959	73.37	77.76	777	0	0.13	Not Reqd	0.00	0.06	0.21	305	973	339	12.64	0.00	0.00
66	66	-0.660	-0.592	-0.635	2.000	10519	12400	163	83	38602	-1018	2008	N	984	73.37	77.76	786	0	0.13	Not Reqd	0.00	0.06	0.21	305	981	339	12.79	0.00	0.00
66	67	-0.685	-0.614	-0.660	2.000	10598	13398	185	133	48265	-812	2000	N	877	79.25	77.76	734	0	0.13	Not Reqd	0.00	0.06	0.21	303	934	271	11.73	0.00	0.00
67	67	-0.685	-0.613	-0.660	2.000	10598	13398	185	54	48276	-809	1753	N	609	79.25	77.76	643	0	0.13	Not Reqd	0.00	0.06	0.21	303	851	270	10.44	0.00	0.00
67	68	-0.715	-0.568	-0.664	2.000	10598	14266	208	99	56332	-605	1740	N	497	84.18	77.76	591	0	0.13	Not Reqd	0.00	0.06	0.21	301	803	202	9.66	0.00	0.00
68	68	-0.716	-0.568	-0.664	2.000	10598	14267	208	21	56341	-605	1433	N	497	84.18	77.76	591	0	0.13	Not Reqd	0.00	0.06	0.21	301	803	202	9.66	0.00	0.00
68	69	-0.739	-0.533	-0.668	2.000	10598	14969	234	61	62789	-398	1415	N	386	88.09	79.28	554	0	0.13	Not Reqd	0.00	0.06	0.21	306	774	133	9.23	0.00	0.00
69	69	-0.739	-0.533	-0.668	2.000	10598	14969	234	-20	62796	-398	1073	N	386	88.09	79.28	554	0	0.13	Not Reqd	0.00	0.06	0.21	306	774	133	9.23	0.00	0.00
69	70	-0.756	-0.509	-0.671	2.000	10598	15477	260	16	67608	-190	1051	N	274	91.00	81.90	525	0	0.13	Not Reqd	0.00	0.06	0.21	316	756	63	8.98	0.00	0.00
70	70	-0.756	-0.509	-0.671	2.000	10598	15477	260	-69	67613	-190	683	N	274	91.00	81.90	525	0	0.13	Not Reqd	0.00	0.06	0.21	316	756	63	8.98	0.00	0.00
70	71	-0.767	-0.495	-0.673	2.000	10598	15758	289	-37	70757	19	656	N	163	92.92	83.63	493	0	0.13	Not Reqd	0.00	0.06	0.21	322	733	6	8.56	0.00	0.00
71	71	-0.767	-0.495	-0.673	2.000	10598	15757	289	-122	70760	19	271	N	163	92.92	83.63	493	0	0.13	Not Reqd	0.00	0.06	0.21	322	733	6	8.56	0.00	0.00
71	72	-0.772	-0.492	-0.675	2.000	10598	15784	318	-94	72208	230	241	N	51	93.86	84.47	458	0	0.13	Not Reqd	0.00	0.06	0.21	325	705	77	6.93	0.00	0.00
72	72	-0.772	-0.492	-0.675	2.000	10598	15784	318	-177	72209	230	-136	N	51	93.86	84.47	458	0	0.13	Not Reqd	0.00	0.06	0.21	325	705	77	6.93	0.00	0.00
72	73	-0.771	-0.498	-0.677	2.000	10598	15562	346	-154	72024	424	-166	N	-51	93.86	84.47	457	0	0.13	Not Reqd	0.00	0.06	0.21	325	703	141	5.87	0.00	0.00
73	73	-0.771	-0.499	-0.677	2.000	10598	15561	346	-235	72022	424	-541	N	-51	93.86	84.47	457	0	0.13	Not Reqd	0.00	0.06	0.21	325	703	141	5.87	0.00	0.00
73	74	-0.765	-0.516	-0.678	2.000	10598	15032	378	-212	70153	637	-577	N	-165	92.92	83.63	491	0	0.13	Not Reqd	0.00	0.06	0.21	321	731	212	5.12	0.00	0.00
74	74	-0.765	-0.516	-0.678	2.000	10598	15031	378	-294	70149	637	-959	N	-165	92.92	83.63	491	0	0.13	Not Reqd	0.00	0.06	0.21	321	731	212	5.12	0.00	0.00
74	75	-0.752	-0.543	-0.680	2.000	10598	14186	410	-273	66521	851	-996	N	-280	91.00	81.90	523	0	0.13	Not Reqd	0.00	0.06	0.21	315	754	284	4.44	0.00	0.00
75	75	-0.752	-0.543	-0.680	2.000	10598	14184	410	-350	66515	851	-1358	N	-280	91.00	81.90	523	0	0.13	Not Reqd	0.00	0.06	0.21	315	754	284	4.44	0.00	0.00
75	76	-0.734	-0.581	-0.681	2.000	10598	13004	444	-330	61111	1066	-1396	N	-398	88.09	79.28	553	0	0.13	Not Reqd	0.00	0.06	0.21	306	773	355	3.82	0.00	0.00
76	76	-0.734	-0.581	-0.681	2.000	10598	13002	444	-401	61103	1066	-1729	N	-398	88.09	79.28	553	0	0.13	Not Reqd	0.00	0.06	0.21	306	773	355	3.82	0.00	0.00
76	77	-0.710	-0.630	-0.683	2.000	10598	11480	478	-381	53916	1281	-1767	N	-518	84.18	77.76	595	0	0.13	Not Reqd	0.00	0.06	0.21	301	806	427	3.38	0.00	0.00
77	77	-0.710	-0.630	-0.683	2.000	10598	11478	478	-444	53905	1281	-2061	N	-518	84.18	77.76	595	0	0.13	Not Reqd	0.00	0.06	0.21	301	806	427	3.38	0.00	0.00
77	78	-0.682	-0.689	-0.684	2.000	10598	9609	513	-423	44929	1497	-2098	N	-640	79.33	77.76	652	0	0.13	Not Reqd	0.00	0.06	0.21	303	859	499	3.10	0.00	0.00
78	78	-0.682	-0.689	-0.684	2.000	10598	9606	511	-484	44917	1498	-2332	N	-921	79.33	77.76	749	0	0.13	Not Reqd	0.00	0.06	0.21	303	947	499	3.63	0.00	0.00
78	79	-0.661	-0.673	-0.665	2.000	10519	7399	547	-462	34125	1718	-2368	N	-1043	73.36	77.76	806	0	0.13	Not Reqd	0.00	0.06	0.21	305	1000	573	3.34	0.00	0.00
79	79	-0.661	-0.673	-0.665	2.000	10519	7396	547	-502	34111	1718	-2556	N	-1017	73.36	77.76	797	0	0.13	Not Reqd	0.00	0.06	0.21	305	991	573	3.30	0.00	0.00
79	80	-0.635	-0.667	-0.647	2.000	10440	4838	582	-477	21480	1944	-2589	N	-1131	66.43	77.76	855	0	0.13	Not Reqd	0.00	0.06	0.21	307	1046	648	3.05	0.00	0.00
80	80	-0.634	-0.667	-0.647	2.000	10440	4835	582	-503	21466	1944	-2708	N	-1107	66.43	77.76	847	0	0.13	Not Reqd	0.00	0.06	0.21	306	1038	648	3.01	0.00	0.00
80	81	-0.601	-0.671	-0.629	2.000	10361	1928	618	-476	6949	2176	-2739	N	-1215	58.59	77.76	893	0	0.13	Not Reqd	0.00	0.06	0.41	615	1357	725	4.07	0.00	0.00
81	81	-0.601	-0.671	-0.629	2.000	10361	1926	618	-486	6934	2176	-2778	N	-1193	58.59	77.76	886	0	0.13	Not Reqd	0.00	0.06	0.41	615	1350	725	4.03	0.00	0.00
81	82	-0.560	-0.685	-0.613	2.000	10282	-1327	654	-455	-9514	2414	-2805	N	-1316	58.17	77.76	926	0	0.13	Not Reqd	0.00	0.06	0.41	615	1386	805	3.67	0.00	0.00
82	82	-0.560	-0.685	-0.613	2.000	10282	-1329	654	-448	-9529	2414	-2754	N	-1297	58.17	77.76	919	0	0.13	Not Reqd	0.00	0.06	0.41	615	1380	805	3.64	0.00	0.00
82	83	-0.757	-0.847	-0.796	2.000	10203	-4921	690	-413	-28072	2689	-2777	N	-2531	68.40	77.76	1332	0	0.13	Not Reqd	0.00	0.06	0.41	615	1752	896	4.72	0.00	0.00
83	83	-0.757	-0.848	-0.797	2.000	10203	-4923	690	-386	-28087	2689	-2626	N	-2507	68.40	77.76	1324	0	0.13	Not Reqd	0.00	0.06	0.41	615	1744	896	4.69	0.00	0.00
83	84	-0.834	-0.727	-0.785	2.000	10124	-8845	726	-346	-48897	2973	-2644	N	-2067	82.28	77.76	1173	0	0.13	Not Reqd	0.00	0.06	0.41	614	1609	991	3.55	0.00	0.00
84	84	-0.834	-0.727	-0.786	2.000	10124	-8846	726	-298	-48910	2973	-2379	N	-2045	82.28	77.76	1165	0	0.13	Not Reqd	0.00	0.06	0.41	614	1602	991	3.52	0.00	0.00
84	85	-0.758	-0.803	-0.779	2.000	10046	-13083	761	-253	-72033	3262	-2392	N	-1072	89.52	80.57	803	405	0.54	Not Reqd	0.00	0.27	0.41	625	1285	1087	1.78	0.00	0.00
85	85	-0.757	-0.802	-0.778	2.000	10046	-13085	762	-183	-72045	3262	-2018	N	-850	89.52	80.57	726	482	0.64	Not Reqd	0.00	0.32	0.41	625	1216	1087	1.51	0.00	0.00
85	86	-0.557	-1.054	-0.787	2.000	10046	-17623	796	-134	-97491	3554	-2027	N	-226	92.78	83.50	495	821	1.06	Not Reqd	0.00	0.53	0.41	638				0.00	0.00
86	86	-0.557	-1.054	-0.787	2.000	10046	-17623	796	-70	-97497	3554	-1676	N	-226	92.78	83.50	495	821	1.06	Not Reqd	0.00	0.53	0.41	638				0.00	0.00
86	87	-0.471	-1.160	-0.791	2.000	10046	-19129	808	-53	-106123	3637	-1678	N	0	93.00	83.70	408	939	1.22	Not Reqd	0.00	0.61	0.41	636				0.00	0.00
87	87	-0.413	-1.241	-0.797	2.000	10046	6062	92	15	-86697	-2832	1758	N	0	93.00	83.70	440	609	0.78	Not Reqd	0.00	0.39	0.41	644				0.00	0.00
87	88	-0.505	-1.131	-0.795	2.000	10046	5832	93	14	-79567	-2760	1739	N	201	92.81	83.53	518	504	0.65	Not Reqd	0.00	0.32	0.41	646				0.00	0.00
88	88	-0.505	-1.131	-0.795	2.000	10046	5832	93	-7	-79560	-2760	2025	N	201	92.81	83.53	518	504	0.65	Not Reqd	0.00	0.32	0.41	646				0.00	0.00
88	89	-0.728	-0.867	-0.792	2.000	10046	5166	93	-9	-58561	-2502	1965	N	765	89.93	80.94	730	197	0.26	Not Reqd	0.00	0.13	0.41	634	1227	834	13.68	0.00	0.00
89	89	-0.729	-0.867	-0.793	2.000	10046	5166	93	-37	-58550	-2502	2268	N	991	89.93	80.94	808	119	0.15	Not Reqd	0.00	0.08	0.41	634	1298	834	15.97	0.00	0.00
89	90	-0.827	-0.783	-0.807	2.000	10124	4579	94	-37	-39509	-2247	2210	N	2095	83.17	77.76	1186	0	0.13	Not Reqd	0.00	0.06	0.41	615	1621	749	28.84	0.00	0.00
90	90	-0.827	-0.782	-0.807	2.000	10124	4579	94	-62	-39496	-2247	2424	N	2118	83.17	77.76	1194	0	0.13	Not Reqd	0.00	0.06	0.41	615	1628	749	29.06	0.00	0.00
90	91	-0.739	-0.926	-0.821	2.000	10203	4064	96	-63	-22380	-1997	2365	N	2735	68.51	77.76	1400	0	0.13	Not Reqd	0.00	0.06	0.41	615	1813	666	36.99	0.00	0.00
91	91	-0.739	-0.925	-0.821	2.000	10203	4064	96	-85	-22367	-1997	2486	N	2760	68.51	77.76	1408	0	0.13	Not Reqd	0.00	0.06	0.41	615	1820	666	37.23	0.00	0.00
91	92	-0.494	-0.711	-0.586	2.000	10282	3616	98	-86	-7123	-1755	2427	N	1215	58.17	77.76	890	0	0.13	Not Reqd	0.00	0.06	0.41	614	1354	585	24.56	0.00	0.00
92	92	-0.490	-0.705	-0.581	2.000	10282	3616	98	-105	-7110	-1755	2465	N	1233	58.17	77.76	897	0	0.13	Not Reqd	0.00	0.06	0.41	614	1360	585	24.74	0.00	0.00
92	93	-0.550	-0.684	-0.604	2.000	10361	7444	103	524	10652	-1547	3036	N	1128	58.59	77.76	863	0	0.13	Not Reqd	0.00	0.06	0.21	307	1053	516	16.64	0.00	0.00
93	93	-0.550	-0.683	-0.604	2.000	10361	7446	103	484	10668	-1547	2977	N	1148	58.59	77.76	870	0	0.13	Not Reqd	0.00	0.06	0.21	307	1059	516	16.83	0.00	0.00
93	94	-0.599	-0.676	-0.629	2.000	10440	10184	121	172	25753	-1333	2608	N	1056	66.43	77.76	814	0	0.13	Not Reqd	0.00	0.06	0.21	305	1007	444	14.96	0.00	0.00
94	94	-0.599	-0.675	-0.628	2.000	10440	10185	121	117	25767	-1333	2467	N	1079	66.43	77.76	822	0	0.13	Not Reqd	0.00	0.06	0.21	305	1014	444	15.14	0.00	0.00
94	95	-0.637	-0.683	-0.654	2.000	10519	11474	141	172	37864	-1123	2464	N	978	73.37	77.76	770	0	0.13	Not Reqd	0.00	0.06	0.21	303	966	374	13.62	0.00	0.00
95	95	-0.637	-0.683	-0.654	2.000	10519	11475	141	109	37877	-1123	2257	N	1004	73.37	77.76	779	0	0.13	Not Reqd	0.00	0.06	0.21	303	974	374	13.80	0.00	0.00

URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[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\Segment4\Rating WB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment4\Rating WB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																									
95	96	-0.667	-0.707	-0.681	2.000	10598	12673	162	160	48392	-917	2250	N	894	79.25	77.76	727	0	0.13	Not Reqd	0.00	0.06	0.21	302	926	306	12.49	0.00	0.00
96	96	-0.667	-0.706	-0.680	2.000	10598	12674	162	91	48404	-917	1989	N	621	79.25	77.76	633	0	0.13	Not Reqd	0.00	0.06	0.21	301	840	306	10.90	0.00	0.00
96	97	-0.702	-0.652	-0.685	2.000	10598	13749	185	137	57342	-713	1977	N	507	84.18	77.76	579	0	0.13	Not Reqd	0.00	0.06	0.21	299	791	238	9.96	0.00	0.00
97	97	-0.703	-0.651	-0.685	2.000	10598	13749	185	62	57352	-713	1665	N	507	84.18	77.76	579	0	0.13	Not Reqd	0.00	0.06	0.21	299	791	238	9.96	0.00	0.00
97	98	-0.732	-0.608	-0.689	2.000	10598	14668	210	104	64691	-507	1649	N	393	88.09	79.28	540	0	0.13	Not Reqd	0.00	0.06	0.21	304	759	169	9.43	0.00	0.00
98	98	-0.732	-0.608	-0.689	2.000	10598	14668	210	24	64699	-507	1296	N	393	88.09	79.28	540	0	0.13	Not Reqd	0.00	0.06	0.21	304	759	169	9.43	0.00	0.00
98	99	-0.755	-0.575	-0.693	2.000	10598	15398	236	61	70409	-299	1275	N	280	91.00	81.90	510	0	0.13	Not Reqd	0.00	0.06	0.21	314	742	100	9.14	0.00	0.00
99	99	-0.755	-0.575	-0.693	2.000	10598	15398	236	-23	70414	-299	892	N	280	91.00	81.90	510	0	0.13	Not Reqd	0.00	0.06	0.21	314	742	100	9.14	0.00	0.00
99	100	-0.772	-0.552	-0.696	2.000	10598	15905	264	10	74460	-90	867	N	166	92.92	83.63	476	0	0.13	Not Reqd	0.00	0.06	0.21	320	716	30	8.79	0.00	0.00
100	100	-0.773	-0.552	-0.696	2.000	10598	15905	264	-77	74463	-90	461	N	166	92.92	83.63	476	0	0.13	Not Reqd	0.00	0.06	0.21	320	716	30	8.79	0.00	0.00
100	101	-0.784	-0.539	-0.699	2.000	10598	16159	294	-48	76814	121	432	N	52	93.86	84.47	440	0	0.13	Not Reqd	0.00	0.06	0.21	322	686	40	7.60	0.00	0.00
101	101	-0.784	-0.539	-0.699	2.000	10598	16158	294	-133	76815	121	31	N	52	93.86	84.47	440	0	0.13	Not Reqd	0.00	0.06	0.21	322	686	40	7.60	0.00	0.00
101	102	-0.789	-0.536	-0.702	2.000	10598	16144	322	-109	77456	315	1	N	-52	93.86	84.47	437	0	0.13	Not Reqd	0.00	0.06	0.21	322	683	105	6.39	0.00	0.00
102	102	-0.789	-0.536	-0.702	2.000	10598	16143	322	-194	77455	315	-403	N	-52	93.86	84.47	437	0	0.13	Not Reqd	0.00	0.06	0.21	322	683	105	6.39	0.00	0.00
102	103	-0.790	-0.542	-0.704	2.000	10598	15837	353	-171	76483	528	-439	N	-168	92.92	83.63	471	0	0.13	Not Reqd	0.00	0.06	0.21	319	711	176	5.54	0.00	0.00
103	103	-0.790	-0.543	-0.704	2.000	10598	15836	353	-257	76480	528	-855	N	-168	92.92	83.63	471	0	0.13	Not Reqd	0.00	0.06	0.21	319	711	176	5.54	0.00	0.00
103	104	-0.786	-0.558	-0.707	2.000	10598	15208	386	-237	73745	742	-893	N	-286	91.00	81.90	502	0	0.13	Not Reqd	0.00	0.06	0.21	312	733	247	4.77	0.00	0.00
104	104	-0.786	-0.558	-0.707	2.000	10598	15206	386	-320	73739	742	-1294	N	-286	91.00	81.90	502	0	0.13	Not Reqd	0.00	0.06	0.21	312	733	247	4.77	0.00	0.00
104	105	-0.776	-0.582	-0.709	2.000	10598	14237	420	-300	69221	957	-1333	N	-406	88.09	79.28	532	0	0.13	Not Reqd	0.00	0.06	0.21	303	751	319	4.09	0.00	0.00
105	105	-0.776	-0.583	-0.709	2.000	10598	14236	420	-378	69213	957	-1710	N	-406	88.09	79.28	532	0	0.13	Not Reqd	0.00	0.06	0.21	303	751	319	4.09	0.00	0.00
105	106	-0.762	-0.616	-0.711	2.000	10598	12916	454	-359	62903	1172	-1749	N	-528	84.18	77.76	572	0	0.13	Not Reqd	0.00	0.06	0.21	298	783	391	3.59	0.00	0.00
106	106	-0.761	-0.616	-0.711	2.000	10598	12914	454	-429	62893	1172	-2091	N	-528	84.18	77.76	572	0	0.13	Not Reqd	0.00	0.06	0.21	298	783	391	3.59	0.00	0.00
106	107	-0.743	-0.658	-0.713	2.000	10598	11237	489	-409	54784	1389	-2129	N	-653	79.33	77.76	626	0	0.13	Not Reqd	0.00	0.06	0.21	299	833	463	3.27	0.00	0.00
107	107	-0.742	-0.658	-0.713	2.000	10598	11234	489	-471	54771	1388	-2433	N	-939	79.33	77.76	725	0	0.13	Not Reqd	0.00	0.06	0.21	300	922	463	3.82	0.00	0.00
107	108	-0.732	-0.626	-0.692	2.000	10519	9197	524	-450	44848	1608	-2469	N	-1064	73.36	77.76	780	0	0.13	Not Reqd	0.00	0.06	0.21	301	973	536	3.50	0.00	0.00
108	108	-0.731	-0.626	-0.693	2.000	10519	9195	524	-500	44834	1608	-2714	N	-1037	73.36	77.76	771	0	0.13	Not Reqd	0.00	0.06	0.21	301	965	536	3.45	0.00	0.00
108	109	-0.714	-0.606	-0.672	2.000	10440	6797	560	-476	33060	1834	-2748	N	-1154	66.43	77.76	827	0	0.13	Not Reqd	0.00	0.06	0.21	303	1017	611	3.17	0.00	0.00
109	109	-0.714	-0.606	-0.672	2.000	10440	6794	560	-513	33044	1834	-2928	N	-1129	66.43	77.76	818	0	0.13	Not Reqd	0.00	0.06	0.21	303	1009	611	3.13	0.00	0.00
109	110	-0.690	-0.598	-0.653	2.000	10361	4037	596	-486	19372	2067	-2958	N	-1239	58.59	77.76	875	0	0.13	Not Reqd	0.00	0.06	0.37	549	1282	689	3.99	0.00	0.00
110	110	-0.690	-0.599	-0.653	2.000	10361	4035	596	-508	19356	2067	-3064	N	-1217	58.59	77.76	868	0	0.13	Not Reqd	0.00	0.06	0.37	549	1275	689	3.95	0.00	0.00
110	111	-0.657	-0.601	-0.634	2.000	10282	922	632	-476	3740	2305	-3090	Y	-1343	49.83	77.76	935	0	0.13	0.104	0.00	0.12	0.37	553	1340	814	3.41	-8.72	-2.98
111	111	-0.657	-0.602	-0.634	2.000	10282	919	632	-482	3723	2305	-3111	Y	-1322	49.83	77.76	928	0	0.13	0.105	0.00	0.12	0.37	553	1333	814	3.38	-8.78	-3.00
111	112	-0.933	-0.796	-0.873	2.000	10203	-2542	668	-445	-14012	2584	-3133	Y	-2803	68.45	77.76	1422	0	0.13	0.106	0.00	0.12	0.37	553	1778	907	4.80	-8.89	-3.04
112	112	-0.933	-0.796	-0.873	2.000	10203	-2545	668	-431	-14029	2584	-3057	N	-2777	68.45	77.76	1414	0	0.13	Not Reqd	0.00	0.06	0.37	553	1770	861	5.08	0.00	0.00
112	113	-1.050	-0.627	-0.859	2.000	10124	-6346	704	-390	-34068	2871	-3073	Y	-2224	82.73	77.76	1229	0	0.13	0.105	0.00	0.12	0.47	692	1729	1003	4.02	-8.78	-3.00
113	113	-1.050	-0.627	-0.859	2.000	10124	-6348	704	-355	-34084	2871	-2888	N	-2200	82.73	77.76	1221	0	0.13	Not Reqd	0.00	0.06	0.47	692	1722	957	4.26	0.00	0.00
113	114	-0.985	-0.693	-0.849	2.000	10046	-10473	739	-308	-56475	3165	-2899	N	-1105	89.70	80.73	838	334	0.44	Not Reqd	0.00	0.22	0.47	710	1393	1055	2.37	0.00	0.00
114	114	-0.984	-0.692	-0.849	2.000	10046	-10475	740	-253	-56490	3165	-2599	N	-866	89.70	80.73	755	417	0.55	Not Reqd	0.00	0.27	0.47	710	1318	1055	2.07	0.00	0.00
114	115	-0.785	-0.936	-0.855	2.000	10046	-14906	775	-200	-81250	3461	-2605	N	-230	92.79	83.51	515	766	0.99	Not Reqd	0.00	0.49	0.47	723				0.00	0.00
115	115	-0.785	-0.936	-0.855	2.000	10046	-14906	775	-146	-81259	3461	-2312	N	-230	92.79	83.51	515	767	0.99	Not Reqd	0.00	0.49	0.47	723				0.00	0.00
115	116	-0.699	-1.041	-0.858	2.000	10046	-16381	786	-128	-89671	3544	-2313	N	0	93.00	83.70	426	887	1.14	Not Reqd	0.00	0.57	0.47	721				0.00	0.00
116	116	-0.699	-1.041	-0.858	2.000	10046	4522	28	175	-68769	-2609	1555	N	0	93.00	83.70	464	502	0.64	Not Reqd	0.00	0.32	0.47	731				0.00	0.00
116	117	-0.785	-0.943	-0.858	2.000	10046	4458	28	174	-62205	-2538	1536	N	230	92.80	83.52	553	387	0.49	Not Reqd	0.00	0.25	0.47	733				0.00	0.00
117	117	-0.785	-0.943	-0.858	2.000	10046	4459	28	158	-62199	-2538	1760	N	230	92.80	83.52	553	387	0.49	Not Reqd	0.00	0.25	0.47	733				0.00	0.00
117	118	-0.965	-0.736	-0.859	2.000	10046	4321	28	157	-42973	-2276	1700	N	1103	89.27	80.34	869	0	0.13	Not Reqd	0.00	0.06	0.37	571	1296	759	58.42	0.00	0.00
118	118	-0.965	-0.737	-0.859	2.000	10046	4322	28	134	-42963	-2276	1928	N	1345	89.27	80.34	952	0	0.13	Not Reqd	0.00	0.06	0.37	572	1372	759	66.52	0.00	0.00
118	119	-0.964	-0.761	-0.872	2.000	10124	4823	33	313	-25163	-2013	2050	N	2500	80.28	77.76	1321	0	0.13	Not Reqd	0.00	0.06	0.37	553	1687	671	92.96	0.00	0.00
119	119	-0.964	-0.761	-0.872	2.000	10124	4824	33	287	-25151	-2013	2186	N	2524	80.28	77.76	1329	0	0.13	Not Reqd	0.00	0.06	0.37	553	1694	671	93.67	0.00	0.00
119	120	-0.794	-1.004	-0.886	2.000	10203	6159	45	439	-8544	-1749	2280	N	3056	64.46	77.76	1507	0	0.13	Not Reqd	0.00	0.06	0.21	307	1633	583	71.31	0.00	0.00
120	120	-0.794	-1.003	-0.886	2.000	10203	6161	45	406	-8532	-1749	2327	N	3083	64.46	77.76	1515	0	0.13	Not Reqd	0.00	0.06	0.21	307	1641	583	71.84	0.00	0.00
120	121	-0.447	-0.830	-0.609	2.000	10282	7958	61	495	6573	-1490	2358	N	1337	57.01	77.76	919	0	0.13	Not Reqd	0.00	0.06	0.21	306	1103	497	30.63	0.00	0.00
121	121	-0.448	-0.830	-0.609	2.000	10282	7961	61	452	6585	-1490	2323	N	1356	57.01	77.76	926	0	0.13	Not Reqd	0.00	0.06	0.21	306	1109	497	30.92	0.00	0.00
121	122	-0.453	-0.886	-0.629	2.000	10361	9726	80	573	19888	-1269	2385	N	1224	66.63	77.76	861	0	0.13	Not Reqd	0.00	0.06	0.21	304	1049	423	24.52	0.00	0.00
122	122	-0.453	-0.885	-0.629	2.000	10361	9729	80	520	19901	-1269	2277	N	1245	66.63	77.76	869	0	0.13	Not Reqd	0.00	0.06	0.21	304	1055	423	24.76	0.00	0.00
122	123	-0.455	-0.953	-0.648	2.000	10440	11421	100	640	31543	-1052	2339	N	1072	74.88	77.76	793	0	0.13	Not Reqd	0.00	0.06	0.21	302	986	351	20.00	0.00	0.00
123	123	-0.455	-0.953	-0.648	2.000	10440	11424	100	578	31555	-1052	2168	N	1095	74.88	77.76	800	0	0.13	Not Reqd	0.00	0.06	0.21	302	992	351	20.20	0.00	0.00
123	124	-0.456	-1.032	-0.668	2.000	10519	13002	123	698	41543	-839	2230	N	939	81.61	77.76	733	0	0.13	Not Reqd	0.00	0.06	0.21	301	930	280	16.91	0.00	0.00
124	124	-0.457	-1.032	-0.669	2.000	10519	13006	123	628	41555	-839	2004	N	965	81.61	77.76	741	0	0.13	Not Reqd	0.00	0.06	0.21	301	938	280	17.09	0.00	0.00
124	125	-0.452	-1.138	-0.689	2.000	10598	14426	147	748	49896	-631	2067	N	859	87.08	78.38	697	0	0.13	Not Reqd	0.00	0.06	0.21	302	899	210	15.05	0.00	0.00
125	125	-0.458	-1.007	-0.648	2.000	10598	14430	147	667	49906	-631	1786	N	518	87.08	78.38	585	0	0.13	Not Reqd	0.00	0.06	0.21	302	798	210	12.98	0.00	0.00
125	126	-0.478	-0.963	-0.646	2.000	10598	15650	174	788	56592	-423	1849	N	411	91.09	81.98	561	0	0.13	Not Reqd	0.00	0.06	0.21	315	788	141	12.19	0.00	0.00
126	126	-0.478	-0.963	-0.646	2.000	10598	15654	174	703	56601	-423	1541	N	411	91.09	81.98	561	0	0.13	Not Reqd	0.00	0.06	0.21	315	788	141	12.19	0.00	0.00
126	127	-0.494	-0.933	-0.646	2.000	10598	16623	202	823	61595	-213	1603	N	249	93.93	84.53	515	0	0.13	Not Reqd	0.00	0.06	0.21	324	755	71	11.14	0.00	0.00

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			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	per web	Factor, RF	(Al)	(Al)
Number	Number			(fpc)		(Tcr)				(Mu)	(Vu)	(Tu)		(Vp)	d_v	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
127	127	-0.494	-0.933	-0.646	2.000	10598	16628	202	733	61603	-213	1268	N	249	93.93	84.53	515	0	0.13	Not Reqd	0.00	0.06	0.21	324	755	71	11.14	0.00	0.00
127	128	-0.511	-0.900	-0.646	2.000	10598	17298	233	853	64857	-1	1330	N	74	95.27	85.74	458	0	0.13	Not Reqd	0.00	0.06	0.21	328	708	0	10.11	0.00	0.00
128	128	-0.511	-0.900	-0.646	2.000	10598	17303	233	758	64863	-1	976	N	74	95.27	85.74	458	0	0.13	Not Reqd	0.00	0.06	0.21	328	708	0	10.11	0.00	0.00
128	129	-0.526	-0.864	-0.643	2.000	10598	17622	266	877	66323	213	1037	N	-56	95.33	85.79	449	0	0.13	Not Reqd	0.00	0.06	0.21	328	699	71	8.09	0.00	0.00
129	129	-0.526	-0.864	-0.643	2.000	10598	17625	266	812	66327	213	793	N	-56	95.33	85.79	449	0	0.13	Not Reqd	0.00	0.06	0.21	328	699	71	8.09	0.00	0.00
129	130	-0.531	-0.852	-0.642	2.000	10598	17693	278	-37	66453	289	-77	N	-123	95.06	85.55	470	0	0.13	Not Reqd	0.00	0.06	0.21	327	717	96	7.70	0.00	0.00
130	130	-0.531	-0.852	-0.642	2.000	10598	17693	278	-103	66453	289	-322	N	-123	95.06	85.55	470	0	0.13	Not Reqd	0.00	0.06	0.21	327	717	96	7.70	0.00	0.00
130	131	-0.544	-0.824	-0.641	2.000	10598	17459	313	-83	65410	506	-360	N	-302	93.23	83.91	520	0	0.13	Not Reqd	0.00	0.06	0.21	320	757	169	6.63	0.00	0.00
131	131	-0.544	-0.824	-0.641	2.000	10598	17458	313	-178	65407	506	-717	N	-302	93.23	83.91	520	0	0.13	Not Reqd	0.00	0.06	0.21	320	757	169	6.63	0.00	0.00
131	132	-0.557	-0.802	-0.642	2.000	10598	16755	351	-160	62454	724	-756	N	-460	89.95	80.95	559	0	0.13	Not Reqd	0.00	0.06	0.21	309	781	241	5.62	0.00	0.00
132	132	-0.557	-0.802	-0.642	2.000	10598	16753	351	-251	62449	724	-1097	N	-460	89.95	80.95	559	0	0.13	Not Reqd	0.00	0.06	0.21	309	781	241	5.62	0.00	0.00
132	133	-0.568	-0.788	-0.644	2.000	10598	15532	390	-232	57535	945	-1136	N	-609	85.33	77.76	596	0	0.13	Not Reqd	0.00	0.06	0.21	297	804	315	4.76	0.00	0.00
133	133	-0.568	-0.788	-0.644	2.000	10598	15530	390	-317	57528	945	-1449	N	-609	85.33	77.76	596	0	0.13	Not Reqd	0.00	0.06	0.21	297	804	315	4.76	0.00	0.00
133	134	-0.578	-0.779	-0.647	2.000	10598	13740	431	-295	50604	1168	-1485	N	-752	79.41	77.76	654	0	0.13	Not Reqd	0.00	0.06	0.37	538	1073	389	5.75	0.00	0.00
134	134	-0.578	-0.779	-0.647	2.000	10598	13738	431	-370	50596	1168	-1761	N	-752	79.41	77.76	654	0	0.13	Not Reqd	0.00	0.06	0.37	538	1073	389	5.75	0.00	0.00
134	135	-0.586	-0.771	-0.650	2.000	10598	11334	475	-343	41616	1392	-1792	N	-906	72.25	77.76	721	0	0.13	Not Reqd	0.00	0.06	0.37	541	1135	464	5.24	0.00	0.00
135	135	-0.586	-0.771	-0.650	2.000	10598	11332	474	-407	41606	1391	-2026	N	-1179	72.25	77.76	815	0	0.13	Not Reqd	0.00	0.06	0.37	542	1221	464	5.79	0.00	0.00
135	136	-0.610	-0.672	-0.633	2.000	10519	8269	519	-371	30514	1621	-2048	N	-1349	63.50	77.76	888	0	0.13	Not Reqd	0.00	0.06	0.37	545	1290	540	5.33	0.00	0.00
136	136	-0.610	-0.673	-0.633	2.000	10519	8267	519	-416	30503	1621	-2214	N	-1323	63.50	77.76	879	0	0.13	Not Reqd	0.00	0.06	0.37	545	1282	540	5.28	0.00	0.00
136	137	-0.633	-0.583	-0.614	2.000	10440	4504	566	-368	17221	1858	-2224	N	-1464	53.21	77.76	947	0	0.13	Not Reqd	0.00	0.06	0.37	549	1346	619	4.86	0.00	0.00
137	137	-0.633	-0.584	-0.614	2.000	10440	4502	566	-392	17208	1858	-2317	N	-1442	53.21	77.76	939	0	0.13	Not Reqd	0.00	0.06	0.37	549	1339	619	4.82	0.00	0.00
137	138	-0.621	-0.554	-0.593	2.000	10361	1	614	-328	6	2515	-2311	N	-1488	41.99	77.76	570	362	0.96	Not Reqd	0.00	0.48	0.37	280				0.00	0.00

1.03

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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								(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	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)	As_prov'd)	(Vs_prov)	(ϕVn)	(Vu)		in^2	in^2
1	1	-0.645	-0.674	-0.657	2.000	13359	2	-648	850	11	-2656	4917	Y	1560	57.58	98.42	1137	0	0.13	0.127	0.00	0.13	0.37	700				11.30	3.86
1	2	-0.689	-0.685	-0.687	2.000	12965	4808	-604	922	19951	-2403	4932	Y	1540	64.73	95.13	1110	0	0.13	0.131	0.00	0.13	0.37	677	1608	874	4.42	11.59	3.96
2	2	-0.689	-0.684	-0.687	2.000	12965	4813	-604	896	19977	-2403	4824	Y	1529	64.73	95.13	1107	0	0.13	0.129	0.00	0.13	0.37	677	1605	872	4.41	11.34	3.88
2	3	-0.725	-0.711	-0.719	2.000	12557	8952	-562	949	37634	-2159	4819	Y	1464	73.21	92.12	1066	0	0.13	0.133	0.00	0.13	0.21	364	1287	791	3.46	11.61	3.97
3	3	-0.725	-0.710	-0.719	2.000	12557	8956	-562	906	37656	-2158	4636	Y	1615	73.21	92.12	1116	0	0.13	0.128	0.00	0.13	0.21	364	1332	788	3.71	11.17	3.82
3	4	-0.743	-0.771	-0.753	2.000	12301	11781	-529	937	50100	-1972	4621	Y	1532	76.35	89.42	1072	0	0.13	0.130	0.00	0.13	0.21	353	1283	726	3.93	11.31	3.87
4	4	-0.743	-0.770	-0.753	2.000	12301	11785	-530	885	50120	-1975	4399	Y	1004	76.35	89.42	889	0	0.13	0.124	0.00	0.13	0.21	353	1118	723	3.08	10.77	3.68
4	5	-0.778	-0.732	-0.762	2.000	11939	14222	-498	908	61219	-1794	4376	Y	913	80.63	86.94	819	0	0.13	0.127	0.00	0.13	0.21	341	1044	663	3.13	10.96	3.75
5	5	-0.778	-0.732	-0.762	2.000	11939	14226	-498	838	61240	-1794	4076	Y	847	80.63	86.94	796	0	0.13	0.118	0.00	0.12	0.21	341	1023	658	3.05	10.21	3.49
5	6	-0.822	-0.676	-0.771	2.000	11623	16765	-459	859	73348	-1569	4038	Y	737	85.29	84.78	722	0	0.13	0.120	0.00	0.12	0.21	330	947	583	3.20	10.33	3.53
6	6	-0.823	-0.676	-0.771	2.000	11623	16769	-459	768	73369	-1569	3638	Y	714	85.29	84.78	714	0	0.13	0.108	0.00	0.12	0.21	330	939	577	3.21	9.31	3.18
6	7	-0.864	-0.624	-0.780	2.000	11354	18750	-421	781	83442	-1346	3593	Y	610	89.15	82.94	650	0	0.13	0.109	0.00	0.12	0.21	320	873	502	3.44	9.37	3.20
7	7	-0.864	-0.624	-0.780	2.000	11354	18754	-421	679	83460	-1346	3139	N	590	89.15	82.94	643	0	0.13	Not Reqd	0.00	0.06	0.21	320	867	449	3.98	0.00	0.00
7	8	-0.900	-0.579	-0.789	2.000	11124	20213	-385	687	91545	-1126	3089	N	487	92.23	83.01	597	0	0.13	Not Reqd	0.00	0.06	0.21	319	825	375	4.50	0.00	0.00
8	8	-0.901	-0.579	-0.789	2.000	11124	20217	-385	577	91560	-1126	2590	N	468	92.23	83.01	590	0	0.13	Not Reqd	0.00	0.06	0.21	319	819	375	4.45	0.00	0.00
8	9	-0.932	-0.543	-0.797	2.000	10933	21192	-351	583	97701	-908	2538	N	366	94.56	85.11	563	0	0.13	Not Reqd	0.00	0.06	0.21	327	801	303	5.26	0.00	0.00
9	9	-0.932	-0.543	-0.797	2.000	10933	21195	-351	468	97713	-908	2005	N	343	94.56	85.11	555	0	0.13	Not Reqd	0.00	0.06	0.21	327	793	303	5.20	0.00	0.00
9	10	-0.957	-0.515	-0.804	2.000	10788	21673	-318	-720	101902	-693	760	N	241	96.16	86.54	526	0	0.13	Not Reqd	0.00	0.06	0.21	332	772	231	6.11	0.00	0.00
10	10	-0.957	-0.516	-0.804	2.000	10788	21669	-318	-838	101905	-693	204	N	222	96.16	86.54	519	0	0.13	Not Reqd	0.00	0.06	0.21	332	766	231	6.05	0.00	0.00
10	11	-0.976	-0.497	-0.810	2.000	10683	21800	-286	-731	104298	-480	253	N	117	97.00	87.30	487	0	0.13	Not Reqd	0.00	0.06	0.21	335	739	160	7.08	0.00	0.00
11	11	-0.976	-0.497	-0.810	2.000	10683	21795	-286	-850	104298	-480	-316	N	97	97.00	87.30	480	0	0.13	Not Reqd	0.00	0.06	0.21	335	733	160	7.01	0.00	0.00
11	12	-0.989	-0.487	-0.815	2.000	10683	21562	-256	-743	104883	-268	-267	N	-27	97.26	87.54	459	0	0.13	Not Reqd	0.00	0.06	0.21	336	715	89	8.33	0.00	0.00
12	12	-0.989	-0.487	-0.815	2.000	10683	21558	-256	-861	104880	-268	-839	N	-50	97.26	87.54	467	0	0.13	Not Reqd	0.00	0.06	0.21	336	722	89	8.41	0.00	0.00
12	13	-0.996	-0.486	-0.820	2.000	10598	21001	-228	-752	103698	-59	-789	N	-136	96.31	86.68	494	0	0.13	Not Reqd	0.00	0.06	0.21	333	744	20	10.52	0.00	0.00
13	13	-0.996	-0.486	-0.820	2.000	10598	20998	-228	-824	103695	-59	-1142	N	-146	96.31	86.68	497	0	0.13	Not Reqd	0.00	0.06	0.21	333	746	20	10.56	0.00	0.00
13	14	-0.997	-0.487	-0.820	2.000	10598	20802	-221	-796	103117	-7	-1129	N	-170	96.03	86.43	503	0	0.13	Not Reqd	0.00	0.06	0.21	332	751	2	11.16	0.00	0.00
14	14	-0.997	-0.487	-0.820	2.000	10598	20799	-221	-867	103113	-7	-1480	N	-170	96.03	86.43	503	0	0.13	Not Reqd	0.00	0.06	0.21	332	751	2	11.16	0.00	0.00
14	15	-0.995	-0.501	-0.824	2.000	10598	19886	-195	-755	99774	201	-1426	N	-278	94.46	85.01	535	0	0.13	Not Reqd	0.00	0.06	0.21	327	776	67	11.91	0.00	0.00
15	15	-0.995	-0.501	-0.824	2.000	10598	19882	-195	-863	99765	201	-1969	N	-278	94.46	85.01	535	0	0.13	Not Reqd	0.00	0.06	0.21	327	776	67	11.91	0.00	0.00
15	16	-0.986	-0.525	-0.827	2.000	10598	18733	-170	-748	94748	407	-1912	N	-396	92.08	82.87	569	0	0.13	Not Reqd	0.00	0.06	0.21	319	799	136	12.68	0.00	0.00
16	16	-0.986	-0.526	-0.827	2.000	10598	18729	-170	-850	94736	407	-2428	N	-396	92.08	82.87	569	0	0.13	Not Reqd	0.00	0.06	0.21	319	799	136	12.68	0.00	0.00
16	17	-0.972	-0.560	-0.830	2.000	10598	17385	-148	-732	88083	611	-2368	N	-510	88.90	80.01	597	0	0.13	Not Reqd	0.00	0.06	0.21	309	815	204	13.43	0.00	0.00
17	17	-0.972	-0.560	-0.830	2.000	10598	17381	-148	-826	88069	611	-2848	N	-510	88.90	80.01	597	0	0.13	Not Reqd	0.00	0.06	0.21	309	815	204	13.43	0.00	0.00
17	18	-0.952	-0.606	-0.832	2.000	10598	15881	-126	-706	79818	813	-2786	N	-620	84.95	77.76	630	0	0.13	Not Reqd	0.00	0.06	0.21	301	838	271	14.48	0.00	0.00
18	18	-0.952	-0.606	-0.832	2.000	10598	15877	-126	-793	79801	813	-3221	Y	-620	84.95	77.76	630	0	0.13	0.105	0.00	0.12	0.21	301	838	319	10.66	-8.87	-3.03
18	19	-0.925	-0.664	-0.835	2.000	10598	14258	-107	-672	69989	1014	-3158	N	-728	80.26	77.76	684	0	0.13	Not Reqd	0.00	0.06	0.21	303	889	338	16.49	0.00	0.00
19	19	-0.925	-0.664	-0.835	2.000	10598	14255	-107	-750	69971	1014	-3539	Y	-728	80.26	77.76	684	0	0.13	0.115	0.00	0.12	0.21	303	889	390	11.69	-9.74	-3.33
19	20	-0.892	-0.734	-0.837	2.000	10598	12558	-89	-665	58641	1213	-3513	Y	-838	74.89	77.76	744	0	0.13	0.115	0.00	0.12	0.21	305	944	456	13.37	-9.67	-3.31
20	20	-0.891	-0.735	-0.837	2.000	10598	12554	-89	-736	58620	1213	-3843	Y	-1183	74.89	77.76	864	0	0.13	0.125	0.00	0.13	0.21	306	1053	461	15.63	-10.58	-3.62
20	21	-0.866	-0.724	-0.814	2.000	10519	11163	-75	-573	46140	1411	-3738	Y	-1294	68.71	77.76	919	0	0.13	0.123	0.00	0.13	0.21	307	1104	526	18.35	-10.35	-3.54
21	21	-0.866	-0.725	-0.814	2.000	10519	11160	-75	-634	46119	1411	-3989	Y	-1261	68.71	77.76	908	0	0.13	0.131	0.00	0.13	0.21	307	1094	529	17.49	-11.05	-3.78
21	22	-0.834	-0.723	-0.791	2.000	10440	9755	-62	-528	32135	1614	-3941	Y	-1378	61.76	77.76	947	0	0.13	0.130	0.00	0.13	0.21	307	1129	596	19.73	-10.98	-3.75
22	22	-0.834	-0.724	-0.791	2.000	10440	9752	-62	-581	32113	1615	-4116	Y	-1349	61.76	77.76	937	0	0.13	0.136	0.00	0.13	0.21	307	1120	599	18.84	-11.47	-3.92
22	23	-0.795	-0.730	-0.769	2.000	10361	8346	-50	-477	16589	1823	-4070	Y	-1472	54.02	77.76	979	0	0.13	0.136	0.00	0.13	0.21	307	1157	668	21.51	-11.41	-3.90
23	23	-0.795	-0.730	-0.769	2.000	10361	8343	-50	-523	16566	1823	-4160	Y	-1445	54.02	77.76	970	0	0.13	0.139	0.00	0.13	0.21	307	1149	669	20.57	-11.66	-3.99
23	24	-0.750	-0.743	-0.747	2.000	10282	6958	-40	-421	-525	2036	-4117	Y	-1568	62.53	77.76	1011	0	0.13	0.138	0.00	0.13	0.41	615	1463	739	37.91	-11.61	-3.97
24	24	-0.750	-0.744	-0.747	2.000	10282	6956	-40	-458	-547	2036	-4114	Y	-1544	62.53	77.76	1003	0	0.13	0.138	0.00	0.13	0.41	615	1456	739	36.53	-11.60	-3.97
24	25	-0.925	-0.902	-0.915	2.000	10203	5611	-31	-359	-19352	2283	-4072	Y	-2718	71.34	77.76	1394	0	0.13	0.138	0.00	0.13	0.41	615	1808	821	64.13	-11.56	-3.95
25	25	-0.925	-0.903	-0.915	2.000	10203	5609	-31	-389	-19374	2284	-3967	Y	-2690	71.34	77.76	1385	0	0.13	0.134	0.00	0.13	0.41	615	1799	820	61.93	-11.26	-3.85
25	26	-0.981	-0.800	-0.899	2.000	10124	4324	-23	-293	-40054	2539	-3929	Y	-2170	83.88	77.76	1211	0	0.13	0.134	0.00	0.13	0.41	615	1643	905	62.81	-11.22	-3.84
26	26	-0.981	-0.800	-0.899	2.000	10124	4323	-23	-316	-40075	2539	-3711	Y	-2144	83.88	77.76	1203	0	0.13	0.127	0.00	0.13	0.41	615	1636	901	60.69	-10.60	-3.62
26	27	-0.873	-0.904	-0.887	2.000	10046	3811	-19	-148	-61977	2797	-3601	Y	-1077	90.17	81.16	868	168	0.22	0.124	0.00	0.17	0.41	642	1359	985	44.35	-10.35	-3.54
27	27	-0.872	-0.904	-0.887	2.000	10046	3810	-19	-168	-61995	2797	-3272	Y	-821	90.17	81.16	783	253	0.33	0.113	0.00	0.22	0.41	642	1282	981	34.79	-9.40	-3.22
27	28	-0.640	-1.194	-0.896	2.000	10046	3888	-19	-169	-85339	3054	-3331	Y	-203	92.83	83.55	556	575	0.73	0.115	0.00	0.42	0.41	654				-9.57	-3.27
28	28	-0.639	-1.194	-0.896	2.000	10046	3888	-19	-183	-85350	3054	-3024	Y	-203	92.83	83.55	556	575	0.73	0.104	0.00	0.42	0.41	654				-8.69	-2.97
28	29	-0.545	-1.312	-0.901	2.000	10046	3931	-19	-183	-93231	3126	-3043	Y	0	93.00	83.70	474	684	0.87	0.105	0.00	0.49	0.41	652				-8.75	-2.99
29	29	-0.545	-1.312	-0.901	2.000	10046	-20676	-787	93	-117840	-3644	1108	N	0	93.00	83.70	434	916	1.18	Not Reqd	0.00	0.59	0.41	643				0.00	0.00
29	30	-0.635	-1.203	-0.898	2.000	10046	-19083	-775	109	-109057	-3561	1106	N	202	92.83	83.55	515	804	1.03	Not Reqd	0.00	0.52	0.41	645				0.00	0.00
30	30	-0.635	-1.203	-0.898	2.000	10046	-19083	-775	178	-109053	-3561	1498	N	202	92.83	83.55	515	804	1.03	Not Reqd	0.00	0.52	0.41	645				0.00	0.00
30	31	-0.852	-0.941	-0.893	2.000	10046	-14329	-738	224	-83169	-3267	1486	N	769	90.31	81.28	735	474	0.62	Not Reqd	0.00	0.31	0.41	637	1235	1089	1.59	0.00	0.00
31	31	-0.853	-0.942	-0.894	2.000	10046	-14328	-738	300	-83159	-3266	1927	N	1028	90.31	81.28	825	385	0.50	Not Reqd	0.00	0.25	0.41	638	1316	1089	1.92	0.00	0.00
31	32	-0.935	-0.873	-0.907	2.000	10124	-9939	-701	338	-59672	-2975	1906	N	2400	84.11	77.76	1288	0	0.13	Not Reqd	0.00	0.06	0.41	615	1713	992	4.09	0.00	0.00
32	32	-0.935	-0.873	-0.907	2.000	10124	-9937	-701	392	-59661	-2975	2231	N	2426	84.11	77.76	1297	0	0.13	Not Reqd	0.00	0.06	0.41	615	1720	992	4.12	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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														(kip)	(kip)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(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_v	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
32	33	-0.781	-1.098	-0.920	2.000	10203	-5926	-664	422	-38545	-2690	2203	N	3317	68.62	77.76	1594	0	0.13	Not Reqd	0.00	0.06	0.41	615	1988	897	5.93	0.00	0.00
33	33	-0.781	-1.097	-0.919	2.000	10203	-5923	-664	455	-38532	-2690	2413	N	3345	68.62	77.76	1603	0	0.13	Not Reqd	0.00	0.06	0.41	615	1996	897	5.97	0.00	0.00
33	34	-0.411	-0.822	-0.585	2.000	10282	-2295	-626	479	-19734	-2414	2379	N	1221	58.17	77.76	876	18	0.13	Not Reqd	0.00	0.06	0.41	611	1339	805	3.56	0.00	0.00
34	34	-0.406	-0.816	-0.579	2.000	10282	-2292	-626	492	-19721	-2414	2486	N	1239	58.17	77.76	883	11	0.13	Not Reqd	0.00	0.06	0.41	611	1345	805	3.59	0.00	0.00
34	35	-0.462	-0.806	-0.602	2.000	10361	950	-589	511	-3064	-2174	2447	N	1134	49.41	77.76	866	0	0.13	Not Reqd	0.00	0.06	0.21	307	1056	725	2.69	0.00	0.00
35	35	-0.462	-0.806	-0.602	2.000	10361	953	-589	506	-3051	-2174	2463	N	1154	49.41	77.76	873	0	0.13	Not Reqd	0.00	0.06	0.21	307	1062	725	2.72	0.00	0.00
35	36	-0.507	-0.812	-0.626	2.000	10440	3808	-553	521	11631	-1941	2420	N	1061	66.43	77.76	842	0	0.13	Not Reqd	0.00	0.06	0.21	307	1034	647	3.10	0.00	0.00
36	36	-0.507	-0.812	-0.626	2.000	10440	3811	-553	500	11644	-1941	2356	N	1084	66.43	77.76	849	0	0.13	Not Reqd	0.00	0.06	0.21	307	1041	647	3.14	0.00	0.00
36	37	-0.541	-0.837	-0.650	2.000	10519	6279	-516	511	24400	-1714	2309	N	983	73.37	77.76	812	0	0.13	Not Reqd	0.00	0.06	0.21	307	1007	571	3.53	0.00	0.00
37	37	-0.541	-0.836	-0.650	2.000	10519	6282	-516	477	24412	-1714	2176	N	1009	73.37	77.76	821	0	0.13	Not Reqd	0.00	0.06	0.21	307	1016	571	3.58	0.00	0.00
37	38	-0.566	-0.881	-0.675	2.000	10598	8366	-481	486	35293	-1494	2127	N	899	79.25	77.76	768	0	0.13	Not Reqd	0.00	0.06	0.21	306	966	498	3.92	0.00	0.00
38	38	-0.566	-0.881	-0.675	2.000	10598	8369	-481	440	35305	-1495	1937	N	624	79.25	77.76	672	0	0.13	Not Reqd	0.00	0.06	0.21	305	879	498	3.38	0.00	0.00
38	39	-0.599	-0.828	-0.679	2.000	10598	10074	-446	448	44354	-1278	1887	N	510	84.18	77.76	616	0	0.13	Not Reqd	0.00	0.06	0.21	303	827	426	3.70	0.00	0.00
39	39	-0.599	-0.828	-0.679	2.000	10598	10077	-446	393	44363	-1278	1645	N	510	84.18	77.76	615	0	0.13	Not Reqd	0.00	0.06	0.21	303	827	426	3.70	0.00	0.00
39	40	-0.626	-0.787	-0.682	2.000	10598	11412	-411	402	51600	-1063	1595	N	395	88.09	79.28	575	0	0.13	Not Reqd	0.00	0.06	0.21	308	794	354	4.21	0.00	0.00
40	40	-0.626	-0.787	-0.682	2.000	10598	11414	-411	339	51608	-1063	1314	N	395	88.09	79.28	575	0	0.13	Not Reqd	0.00	0.06	0.21	308	794	354	4.21	0.00	0.00
40	41	-0.647	-0.756	-0.685	2.000	10598	12394	-378	348	57049	-848	1265	N	281	91.00	81.90	545	0	0.13	Not Reqd	0.00	0.06	0.21	318	777	283	4.92	0.00	0.00
41	41	-0.647	-0.756	-0.685	2.000	10598	12396	-378	281	57055	-848	955	N	281	91.00	81.90	545	0	0.13	Not Reqd	0.00	0.06	0.21	318	777	283	4.92	0.00	0.00
41	42	-0.662	-0.736	-0.688	2.000	10598	13036	-346	292	60713	-635	908	N	167	92.92	83.63	513	0	0.13	Not Reqd	0.00	0.06	0.21	324	754	212	5.70	0.00	0.00
42	42	-0.662	-0.735	-0.688	2.000	10598	13038	-346	221	60717	-635	577	N	167	92.92	83.63	513	0	0.13	Not Reqd	0.00	0.06	0.21	324	754	212	5.70	0.00	0.00
42	43	-0.671	-0.726	-0.690	2.000	10598	13363	-315	235	62619	-423	533	N	53	93.86	84.47	479	0	0.13	Not Reqd	0.00	0.06	0.21	327	725	141	6.56	0.00	0.00
43	43	-0.671	-0.726	-0.690	2.000	10598	13365	-315	165	62621	-423	206	N	53	93.86	84.47	479	0	0.13	Not Reqd	0.00	0.06	0.21	327	725	141	6.56	0.00	0.00
43	44	-0.674	-0.726	-0.692	2.000	10598	13408	-288	181	62844	-230	169	N	-44	93.88	84.49	478	0	0.13	Not Reqd	0.00	0.06	0.21	327	725	77	7.75	0.00	0.00
44	44	-0.674	-0.726	-0.692	2.000	10598	13409	-288	111	62844	-230	-159	N	-44	93.88	84.49	478	0	0.13	Not Reqd	0.00	0.06	0.21	327	725	77	7.75	0.00	0.00
44	45	-0.670	-0.738	-0.694	2.000	10598	13203	-260	132	61453	-20	-196	N	-162	93.03	83.73	515	0	0.13	Not Reqd	0.00	0.06	0.21	325	756	7	9.64	0.00	0.00
45	45	-0.670	-0.738	-0.694	2.000	10598	13204	-260	60	61451	-20	-531	N	-162	93.03	83.73	515	0	0.13	Not Reqd	0.00	0.06	0.21	325	756	7	9.64	0.00	0.00
45	46	-0.663	-0.759	-0.696	2.000	10598	12766	-233	87	58387	187	-563	N	-308	91.07	81.96	558	0	0.13	Not Reqd	0.00	0.06	0.21	318	789	62	10.33	0.00	0.00
46	46	-0.663	-0.759	-0.696	2.000	10598	12767	-233	17	58383	187	-881	N	-308	91.07	81.96	558	0	0.13	Not Reqd	0.00	0.06	0.21	318	789	62	10.33	0.00	0.00
46	47	-0.654	-0.782	-0.698	2.000	10598	12131	-208	48	53679	394	-908	N	-453	87.84	79.05	596	0	0.13	Not Reqd	0.00	0.06	0.21	308	813	131	10.82	0.00	0.00
47	47	-0.654	-0.782	-0.698	2.000	10598	12131	-208	-18	53673	394	-1200	N	-453	87.84	79.05	596	0	0.13	Not Reqd	0.00	0.06	0.21	308	813	131	10.82	0.00	0.00
47	48	-0.640	-0.816	-0.701	2.000	10598	11331	-185	18	47363	598	-1222	N	-531	83.68	77.76	626	0	0.13	Not Reqd	0.00	0.06	0.21	304	837	199	11.32	0.00	0.00
48	48	-0.640	-0.816	-0.701	2.000	10598	11331	-185	-44	47356	598	-1480	N	-531	83.68	77.76	626	0	0.13	Not Reqd	0.00	0.06	0.21	304	837	199	11.32	0.00	0.00
48	49	-0.610	-0.881	-0.704	2.000	10598	10463	-164	-72	39536	801	-1566	N	-539	79.27	77.76	643	0	0.13	Not Reqd	0.00	0.06	0.21	305	853	267	11.73	0.00	0.00
49	49	-0.610	-0.882	-0.704	2.000	10598	10462	-164	-127	39526	801	-1769	N	-828	79.27	77.76	743	0	0.13	Not Reqd	0.00	0.06	0.21	305	943	267	13.39	0.00	0.00
49	50	-0.590	-0.852	-0.687	2.000	10519	2400	-150	272	23059	999	-1427	N	-1071	73.84	77.76	845	0	0.13	Not Reqd	0.00	0.06	0.21	307	1037	333	15.09	0.00	0.00
50	50	-0.590	-0.853	-0.687	2.000	10519	2402	-150	259	23050	999	-1554	N	-1044	73.84	77.76	836	0	0.13	Not Reqd	0.00	0.06	0.21	307	1029	333	14.92	0.00	0.00
50	51	-0.576	-0.816	-0.669	2.000	10440	3032	-145	253	13784	1194	-1618	N	-1211	66.67	77.76	892	0	0.13	Not Reqd	0.00	0.06	0.21	307	1079	398	15.05	0.00	0.00
51	51	-0.576	-0.816	-0.669	2.000	10440	3033	-145	237	13775	1194	-1695	N	-1186	66.67	77.76	883	0	0.13	Not Reqd	0.00	0.06	0.21	307	1072	398	14.90	0.00	0.00
51	52	-0.557	-0.793	-0.653	2.000	10361	3701	-142	234	3007	1394	-1756	N	-1271	58.56	77.76	911	0	0.13	Not Reqd	0.00	0.06	0.41	615	1374	465	20.24	0.00	0.00
52	52	-0.556	-0.794	-0.653	2.000	10361	3702	-142	213	2997	1394	-1774	N	-1248	58.56	77.76	904	0	0.13	Not Reqd	0.00	0.06	0.41	615	1367	465	20.10	0.00	0.00
52	53	-0.527	-0.786	-0.636	2.000	10282	4419	-139	212	-9309	1600	-1834	N	-1369	58.30	77.76	944	0	0.13	Not Reqd	0.00	0.06	0.41	615	1403	533	19.81	0.00	0.00
53	53	-0.527	-0.786	-0.636	2.000	10282	4420	-139	188	-9319	1600	-1784	N	-1349	58.30	77.76	937	0	0.13	Not Reqd	0.00	0.06	0.41	615	1397	533	19.67	0.00	0.00
53	54	-0.754	-0.943	-0.837	2.000	10203	5195	-137	187	-23323	1841	-1843	N	-2676	68.53	77.76	1380	0	0.13	Not Reqd	0.00	0.06	0.41	615	1795	614	26.96	0.00	0.00
54	54	-0.754	-0.943	-0.837	2.000	10203	5196	-137	159	-23333	1841	-1718	N	-2650	68.53	77.76	1371	0	0.13	Not Reqd	0.00	0.06	0.41	615	1788	614	26.80	0.00	0.00
54	55	-0.849	-0.796	-0.825	2.000	10124	6038	-135	158	-39209	2091	-1776	N	-2188	82.46	77.76	1217	0	0.13	Not Reqd	0.00	0.06	0.41	615	1649	697	22.16	0.00	0.00
55	55	-0.849	-0.796	-0.825	2.000	10124	6039	-135	125	-39218	2091	-1564	N	-2165	82.46	77.76	1209	0	0.13	Not Reqd	0.00	0.06	0.41	615	1642	697	22.01	0.00	0.00
55	56	-0.783	-0.857	-0.817	2.000	10046	6954	-134	124	-57020	2346	-1623	N	-1110	89.61	80.65	876	0	0.13	Not Reqd	0.00	0.06	0.41	638	1362	782	14.00	0.00	0.00
56	56	-0.783	-0.856	-0.817	2.000	10046	6954	-134	87	-57027	2347	-1333	N	-876	89.61	80.65	798	71	0.13	Not Reqd	0.00	0.06	0.41	638	1292	782	12.42	0.00	0.00
56	57	-0.587	-1.101	-0.825	2.000	10046	7947	-134	86	-76787	2604	-1393	N	-231	92.79	83.51	561	404	0.51	Not Reqd	0.00	0.26	0.41	653				0.00	0.00
57	57	-0.587	-1.101	-0.825	2.000	10046	7947	-134	57	-76791	2604	-1117	N	-231	92.79	83.51	561	404	0.51	Not Reqd	0.00	0.26	0.41	653				0.00	0.00
57	58	-0.502	-1.207	-0.829	2.000	10046	8282	-133	56	-83525	2676	-1136	N	0	93.00	83.70	471	520	0.66	Not Reqd	0.00	0.33	0.41	651				0.00	0.00
58	58	-0.542	-1.145	-0.822	2.000	10046	-20671	-788	100	-108778	-3627	1716	N	0	93.00	83.70	426	917	1.18	Not Reqd	0.00	0.59	0.41	641				0.00	0.00
58	59	-0.632	-1.038	-0.820	2.000	10046	-19146	-776	114	-100109	-3544	1711	N	197	92.82	83.54	505	808	1.04	Not Reqd	0.00	0.52	0.41	643				0.00	0.00
59	59	-0.632	-1.038	-0.820	2.000	10046	-19145	-776	183	-100102	-3544	2071	N	197	92.82	83.54	505	808	1.04	Not Reqd	0.00	0.52	0.41	643				0.00	0.00
59	60	-0.850	-0.778	-0.817	2.000	10046	-14566	-740	221	-74534	-3250	2051	N	750	90.13	81.12	718	486	0.63	Not Reqd	0.00	0.32	0.41	634	1217	1083	1.54	0.00	0.00
60	60	-0.851	-0.779	-0.817	2.000	10046	-14564	-740	299	-74522	-3251	2435	N	987	90.13	81.12	800	404	0.53	Not Reqd	0.00	0.26	0.41	634	1291	1084	1.84	0.00	0.00
60	61	-0.942	-0.697	-0.831	2.000	10124	-10308	-703	332	-51300	-2960	2410	N	2200	83.68	77.76	1221	0	0.13	Not Reqd	0.00	0.06	0.41	615	1652	987	3.84	0.00	0.00
61	61	-0.942	-0.696	-0.831	2.000	10124	-10306	-703	388	-51286	-2961	2687	N	2224	83.68	77.76	1229	0	0.13	Not Reqd	0.00	0.06	0.41	615	1660	987	3.87	0.00	0.00
61	62	-0.827	-0.871	-0.846	2.000	10203	-6384	-667	416	-30396	-2676	2657	N	2962	68.57	77.76	1475	0	0.13	Not Reqd	0.00	0.06	0.41	615	1881	892	5.45	0.00	0.00
62	62	-0.827	-0.870	-0.846	2.000	10203	-6381	-667	451	-30381	-2676	2821	N	2988	68.57	77.76	1484	0	0.13	Not Reqd	0.00	0.06	0.41	615	1889	892	5.49	0.00	0.00
62	63	-0.526	-0.623	-0.567	2.000	10282	-2805	-630	474	-11773	-2400	2786	N	1191	58.17	77.76	877	11	0.13	Not Reqd	0.00	0.06	0.41	613	1342	800	3.58	0.00	0.00
63	63	-0.522	-0.617	-0.562	2.000	10282	-2803	-630	489	-11757	-2400	2848	N	1209	58.17	77.76	884	5	0.13	Not Reqd	0.00	0.06	0.41	614	1348	800	3.61	0.00	0.00
63	64	-0.579	-0.595	-0.585	2.000	10361	421	-593	508	4743	-2161	2809	N	1106	58.59	77.76	857	0	0.13	Not Reqd	0.00	0.06	0.21	307	1048	720	2.66	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																											
64	64	-0.579	-0.594	-0.585	2.000	10361	424	-593	506	4758	-2161	2781	N	1126	58.59	77.76	863	0	0.13	Not Reqd	0.00	0.06	0.21	307	1054	720	2.69	0.00	0.00
64	65	-0.625	-0.586	-0.610	2.000	10440	3289	-557	521	19314	-1928	2739	N	1035	66.43	77.76	827	0	0.13	Not Reqd	0.00	0.06	0.21	307	1020	643	3.04	0.00	0.00
65	65	-0.625	-0.585	-0.609	2.000	10440	3292	-556	504	19329	-1928	2632	N	1058	66.43	77.76	835	0	0.13	Not Reqd	0.00	0.06	0.21	307	1027	643	3.07	0.00	0.00
65	66	-0.660	-0.592	-0.635	2.000	10519	5795	-520	516	31987	-1701	2586	N	959	73.37	77.76	782	0	0.13	Not Reqd	0.00	0.06	0.21	305	978	567	3.37	0.00	0.00
66	66	-0.660	-0.592	-0.635	2.000	10519	5798	-520	485	32000	-1701	2410	N	984	73.37	77.76	790	0	0.13	Not Reqd	0.00	0.06	0.21	305	986	567	3.42	0.00	0.00
66	67	-0.685	-0.614	-0.660	2.000	10598	7938	-484	495	42805	-1481	2362	N	877	79.25	77.76	738	0	0.13	Not Reqd	0.00	0.06	0.21	303	938	494	3.75	0.00	0.00
67	67	-0.685	-0.613	-0.660	2.000	10598	7940	-486	445	42818	-1480	2143	N	609	79.25	77.76	645	0	0.13	Not Reqd	0.00	0.06	0.21	303	854	493	3.23	0.00	0.00
67	68	-0.715	-0.568	-0.664	2.000	10598	9727	-450	454	51793	-1264	2095	N	497	84.18	77.76	592	0	0.13	Not Reqd	0.00	0.06	0.21	301	804	421	3.55	0.00	0.00
68	68	-0.716	-0.568	-0.664	2.000	10598	9730	-450	401	51804	-1264	1813	N	497	84.18	77.76	592	0	0.13	Not Reqd	0.00	0.06	0.21	301	804	421	3.55	0.00	0.00
68	69	-0.739	-0.533	-0.668	2.000	10598	11158	-416	410	58978	-1048	1764	N	386	88.09	79.28	553	0	0.13	Not Reqd	0.00	0.06	0.21	306	773	349	4.06	0.00	0.00
69	69	-0.739	-0.533	-0.668	2.000	10598	11160	-416	349	58986	-1048	1442	N	386	88.09	79.28	553	0	0.13	Not Reqd	0.00	0.06	0.21	306	773	349	4.06	0.00	0.00
69	70	-0.756	-0.509	-0.671	2.000	10598	12239	-382	359	64371	-833	1394	N	274	91.00	81.90	525	0	0.13	Not Reqd	0.00	0.06	0.21	316	756	278	4.76	0.00	0.00
70	70	-0.756	-0.509	-0.671	2.000	10598	12241	-382	292	64377	-833	1043	N	274	91.00	81.90	525	0	0.13	Not Reqd	0.00	0.06	0.21	316	756	278	4.76	0.00	0.00
70	71	-0.767	-0.495	-0.673	2.000	10598	12982	-350	303	67981	-619	996	N	163	92.92	83.63	494	0	0.13	Not Reqd	0.00	0.06	0.21	322	734	206	5.53	0.00	0.00
71	71	-0.767	-0.495	-0.673	2.000	10598	12983	-350	233	67985	-619	626	N	163	92.92	83.63	494	0	0.13	Not Reqd	0.00	0.06	0.21	322	734	206	5.53	0.00	0.00
71	72	-0.772	-0.492	-0.675	2.000	10598	13407	-318	246	69831	-406	581	N	51	93.86	84.47	460	0	0.13	Not Reqd	0.00	0.06	0.21	325	707	135	6.39	0.00	0.00
72	72	-0.772	-0.492	-0.675	2.000	10598	13408	-318	176	69833	-406	217	N	51	93.86	84.47	460	0	0.13	Not Reqd	0.00	0.06	0.21	325	707	135	6.39	0.00	0.00
72	73	-0.771	-0.498	-0.677	2.000	10598	13536	-290	191	69998	-212	179	N	-51	93.86	84.47	463	0	0.13	Not Reqd	0.00	0.06	0.21	325	709	71	7.60	0.00	0.00
73	73	-0.771	-0.499	-0.677	2.000	10598	13537	-290	120	69998	-212	-187	N	-51	93.86	84.47	463	0	0.13	Not Reqd	0.00	0.06	0.21	325	709	71	7.60	0.00	0.00
73	74	-0.765	-0.516	-0.678	2.000	10598	13414	-261	140	68535	-2	-225	N	-165	92.92	83.63	497	0	0.13	Not Reqd	0.00	0.06	0.21	322	738	1	9.46	0.00	0.00
74	74	-0.765	-0.516	-0.678	2.000	10598	13415	-261	67	68532	-2	-598	N	-165	92.92	83.63	497	0	0.13	Not Reqd	0.00	0.06	0.21	322	738	1	9.46	0.00	0.00
74	75	-0.752	-0.543	-0.680	2.000	10598	13046	-234	90	65382	207	-633	N	-280	91.00	81.90	531	0	0.13	Not Reqd	0.00	0.06	0.21	316	762	69	9.90	0.00	0.00
75	75	-0.752	-0.543	-0.680	2.000	10598	13047	-234	19	65377	207	-989	N	-280	91.00	81.90	531	0	0.13	Not Reqd	0.00	0.06	0.21	316	762	69	9.90	0.00	0.00
75	76	-0.734	-0.581	-0.681	2.000	10598	12463	-208	47	60570	414	-1019	N	-398	88.09	79.28	562	0	0.13	Not Reqd	0.00	0.06	0.21	307	781	138	10.30	0.00	0.00
76	76	-0.734	-0.581	-0.681	2.000	10598	12463	-208	-21	60564	414	-1349	N	-398	88.09	79.28	562	0	0.13	Not Reqd	0.00	0.06	0.21	307	781	138	10.30	0.00	0.00
76	77	-0.710	-0.630	-0.683	2.000	10598	11696	-183	12	54131	620	-1374	N	-518	84.18	77.76	602	0	0.13	Not Reqd	0.00	0.06	0.21	302	814	207	10.94	0.00	0.00
77	77	-0.710	-0.630	-0.683	2.000	10598	11696	-183	-52	54123	620	-1669	N	-518	84.18	77.76	602	0	0.13	Not Reqd	0.00	0.06	0.21	302	814	207	10.94	0.00	0.00
77	78	-0.682	-0.689	-0.684	2.000	10598	10773	-161	-14	46093	824	-1689	N	-640	79.33	77.76	658	0	0.13	Not Reqd	0.00	0.06	0.21	303	865	275	12.04	0.00	0.00
78	78	-0.682	-0.689	-0.684	2.000	10598	10773	-161	-77	46083	826	-1925	N	-921	79.33	77.76	753	0	0.13	Not Reqd	0.00	0.06	0.21	303	951	275	13.60	0.00	0.00
78	79	-0.661	-0.673	-0.665	2.000	10519	10146	-142	222	36872	1029	-1684	N	-1043	73.36	77.76	809	0	0.13	Not Reqd	0.00	0.06	0.21	305	1003	343	14.91	0.00	0.00
79	79	-0.661	-0.673	-0.665	2.000	10519	10147	-142	167	36862	1029	-1887	N	-1017	73.36	77.76	801	0	0.13	Not Reqd	0.00	0.06	0.21	305	995	343	14.74	0.00	0.00
79	80	-0.635	-0.667	-0.647	2.000	10440	9355	-126	162	25997	1235	-1950	N	-1131	66.43	77.76	855	0	0.13	Not Reqd	0.00	0.06	0.21	307	1046	412	16.07	0.00	0.00
80	80	-0.634	-0.667	-0.647	2.000	10440	9355	-126	112	25986	1235	-2093	N	-1107	66.43	77.76	847	0	0.13	Not Reqd	0.00	0.06	0.21	307	1038	412	15.89	0.00	0.00
80	81	-0.601	-0.671	-0.629	2.000	10361	3996	-118	144	9016	1440	-2118	N	-1215	58.59	77.76	893	0	0.13	Not Reqd	0.00	0.06	0.41	615	1357	480	23.33	0.00	0.00
81	81	-0.601	-0.671	-0.629	2.000	10361	3996	-118	122	9004	1440	-2169	N	-1193	58.59	77.76	886	0	0.13	Not Reqd	0.00	0.06	0.41	615	1350	480	23.15	0.00	0.00
81	82	-0.560	-0.685	-0.613	2.000	10282	4515	-115	120	-3672	1646	-2230	N	-1316	58.17	77.76	927	0	0.13	Not Reqd	0.00	0.06	0.41	615	1387	549	22.95	0.00	0.00
82	82	-0.560	-0.685	-0.613	2.000	10282	4516	-115	95	-3684	1645	-2211	N	-1297	58.17	77.76	920	0	0.13	Not Reqd	0.00	0.06	0.41	615	1381	548	22.78	0.00	0.00
82	83	-0.757	-0.847	-0.796	2.000	10203	5091	-112	94	-18061	1887	-2270	N	-2531	68.40	77.76	1332	0	0.13	Not Reqd	0.00	0.06	0.41	615	1752	629	31.01	0.00	0.00
83	83	-0.757	-0.848	-0.797	2.000	10203	5091	-112	66	-18073	1887	-2174	N	-2507	68.40	77.76	1324	0	0.13	Not Reqd	0.00	0.06	0.41	615	1744	629	30.80	0.00	0.00
83	84	-0.834	-0.727	-0.785	2.000	10124	5732	-111	66	-34320	2137	-2232	N	-2067	82.28	77.76	1177	0	0.13	Not Reqd	0.00	0.06	0.41	615	1613	712	25.44	0.00	0.00
84	84	-0.834	-0.727	-0.786	2.000	10124	5732	-111	34	-34332	2137	-2047	N	-2045	82.28	77.76	1170	0	0.13	Not Reqd	0.00	0.06	0.41	615	1606	712	25.24	0.00	0.00
84	85	-0.758	-0.803	-0.779	2.000	10046	6447	-109	34	-52503	2392	-2106	N	-1072	89.52	80.57	845	41	0.13	Not Reqd	0.00	0.06	0.41	634	1331	797	15.61	0.00	0.00
85	85	-0.757	-0.802	-0.778	2.000	10046	6447	-110	-2	-52514	2390	-1837	N	-850	89.52	80.57	768	117	0.15	Not Reqd	0.00	0.08	0.41	633	1261	797	13.63	0.00	0.00
85	86	-0.557	-1.054	-0.787	2.000	10046	7247	-110	-4	-72622	2648	-1897	N	-226	92.78	83.50	538	443	0.56	Not Reqd	0.00	0.28	0.41	648				0.00	0.00
86	86	-0.557	-1.054	-0.787	2.000	10046	7247	-110	-30	-72628	2648	-1636	N	-226	92.78	83.50	538	443	0.56	Not Reqd	0.00	0.28	0.41	648				0.00	0.00
86	87	-0.471	-1.160	-0.791	2.000	10046	7521	-110	-31	-79473	2720	-1655	N	0	93.00	83.70	451	557	0.71	Not Reqd	0.00	0.36	0.41	647				0.00	0.00
87	87	-0.413	-1.241	-0.797	2.000	10046	-19953	-779	100	-112713	-3703	1844	N	0	93.00	83.70	400	972	1.27	Not Reqd	0.00	0.63	0.41	634				0.00	0.00
87	88	-0.505	-1.131	-0.795	2.000	10046	-18466	-768	114	-103864	-3620	1839	N	201	92.81	83.53	478	862	1.12	Not Reqd	0.00	0.56	0.41	636				0.00	0.00
88	88	-0.505	-1.131	-0.795	2.000	10046	-18465	-768	180	-103857	-3620	2212	N	201	92.81	83.53	478	862	1.12	Not Reqd	0.00	0.56	0.41	636				0.00	0.00
88	89	-0.728	-0.867	-0.792	2.000	10046	-13989	-732	219	-77716	-3327	2193	N	765	89.93	80.94	691	541	0.71	Not Reqd	0.00	0.36	0.41	626	1185	1109	1.31	0.00	0.00
89	89	-0.729	-0.867	-0.793	2.000	10046	-13987	-732	293	-77703	-3327	2598	N	991	89.93	80.94	769	463	0.61	Not Reqd	0.00	0.31	0.41	626	1255	1109	1.60	0.00	0.00
89	90	-0.827	-0.783	-0.807	2.000	10124	-9808	-696	327	-53895	-3037	2574	N	2095	83.17	77.76	1173	0	0.13	Not Reqd	0.00	0.06	0.41	612	1607	1012	3.56	0.00	0.00
90	90	-0.827	-0.782	-0.807	2.000	10124	-9806	-696	380	-53880	-3037	2866	N	2118	83.17	77.76	1181	0	0.13	Not Reqd	0.00	0.06	0.41	612	1614	1012	3.59	0.00	0.00
90	91	-0.739	-0.926	-0.821	2.000	10203	-5943	-660	409	-32387	-2752	2837	N	2735	68.51	77.76	1400	0	0.13	Not Reqd	0.00	0.06	0.41	615	1813	917	5.07	0.00	0.00
91	91	-0.739	-0.925	-0.821	2.000	10203	-5940	-660	441	-32372	-2752	3012	N	2760	68.51	77.76	1408	0	0.13	Not Reqd	0.00	0.06	0.41	615	1820	917	5.11	0.00	0.00
91	92	-0.494	-0.711	-0.586	2.000	10282	-2410	-623	465	-13149	-2477	2978	N	1215	58.17	77.76	868	49	0.13	Not Reqd	0.00	0.06	0.41	610	1331	826	3.43	0.00	0.00
92	92	-0.490	-0.705	-0.581	2.000	10282	-2407	-623	478	-13133	-2476	3048	N	1233	58.17	77.76	875	42	0.13	Not Reqd	0.00	0.06	0.41	610	1337	825	3.46	0.00	0.00
92	93	-0.550	-0.684	-0.604	2.000	10361	781	-587	498	3989	-2237	3010	N	1128	58.59	77.76	864	0	0.13	Not Reqd	0.00	0.06	0.21	307	1054	746	2.58	0.00	0.00
93	93	-0.550	-0.683	-0.604	2.000	10361	783	-587	494	4006	-2237	2987	N	1148	58.59	77.76	871	0	0.13	Not Reqd	0.00	0.06	0.21	307	1060	746	2.61	0.00	0.00
93	94	-0.599	-0.676	-0.629	2.000	10440	3619	-550	509	19188	-2004	2945	N	1056	66.43	77.76	819	0	0.13	Not Reqd	0.00	0.06	0.21	305	1012	668	2.87	0.00	0.00
94	94	-0.599	-0.675	-0.628	2.000	10440	3622	-550	490	19204	-2004	2840	N	1079	66.43	77.76	827	0	0.13	Not Reqd	0.00	0.06	0.21	305	1019	668	2.91	0.00	0.00
94	95	-0.637	-0.683	-0.654	2.000	10519	6098	-514	502	32488	-1777	2794	N	978	73.37	77.76	772	0	0.13	Not Reqd	0.00	0.06	0.21	303	968	592	3.19	0.00	0.00
95	95	-0.637	-0.683	-0.654	2.000	10519	6101	-514	469	32503	-1777	2617	N	1004	73.37	77.76	781	0	0.13	Not Reqd	0.00	0.06	0.21	303	976	592	3.24	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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

																		(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 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
95	96	-0.667	-0.707	-0.681	2.000	10598	8212	-478	479	43930	-1557	2569	N	894	79.25	77.76	728	0	0.13	Not Reqd	0.00	0.06	0.21	302	926	519	3.56	0.00	0.00
96	96	-0.667	-0.706	-0.680	2.000	10598	8214	-478	434	43944	-1557	2332	N	621	79.25	77.76	633	0	0.13	Not Reqd	0.00	0.06	0.21	301	841	519	3.02	0.00	0.00
96	97	-0.702	-0.652	-0.685	2.000	10598	9958	-443	443	53551	-1341	2283	N	507	84.18	77.76	579	0	0.13	Not Reqd	0.00	0.06	0.21	299	790	447	3.33	0.00	0.00
97	97	-0.703	-0.651	-0.685	2.000	10598	9960	-443	388	53563	-1341	1991	N	507	84.18	77.76	579	0	0.13	Not Reqd	0.00	0.06	0.21	299	790	447	3.33	0.00	0.00
97	98	-0.732	-0.608	-0.689	2.000	10598	11337	-408	397	61360	-1124	1942	N	393	88.09	79.28	538	0	0.13	Not Reqd	0.00	0.06	0.21	304	758	375	3.82	0.00	0.00
98	98	-0.732	-0.608	-0.689	2.000	10598	11339	-408	335	61370	-1124	1607	N	393	88.09	79.28	538	0	0.13	Not Reqd	0.00	0.06	0.21	304	758	375	3.82	0.00	0.00
98	99	-0.755	-0.575	-0.693	2.000	10598	12358	-374	344	67369	-909	1558	N	280	91.00	81.90	508	0	0.13	Not Reqd	0.00	0.06	0.21	313	740	303	4.51	0.00	0.00
99	99	-0.755	-0.575	-0.693	2.000	10598	12359	-374	276	67376	-909	1191	N	280	91.00	81.90	508	0	0.13	Not Reqd	0.00	0.06	0.21	313	740	303	4.51	0.00	0.00
99	100	-0.772	-0.552	-0.696	2.000	10598	13028	-340	286	71583	-695	1143	N	166	92.92	83.63	476	0	0.13	Not Reqd	0.00	0.06	0.21	320	716	232	5.27	0.00	0.00
100	100	-0.773	-0.552	-0.696	2.000	10598	13029	-340	216	71588	-695	753	N	166	92.92	83.63	476	0	0.13	Not Reqd	0.00	0.06	0.21	320	716	232	5.27	0.00	0.00
100	101	-0.784	-0.539	-0.699	2.000	10598	13369	-308	228	74024	-481	708	N	52	93.86	84.47	441	0	0.13	Not Reqd	0.00	0.06	0.21	323	687	160	6.12	0.00	0.00
101	101	-0.784	-0.539	-0.699	2.000	10598	13370	-308	158	74026	-481	321	N	52	93.86	84.47	441	0	0.13	Not Reqd	0.00	0.06	0.21	323	687	160	6.12	0.00	0.00
101	102	-0.789	-0.536	-0.702	2.000	10598	13408	-280	172	74720	-287	282	N	-52	93.86	84.47	442	0	0.13	Not Reqd	0.00	0.06	0.21	323	688	96	7.34	0.00	0.00
102	102	-0.789	-0.536	-0.702	2.000	10598	13409	-280	102	74721	-287	-108	N	-52	93.86	84.47	442	0	0.13	Not Reqd	0.00	0.06	0.21	323	688	96	7.34	0.00	0.00
102	103	-0.790	-0.542	-0.704	2.000	10598	13175	-251	120	73822	-76	-147	N	-168	92.92	83.63	478	0	0.13	Not Reqd	0.00	0.06	0.21	320	718	25	9.29	0.00	0.00
103	103	-0.790	-0.543	-0.704	2.000	10598	13176	-251	49	73820	-76	-549	N	-168	92.92	83.63	478	0	0.13	Not Reqd	0.00	0.06	0.21	320	718	25	9.29	0.00	0.00
103	104	-0.786	-0.558	-0.707	2.000	10598	12683	-223	72	71220	133	-584	N	-286	91.00	81.90	510	0	0.13	Not Reqd	0.00	0.06	0.21	313	741	44	10.39	0.00	0.00
104	104	-0.786	-0.558	-0.707	2.000	10598	12683	-223	3	71216	133	-972	N	-286	91.00	81.90	510	0	0.13	Not Reqd	0.00	0.06	0.21	313	741	44	10.39	0.00	0.00
104	105	-0.776	-0.582	-0.709	2.000	10598	11961	-196	30	66945	341	-1002	N	-406	88.09	79.28	540	0	0.13	Not Reqd	0.00	0.06	0.21	304	760	114	10.89	0.00	0.00
105	105	-0.776	-0.583	-0.709	2.000	10598	11961	-196	-35	66939	341	-1367	N	-406	88.09	79.28	540	0	0.13	Not Reqd	0.00	0.06	0.21	304	760	114	10.89	0.00	0.00
105	106	-0.762	-0.616	-0.711	2.000	10598	11043	-171	-2	61030	547	-1392	N	-528	84.18	77.76	582	0	0.13	Not Reqd	0.00	0.06	0.21	299	793	182	11.70	0.00	0.00
106	106	-0.761	-0.616	-0.711	2.000	10598	11043	-171	-62	61022	547	-1725	N	-528	84.18	77.76	582	0	0.13	Not Reqd	0.00	0.06	0.21	299	793	182	11.70	0.00	0.00
106	107	-0.743	-0.658	-0.713	2.000	10598	9957	-148	-24	53504	751	-1745	N	-653	79.33	77.76	636	0	0.13	Not Reqd	0.00	0.06	0.21	300	843	250	13.01	0.00	0.00
107	107	-0.742	-0.658	-0.713	2.000	10598	9957	-148	-81	53494	751	-2042	N	-939	79.33	77.76	731	0	0.13	Not Reqd	0.00	0.06	0.21	300	928	250	14.74	0.00	0.00
107	108	-0.732	-0.626	-0.692	2.000	10519	9130	-129	217	44780	954	-1802	N	-1064	73.36	77.76	786	0	0.13	Not Reqd	0.00	0.06	0.21	302	979	318	16.33	0.00	0.00
108	108	-0.731	-0.626	-0.693	2.000	10519	9131	-129	168	44770	954	-2046	N	-1037	73.36	77.76	777	0	0.13	Not Reqd	0.00	0.06	0.21	302	971	318	16.15	0.00	0.00
108	109	-0.714	-0.606	-0.672	2.000	10440	8180	-113	163	34443	1161	-2108	N	-1154	66.43	77.76	833	0	0.13	Not Reqd	0.00	0.06	0.21	304	1023	387	17.89	0.00	0.00
109	109	-0.714	-0.606	-0.672	2.000	10440	8181	-113	119	34431	1161	-2296	N	-1129	66.43	77.76	824	0	0.13	Not Reqd	0.00	0.06	0.21	304	1015	387	17.68	0.00	0.00
109	110	-0.690	-0.598	-0.653	2.000	10361	5875	-98	-189	21209	1372	-2662	N	-1239	58.59	77.76	881	0	0.13	Not Reqd	0.00	0.06	0.37	550	1288	457	26.38	0.00	0.00
110	110	-0.690	-0.599	-0.653	2.000	10361	5874	-98	-221	21194	1372	-2777	N	-1217	58.59	77.76	873	0	0.13	Not Reqd	0.00	0.06	0.37	550	1281	457	26.17	0.00	0.00
110	111	-0.657	-0.601	-0.634	2.000	10282	2290	-94	130	5108	1580	-2484	N	-1343	49.83	77.76	935	0	0.13	Not Reqd	0.00	0.06	0.37	553	1340	527	27.09	0.00	0.00
111	111	-0.657	-0.602	-0.634	2.000	10282	2290	-94	118	5094	1580	-2512	N	-1322	49.83	77.76	929	0	0.13	Not Reqd	0.00	0.06	0.37	553	1334	527	26.89	0.00	0.00
111	112	-0.933	-0.796	-0.873	2.000	10203	2683	-91	117	-8786	1824	-2570	N	-2803	68.45	77.76	1422	0	0.13	Not Reqd	0.00	0.06	0.37	553	1778	608	39.56	0.00	0.00
112	112	-0.933	-0.796	-0.873	2.000	10203	2684	-91	103	-8800	1825	-2523	N	-2777	68.45	77.76	1414	0	0.13	Not Reqd	0.00	0.06	0.37	553	1770	608	39.30	0.00	0.00
112	113	-1.050	-0.627	-0.859	2.000	10124	3145	-89	103	-24577	2078	-2581	N	-2224	82.73	77.76	1229	0	0.13	Not Reqd	0.00	0.06	0.47	692	1729	693	35.83	0.00	0.00
113	113	-1.050	-0.627	-0.859	2.000	10124	3145	-89	86	-24591	2078	-2447	N	-2200	82.73	77.76	1221	0	0.13	Not Reqd	0.00	0.06	0.47	692	1722	693	35.59	0.00	0.00
113	114	-0.985	-0.693	-0.849	2.000	10046	3683	-88	85	-42319	2337	-2506	N	-1105	89.70	80.73	873	0	0.13	Not Reqd	0.00	0.06	0.47	718	1432	779	23.22	0.00	0.00
114	114	-0.984	-0.692	-0.849	2.000	10046	3683	-88	66	-42332	2337	-2281	N	-866	89.70	80.73	790	76	0.13	Not Reqd	0.00	0.06	0.47	717	1356	779	20.65	0.00	0.00
114	115	-0.785	-0.936	-0.855	2.000	10046	4304	-88	64	-62040	2599	-2341	N	-230	92.79	83.51	553	410	0.52	Not Reqd	0.00	0.26	0.47	733				0.00	0.00
115	115	-0.785	-0.936	-0.855	2.000	10046	4305	-88	49	-62048	2599	-2118	N	-230	92.79	83.51	553	410	0.52	Not Reqd	0.00	0.26	0.47	733				0.00	0.00
115	116	-0.699	-1.041	-0.858	2.000	10046	4522	-88	48	-68769	2671	-2137	N	0	93.00	83.70	463	526	0.67	Not Reqd	0.00	0.33	0.47	731				0.00	0.00
116	116	-0.699	-1.041	-0.858	2.000	10046	-17793	-737	47	-91085	-3374	1427	N	0	93.00	83.70	426	824	1.06	Not Reqd	0.00	0.53	0.47	721				0.00	0.00
116	117	-0.785	-0.943	-0.858	2.000	10046	-16337	-725	63	-83000	-3290	1424	N	230	92.80	83.52	515	704	0.91	Not Reqd	0.00	0.45	0.47	723				0.00	0.00
117	117	-0.785	-0.943	-0.858	2.000	10046	-16337	-725	122	-82994	-3290	1723	N	230	92.80	83.52	515	704	0.91	Not Reqd	0.00	0.45	0.47	723				0.00	0.00
117	118	-0.965	-0.736	-0.859	2.000	10046	-11997	-688	166	-59291	-2992	1709	N	1103	89.27	80.34	831	277	0.36	Not Reqd	0.00	0.18	0.37	565	1257	997	2.13	0.00	0.00
118	118	-0.965	-0.737	-0.859	2.000	10046	-11996	-688	229	-59281	-2991	2024	N	1345	89.27	80.34	915	193	0.25	Not Reqd	0.00	0.13	0.37	565	1332	997	2.46	0.00	0.00
118	119	-0.964	-0.761	-0.872	2.000	10124	-8005	-650	266	-37991	-2696	2002	N	2500	80.28	77.76	1321	0	0.13	Not Reqd	0.00	0.06	0.37	553	1687	899	4.64	0.00	0.00
119	119	-0.964	-0.761	-0.872	2.000	10124	-8004	-650	309	-37979	-2696	2209	N	2524	80.28	77.76	1329	0	0.13	Not Reqd	0.00	0.06	0.37	553	1694	899	4.67	0.00	0.00
119	120	-0.794	-1.004	-0.886	2.000	10203	-4383	-612	339	-19086	-2406	2180	N	3056	64.46	77.76	1507	0	0.13	Not Reqd	0.00	0.06	0.21	307	1633	802	5.07	0.00	0.00
120	120	-0.794	-1.003	-0.886	2.000	10203	-4381	-612	363	-19074	-2406	2284	N	3083	64.46	77.76	1515	0	0.13	Not Reqd	0.00	0.06	0.21	307	1641	802	5.11	0.00	0.00
120	121	-0.447	-0.830	-0.609	2.000	10282	-1147	-574	385	-2532	-2125	2248	N	1337	50.99	77.76	919	0	0.13	Not Reqd	0.00	0.06	0.21	306	1102	708	3.06	0.00	0.00
121	121	-0.448	-0.830	-0.609	2.000	10282	-1145	-574	391	-2520	-2125	2262	N	1356	50.99	77.76	925	0	0.13	Not Reqd	0.00	0.06	0.21	306	1108	708	3.09	0.00	0.00
121	122	-0.453	-0.886	-0.629	2.000	10361	1648	-535	1905	11811	-1884	3717	Y	1224	66.63	77.76	869	0	0.13	0.124	0.00	0.13	0.21	305	1057	683	2.81	10.42	3.56
122	122	-0.453	-0.885	-0.629	2.000	10361	1659	-535	1896	11831	-1884	3653	Y	1245	66.63	77.76	877	0	0.13	0.122	0.00	0.13	0.21	305	1064	682	2.85	10.24	3.50
122	123	-0.455	-0.953	-0.648	2.000	10440	4080	-497	1792	24202	-1649	3491	Y	1072	74.88	77.76	800	0	0.13	0.116	0.00	0.12	0.21	303	993	601	3.04	9.73	3.33
123	123	-0.455	-0.953	-0.648	2.000	10440	4090	-497	1770	24220	-1649	3359	Y	1095	74.88	77.76	808	0	0.13	0.111	0.00	0.12	0.21	303	1000	599	3.09	9.36	3.20
123	124	-0.456	-1.032	-0.668	2.000	10519	6087	-458	1662	34628	-1420	3194	Y	939	81.61	77.76	741	0	0.13	0.105	0.00	0.12	0.21	302	938	521	3.36	8.85	3.02
124	124	-0.457	-1.032	-0.669	2.000	10519	6096	-458	1629	34645	-1420	3006	N	965	81.61	77.76	750	0	0.13	Not Reqd	0.00	0.06	0.21	302	946	473	4.10	0.00	0.00
124	125	-0.452	-1.138	-0.689	2.000	10598	7656	-420	1520	43125	-1198	2839	N	859	87.08	78.38	708	0	0.13	Not Reqd	0.00	0.06	0.21	303	910	399	4.65	0.00	0.00
125	125	-0.458	-1.007	-0.648	2.000	10598	7664	-420	1477	43140	-1198	2596	N	518	87.08	78.38	590	0	0.13	Not Reqd	0.00	0.06	0.21	302	803	399	3.88	0.00	0.00
125	126	-0.478	-0.963	-0.646	2.000	10598	8778	-382	1369	49720	-978	2430	N	411	91.09	81.98	567	0	0.13	Not Reqd	0.00	0.06	0.21	315	794	326	4.67	0.00	0.00
126	126	-0.478	-0.963	-0.646	2.000	10598	8785	-382	1321	49733	-978	2159	N	411	91.09	81.98	567	0	0.13	Not Reqd	0.00	0.06	0.21	315	794	326	4.67	0.00	0.00
126	127	-0.494	-0.933	-0.646	2.000	10598	9449	-344	1215	54421	-759	1995	N	249	93.93	84.53	521	0	0.13	Not Reqd	0.00	0.06	0.21	325	761	253	5.43	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																											
127	127	-0.494	-0.933	-0.646	2.000	10598	9456	-344	1164	54431	-759	1699	N	249	93.93	84.53	521	0	0.13	Not Reqd	0.00	0.06	0.21	325	761	253	5.43	0.00	0.00
127	128	-0.511	-0.900	-0.646	2.000	10598	9669	-307	1062	57227	-541	1539	N	74	95.27	85.74	466	0	0.13	Not Reqd	0.00	0.06	0.21	329	716	180	6.24	0.00	0.00
128	128	-0.511	-0.900	-0.646	2.000	10598	9675	-307	1010	57235	-541	1228	N	74	95.27	85.74	466	0	0.13	Not Reqd	0.00	0.06	0.21	329	716	180	6.24	0.00	0.00
128	129	-0.526	-0.864	-0.643	2.000	10598	9442	-270	914	58143	-323	1074	N	-56	95.33	85.79	461	0	0.13	Not Reqd	0.00	0.06	0.21	329	712	108	7.71	0.00	0.00
129	129	-0.526	-0.864	-0.643	2.000	10598	9445	-270	879	58147	-323	860	N	-56	95.33	85.79	461	0	0.13	Not Reqd	0.00	0.06	0.21	329	712	108	7.71	0.00	0.00
129	130	-0.531	-0.852	-0.642	2.000	10598	9246	-257	846	58006	-246	807	N	-123	95.06	85.55	484	0	0.13	Not Reqd	0.00	0.06	0.21	329	732	82	8.58	0.00	0.00
130	130	-0.531	-0.852	-0.642	2.000	10598	9249	-257	812	58009	-246	593	N	-123	95.06	85.55	484	0	0.13	Not Reqd	0.00	0.06	0.21	329	732	82	8.58	0.00	0.00
130	131	-0.544	-0.824	-0.641	2.000	10598	8416	-221	727	56367	-29	449	N	-302	93.23	83.91	534	0	0.13	Not Reqd	0.00	0.06	0.21	322	771	10	11.31	0.00	0.00
131	131	-0.544	-0.824	-0.641	2.000	10598	8419	-221	681	56369	-29	142	N	-302	93.23	83.91	534	0	0.13	Not Reqd	0.00	0.06	0.21	322	771	10	11.31	0.00	0.00
131	132	-0.557	-0.802	-0.642	2.000	10598	8082	-191	535	53781	183	-61	N	-460	89.95	80.95	573	0	0.13	Not Reqd	0.00	0.06	0.21	311	796	61	12.54	0.00	0.00
132	132	-0.557	-0.802	-0.642	2.000	10598	8085	-191	491	53780	183	-354	N	-460	89.95	80.95	573	0	0.13	Not Reqd	0.00	0.06	0.21	311	796	61	12.54	0.00	0.00
132	133	-0.568	-0.788	-0.644	2.000	10598	7183	-166	448	49186	389	-456	N	-609	85.33	77.76	611	0	0.13	Not Reqd	0.00	0.06	0.21	299	819	130	13.49	0.00	0.00
133	133	-0.568	-0.788	-0.644	2.000	10598	7185	-166	409	49183	389	-723	N	-609	85.33	77.76	611	0	0.13	Not Reqd	0.00	0.06	0.21	299	819	130	13.49	0.00	0.00
133	134	-0.578	-0.779	-0.647	2.000	10598	6030	-141	374	42894	595	-816	N	-752	79.41	77.76	671	0	0.13	Not Reqd	0.00	0.06	0.37	541	1091	198	19.98	0.00	0.00
134	134	-0.578	-0.779	-0.647	2.000	10598	6032	-141	341	42889	595	-1050	N	-752	79.41	77.76	671	0	0.13	Not Reqd	0.00	0.06	0.37	541	1091	198	19.98	0.00	0.00
134	135	-0.586	-0.771	-0.650	2.000	10598	4646	-118	316	34929	799	-1132	N	-906	72.25	77.76	738	0	0.13	Not Reqd	0.00	0.06	0.37	544	1155	266	23.60	0.00	0.00
135	135	-0.586	-0.771	-0.650	2.000	10598	4648	-118	290	34922	799	-1329	N	-1179	72.25	77.76	826	0	0.13	Not Reqd	0.00	0.06	0.37	544	1233	266	25.60	0.00	0.00
135	136	-0.610	-0.672	-0.633	2.000	10519	-1406	-112	196	20839	990	-1482	N	-1349	63.50	77.76	907	0	0.13	Not Reqd	0.00	0.06	0.37	548	1310	330	27.36	0.00	0.00
136	136	-0.610	-0.673	-0.633	2.000	10519	-1405	-112	203	20831	990	-1595	N	-1323	63.50	77.76	899	0	0.13	Not Reqd	0.00	0.06	0.37	548	1302	330	27.16	0.00	0.00
136	137	-0.633	-0.583	-0.614	2.000	10440	-775	-109	191	11941	1183	-1665	N	-1464	53.21	77.76	960	0	0.13	Not Reqd	0.00	0.06	0.37	551	1360	394	27.61	0.00	0.00
137	137	-0.633	-0.584	-0.614	2.000	10440	-774	-109	195	11932	1183	-1730	N	-1442	53.21	77.76	953	0	0.13	Not Reqd	0.00	0.06	0.37	551	1353	394	27.43	0.00	0.00
137	138	-0.621	-0.554	-0.593	2.000	10361	0	-108	183	5	1794	-1800	N	-1488	41.99	77.76	664	0	0.13	Not Reqd	0.00	0.06	0.37	432				0.00	0.00

1.31

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																									
1	1	-0.645	-0.674	-0.657	2.000	13359	18	-480	8311	27	-2487	12378	Y	1560	57.58	98.42	1137	0	0.13	0.320	0.00	0.22	0.37	700				28.43	9.72
1	2	-0.689	-0.685	-0.687	2.000	12965	3517	-440	7973	18659	-2238	11983	Y	1540	64.73	95.13	1110	0	0.13	0.319	0.00	0.22	0.37	677	1608	923	3.59	28.16	9.63
2	2	-0.689	-0.684	-0.687	2.000	12965	3559	-440	7955	18724	-2238	11882	Y	1529	64.73	95.13	1107	0	0.13	0.317	0.00	0.22	0.37	677	1605	922	3.59	27.93	9.55
2	3	-0.725	-0.711	-0.719	2.000	12557	6668	-415	7632	35350	-2013	11502	Y	1464	73.21	92.12	1066	0	0.13	0.316	0.00	0.22	0.21	364	1287	841	2.78	27.71	9.47
3	3	-0.725	-0.710	-0.719	2.000	12557	6704	-415	7595	35404	-2011	11325	Y	1615	73.21	92.12	1116	0	0.13	0.312	0.00	0.22	0.21	364	1332	838	2.97	27.28	9.33
3	4	-0.743	-0.771	-0.753	2.000	12301	8764	-390	7311	47083	-1833	10995	Y	1532	76.35	89.42	1072	0	0.13	0.309	0.00	0.22	0.21	353	1283	773	3.14	26.91	9.20
4	4	-0.743	-0.770	-0.753	2.000	12301	8795	-390	7282	47130	-1836	10796	Y	1004	76.35	89.42	896	0	0.13	0.303	0.00	0.22	0.21	353	1124	771	2.48	26.42	9.03
4	5	-0.778	-0.732	-0.762	2.000	11939	10553	-366	6990	57550	-1662	10458	Y	913	80.63	86.94	829	0	0.13	0.303	0.00	0.22	0.21	342	1054	708	2.53	26.20	8.96
5	5	-0.778	-0.732	-0.762	2.000	11939	10582	-365	6939	57596	-1662	10176	Y	847	80.63	86.94	806	0	0.13	0.294	0.00	0.21	0.21	342	1033	704	2.47	25.49	8.72
5	6	-0.822	-0.676	-0.771	2.000	11623	12385	-335	6567	68968	-1445	9746	Y	737	85.29	84.78	732	0	0.13	0.290	0.00	0.21	0.21	331	957	626	2.59	24.94	8.52
6	6	-0.823	-0.676	-0.771	2.000	11623	12410	-335	6500	69009	-1445	9370	Y	714	85.29	84.78	724	0	0.13	0.278	0.00	0.20	0.21	331	950	620	2.59	23.97	8.20
6	7	-0.864	-0.624	-0.780	2.000	11354	13778	-306	6125	78471	-1231	8937	Y	610	89.15	82.94	660	0	0.13	0.272	0.00	0.20	0.21	322	884	542	2.77	23.29	7.96
7	7	-0.864	-0.624	-0.780	2.000	11354	13793	-306	6050	78500	-1231	8510	Y	590	89.15	82.94	653	0	0.13	0.259	0.00	0.19	0.21	322	877	536	2.78	22.18	7.58
7	8	-0.900	-0.579	-0.789	2.000	11124	14756	-278	5675	86087	-1019	8077	Y	487	92.23	83.01	608	0	0.13	0.251	0.00	0.19	0.21	321	835	459	3.13	21.39	7.31
8	8	-0.901	-0.579	-0.789	2.000	11124	14754	-277	5595	86098	-1018	7608	Y	468	92.23	83.01	601	0	0.13	0.236	0.00	0.18	0.21	321	829	452	3.16	20.15	6.89
8	9	-0.932	-0.543	-0.797	2.000	10933	15337	-251	5225	91846	-808	7179	Y	366	94.56	85.11	574	0	0.13	0.227	0.00	0.18	0.21	328	812	376	3.71	19.28	6.59
9	9	-0.932	-0.543	-0.797	2.000	10933	15309	-250	5141	91827	-808	6679	Y	343	94.56	85.11	566	0	0.13	0.211	0.00	0.17	0.21	328	805	368	3.74	17.93	6.13
9	10	-0.957	-0.515	-0.804	2.000	10788	14796	-32	4914	95025	-408	6393	Y	241	96.16	86.54	541	0	0.13	0.205	0.00	0.17	0.21	334	787	230	7.68	17.35	5.93
10	10	-0.957	-0.516	-0.804	2.000	10788	14816	-32	4833	95052	-408	5875	Y	222	96.16	86.54	534	0	0.13	0.188	0.00	0.16	0.21	334	781	223	7.80	15.95	5.45
10	11	-0.976	-0.497	-0.810	2.000	10683	15212	-8	4799	97711	-202	5783	Y	117	97.00	87.30	501	0	0.13	0.187	0.00	0.16	0.21	336	754	153	9.16	15.82	5.41
11	11	-0.976	-0.497	-0.810	2.000	10683	15225	-8	4716	97728	-202	5250	Y	97	97.00	87.30	495	0	0.13	0.170	0.00	0.15	0.21	336	748	145	9.33	14.36	4.91
11	12	-0.989	-0.487	-0.815	2.000	10683	15344	15	4698	98665	3	5174	Y	-27	97.26	87.54	472	0	0.13	0.167	0.00	0.15	0.21	337	729	78	9.74	14.15	4.84
12	12	-0.989	-0.487	-0.815	2.000	10683	15341	16	4615	98664	3	4636	Y	-50	97.26	87.54	480	0	0.13	0.150	0.00	0.14	0.21	337	735	70	10.07	12.68	4.34
12	13	-0.996	-0.486	-0.820	2.000	10598	15196	39	4614	97893	208	4577	Y	-136	96.31	86.68	504	0	0.13	0.149	0.00	0.14	0.21	334	754	137	8.61	12.60	4.31
13	13	-0.996	-0.486	-0.820	2.000	10598	15172	39	4562	97869	208	4244	Y	-146	96.31	86.68	507	0	0.13	0.138	0.00	0.13	0.21	334	757	132	8.77	11.68	3.99
13	14	-0.997	-0.487	-0.820	2.000	10598	15094	45	4564	97410	259	4231	Y	-170	96.03	86.43	514	0	0.13	0.138	0.00	0.13	0.21	333	762	149	8.44	11.65	3.98
14	14	-0.997	-0.487	-0.820	2.000	10598	15011	46	4512	97325	260	3899	Y	-170	96.03	86.43	514	0	0.13	0.127	0.00	0.13	0.21	333	762	144	8.54	10.73	3.67
14	15	-0.995	-0.501	-0.824	2.000	10598	14538	68	4530	94426	464	3859	Y	-278	94.46	85.01	543	0	0.13	0.126	0.00	0.13	0.21	328	784	212	7.38	10.62	3.63
15	15	-0.995	-0.501	-0.824	2.000	10598	14466	69	4452	94348	465	3345	Y	-278	94.46	85.01	543	0	0.13	0.109	0.00	0.12	0.21	328	784	204	7.52	9.21	3.15
15	16	-0.986	-0.525	-0.827	2.000	10598	13750	91	4487	89765	668	3322	Y	-396	92.08	82.87	574	0	0.13	0.108	0.00	0.12	0.21	320	805	272	6.51	9.15	3.13
16	16	-0.986	-0.526	-0.827	2.000	10598	13729	92	4412	89736	669	2833	N	-396	92.08	82.87	574	0	0.13	Not Reqd	0.00	0.06	0.21	320	805	223	20.05	0.00	0.00
16	17	-0.972	-0.560	-0.830	2.000	10598	12795	113	4466	83493	871	2829	N	-510	88.90	80.01	602	0	0.13	Not Reqd	0.00	0.06	0.21	309	820	290	15.04	0.00	0.00
17	17	-0.972	-0.560	-0.830	2.000	10598	12744	114	4396	83432	872	2375	N	-510	88.90	80.01	602	0	0.13	Not Reqd	0.00	0.06	0.21	309	820	291	14.96	0.00	0.00
17	18	-0.952	-0.606	-0.832	2.000	10598	11604	135	4472	75540	1074	2392	N	-620	84.95	77.76	635	0	0.13	Not Reqd	0.00	0.06	0.21	302	843	358	11.80	0.00	0.00
18	18	-0.952	-0.606	-0.832	2.000	10598	11543	135	4409	75467	1075	1981	N	-620	84.95	77.76	635	0	0.13	Not Reqd	0.00	0.06	0.21	302	843	358	11.75	0.00	0.00
18	19	-0.925	-0.664	-0.835	2.000	10598	13352	362	4581	69083	1483	2095	N	-728	80.26	77.76	680	0	0.13	Not Reqd	0.00	0.06	0.21	303	884	494	4.23	0.00	0.00
19	19	-0.925	-0.664	-0.835	2.000	10598	13369	362	4508	69086	1483	1718	N	-728	80.26	77.76	680	0	0.13	Not Reqd	0.00	0.06	0.21	303	884	494	4.23	0.00	0.00
19	20	-0.892	-0.734	-0.837	2.000	10598	11957	388	4908	58039	1690	2060	N	-838	74.89	77.76	738	0	0.13	Not Reqd	0.00	0.06	0.21	305	938	563	3.90	0.00	0.00
20	20	-0.891	-0.735	-0.837	2.000	10598	11982	388	4839	58048	1690	1732	N	-1183	74.89	77.76	858	0	0.13	Not Reqd	0.00	0.06	0.21	305	1047	563	4.74	0.00	0.00
20	21	-0.866	-0.724	-0.814	2.000	10519	10303	414	5246	45280	1900	2080	N	-1294	68.71	77.76	917	0	0.13	Not Reqd	0.00	0.06	0.21	307	1101	633	4.39	0.00	0.00
21	21	-0.866	-0.725	-0.814	2.000	10519	9147	422	5194	44106	1908	1839	N	-1261	68.71	77.76	908	0	0.13	Not Reqd	0.00	0.06	0.21	307	1094	636	4.25	0.00	0.00
21	22	-0.834	-0.723	-0.791	2.000	10440	7144	448	5605	29524	2124	2192	N	-1378	61.76	77.76	947	0	0.13	Not Reqd	0.00	0.06	0.21	307	1129	708	3.82	0.00	0.00
22	22	-0.834	-0.724	-0.791	2.000	10440	6846	450	5568	29207	2126	2033	N	-1349	61.76	77.76	937	0	0.13	Not Reqd	0.00	0.06	0.21	307	1120	709	3.75	0.00	0.00
22	23	-0.795	-0.730	-0.769	2.000	10361	4574	475	5981	12817	2348	2388	N	-1472	54.02	77.76	979	0	0.13	Not Reqd	0.00	0.06	0.21	307	1157	783	3.36	0.00	0.00
23	23	-0.795	-0.730	-0.769	2.000	10361	4429	476	5956	12652	2350	2318	N	-1445	54.02	77.76	970	0	0.13	Not Reqd	0.00	0.06	0.21	307	1149	783	3.31	0.00	0.00
23	24	-0.750	-0.743	-0.747	2.000	10282	1903	502	6370	-5580	2578	2674	N	-1568	62.53	77.76	1011	0	0.13	Not Reqd	0.00	0.06	0.41	615	1463	859	4.61	0.00	0.00
24	24	-0.750	-0.744	-0.747	2.000	10282	1448	505	6360	-6055	2581	2705	N	-1544	62.53	77.76	1003	0	0.13	Not Reqd	0.00	0.06	0.41	615	1456	860	4.54	0.00	0.00
24	25	-0.925	-0.902	-0.915	2.000	10203	-1339	530	6778	-26303	2845	3064	Y	-2718	71.34	77.76	1394	0	0.13	0.104	0.00	0.12	0.41	615	1808	994	3.94	8.70	2.97
25	25	-0.925	-0.903	-0.915	2.000	10203	-2132	535	6788	-27115	2849	3210	Y	-2690	71.34	77.76	1385	0	0.13	0.109	0.00	0.12	0.41	615	1799	997	3.88	9.11	3.11
25	26	-0.981	-0.800	-0.899	2.000	10124	-5184	560	7210	-49563	3122	3574	Y	-2170	83.88	77.76	1211	0	0.13	0.122	0.00	0.13	0.41	615	1643	1094	2.88	10.21	3.49
26	26	-0.981	-0.800	-0.899	2.000	10124	-5551	562	7239	-49949	3125	3845	Y	-2144	83.88	77.76	1203	0	0.13	0.131	0.00	0.13	0.41	615	1636	1098	2.83	10.98	3.75
26	27	-0.873	-0.904	-0.887	2.000	10046	-8841	587	7668	-74629	3403	4216	Y	-1077	90.17	81.16	854	406	0.53	0.145	0.00	0.34	0.41	639	1344	1197	1.48	12.12	4.14
27	27	-0.872	-0.904	-0.887	2.000	10046	-9060	589	7717	-74866	3405	4613	Y	-821	90.17	81.16	765	496	0.64	0.159	0.00	0.40	0.41	638	1263	1203	1.19	13.26	4.53
27	28	-0.640	-1.194	-0.896	2.000	10046	-12568	613	8154	-101796	3687	4992	Y	-203	92.83	83.55	524	841	1.07	0.172	0.00	0.62	0.41	647				14.35	4.91
28	28	-0.639	-1.194	-0.896	2.000	10046	-12679	614	8199	-101917	3688	5359	Y	-203	92.83	83.55	524	842	1.08	0.184	0.00	0.63	0.41	647				15.40	5.27
28	29	-0.545	-1.312	-0.901	2.000	10046	-13841	622	8343	-111003	3767	5483	Y	0	93.00	83.70	442	954	1.22	0.189	0.00	0.71	0.41	645				15.76	5.39
29	29	-0.545	-1.312	-0.901	2.000	10046	-7059	-529	8884	-104223	-3386	9899	Y	0	93.00	83.70	455	799	1.02	0.340	0.00	0.68	0.41	648				28.45	9.73
29	30	-0.635	-1.203	-0.898	2.000	10046	-6031	-520	8768	-96005	-3305	9764	Y	202	92.83	83.55	536	688	0.88	0.336	0.00	0.61	0.41	650				28.07	9.60
30	30	-0.635	-1.203	-0.898	2.000	10046	-5999	-520	8790	-95969	-3305	10110	Y	202	92.83	83.55	536	688	0.88	0.348	0.00	0.61	0.41	650				29.06	9.93
30	31	-0.852	-0.941	-0.893	2.000	10046	-2963	-492	8430	-71803	-3020	9692	Y	769	90.31	81.28	758	360	0.46	0.333	0.00	0.40	0.41	641	1260	1150	1.38	27.86	9.52
31	31	-0.853	-0.942	-0.894	2.000	10046	-2919	-491	8445	-71750	-3020	10072	Y	1028	90.31	81.28	848	270	0.35	0.346	0.00	0.35	0.41	642	1341	1155	1.64	28.95	9.90
31	32	-0.935	-0.873	-0.907	2.000	10124	-163	-463	8081	-49896	-2737	9650	Y	2400	84.11	77.76	1288	0	0.13	0.329	0.00	0.23	0.41	615	1713	1055	3.40	27.56	9.42
32	32	-0.935	-0.873	-0.907	2.000	10124	-119	-463	8082	-49843	-2737	9921	Y	2426	84.11	77.76	1297	0	0.13	0.338	0.00	0.23	0.41	615	1720	1059	3.42	28.34	9.69

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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	-0.781	-1.098	-0.920	2.000	10203	2346	-434	7713	-30273	-2460	9494	Y	3317	68.62	77.76	1594	0	0.13	0.321	0.00	0.23	0.41	615	1988	960	4.97	26.95	9.21
33	33	-0.781	-1.097	-0.919	2.000	10203	2388	-434	7700	-30221	-2460	9658	Y	3345	68.62	77.76	1603	0	0.13	0.327	0.00	0.23	0.41	615	1996	963	5.00	27.41	9.37
33	34	-0.411	-0.822	-0.585	2.000	10282	4559	-405	7324	-12881	-2193	9223	Y	1221	58.17	77.76	893	0	0.13	0.310	0.00	0.22	0.41	615	1357	867	3.01	26.02	8.89
34	34	-0.406	-0.816	-0.579	2.000	10282	4565	-408	7299	-12864	-2196	9293	Y	1239	58.17	77.76	900	0	0.13	0.312	0.00	0.22	0.41	615	1363	869	3.03	26.21	8.96
34	35	-0.462	-0.806	-0.602	2.000	10361	6458	-379	6915	2444	-1964	8851	Y	1134	58.59	77.76	866	0	0.13	0.295	0.00	0.21	0.21	307	1056	786	2.18	24.81	8.48
35	35	-0.462	-0.806	-0.602	2.000	10361	6491	-380	6879	2487	-1965	8837	Y	1154	58.59	77.76	873	0	0.13	0.295	0.00	0.21	0.21	307	1062	786	2.21	24.77	8.47
35	36	-0.507	-0.812	-0.626	2.000	10440	8093	-352	6490	15916	-1740	8389	Y	1061	66.43	77.76	842	0	0.13	0.278	0.00	0.20	0.21	307	1034	704	2.55	23.37	7.99
36	36	-0.507	-0.812	-0.626	2.000	10440	8127	-351	6445	15960	-1740	8302	Y	1084	66.43	77.76	849	0	0.13	0.275	0.00	0.20	0.21	307	1041	703	2.59	23.13	7.91
36	37	-0.541	-0.837	-0.650	2.000	10519	9426	-323	6055	27547	-1521	7853	Y	983	73.37	77.76	808	0	0.13	0.258	0.00	0.19	0.21	307	1003	623	2.93	21.75	7.44
37	37	-0.541	-0.836	-0.650	2.000	10519	9428	-320	6003	27558	-1518	7703	Y	1009	73.37	77.76	817	0	0.13	0.253	0.00	0.19	0.21	307	1011	620	3.00	21.33	7.29
37	38	-0.566	-0.881	-0.675	2.000	10598	10408	-293	5617	37335	-1306	7258	Y	899	79.25	77.76	766	0	0.13	0.237	0.00	0.18	0.21	305	964	543	3.33	19.98	6.83
38	38	-0.566	-0.881	-0.675	2.000	10598	10439	-293	5557	37375	-1307	7054	Y	624	79.25	77.76	670	0	0.13	0.230	0.00	0.18	0.21	305	877	540	2.88	19.42	6.64
38	39	-0.599	-0.828	-0.679	2.000	10598	11127	-266	5179	45407	-1099	6618	Y	510	84.18	77.76	616	0	0.13	0.216	0.00	0.17	0.21	303	827	464	3.20	18.22	6.23
39	39	-0.599	-0.828	-0.679	2.000	10598	11155	-266	5119	45442	-1099	6371	Y	510	84.18	77.76	616	0	0.13	0.208	0.00	0.17	0.21	303	827	460	3.23	17.54	6.00
39	40	-0.626	-0.787	-0.682	2.000	10598	10082	-73	4996	50270	-725	6190	Y	395	88.09	79.28	582	0	0.13	0.202	0.00	0.17	0.21	309	802	333	5.77	17.04	5.83
40	40	-0.626	-0.787	-0.682	2.000	10598	10089	-73	4941	50283	-724	5916	Y	395	88.09	79.28	582	0	0.13	0.193	0.00	0.16	0.21	309	801	329	5.86	16.29	5.57
40	41	-0.647	-0.756	-0.685	2.000	10598	10704	-49	4912	55358	-519	5829	Y	281	91.00	81.90	553	0	0.13	0.190	0.00	0.16	0.21	318	784	259	6.90	16.05	5.49
41	41	-0.647	-0.756	-0.685	2.000	10598	10694	-48	4854	55352	-519	5528	Y	281	91.00	81.90	553	0	0.13	0.180	0.00	0.15	0.21	318	784	255	7.03	15.22	5.20
41	42	-0.662	-0.736	-0.688	2.000	10598	11074	-25	4840	58750	-314	5456	Y	167	92.92	83.63	521	0	0.13	0.178	0.00	0.15	0.21	325	762	185	8.22	15.02	5.14
42	42	-0.662	-0.735	-0.688	2.000	10598	11099	-25	4780	58779	-314	5136	Y	167	92.92	83.63	521	0	0.13	0.167	0.00	0.15	0.21	325	762	180	8.36	14.14	4.83
42	43	-0.671	-0.726	-0.690	2.000	10598	11251	-1	4781	60507	-109	5078	Y	53	93.86	84.47	487	0	0.13	0.166	0.00	0.15	0.21	328	733	111	9.75	13.98	4.78
43	43	-0.671	-0.726	-0.690	2.000	10598	11275	-1	4722	60532	-109	4763	Y	53	93.86	84.47	487	0	0.13	0.155	0.00	0.14	0.21	328	733	107	9.92	13.11	4.48
43	44	-0.674	-0.726	-0.692	2.000	10598	11212	20	4735	60648	78	4723	Y	-44	93.88	84.49	484	0	0.13	0.154	0.00	0.14	0.21	328	731	96	9.29	13.00	4.45
44	44	-0.674	-0.726	-0.692	2.000	10598	11234	20	4677	60669	79	4407	Y	-44	93.88	84.49	484	0	0.13	0.144	0.00	0.14	0.21	328	731	91	9.44	12.13	4.15
44	45	-0.670	-0.738	-0.694	2.000	10598	10952	43	4706	59202	283	4378	Y	-162	93.03	83.73	520	0	0.13	0.143	0.00	0.14	0.21	325	760	159	8.16	12.05	4.12
45	45	-0.670	-0.738	-0.694	2.000	10598	10947	44	4647	59194	283	4056	Y	-162	93.03	83.73	520	0	0.13	0.132	0.00	0.13	0.21	325	760	154	8.28	11.17	3.82
45	46	-0.663	-0.759	-0.696	2.000	10598	10446	67	4694	56066	488	4045	Y	-308	91.07	81.96	562	0	0.13	0.132	0.00	0.13	0.21	319	792	222	7.22	11.14	3.81
46	46	-0.663	-0.759	-0.696	2.000	10598	10450	67	4637	56067	488	3740	Y	-308	91.07	81.96	562	0	0.13	0.122	0.00	0.13	0.21	319	792	218	7.32	10.30	3.52
46	47	-0.654	-0.782	-0.698	2.000	10598	9739	90	4705	51287	692	3749	Y	-453	87.84	79.05	599	0	0.13	0.122	0.00	0.13	0.21	308	816	286	6.33	10.32	3.53
47	47	-0.654	-0.782	-0.698	2.000	10598	9714	90	4652	51256	692	3470	Y	-453	87.84	79.05	599	0	0.13	0.113	0.00	0.12	0.21	308	816	282	6.40	9.55	3.27
47	48	-0.640	-0.816	-0.701	2.000	10598	11060	287	4855	47092	1071	3615	Y	-531	83.68	77.76	620	0	0.13	0.118	0.00	0.12	0.21	303	831	410	3.51	9.95	3.40
48	48	-0.640	-0.816	-0.701	2.000	10598	11074	287	4795	47099	1071	3359	Y	-531	83.68	77.76	620	0	0.13	0.109	0.00	0.12	0.21	303	831	407	3.55	9.25	3.16
48	49	-0.610	-0.881	-0.704	2.000	10598	10248	314	5194	39321	1279	3700	Y	-539	79.27	77.76	637	0	0.13	0.121	0.00	0.13	0.21	305	847	481	3.02	10.19	3.48
49	49	-0.610	-0.882	-0.704	2.000	10598	10276	314	5140	39340	1278	3499	Y	-828	79.27	77.76	737	0	0.13	0.114	0.00	0.12	0.21	305	938	478	3.55	9.63	3.29
49	50	-0.590	-0.852	-0.687	2.000	10519	9182	341	5545	29840	1490	3846	Y	-1071	73.84	77.76	834	0	0.13	0.126	0.00	0.13	0.21	306	1026	553	3.42	10.65	3.64
50	50	-0.590	-0.853	-0.687	2.000	10519	9210	341	5495	29859	1490	3682	Y	-1044	73.84	77.76	824	0	0.13	0.121	0.00	0.13	0.21	306	1018	551	3.39	10.20	3.49
50	51	-0.576	-0.816	-0.669	2.000	10440	7851	368	5904	18603	1707	4032	Y	-1211	66.67	77.76	892	0	0.13	0.133	0.00	0.13	0.21	307	1079	629	3.15	11.24	3.84
51	51	-0.576	-0.816	-0.669	2.000	10440	7882	368	5861	18624	1707	3929	Y	-1186	66.67	77.76	883	0	0.13	0.130	0.00	0.13	0.21	307	1072	627	3.12	10.95	3.74
51	52	-0.557	-0.793	-0.653	2.000	10361	6262	395	6270	5569	1931	4281	Y	-1271	58.56	77.76	911	0	0.13	0.143	0.00	0.14	0.41	615	1374	707	3.97	12.00	4.10
52	52	-0.556	-0.794	-0.653	2.000	10361	5263	403	6239	4559	1939	4252	Y	-1248	58.56	77.76	904	0	0.13	0.142	0.00	0.14	0.41	615	1367	709	3.90	11.92	4.08
52	53	-0.527	-0.786	-0.636	2.000	10282	3326	430	6648	-10402	2168	4603	Y	-1369	58.30	77.76	944	0	0.13	0.155	0.00	0.14	0.41	615	1403	791	3.53	12.98	4.44
53	53	-0.527	-0.786	-0.636	2.000	10282	3030	432	6631	-10708	2171	4659	Y	-1349	58.30	77.76	937	0	0.13	0.157	0.00	0.14	0.41	615	1397	792	3.50	13.14	4.49
53	54	-0.754	-0.943	-0.837	2.000	10203	826	459	7043	-27692	2437	5012	Y	-2676	68.53	77.76	1380	0	0.13	0.170	0.00	0.15	0.41	615	1795	886	4.53	14.23	4.86
54	54	-0.754	-0.943	-0.837	2.000	10203	675	461	7038	-27854	2438	5162	Y	-2650	68.53	77.76	1371	0	0.13	0.175	0.00	0.15	0.41	615	1788	889	4.49	14.65	5.01
54	55	-0.849	-0.796	-0.825	2.000	10124	-1777	487	7454	-47024	2713	5520	Y	-2188	82.46	77.76	1217	0	0.13	0.188	0.00	0.16	0.41	615	1649	986	3.43	15.76	5.39
55	55	-0.849	-0.796	-0.825	2.000	10124	-1855	488	7463	-47111	2714	5774	Y	-2165	82.46	77.76	1209	0	0.13	0.197	0.00	0.16	0.41	615	1642	990	3.39	16.49	5.64
55	56	-0.783	-0.857	-0.817	2.000	10046	-4537	515	7885	-68510	2995	6137	Y	-1110	89.61	80.65	852	257	0.34	0.211	0.00	0.27	0.41	633	1337	1089	1.86	17.64	6.03
56	56	-0.783	-0.856	-0.817	2.000	10046	-5056	518	7903	-69038	2999	6483	Y	-876	89.61	80.65	770	340	0.44	0.223	0.00	0.33	0.41	633	1263	1095	1.58	18.63	6.37
56	57	-0.587	-1.101	-0.825	2.000	10046	-7973	544	8332	-92707	3282	6853	Y	-231	92.79	83.51	529	686	0.88	0.236	0.00	0.56	0.41	646				19.70	6.73
57	57	-0.587	-1.101	-0.825	2.000	10046	-8507	547	8362	-93246	3285	7188	Y	-231	92.79	83.51	528	688	0.88	0.247	0.00	0.56	0.41	646				20.66	7.06
57	58	-0.502	-1.207	-0.829	2.000	10046	-9486	556	8502	-101293	3365	7309	Y	0	93.00	83.70	438	808	1.04	0.251	0.00	0.64	0.41	644				21.01	7.18
58	58	-0.542	-1.145	-0.822	2.000	10046	-6068	-521	8829	-94175	-3360	10444	Y	0	93.00	83.70	448	796	1.02	0.359	0.00	0.69	0.41	646				30.02	10.26
58	59	-0.632	-1.038	-0.820	2.000	10046	-5115	-512	8711	-86078	-3279	10308	Y	197	92.82	83.54	527	688	0.88	0.354	0.00	0.62	0.41	648				29.63	10.13
59	59	-0.632	-1.038	-0.820	2.000	10046	-5086	-512	8729	-86042	-3279	10617	Y	197	92.82	83.54	527	687	0.88	0.365	0.00	0.62	0.41	648				30.52	10.43
59	60	-0.850	-0.778	-0.817	2.000	10046	-2259	-484	8365	-62228	-2994	10195	Y	750	90.13	81.12	742	367	0.47	0.351	0.00	0.41	0.41	638	1243	1149	1.33	29.30	10.02
60	60	-0.851	-0.779	-0.817	2.000	10046	-2218	-483	8383	-62176	-2995	10518	Y	987	90.13	81.12	824	285	0.37	0.362	0.00	0.37	0.41	639	1317	1154	1.57	30.23	10.34
60	61	-0.942	-0.697	-0.831	2.000	10124	360	-455	8015	-40632	-2713	10093	Y	2200	83.68	77.76	1221	0	0.13	0.344	0.00	0.24	0.41	615	1652	1053	3.22	28.83	9.86
61	61	-0.942	-0.696	-0.831	2.000	10124	259	-459	8014	-40721	-2716	10313	Y	2224	83.68	77.76	1229	0	0.13	0.352	0.00	0.24	0.41	615	1660	1058	3.22	29.46	10.07
61	62	-0.827	-0.871	-0.846	2.000	10203	2608	-430	7643	-21404	-2440	9884	Y	2962	68.57	77.76	1475	0	0.13	0.335	0.00	0.23	0.41	615	1881	959	4.59	28.06	9.59
62	62	-0.827	-0.870	-0.846	2.000	10203	2521	-434	7630	-21478	-2443	10000	Y	2988	68.57	77.76	1484	0	0.13	0.339	0.00	0.23	0.41	615	1889	962	4.60	28.38	9.70
62	63	-0.526	-0.623	-0.567	2.000	10282	4633	-406	7253	-4334	-2176	9565	Y	1191	58.17	77.76	885	0	0.13	0.321	0.00	0.23	0.41	615	1350	867	2.99	26.98	9.22
63	63	-0.522	-0.617	-0.562	2.000	10282	4618	-408	7228	-4337	-2178	9587	Y	1209	58.17	77.76	891	0	0.13	0.322	0.00	0.23	0.41	615	1355	868	3.01	27.04	9.25
63	64	-0.579	-0.595	-0.585	2.000	10361	6473	-379	6845	10795	-1947	9146	Y	1106	58.59	77.76	857	0	0.13	0.305	0.00	0.22	0.21	307	1048	784	2.16	25.64	8.77

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																											
64	64	-0.579	-0.594	-0.585	2.000	10361	6472	-380	6810	10806	-1948	9085	Y	1126	58.59	77.76	863	0	0.13	0.303	0.00	0.22	0.21	307	1054	784	2.19	25.47	8.71
64	65	-0.625	-0.586	-0.610	2.000	10440	8060	-352	6421	24085	-1723	8638	Y	1035	66.43	77.76	819	0	0.13	0.286	0.00	0.21	0.21	306	1013	702	2.46	24.07	8.23
65	65	-0.625	-0.585	-0.609	2.000	10440	8043	-353	6378	24080	-1724	8506	Y	1058	66.43	77.76	827	0	0.13	0.281	0.00	0.21	0.21	306	1020	701	2.51	23.70	8.10
65	66	-0.660	-0.592	-0.635	2.000	10519	9359	-325	5989	35551	-1506	8058	Y	959	73.37	77.76	777	0	0.13	0.265	0.00	0.20	0.21	305	973	621	2.79	22.32	7.63
66	66	-0.660	-0.592	-0.635	2.000	10519	9261	-326	5939	35463	-1508	7864	Y	984	73.37	77.76	786	0	0.13	0.258	0.00	0.19	0.21	305	981	619	2.84	21.78	7.45
66	67	-0.685	-0.614	-0.660	2.000	10598	10308	-299	5554	45175	-1296	7421	Y	877	79.25	77.76	736	0	0.13	0.242	0.00	0.19	0.21	303	935	542	3.17	20.43	6.98
67	67	-0.685	-0.613	-0.660	2.000	10598	9722	-306	5487	44600	-1300	7186	Y	609	79.25	77.76	644	0	0.13	0.234	0.00	0.18	0.21	303	852	540	2.71	19.78	6.76
67	68	-0.715	-0.568	-0.664	2.000	10598	10546	-279	5111	52611	-1092	6751	Y	497	84.18	77.76	592	0	0.13	0.220	0.00	0.17	0.21	301	804	464	3.02	18.59	6.35
68	68	-0.716	-0.568	-0.664	2.000	10598	10185	-282	5055	52259	-1095	6466	Y	497	84.18	77.76	593	0	0.13	0.211	0.00	0.17	0.21	301	805	461	3.04	17.80	6.09
68	69	-0.739	-0.533	-0.668	2.000	10598	10128	-72	4991	57948	-704	6345	Y	386	88.09	79.28	559	0	0.13	0.207	0.00	0.17	0.21	307	779	328	5.61	17.47	5.97
69	69	-0.739	-0.533	-0.668	2.000	10598	10153	-72	4936	57980	-704	6029	Y	386	88.09	79.28	559	0	0.13	0.197	0.00	0.16	0.21	307	779	324	5.69	16.60	5.67
69	70	-0.756	-0.509	-0.671	2.000	10598	10762	-49	4909	62893	-499	5944	Y	274	91.00	81.90	531	0	0.13	0.194	0.00	0.16	0.21	316	763	254	6.73	16.36	5.59
70	70	-0.756	-0.509	-0.671	2.000	10598	10545	-52	4851	62681	-503	5602	Y	274	91.00	81.90	532	0	0.13	0.183	0.00	0.16	0.21	316	763	250	6.76	15.42	5.27
70	71	-0.767	-0.495	-0.673	2.000	10598	10962	-29	4839	65961	-298	5532	Y	163	92.92	83.63	502	0	0.13	0.180	0.00	0.15	0.21	323	742	181	7.92	15.23	5.21
71	71	-0.767	-0.495	-0.673	2.000	10598	10898	-30	4779	65900	-299	5173	Y	163	92.92	83.63	502	0	0.13	0.169	0.00	0.15	0.21	323	742	176	8.02	14.24	4.87
71	72	-0.772	-0.492	-0.675	2.000	10598	11105	-6	4782	67528	-95	5117	Y	51	93.86	84.47	468	0	0.13	0.167	0.00	0.15	0.21	326	715	107	9.35	14.09	4.82
72	72	-0.772	-0.492	-0.675	2.000	10598	11088	-7	4724	67513	-95	4765	Y	51	93.86	84.47	468	0	0.13	0.155	0.00	0.14	0.21	326	715	102	9.51	13.12	4.48
72	73	-0.771	-0.498	-0.677	2.000	10598	11082	15	4739	67544	93	4727	Y	-51	93.86	84.47	468	0	0.13	0.154	0.00	0.14	0.21	326	715	101	9.19	13.01	4.45
73	73	-0.771	-0.499	-0.677	2.000	10598	11059	15	4681	67520	93	4374	Y	-51	93.86	84.47	469	0	0.13	0.143	0.00	0.14	0.21	326	715	96	9.34	12.04	4.12
73	74	-0.765	-0.516	-0.678	2.000	10598	10839	39	4712	65959	298	4347	Y	-165	92.92	83.63	502	0	0.13	0.142	0.00	0.14	0.21	323	743	164	8.02	11.97	4.09
74	74	-0.765	-0.516	-0.678	2.000	10598	10733	41	4653	65851	300	3988	Y	-165	92.92	83.63	503	0	0.13	0.130	0.00	0.13	0.21	323	743	159	8.10	10.98	3.75
74	75	-0.752	-0.543	-0.680	2.000	10598	10282	64	4701	62617	504	3978	Y	-280	91.00	81.90	534	0	0.13	0.130	0.00	0.13	0.21	316	765	227	6.94	10.95	3.74
75	75	-0.752	-0.543	-0.680	2.000	10598	10304	64	4645	62635	504	3637	Y	-280	91.00	81.90	534	0	0.13	0.119	0.00	0.12	0.21	316	765	222	7.05	10.01	3.42
75	76	-0.734	-0.581	-0.681	2.000	10598	9643	87	4713	57750	708	3647	Y	-398	88.09	79.28	563	0	0.13	0.119	0.00	0.12	0.21	307	783	290	6.00	10.04	3.43
76	76	-0.734	-0.581	-0.681	2.000	10598	9667	87	4661	57768	708	3333	Y	-398	88.09	79.28	563	0	0.13	0.109	0.00	0.12	0.21	307	783	285	6.09	9.18	3.14
76	77	-0.710	-0.630	-0.683	2.000	10598	11185	284	4912	53621	1087	3526	Y	-518	84.18	77.76	598	0	0.13	0.115	0.00	0.12	0.21	301	809	415	3.36	9.71	3.32
77	77	-0.710	-0.630	-0.683	2.000	10598	11211	284	4851	53639	1087	3234	Y	-518	84.18	77.76	597	0	0.13	0.105	0.00	0.12	0.21	301	809	410	3.39	8.90	3.04
77	78	-0.682	-0.689	-0.684	2.000	10598	10424	311	5251	45744	1295	3576	Y	-640	79.33	77.76	653	0	0.13	0.117	0.00	0.12	0.21	303	860	485	3.07	9.84	3.37
78	78	-0.682	-0.689	-0.684	2.000	10598	10453	310	5192	45763	1297	3344	Y	-921	79.33	77.76	750	0	0.13	0.109	0.00	0.12	0.21	303	948	482	3.59	9.21	3.15
78	79	-0.661	-0.673	-0.665	2.000	10519	9405	337	5598	36131	1508	3692	Y	-1043	73.36	77.76	805	0	0.13	0.121	0.00	0.13	0.21	305	998	557	3.26	10.22	3.50
79	79	-0.661	-0.673	-0.665	2.000	10519	9435	337	5547	36150	1508	3493	Y	-1017	73.36	77.76	795	0	0.13	0.115	0.00	0.12	0.21	304	990	554	3.24	9.67	3.31
79	80	-0.635	-0.667	-0.647	2.000	10440	8117	364	5956	24759	1726	3844	Y	-1131	66.43	77.76	851	0	0.13	0.127	0.00	0.13	0.21	306	1041	632	2.95	10.71	3.66
80	80	-0.634	-0.667	-0.647	2.000	10440	7583	370	5912	24213	1731	3707	Y	-1107	66.43	77.76	844	0	0.13	0.123	0.00	0.13	0.21	306	1035	632	2.91	10.33	3.53
80	81	-0.601	-0.671	-0.629	2.000	10361	5956	397	6321	10976	1955	4059	Y	-1215	58.59	77.76	893	0	0.13	0.135	0.00	0.13	0.41	615	1357	712	3.86	11.38	3.89
81	81	-0.601	-0.671	-0.629	2.000	10361	5283	403	6291	10291	1961	4000	Y	-1193	58.59	77.76	886	0	0.13	0.133	0.00	0.13	0.41	615	1350	713	3.80	11.21	3.83
81	82	-0.560	-0.685	-0.613	2.000	10282	3342	431	6700	-4846	2191	4351	Y	-1316	58.17	77.76	927	0	0.13	0.146	0.00	0.14	0.41	615	1387	795	3.44	12.27	4.20
82	82	-0.560	-0.685	-0.613	2.000	10282	3081	433	6683	-5120	2193	4376	Y	-1297	58.17	77.76	920	0	0.13	0.147	0.00	0.14	0.41	615	1381	796	3.41	12.34	4.22
82	83	-0.757	-0.847	-0.796	2.000	10203	859	461	7094	-22292	2460	4730	Y	-2531	68.40	77.76	1332	0	0.13	0.160	0.00	0.14	0.41	615	1752	890	4.34	13.42	4.59
83	83	-0.757	-0.848	-0.797	2.000	10203	722	462	7090	-22442	2461	4850	Y	-2507	68.40	77.76	1324	0	0.13	0.164	0.00	0.15	0.41	615	1744	892	4.29	13.77	4.71
83	84	-0.834	-0.727	-0.785	2.000	10124	-1765	489	7505	-41817	2737	5207	Y	-2067	82.28	77.76	1177	0	0.13	0.178	0.00	0.15	0.41	615	1613	989	3.27	14.87	5.08
84	84	-0.834	-0.727	-0.786	2.000	10124	-2553	495	7516	-42617	2743	5435	Y	-2045	82.28	77.76	1170	0	0.13	0.185	0.00	0.16	0.41	615	1606	995	3.21	15.52	5.31
84	85	-0.758	-0.803	-0.779	2.000	10046	-5331	523	7938	-64281	3024	5798	Y	-1072	89.52	80.57	817	303	0.40	0.199	0.00	0.30	0.41	628	1301	1094	1.71	16.67	5.70
85	85	-0.757	-0.802	-0.778	2.000	10046	-5944	528	7962	-64904	3028	6127	Y	-850	89.52	80.57	740	382	0.50	0.211	0.00	0.36	0.41	628	1231	1100	1.45	17.61	6.02
85	86	-0.557	-1.054	-0.787	2.000	10046	-8989	554	8391	-88857	3312	6498	Y	-226	92.78	83.50	508	718	0.93	0.223	0.00	0.57	0.41	641				18.68	6.39
86	86	-0.557	-1.054	-0.787	2.000	10046	-9287	557	8424	-89161	3314	6818	Y	-226	92.78	83.50	508	720	0.93	0.234	0.00	0.58	0.41	641				19.60	6.70
86	87	-0.471	-1.160	-0.791	2.000	10046	-10310	565	8564	-97303	3395	6940	Y	0	93.00	83.70	421	837	1.08	0.239	0.00	0.66	0.41	640				19.95	6.82
87	87	-0.413	-1.241	-0.797	2.000	10046	-7337	-531	8768	-100096	-3455	10512	Y	0	93.00	83.70	417	863	1.12	0.361	0.00	0.74	0.41	639				30.21	10.33
87	88	-0.505	-1.131	-0.795	2.000	10046	-6370	-522	8650	-91768	-3375	10375	Y	201	92.81	83.53	496	754	0.97	0.357	0.00	0.67	0.41	640				29.82	10.19
88	88	-0.505	-1.131	-0.795	2.000	10046	-6342	-522	8673	-91734	-3375	10705	Y	201	92.81	83.53	496	754	0.97	0.368	0.00	0.67	0.41	640				30.77	10.52
88	89	-0.728	-0.867	-0.792	2.000	10046	-3457	-495	8308	-67185	-3090	10282	Y	765	89.93	80.94	709	435	0.57	0.354	0.00	0.46	0.41	630	1205	1182	1.08	29.55	10.10
89	89	-0.729	-0.867	-0.793	2.000	10046	-3423	-495	8330	-67140	-3090	10635	Y	991	89.93	80.94	787	357	0.47	0.366	0.00	0.42	0.41	630	1276	1187	1.31	30.57	10.45
89	90	-0.827	-0.783	-0.807	2.000	10124	-765	-467	7962	-44853	-2808	10209	Y	2095	83.17	77.76	1186	0	0.13	0.348	0.00	0.24	0.41	615	1621	1087	2.95	29.16	9.97
90	90	-0.827	-0.782	-0.807	2.000	10124	-895	-472	7967	-44970	-2812	10453	Y	2118	83.17	77.76	1194	0	0.13	0.357	0.00	0.24	0.41	615	1628	1092	2.95	29.86	10.21
90	91	-0.739	-0.926	-0.821	2.000	10203	1557	-444	7596	-24888	-2536	10024	Y	2735	68.51	77.76	1400	0	0.13	0.339	0.00	0.23	0.41	615	1813	994	4.15	28.45	9.73
91	91	-0.739	-0.925	-0.821	2.000	10203	1532	-446	7588	-24899	-2538	10159	Y	2760	68.51	77.76	1408	0	0.13	0.344	0.00	0.24	0.41	615	1820	996	4.16	28.83	9.86
91	92	-0.494	-0.711	-0.586	2.000	10282	3743	-418	7211	-6997	-2271	9724	Y	1215	58.17	77.76	884	0	0.13	0.327	0.00	0.23	0.41	613	1347	901	2.82	27.43	9.38
92	92	-0.490	-0.705	-0.581	2.000	10282	3735	-419	7191	-6991	-2272	9761	Y	1233	58.17	77.76	890	0	0.13	0.328	0.00	0.23	0.41	613	1353	902	2.84	27.53	9.41
92	93	-0.550	-0.684	-0.604	2.000	10361	5691	-391	6807	8900	-2041	9319	Y	1128	58.59	77.76	859	0	0.13	0.311	0.00	0.22	0.21	307	1050	818	2.00	26.12	8.93
93	93	-0.550	-0.683	-0.604	2.000	10361	5671	-392	6776	8893	-2042	9270	Y	1148	58.59	77.76	867	0	0.13	0.309	0.00	0.22	0.21	307	1056	818	2.03	25.99	8.88
93	94	-0.599	-0.676	-0.629	2.000	10440	7364	-363	6386	22932	-1817	8822	Y	1056	66.43	77.76	813	0	0.13	0.292	0.00	0.21	0.21	305	1006	736	2.25	24.58	8.40
94	94	-0.599	-0.675	-0.628	2.000	10440	7294	-364	6346	22876	-1818	8697	Y	1079	66.43	77.76	821	0	0.13	0.288	0.00	0.21	0.21	305	1014	735	2.30	24.23	8.28
94	95	-0.637	-0.683	-0.654	2.000	10519	8718	-336	5957	35108	-1600	8249	Y	978	73.37	77.76	769	0	0.13	0.271	0.00	0.20	0.21	303	965	655	2.55	22.85	7.81
95	95	-0.637	-0.683	-0.654	2.000	10519	8505	-338	5910	34907	-1602	8057	Y	1004	73.37	77.76	779	0	0.13	0.265	0.00	0.20	0.21	303	974	653	2.60	22.32	7.63

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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 + Maximum LL Torsion @ t=00																											
95	96	-0.667	-0.707	-0.681	2.000	10598	9664	-311	5524	45383	-1390	7614	Y	894	79.25	77.76	727	0	0.13	0.248	0.00	0.19	0.21	302	926	576	2.89	20.96	7.17
96	96	-0.667	-0.706	-0.680	2.000	10598	9637	-311	5469	45367	-1390	7367	Y	621	79.25	77.76	633	0	0.13	0.240	0.00	0.18	0.21	301	840	572	2.45	20.28	6.93
96	97	-0.702	-0.652	-0.685	2.000	10598	10513	-283	5092	54106	-1181	6932	Y	507	84.18	77.76	580	0	0.13	0.226	0.00	0.18	0.21	300	791	496	2.74	19.08	6.52
97	97	-0.703	-0.651	-0.685	2.000	10598	10290	-285	5035	53892	-1183	6638	Y	507	84.18	77.76	580	0	0.13	0.216	0.00	0.17	0.21	300	791	492	2.77	18.27	6.25
97	98	-0.732	-0.608	-0.689	2.000	10598	10106	-74	4972	60130	-790	6517	Y	393	88.09	79.28	544	0	0.13	0.212	0.00	0.17	0.21	305	764	360	5.12	17.94	6.13
98	98	-0.732	-0.608	-0.689	2.000	10598	10043	-75	4917	60074	-791	6190	Y	393	88.09	79.28	544	0	0.13	0.202	0.00	0.17	0.21	305	764	355	5.19	17.04	5.83
98	99	-0.755	-0.575	-0.693	2.000	10598	10686	-51	4890	65697	-587	6105	Y	280	91.00	81.90	515	0	0.13	0.199	0.00	0.16	0.21	314	746	286	6.15	16.81	5.75
99	99	-0.755	-0.575	-0.693	2.000	10598	10636	-52	4832	65653	-588	5747	Y	280	91.00	81.90	515	0	0.13	0.187	0.00	0.16	0.21	314	746	281	6.24	15.82	5.41
99	100	-0.772	-0.552	-0.696	2.000	10598	11066	-29	4820	69621	-383	5676	Y	166	92.92	83.63	483	0	0.13	0.185	0.00	0.16	0.21	320	723	212	7.33	15.63	5.34
100	100	-0.773	-0.552	-0.696	2.000	10598	11075	-29	4759	69634	-383	5297	Y	166	92.92	83.63	483	0	0.13	0.173	0.00	0.15	0.21	320	723	206	7.46	14.58	4.99
100	101	-0.784	-0.539	-0.699	2.000	10598	11282	-5	4762	71937	-178	5241	Y	52	93.86	84.47	447	0	0.13	0.171	0.00	0.15	0.21	323	694	137	8.72	14.43	4.93
101	101	-0.784	-0.539	-0.699	2.000	10598	11304	-5	4703	71961	-178	4866	Y	52	93.86	84.47	447	0	0.13	0.159	0.00	0.14	0.21	323	694	131	8.89	13.40	4.58
101	102	-0.789	-0.536	-0.702	2.000	10598	11293	16	4717	72605	9	4827	Y	-52	93.86	84.47	447	0	0.13	0.157	0.00	0.14	0.21	323	694	74	9.24	13.29	4.54
102	102	-0.789	-0.536	-0.702	2.000	10598	11316	16	4658	72628	9	4449	Y	-52	93.86	84.47	447	0	0.13	0.145	0.00	0.14	0.21	323	694	69	9.41	12.25	4.19
102	103	-0.790	-0.542	-0.704	2.000	10598	11087	40	4688	71734	214	4421	Y	-168	92.92	83.63	482	0	0.13	0.144	0.00	0.14	0.21	320	722	137	8.08	12.17	4.16
103	103	-0.790	-0.543	-0.704	2.000	10598	11112	40	4628	71756	214	4030	Y	-168	92.92	83.63	482	0	0.13	0.131	0.00	0.13	0.21	320	722	131	8.23	11.10	3.79
103	104	-0.786	-0.558	-0.707	2.000	10598	10660	63	4676	69197	419	4020	Y	-286	91.00	81.90	513	0	0.13	0.131	0.00	0.13	0.21	314	744	199	7.04	11.07	3.78
104	104	-0.786	-0.558	-0.707	2.000	10598	10644	62	4618	69177	418	3643	Y	-286	91.00	81.90	513	0	0.13	0.119	0.00	0.12	0.21	314	744	193	7.19	10.03	3.43
104	105	-0.776	-0.582	-0.709	2.000	10598	9981	85	4686	64965	622	3653	Y	-406	88.09	79.28	542	0	0.13	0.119	0.00	0.12	0.21	304	761	261	6.12	10.06	3.44
105	105	-0.776	-0.583	-0.709	2.000	10598	9990	85	4632	64968	622	3299	Y	-406	88.09	79.28	542	0	0.13	0.108	0.00	0.12	0.21	304	761	256	6.22	9.08	3.11
105	106	-0.762	-0.616	-0.711	2.000	10598	11631	285	4903	61619	1003	3513	Y	-528	84.18	77.76	576	0	0.13	0.115	0.00	0.12	0.21	298	787	386	3.39	9.67	3.31
106	106	-0.761	-0.616	-0.711	2.000	10598	11651	284	4840	61630	1002	3178	N	-528	84.18	77.76	576	0	0.13	Not Reqd	0.00	0.06	0.21	298	787	334	5.77	0.00	0.00
106	107	-0.743	-0.658	-0.713	2.000	10598	10864	311	5240	54411	1211	3520	Y	-653	79.33	77.76	629	0	0.13	0.115	0.00	0.12	0.21	300	836	456	3.10	9.69	3.31
107	107	-0.742	-0.658	-0.713	2.000	10598	10890	311	5180	54427	1210	3219	Y	-939	79.33	77.76	728	0	0.13	0.105	0.00	0.12	0.21	300	925	451	3.63	8.86	3.03
107	108	-0.732	-0.626	-0.692	2.000	10519	9829	338	5585	45480	1421	3566	Y	-1064	73.36	77.76	781	0	0.13	0.117	0.00	0.12	0.21	301	974	527	3.29	9.88	3.38
108	108	-0.731	-0.626	-0.693	2.000	10519	9858	338	5532	45498	1421	3319	Y	-1037	73.36	77.76	772	0	0.13	0.109	0.00	0.12	0.21	301	966	523	3.28	9.19	3.14
108	109	-0.714	-0.606	-0.672	2.000	10440	8520	366	5941	34783	1639	3669	Y	-1154	66.43	77.76	826	0	0.13	0.121	0.00	0.13	0.21	303	1016	601	2.98	10.22	3.50
109	109	-0.714	-0.606	-0.672	2.000	10440	8267	368	5894	34517	1642	3480	Y	-1129	66.43	77.76	818	0	0.13	0.115	0.00	0.12	0.21	303	1009	599	2.95	9.70	3.31
109	110	-0.690	-0.598	-0.653	2.000	10361	6633	396	6304	21968	1866	3831	Y	-1239	58.59	77.76	873	0	0.13	0.128	0.00	0.13	0.37	549	1279	679	3.67	10.74	3.67
110	110	-0.690	-0.599	-0.653	2.000	10361	5948	402	6270	21269	1872	3714	Y	-1217	58.59	77.76	866	0	0.13	0.124	0.00	0.13	0.37	549	1274	679	3.63	10.41	3.56
110	111	-0.657	-0.601	-0.634	2.000	10282	3993	429	6680	6811	2102	4066	Y	-1343	49.83	77.76	931	0	0.13	0.137	0.00	0.13	0.37	553	1336	761	3.38	11.47	3.92
111	111	-0.657	-0.602	-0.634	2.000	10282	3755	431	6659	6559	2105	4029	Y	-1322	49.83	77.76	925	0	0.13	0.135	0.00	0.13	0.37	553	1330	761	3.35	11.37	3.89
111	112	-0.933	-0.796	-0.873	2.000	10203	1514	459	7071	-9955	2375	4384	Y	-2803	68.45	77.76	1422	0	0.13	0.148	0.00	0.14	0.37	553	1778	856	4.58	12.44	4.25
112	112	-0.933	-0.796	-0.873	2.000	10203	1395	460	7063	-10089	2376	4438	Y	-2777	68.45	77.76	1414	0	0.13	0.150	0.00	0.14	0.37	553	1770	858	4.54	12.60	4.31
112	113	-1.050	-0.627	-0.859	2.000	10124	-1119	488	7481	-28841	2655	4797	Y	-2224	82.73	77.76	1229	0	0.13	0.164	0.00	0.15	0.47	692	1729	956	3.83	13.70	4.68
113	113	-1.050	-0.627	-0.859	2.000	10124	-1346	490	7487	-29082	2658	4954	Y	-2200	82.73	77.76	1221	0	0.13	0.169	0.00	0.15	0.47	692	1722	959	3.78	14.15	4.84
113	114	-0.985	-0.693	-0.849	2.000	10046	-4129	518	7911	-50131	2943	5320	Y	-1105	89.70	80.73	851	239	0.31	0.183	0.00	0.25	0.47	713	1408	1060	2.20	15.29	5.23
114	114	-0.984	-0.692	-0.849	2.000	10046	-5010	524	7936	-51025	2950	5589	Y	-866	89.70	80.73	767	326	0.43	0.192	0.00	0.31	0.47	712	1331	1066	1.91	16.07	5.49
114	115	-0.785	-0.936	-0.855	2.000	10046	-8082	551	8368	-74426	3238	5964	Y	-230	92.79	83.51	527	672	0.86	0.205	0.00	0.53	0.47	726				17.14	5.86
115	115	-0.785	-0.936	-0.855	2.000	10046	-8325	553	8398	-74678	3240	6232	Y	-230	92.79	83.51	527	673	0.86	0.214	0.00	0.54	0.47	726				17.91	6.12
115	116	-0.699	-1.041	-0.858	2.000	10046	-9357	562	8540	-82648	3320	6355	Y	0	93.00	83.70	437	793	1.02	0.219	0.00	0.62	0.47	724				18.27	6.24
116	116	-0.699	-1.041	-0.858	2.000	10046	-5492	-517	8154	-78784	-3154	9534	Y	0	93.00	83.70	444	724	0.93	0.328	0.00	0.63	0.47	726				27.40	9.37
116	117	-0.785	-0.943	-0.858	2.000	10046	-4502	-507	8034	-71165	-3073	9395	Y	230	92.80	83.52	533	605	0.77	0.323	0.00	0.55	0.47	728				27.00	9.23
117	117	-0.785	-0.943	-0.858	2.000	10046	-4476	-507	8050	-71133	-3073	9651	Y	230	92.80	83.52	534	604	0.77	0.332	0.00	0.55	0.47	728				27.74	9.48
117	118	-0.965	-0.736	-0.859	2.000	10046	-1549	-479	7676	-48843	-2783	9220	Y	1103	89.27	80.34	852	179	0.23	0.317	0.00	0.28	0.37	568	1278	1064	1.78	26.50	9.06
118	118	-0.965	-0.737	-0.859	2.000	10046	-1512	-479	7684	-48797	-2783	9478	Y	1345	89.27	80.34	935	95	0.13	0.326	0.00	0.23	0.37	569	1354	1068	2.05	27.24	9.31
118	119	-0.964	-0.761	-0.872	2.000	10124	1147	-450	7307	-28839	-2496	9043	Y	2500	80.28	77.76	1321	0	0.13	0.309	0.00	0.22	0.37	553	1687	966	3.80	25.83	8.83
119	119	-0.964	-0.761	-0.872	2.000	10124	1180	-450	7300	-28795	-2496	9199	Y	2524	80.28	77.76	1329	0	0.13	0.314	0.00	0.22	0.37	553	1694	968	3.82	26.27	8.98
119	120	-0.794	-1.004	-0.886	2.000	10203	3556	-421	6918	-11147	-2215	8759	Y	3056	64.46	77.76	1507	0	0.13	0.297	0.00	0.21	0.21	307	1633	868	4.16	24.86	8.50
120	120	-0.794	-1.003	-0.886	2.000	10203	3584	-421	6898	-11109	-2215	8819	Y	3083	64.46	77.76	1515	0	0.13	0.299	0.00	0.21	0.21	307	1641	869	4.19	25.03	8.56
120	121	-0.447	-0.830	-0.609	2.000	10282	5664	-391	6508	4278	-1943	8371	Y	1337	57.01	77.76	918	0	0.13	0.281	0.00	0.21	0.21	306	1102	771	2.46	23.61	8.07
121	121	-0.448	-0.830	-0.609	2.000	10282	5683	-391	6477	4308	-1943	8347	Y	1356	57.01	77.76	924	0	0.13	0.280	0.00	0.20	0.21	306	1107	771	2.49	23.55	8.05
121	122	-0.453	-0.886	-0.629	2.000	10361	7456	-362	6078	17618	-1711	7890	Y	1224	66.63	77.76	860	0	0.13	0.263	0.00	0.20	0.21	304	1048	687	2.71	22.12	7.56
122	122	-0.453	-0.885	-0.629	2.000	10361	7458	-362	6037	17630	-1711	7794	Y	1245	66.63	77.76	867	0	0.13	0.260	0.00	0.19	0.21	304	1054	686	2.76	21.85	7.47
122	123	-0.455	-0.953	-0.648	2.000	10440	8916	-332	5631	29037	-1485	7330	Y	1072	74.88	77.76	793	0	0.13	0.243	0.00	0.19	0.21	302	986	603	2.97	20.42	6.98
123	123	-0.455	-0.953	-0.648	2.000	10440	8875	-333	5582	29006	-1485	7172	Y	1095	74.88	77.76	801	0	0.13	0.237	0.00	0.18	0.21	302	993	601	3.03	19.98	6.83
123	124	-0.456	-1.032	-0.668	2.000	10519	10010	-303	5175	38552	-1265	6706	Y	939	81.61	77.76	736	0	0.13	0.220	0.00	0.17	0.21	301	933	521	3.32	18.57	6.35
124	124	-0.457	-1.032	-0.669	2.000	10519	9770	-306	5120	38319	-1268	6497	Y	965	81.61	77.76	745	0	0.13	0.213	0.00	0.17	0.21	301	941	519	3.38	17.99	6.15
124	125	-0.452	-1.138	-0.689	2.000	10598	8861	-101	4723	44330	-879	6042	Y	859	87.08	78.38	710	0	0.13	0.197	0.00	0.16	0.21	303	911	382	6.11	16.63	5.69
125	125	-0.458	-1.007	-0.648	2.000	10598	8697	-103	4675	44173	-881	5794	Y	518	87.08	78.38	592	0	0.13	0.189	0.00	0.16	0.21	303	805	379	5.11	15.95	5.45
125	126	-0.478	-0.963	-0.646	2.000	10598	9563	-78	4619	50505	-675	5680	Y	411	91.09	81.98	569	0	0.13	0.185	0.00	0.16	0.21	316	796	309	6.16	15.64	5.35
126	126	-0.478	-0.963	-0.646	2.000	10598	9448	-80	4567	50396	-676	5405	Y	411	91.09	81.98	569	0	0.13	0.176	0.00	0.15	0.21	316	796	305	6.22	14.88	5.09
126	127	-0.494	-0.933	-0.646	2.000	10598	10056	-54	4530	55027	-470	5310	Y	249	93.93	84.53	524	0	0.13	0.173	0.00	0.15	0.21	325	764	235	7.22	14.62	5.00

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																											
127	127	-0.494	-0.933	-0.646	2.000	10598	9997	-55	4475	54972	-471	5010	Y	249	93.93	84.53	524	0	0.13	0.163	0.00	0.15	0.21	325	764	231	7.30	13.79	4.72
127	128	-0.511	-0.900	-0.646	2.000	10598	10322	-29	4457	57880	-263	4934	Y	74	95.27	85.74	469	0	0.13	0.161	0.00	0.15	0.21	329	718	161	8.38	13.58	4.64
128	128	-0.511	-0.900	-0.646	2.000	10598	10338	-29	4400	57898	-263	4618	Y	74	95.27	85.74	469	0	0.13	0.151	0.00	0.14	0.21	329	718	156	8.52	12.71	4.35
128	129	-0.526	-0.864	-0.643	2.000	10598	10357	-2	4399	59059	-55	4559	Y	-56	95.33	85.79	463	0	0.13	0.149	0.00	0.14	0.21	329	713	86	10.54	12.55	4.29
129	129	-0.526	-0.864	-0.643	2.000	10598	10247	-4	4361	58949	-57	4342	Y	-56	95.33	85.79	463	0	0.13	0.142	0.00	0.14	0.21	329	714	83	10.58	11.95	4.09
129	130	-0.531	-0.852	-0.642	2.000	10598	10181	6	4364	58942	17	4324	Y	-123	95.06	85.55	483	0	0.13	0.141	0.00	0.14	0.21	328	730	69	10.96	11.90	4.07
130	130	-0.531	-0.852	-0.642	2.000	10598	10127	4	4326	58887	15	4107	Y	-123	95.06	85.55	483	0	0.13	0.134	0.00	0.13	0.21	328	730	66	11.15	11.31	3.87
130	131	-0.544	-0.824	-0.641	2.000	10598	9722	32	4347	57673	224	4069	Y	-302	93.23	83.91	535	0	0.13	0.133	0.00	0.13	0.21	322	771	135	9.50	11.20	3.83
131	131	-0.544	-0.824	-0.641	2.000	10598	9710	31	4294	57659	224	3755	Y	-302	93.23	83.91	535	0	0.13	0.122	0.00	0.13	0.21	322	771	130	9.68	10.34	3.53
131	132	-0.557	-0.802	-0.642	2.000	10598	8962	59	4334	54661	433	3738	Y	-460	89.95	80.95	574	0	0.13	0.122	0.00	0.13	0.21	311	797	199	8.13	10.29	3.52
132	132	-0.557	-0.802	-0.642	2.000	10598	8971	59	4285	54666	432	3440	Y	-460	89.95	80.95	574	0	0.13	0.112	0.00	0.12	0.21	311	797	195	8.26	9.47	3.24
132	133	-0.568	-0.788	-0.644	2.000	10598	9892	252	4463	51896	807	3559	Y	-609	85.33	77.76	606	0	0.13	0.116	0.00	0.12	0.21	299	815	322	4.29	9.80	3.35
133	133	-0.568	-0.788	-0.644	2.000	10598	9908	252	4409	51906	807	3277	Y	-609	85.33	77.76	606	0	0.13	0.107	0.00	0.12	0.21	299	815	317	4.34	9.02	3.08
133	134	-0.578	-0.779	-0.647	2.000	10598	8903	283	4819	45768	1020	3629	Y	-752	79.41	77.76	664	0	0.13	0.118	0.00	0.12	0.37	540	1084	393	5.17	9.99	3.42
134	134	-0.578	-0.779	-0.647	2.000	10598	8926	283	4771	45784	1019	3380	Y	-752	79.41	77.76	664	0	0.13	0.110	0.00	0.12	0.37	540	1084	390	5.21	9.31	3.18
134	135	-0.586	-0.771	-0.650	2.000	10598	7453	316	5197	37736	1234	3749	Y	-906	72.25	77.76	730	0	0.13	0.122	0.00	0.13	0.37	543	1146	467	4.72	10.32	3.53
135	135	-0.586	-0.771	-0.650	2.000	10598	7480	316	5154	37754	1233	3534	Y	-1179	72.25	77.76	824	0	0.13	0.115	0.00	0.12	0.37	543	1231	463	5.23	9.73	3.33
135	136	-0.610	-0.672	-0.633	2.000	10519	5505	351	5592	27750	1452	3914	Y	-1349	63.50	77.76	896	0	0.13	0.129	0.00	0.13	0.37	546	1298	542	4.79	10.84	3.71
136	136	-0.610	-0.673	-0.633	2.000	10519	5534	351	5562	27770	1452	3764	Y	-1323	63.50	77.76	887	0	0.13	0.124	0.00	0.13	0.37	546	1290	540	4.77	10.42	3.56
136	137	-0.633	-0.583	-0.614	2.000	10440	3025	386	6010	15741	1678	4154	Y	-1464	53.21	77.76	953	0	0.13	0.137	0.00	0.13	0.37	550	1352	621	4.36	11.58	3.96
137	137	-0.633	-0.584	-0.614	2.000	10440	3057	386	5994	15763	1678	4069	Y	-1442	53.21	77.76	945	0	0.13	0.135	0.00	0.13	0.37	549	1345	619	4.34	11.34	3.88
137	138	-0.621	-0.554	-0.593	2.000	10361	-16	423	6452	-11	2324	4469	Y	-1488	66.01	77.76	614	247	0.49	0.149	0.00	0.32	0.37	373				12.53	4.28
																											1.08		

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																									
1	1	-0.645	-0.674	-0.657	2.000	13359	-16	-465	-7276	-7	-2472	-3208	N	1560	79.11	98.42	1137	0	0.13	Not Reqd	0.00	0.06	0.37	700				0.00	0.00
1	2	-0.689	-0.685	-0.687	2.000	12965	3414	-431	-6846	18557	-2230	-2837	N	1540	64.73	95.13	1110	0	0.13	Not Reqd	0.00	0.06	0.37	677	1608	743	7.02	0.00	0.00
2	2	-0.689	-0.684	-0.687	2.000	12965	3377	-431	-6865	18541	-2230	-2937	N	1529	64.73	95.13	1107	0	0.13	Not Reqd	0.00	0.06	0.37	677	1605	743	7.00	0.00	0.00
2	3	-0.725	-0.711	-0.719	2.000	12557	6299	-399	-6440	34981	-1996	-2571	N	1464	73.21	92.12	1066	0	0.13	Not Reqd	0.00	0.06	0.21	364	1287	665	5.68	0.00	0.00
3	3	-0.725	-0.710	-0.719	2.000	12557	6268	-399	-6467	34968	-1995	-2737	N	1615	73.21	92.12	1116	0	0.13	Not Reqd	0.00	0.06	0.21	364	1332	665	6.02	0.00	0.00
3	4	-0.743	-0.771	-0.753	2.000	12301	8234	-373	-6134	46552	-1817	-2450	N	1532	76.35	89.42	1072	0	0.13	Not Reqd	0.00	0.06	0.21	353	1283	606	6.44	0.00	0.00
4	4	-0.743	-0.770	-0.753	2.000	12301	8206	-374	-6181	46541	-1819	-2667	N	1004	76.35	89.42	896	0	0.13	Not Reqd	0.00	0.06	0.21	353	1124	606	5.15	0.00	0.00
4	5	-0.778	-0.732	-0.762	2.000	11939	9877	-349	-5854	56874	-1646	-2386	N	913	80.63	86.94	831	0	0.13	Not Reqd	0.00	0.06	0.21	342	1055	549	5.35	0.00	0.00
5	5	-0.778	-0.732	-0.762	2.000	11939	9848	-350	-5902	56862	-1646	-2665	N	847	80.63	86.94	808	0	0.13	Not Reqd	0.00	0.06	0.21	342	1035	549	5.17	0.00	0.00
5	6	-0.822	-0.676	-0.771	2.000	11623	11547	-320	-5499	68130	-1430	-2320	N	737	85.29	84.78	734	0	0.13	Not Reqd	0.00	0.06	0.21	331	959	477	5.53	0.00	0.00
6	6	-0.823	-0.676	-0.771	2.000	11623	11517	-320	-5562	68117	-1430	-2691	N	714	85.29	84.78	726	0	0.13	Not Reqd	0.00	0.06	0.21	331	952	477	5.46	0.00	0.00
6	7	-0.864	-0.624	-0.780	2.000	11354	12790	-291	-5166	77482	-1216	-2354	N	610	89.15	82.94	662	0	0.13	Not Reqd	0.00	0.06	0.21	322	886	405	5.95	0.00	0.00
7	7	-0.864	-0.624	-0.780	2.000	11354	12763	-291	-5236	77470	-1216	-2776	N	590	89.15	82.94	655	0	0.13	Not Reqd	0.00	0.06	0.21	322	879	405	5.89	0.00	0.00
7	8	-0.900	-0.579	-0.789	2.000	11124	13637	-263	-4849	84968	-1004	-2447	N	487	92.23	83.01	610	0	0.13	Not Reqd	0.00	0.06	0.21	321	838	335	6.73	0.00	0.00
8	8	-0.901	-0.579	-0.789	2.000	11124	13613	-263	-4923	84956	-1004	-2910	N	468	92.23	83.01	603	0	0.13	Not Reqd	0.00	0.06	0.21	321	831	335	6.66	0.00	0.00
8	9	-0.932	-0.543	-0.797	2.000	10933	14117	-237	-4543	90625	-794	-2588	N	366	94.56	85.11	576	0	0.13	Not Reqd	0.00	0.06	0.21	328	814	265	7.96	0.00	0.00
9	9	-0.932	-0.543	-0.797	2.000	10933	14096	-237	-4620	90614	-795	-3083	N	343	94.56	85.11	568	0	0.13	Not Reqd	0.00	0.06	0.21	328	807	265	7.87	0.00	0.00
9	10	-0.957	-0.515	-0.804	2.000	10788	14347	-26	-4471	94576	-402	-2992	N	241	96.16	86.54	542	0	0.13	Not Reqd	0.00	0.06	0.21	334	788	134	75.15	0.00	0.00
10	10	-0.957	-0.516	-0.804	2.000	10788	14328	-27	-4549	94564	-402	-3508	Y	222	96.16	86.54	535	0	0.13	0.112	0.00	0.12	0.21	334	782	186	8.83	-9.52	-3.25
10	11	-0.976	-0.497	-0.810	2.000	10683	14733	-3	-4483	97232	-196	-3500	Y	117	97.00	87.30	502	0	0.13	0.113	0.00	0.12	0.21	337	755	117	10.50	-9.57	-3.27
11	11	-0.976	-0.497	-0.810	2.000	10683	14721	-3	-4564	97224	-196	-4030	Y	97	97.00	87.30	496	0	0.13	0.130	0.00	0.13	0.21	337	749	125	10.12	-11.02	-3.77
11	12	-0.989	-0.487	-0.815	2.000	10683	14850	21	-4515	98171	9	-4040	Y	-27	97.26	87.54	473	0	0.13	0.131	0.00	0.13	0.21	337	730	63	10.06	-11.05	-3.78
12	12	-0.989	-0.487	-0.815	2.000	10683	14853	20	-4596	98175	8	-4575	Y	-50	97.26	87.54	481	0	0.13	0.148	0.00	0.14	0.21	337	736	70	9.91	-12.51	-4.28
12	13	-0.996	-0.486	-0.820	2.000	10598	14718	44	-4565	97416	213	-4602	Y	-136	96.31	86.68	504	0	0.13	0.150	0.00	0.14	0.21	334	754	139	8.51	-12.67	-4.33
13	13	-0.996	-0.486	-0.820	2.000	10598	14742	43	-4616	97439	212	-4934	Y	-146	96.31	86.68	508	0	0.13	0.161	0.00	0.15	0.21	334	757	144	8.43	-13.58	-4.64
13	14	-0.997	-0.487	-0.820	2.000	10598	14666	49	-4609	96982	263	-4942	Y	-170	96.03	86.43	514	0	0.13	0.161	0.00	0.15	0.21	333	763	161	8.13	-13.61	-4.65
14	14	-0.997	-0.487	-0.820	2.000	10598	14749	48	-4659	97063	262	-5273	Y	-170	96.03	86.43	514	0	0.13	0.172	0.00	0.15	0.21	333	763	165	8.04	-14.52	-4.96
14	15	-0.995	-0.501	-0.824	2.000	10598	14304	71	-4645	94192	466	-5316	Y	-278	94.46	85.01	544	0	0.13	0.173	0.00	0.15	0.21	328	784	234	6.97	-14.64	-5.00
15	15	-0.995	-0.501	-0.824	2.000	10598	14375	70	-4723	94258	465	-5830	Y	-278	94.46	85.01	544	0	0.13	0.190	0.00	0.16	0.21	328	784	241	6.84	-16.05	-5.49
15	16	-0.986	-0.525	-0.827	2.000	10598	13705	92	-4723	89720	669	-5887	Y	-396	92.08	82.87	574	0	0.13	0.192	0.00	0.16	0.21	320	805	310	5.93	-16.21	-5.54
16	16	-0.986	-0.526	-0.827	2.000	10598	13725	91	-4798	89732	668	-6376	Y	-396	92.08	82.87	574	0	0.13	0.208	0.00	0.17	0.21	320	805	317	5.81	-17.55	-6.00
16	17	-0.972	-0.560	-0.830	2.000	10598	12838	113	-4812	83535	871	-6448	Y	-510	88.90	80.01	602	0	0.13	0.210	0.00	0.17	0.21	309	820	386	4.99	-17.75	-6.07
17	17	-0.972	-0.560	-0.830	2.000	10598	12886	112	-4882	83574	871	-6903	Y	-510	88.90	80.01	602	0	0.13	0.225	0.00	0.18	0.21	309	820	392	4.90	-19.01	-6.50
17	18	-0.952	-0.606	-0.832	2.000	10598	11799	133	-4911	75735	1073	-6991	Y	-620	84.95	77.76	635	0	0.13	0.228	0.00	0.18	0.21	302	843	461	4.26	-19.25	-6.58
18	18	-0.952	-0.606	-0.832	2.000	10598	15159	334	-4988	79083	1274	-7416	Y	-620	84.95	77.76	626	0	0.13	0.242	0.00	0.19	0.21	301	834	534	2.62	-20.42	-6.98
18	19	-0.925	-0.664	-0.835	2.000	10598	14068	360	-5345	69799	1481	-7831	Y	-728	80.26	77.76	679	0	0.13	0.255	0.00	0.19	0.21	302	883	609	2.38	-21.56	-7.37
19	19	-0.925	-0.664	-0.835	2.000	10598	14405	357	-5423	70122	1478	-8212	Y	-728	80.26	77.76	678	0	0.13	0.268	0.00	0.20	0.21	302	882	614	2.35	-22.61	-7.73
19	20	-0.892	-0.734	-0.837	2.000	10598	13060	383	-5788	59142	1685	-8636	Y	-838	74.89	77.76	736	0	0.13	0.281	0.00	0.21	0.21	304	936	689	2.16	-23.77	-8.13
20	20	-0.891	-0.735	-0.837	2.000	10598	13126	382	-5860	59191	1684	-8967	Y	-1183	74.89	77.76	856	0	0.13	0.292	0.00	0.21	0.21	305	1045	694	2.64	-24.69	-8.44
20	21	-0.866	-0.724	-0.814	2.000	10519	11518	408	-6228	46495	1894	-9393	Y	-1294	68.71	77.76	914	0	0.13	0.308	0.00	0.22	0.21	307	1099	770	2.44	-26.01	-8.89
21	21	-0.866	-0.725	-0.814	2.000	10519	11520	408	-6290	46479	1894	-9646	Y	-1261	68.71	77.76	902	0	0.13	0.317	0.00	0.22	0.21	307	1088	774	2.37	-26.71	-9.13
21	22	-0.834	-0.723	-0.791	2.000	10440	9654	434	-6656	32034	2110	-10069	Y	-1378	61.76	77.76	947	0	0.13	0.333	0.00	0.23	0.21	307	1129	852	2.14	-28.06	-9.59
22	22	-0.834	-0.724	-0.791	2.000	10440	9636	434	-6708	31997	2110	-10243	Y	-1349	61.76	77.76	937	0	0.13	0.339	0.00	0.23	0.21	307	1120	855	2.09	-28.54	-9.76
22	23	-0.795	-0.730	-0.769	2.000	10361	7518	459	-7068	15761	2332	-10661	Y	-1472	54.02	77.76	979	0	0.13	0.355	0.00	0.24	0.21	307	1157	935	1.86	-29.89	-10.22
23	23	-0.795	-0.730	-0.769	2.000	10361	7490	459	-7109	15714	2332	-10747	Y	-1445	54.02	77.76	970	0	0.13	0.358	0.00	0.24	0.21	307	1149	936	1.83	-30.13	-10.30
23	24	-0.750	-0.743	-0.747	2.000	10282	5129	485	-7462	-2354	2561	-11158	Y	-1568	62.53	77.76	1011	0	0.13	0.375	0.00	0.25	0.41	615	1463	1018	2.63	-31.47	-10.76
24	24	-0.750	-0.744	-0.747	2.000	10282	5094	485	-7490	-2408	2561	-11145	Y	-1544	62.53	77.76	1003	0	0.13	0.374	0.00	0.25	0.41	615	1456	1018	2.61	-31.44	-10.75
24	25	-0.925	-0.902	-0.915	2.000	10203	2496	510	-7837	-22467	2825	-11551	Y	-2718	71.34	77.76	1394	0	0.13	0.391	0.00	0.26	0.41	615	1808	1112	3.43	-32.78	-11.21
25	25	-0.925	-0.903	-0.915	2.000	10203	2458	510	-7851	-22526	2825	-11429	Y	-2690	71.34	77.76	1385	0	0.13	0.387	0.00	0.26	0.41	615	1799	1111	3.41	-32.44	-11.09
25	26	-0.981	-0.800	-0.899	2.000	10124	-368	536	-8195	-44747	3098	-11831	Y	-2170	83.88	77.76	1211	0	0.13	0.404	0.00	0.27	0.41	615	1643	1207	2.46	-33.79	-11.55
26	26	-0.981	-0.800	-0.899	2.000	10124	-410	536	-8193	-44808	3098	-11587	Y	-2144	83.88	77.76	1203	0	0.13	0.395	0.00	0.26	0.41	615	1636	1204	2.44	-33.10	-11.31
26	27	-0.873	-0.904	-0.887	2.000	10046	-3453	561	-8534	-69241	3377	-11987	Y	-1077	90.17	81.16	864	386	0.50	0.412	0.00	0.46	0.41	641	1355	1303	1.17	-34.45	-11.78
27	27	-0.872	-0.904	-0.887	2.000	10046	-3496	561	-8517	-69301	3377	-11620	Y	-821	90.17	81.16	775	476	0.61	0.400	0.00	0.51	0.41	640	1274	1297	0.93	-33.40	-11.42
27	28	-0.640	-1.194	-0.896	2.000	10046	-6743	585	-8858	-95970	3659	-12020	Y	-203	92.83	83.55	533	822	1.05	0.413	0.00	0.73	0.41	649				-34.55	-11.81
28	28	-0.639	-1.194	-0.896	2.000	10046	-6773	585	-8834	-96011	3659	-11675	Y	-203	92.83	83.55	533	822	1.05	0.401	0.00	0.72	0.41	649				-33.56	-11.47
28	29	-0.545	-1.312	-0.901	2.000	10046	-7849	593	-8944	-105011	3738	-11803	Y	0	93.00	83.70	450	934	1.19	0.406	0.00	0.80	0.41	647				-33.93	-11.60
29	29	-0.545	-1.312	-0.901	2.000	10046	-13072	-566	-8406	-110235	-3423	-7390	Y	0	93.00	83.70	446	822	1.05	0.254	0.00	0.65	0.41	646				-21.24	-7.26
29	30	-0.635	-1.203	-0.898	2.000	10046	-11945	-557	-8264	-101918	-3342	-7268	Y	202	92.83	83.55	527	711	0.91	0.250	0.00	0.58	0.41	648				-20.89	-7.14
30	30	-0.635	-1.203	-0.898	2.000	10046	-11766	-555	-8222	-101736	-3341	-6902	Y	202	92.83	83.55	527	710	0.91	0.237	0.00	0.57	0.41	648				-19.84	-6.78
30	31	-0.852	-0.941	-0.893	2.000	10046	-8423	-527	-7792	-77263	-3055	-6530	Y	769	90.31	81.28	748	384	0.50	0.225	0.00	0.36	0.41	639	1249	1115	1.46	-18.77	-6.42
31	31	-0.853	-0.942	-0.894	2.000	10046	-8100	-524	-7747	-76932	-3052	-6121	Y	1028	90.31	81.28	838	292	0.38	0.210	0.00	0.29	0.41	640	1330	1108	1.77	-17.59	-6.01
31	32	-0.935	-0.873	-0.907	2.000	10124	-5062	-495	-7325	-54795	-2769	-5757	Y	2400	84.11	77.76	1288	0	0.13	0.196	0.00	0.16	0.41	615	1713	1008	3.58	-16.44	-5.62
32	32	-0.935	-0.873	-0.907	2.000	10124	-4583	-491	-7299	-54307	-2766	-5460	Y	2426	84.11	77.76	1297	0	0.13	0.186	0.00	0.16	0.41	615	1720	1003	3.64	-15.59	-5.33

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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	-0.781	-1.098	-0.920	2.000	10203	-1865	-463	-6882	-34484	-2489	-5102	Y	3317	68.62	77.76	1594	0	0.13	0.173	0.00	0.15	0.41	615	1988	905	5.23	-14.48	-4.95
33	33	-0.781	-1.097	-0.919	2.000	10203	-1029	-456	-6874	-33639	-2483	-4916	Y	3345	68.62	77.76	1603	0	0.13	0.166	0.00	0.15	0.41	615	1996	900	5.32	-13.95	-4.77
33	34	-0.411	-0.822	-0.585	2.000	10282	1343	-428	-6460	-16097	-2215	-4560	Y	1221	58.17	77.76	886	0	0.13	0.153	0.00	0.14	0.41	613	1350	806	3.28	-12.86	-4.40
34	34	-0.406	-0.816	-0.579	2.000	10282	2428	-419	-6471	-15001	-2207	-4477	Y	1239	58.17	77.76	895	0	0.13	0.150	0.00	0.14	0.41	614	1358	802	3.36	-12.63	-4.32
34	35	-0.462	-0.806	-0.602	2.000	10361	4435	-391	-6058	420	-1976	-4121	Y	1134	58.59	77.76	866	0	0.13	0.137	0.00	0.13	0.21	307	1056	719	2.53	-11.55	-3.95
35	35	-0.462	-0.806	-0.602	2.000	10361	4762	-388	-6082	758	-1973	-4125	Y	1154	58.59	77.76	873	0	0.13	0.138	0.00	0.13	0.21	307	1062	718	2.57	-11.56	-3.95
35	36	-0.507	-0.812	-0.626	2.000	10440	6448	-359	-5670	14270	-1748	-3770	Y	1061	66.43	77.76	842	0	0.13	0.125	0.00	0.13	0.21	307	1034	638	2.94	-10.51	-3.59
36	36	-0.507	-0.812	-0.626	2.000	10440	7248	-352	-5706	15081	-1741	-3850	Y	1084	66.43	77.76	849	0	0.13	0.127	0.00	0.13	0.21	307	1041	637	3.00	-10.73	-3.67
36	37	-0.541	-0.837	-0.650	2.000	10519	8580	-324	-5298	26700	-1522	-3500	Y	983	73.37	77.76	810	0	0.13	0.115	0.00	0.12	0.21	307	1005	559	3.39	-9.69	-3.31
37	37	-0.541	-0.836	-0.650	2.000	10519	9429	-316	-5349	27559	-1514	-3649	Y	1009	73.37	77.76	817	0	0.13	0.120	0.00	0.12	0.21	307	1011	559	3.45	-10.11	-3.46
37	38	-0.566	-0.881	-0.675	2.000	10598	10400	-289	-4949	37328	-1302	-3307	Y	899	79.25	77.76	766	0	0.13	0.108	0.00	0.12	0.21	305	964	483	3.84	-9.11	-3.11
38	38	-0.566	-0.881	-0.675	2.000	10598	10376	-289	-5005	37312	-1303	-3508	Y	624	79.25	77.76	670	0	0.13	0.114	0.00	0.12	0.21	305	878	486	3.30	-9.66	-3.30
38	39	-0.599	-0.828	-0.679	2.000	10598	9043	-96	-4664	43323	-928	-3225	Y	510	84.18	77.76	622	0	0.13	0.105	0.00	0.12	0.21	304	834	357	5.73	-8.88	-3.04
39	39	-0.599	-0.828	-0.679	2.000	10598	9026	-96	-4713	43312	-929	-3461	Y	510	84.18	77.76	622	0	0.13	0.113	0.00	0.12	0.21	304	834	361	5.65	-9.53	-3.26
39	40	-0.626	-0.787	-0.682	2.000	10598	9901	-73	-4630	50089	-724	-3436	Y	395	88.09	79.28	582	0	0.13	0.112	0.00	0.12	0.21	309	802	292	6.50	-9.46	-3.23
40	40	-0.626	-0.787	-0.682	2.000	10598	9895	-73	-4684	50089	-725	-3709	Y	395	88.09	79.28	582	0	0.13	0.121	0.00	0.13	0.21	309	802	296	6.40	-10.21	-3.49
40	41	-0.647	-0.756	-0.685	2.000	10598	10552	-50	-4621	55206	-520	-3704	Y	281	91.00	81.90	553	0	0.13	0.121	0.00	0.13	0.21	319	785	228	7.55	-10.20	-3.49
41	41	-0.647	-0.756	-0.685	2.000	10598	10564	-51	-4678	55222	-521	-4005	Y	281	91.00	81.90	553	0	0.13	0.131	0.00	0.13	0.21	319	784	233	7.41	-11.02	-3.77
41	42	-0.662	-0.736	-0.688	2.000	10598	11000	-27	-4632	58676	-316	-4016	Y	167	92.92	83.63	522	0	0.13	0.131	0.00	0.13	0.21	325	762	165	8.70	-11.06	-3.78
42	42	-0.662	-0.735	-0.688	2.000	10598	10975	-27	-4692	58654	-316	-4336	Y	167	92.92	83.63	522	0	0.13	0.141	0.00	0.14	0.21	325	762	169	8.55	-11.94	-4.08
42	43	-0.671	-0.726	-0.690	2.000	10598	11182	-4	-4661	60438	-111	-4363	Y	53	93.86	84.47	487	0	0.13	0.142	0.00	0.14	0.21	328	734	102	10.01	-12.01	-4.11
43	43	-0.671	-0.726	-0.690	2.000	10598	11159	-4	-4720	60416	-111	-4679	Y	53	93.86	84.47	487	0	0.13	0.153	0.00	0.14	0.21	328	734	106	9.84	-12.88	-4.40
43	44	-0.674	-0.726	-0.692	2.000	10598	11151	18	-4704	60587	76	-4717	Y	-44	93.88	84.49	484	0	0.13	0.154	0.00	0.14	0.21	328	731	95	9.43	-12.98	-4.44
44	44	-0.674	-0.726	-0.692	2.000	10598	11129	18	-4762	60564	76	-5033	Y	-44	93.88	84.49	484	0	0.13	0.164	0.00	0.15	0.21	328	731	100	9.28	-13.86	-4.74
44	45	-0.670	-0.738	-0.694	2.000	10598	10903	41	-4759	59153	281	-5087	Y	-162	93.03	83.73	520	0	0.13	0.166	0.00	0.15	0.21	325	761	169	8.05	-14.01	-4.79
45	45	-0.670	-0.738	-0.694	2.000	10598	10908	41	-4818	59156	280	-5409	Y	-162	93.03	83.73	520	0	0.13	0.176	0.00	0.15	0.21	325	761	173	7.93	-14.89	-5.09
45	46	-0.663	-0.759	-0.696	2.000	10598	10469	64	-4830	56089	484	-5479	Y	-308	91.07	81.96	562	0	0.13	0.179	0.00	0.15	0.21	319	792	242	6.94	-15.09	-5.16
46	46	-0.663	-0.759	-0.696	2.000	10598	10463	63	-4887	56079	484	-5785	Y	-308	91.07	81.96	562	0	0.13	0.189	0.00	0.16	0.21	319	792	247	6.84	-15.93	-5.44
46	47	-0.654	-0.782	-0.698	2.000	10598	9815	86	-4916	51363	688	-5872	Y	-453	87.84	79.05	599	0	0.13	0.191	0.00	0.16	0.21	308	816	316	5.93	-16.17	-5.53
47	47	-0.654	-0.782	-0.698	2.000	10598	9838	85	-4970	51380	688	-6152	Y	-453	87.84	79.05	599	0	0.13	0.201	0.00	0.17	0.21	308	816	320	5.86	-16.94	-5.79
47	48	-0.640	-0.816	-0.701	2.000	10598	11471	302	-5230	47503	1085	-6470	Y	-531	83.68	77.76	619	0	0.13	0.211	0.00	0.17	0.21	303	830	457	3.09	-17.81	-6.09
48	48	-0.640	-0.816	-0.701	2.000	10598	11684	300	-5293	47709	1084	-6729	Y	-531	83.68	77.76	619	0	0.13	0.219	0.00	0.17	0.21	303	829	461	3.07	-18.53	-6.33
48	49	-0.610	-0.881	-0.704	2.000	10598	10781	327	-5661	39854	1292	-7155	Y	-539	79.27	77.76	635	0	0.13	0.233	0.00	0.18	0.21	304	846	536	2.61	-19.70	-6.73
49	49	-0.610	-0.882	-0.704	2.000	10598	10801	327	-5722	39865	1291	-7364	Y	-828	79.27	77.76	736	0	0.13	0.240	0.00	0.18	0.21	305	936	539	3.05	-20.27	-6.93
49	50	-0.590	-0.852	-0.687	2.000	10519	9632	354	-6093	30290	1502	-7792	Y	-1071	73.84	77.76	833	0	0.13	0.256	0.00	0.19	0.21	306	1025	616	2.97	-21.58	-7.38
50	50	-0.590	-0.853	-0.687	2.000	10519	9837	352	-6146	30486	1500	-7959	Y	-1044	73.84	77.76	823	0	0.13	0.261	0.00	0.20	0.21	306	1016	618	2.91	-22.04	-7.54
50	51	-0.576	-0.816	-0.669	2.000	10440	8419	379	-6516	19171	1718	-8387	Y	-1211	66.67	77.76	892	0	0.13	0.278	0.00	0.20	0.21	307	1079	697	2.72	-23.37	-7.99
51	51	-0.576	-0.816	-0.669	2.000	10440	8481	378	-6562	19223	1717	-8493	Y	-1186	66.67	77.76	883	0	0.13	0.281	0.00	0.21	0.21	307	1072	698	2.68	-23.66	-8.09
51	52	-0.557	-0.793	-0.653	2.000	10361	6808	405	-6927	6115	1941	-8917	Y	-1271	58.56	77.76	911	0	0.13	0.297	0.00	0.21	0.41	615	1374	779	3.51	-25.00	-8.55
52	52	-0.556	-0.794	-0.653	2.000	10361	6822	405	-6964	6118	1940	-8951	Y	-1248	58.56	77.76	904	0	0.13	0.298	0.00	0.21	0.41	615	1367	779	3.47	-25.09	-8.58
52	53	-0.527	-0.786	-0.636	2.000	10282	4900	432	-7323	-8827	2170	-9369	Y	-1369	58.30	77.76	944	0	0.13	0.315	0.00	0.22	0.41	615	1403	862	3.15	-26.43	-9.03
53	53	-0.527	-0.786	-0.636	2.000	10282	4898	431	-7350	-8841	2169	-9322	Y	-1349	58.30	77.76	937	0	0.13	0.313	0.00	0.22	0.41	615	1397	861	3.13	-26.29	-8.99
53	54	-0.754	-0.943	-0.837	2.000	10203	2734	458	-7705	-25784	2436	-9735	Y	-2676	68.53	77.76	1380	0	0.13	0.330	0.00	0.23	0.41	615	1795	956	4.15	-27.63	-9.45
54	54	-0.754	-0.943	-0.837	2.000	10203	2732	457	-7720	-25797	2435	-9596	Y	-2650	68.53	77.76	1371	0	0.13	0.325	0.00	0.23	0.41	615	1788	953	4.13	-27.24	-9.31
54	55	-0.849	-0.796	-0.825	2.000	10124	340	484	-8072	-44906	2710	-10006	Y	-2188	82.46	77.76	1217	0	0.13	0.341	0.00	0.24	0.41	615	1649	1051	3.13	-28.58	-9.77
55	55	-0.849	-0.796	-0.825	2.000	10124	356	482	-8074	-44901	2708	-9763	Y	-2165	82.46	77.76	1209	0	0.13	0.333	0.00	0.23	0.41	615	1642	1047	3.12	-27.89	-9.53
55	56	-0.783	-0.857	-0.817	2.000	10046	-2247	509	-8424	-66220	2989	-10172	Y	-1110	89.61	80.65	856	251	0.33	0.350	0.00	0.34	0.41	634	1341	1147	1.66	-29.24	-10.00
56	56	-0.783	-0.856	-0.817	2.000	10046	-2187	507	-8409	-66169	2987	-9830	Y	-876	89.61	80.65	775	331	0.43	0.338	0.00	0.38	0.41	634	1268	1141	1.43	-28.25	-9.66
56	57	-0.587	-1.101	-0.825	2.000	10046	-4976	533	-8760	-89710	3271	-10239	Y	-231	92.79	83.51	534	678	0.87	0.352	0.00	0.61	0.41	647				-29.43	-10.06
57	57	-0.587	-1.101	-0.825	2.000	10046	-4869	530	-8742	-89608	3268	-9916	Y	-231	92.79	83.51	534	677	0.86	0.341	0.00	0.60	0.41	647				-28.50	-9.74
57	58	-0.502	-1.207	-0.829	2.000	10046	-5790	538	-8856	-97598	3348	-10049	Y	0	93.00	83.70	444	796	1.02	0.346	0.00	0.68	0.41	645				-28.88	-9.87
58	58	-0.542	-1.145	-0.822	2.000	10046	-11736	-556	-8314	-99844	-3395	-6699	Y	0	93.00	83.70	440	818	1.05	0.230	0.00	0.64	0.41	644				-19.25	-6.58
58	59	-0.632	-1.038	-0.820	2.000	10046	-10688	-547	-8176	-91651	-3314	-6579	Y	197	92.82	83.54	519	709	0.91	0.226	0.00	0.57	0.41	646				-18.91	-6.46
59	59	-0.632	-1.038	-0.820	2.000	10046	-10350	-544	-8138	-91307	-3312	-6250	Y	197	92.82	83.54	519	708	0.90	0.215	0.00	0.56	0.41	646				-17.96	-6.14
59	60	-0.850	-0.778	-0.817	2.000	10046	-7233	-516	-7715	-67202	-3027	-5885	Y	750	90.13	81.12	733	388	0.50	0.202	0.00	0.35	0.41	637	1233	1096	1.48	-16.91	-5.78
60	60	-0.851	-0.779	-0.817	2.000	10046	-6575	-511	-7683	-66533	-3023	-5548	Y	987	90.13	81.12	816	303	0.39	0.191	0.00	0.29	0.41	637	1308	1090	1.77	-15.95	-5.45
60	61	-0.942	-0.697	-0.831	2.000	10124	-3746	-483	-7266	-44738	-2740	-5188	Y	2200	83.68	77.76	1221	0	0.13	0.177	0.00	0.15	0.41	615	1652	990	3.47	-14.82	-5.07
61	61	-0.942	-0.696	-0.831	2.000	10124	-3014	-478	-7249	-43994	-2735	-4949	Y	2224	83.68	77.76	1229	0	0.13	0.169	0.00	0.15	0.41	615	1660	985	3.53	-14.14	-4.83
61	62	-0.827	-0.871	-0.846	2.000	10203	-487	-449	-6835	-24499	-2459	-4594	Y	2962	68.57	77.76	1475	0	0.13	0.156	0.00	0.14	0.41	615	1881	887	4.96	-13.04	-4.46
62	62	-0.827	-0.870	-0.846	2.000	10203	-331	-448	-6833	-24330	-2457	-4463	Y	2988	68.57	77.76	1484	0	0.13	0.151	0.00	0.14	0.41	615	1889	885	5.01	-12.67	-4.33
62	63	-0.526	-0.623	-0.567	2.000	10282	1918	-420	-6420	-7050	-2190	-4108	Y	1191	58.17	77.76	885	0	0.13	0.138	0.00	0.13	0.41	615	1350	791	3.38	-11.59	-3.96
63	63	-0.522	-0.617	-0.562	2.000	10282	2211	-417	-6432	-6743	-2187	-4073	Y	1209	58.17	77.76	891	0	0.13	0.137	0.00	0.13	0.41	615	1355	789	3.42	-11.49	-3.93
63	64	-0.579	-0.595	-0.585	2.000	10361	4167	-389	-6019	8489	-1956	-3718	Y	1106	58.59	77.76	857	0	0.13	0.124	0.00	0.13	0.21	307	1048	707	2.56	-10.42	-3.56

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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																									
64	64	-0.579	-0.594	-0.585	2.000	10361	4911	-382	-6043	9246	-1950	-3768	Y	1126	58.59	77.76	863	0	0.13	0.126	0.00	0.13	0.21	307	1054	706	2.61	-10.56	-3.61
64	65	-0.625	-0.586	-0.610	2.000	10440	6538	-354	-5631	22564	-1725	-3414	Y	1035	66.43	77.76	822	0	0.13	0.113	0.00	0.12	0.21	306	1016	626	2.94	-9.51	-3.25
65	65	-0.625	-0.585	-0.609	2.000	10440	6992	-349	-5669	23029	-1721	-3541	Y	1058	66.43	77.76	829	0	0.13	0.117	0.00	0.12	0.21	306	1022	626	2.98	-9.87	-3.37
65	66	-0.660	-0.592	-0.635	2.000	10519	8306	-322	-5260	34497	-1503	-3191	Y	959	73.37	77.76	779	0	0.13	0.105	0.00	0.12	0.21	305	975	548	3.31	-8.84	-3.02
66	66	-0.660	-0.592	-0.635	2.000	10519	8277	-322	-5305	34479	-1503	-3381	Y	984	73.37	77.76	788	0	0.13	0.111	0.00	0.12	0.21	305	983	551	3.33	-9.36	-3.20
66	67	-0.685	-0.614	-0.660	2.000	10598	9310	-294	-4905	44178	-1291	-3038	N	877	79.25	77.76	738	0	0.13	Not Reqd	0.00	0.06	0.21	303	937	430	6.17	0.00	0.00
67	67	-0.685	-0.613	-0.660	2.000	10598	9283	-295	-4957	44161	-1289	-3259	Y	609	79.25	77.76	645	0	0.13	0.106	0.00	0.12	0.21	303	853	478	3.19	-8.97	-3.07
67	68	-0.715	-0.568	-0.664	2.000	10598	9197	-91	-4660	51263	-904	-3019	N	497	84.18	77.76	597	0	0.13	Not Reqd	0.00	0.06	0.21	302	809	301	17.68	0.00	0.00
68	68	-0.716	-0.568	-0.664	2.000	10598	9172	-91	-4710	51246	-904	-3299	Y	497	84.18	77.76	597	0	0.13	0.108	0.00	0.12	0.21	302	809	350	5.59	-9.08	-3.10
68	69	-0.739	-0.533	-0.668	2.000	10598	9995	-68	-4628	57815	-700	-3275	Y	386	88.09	79.28	559	0	0.13	0.107	0.00	0.12	0.21	307	779	282	6.46	-9.01	-3.08
69	69	-0.739	-0.533	-0.668	2.000	10598	9971	-68	-4682	57798	-700	-3589	Y	386	88.09	79.28	559	0	0.13	0.117	0.00	0.12	0.21	307	779	286	6.36	-9.88	-3.38
69	70	-0.756	-0.509	-0.671	2.000	10598	10585	-45	-4621	62717	-496	-3585	Y	274	91.00	81.90	532	0	0.13	0.117	0.00	0.12	0.21	316	763	218	7.54	-9.87	-3.37
70	70	-0.756	-0.509	-0.671	2.000	10598	10803	-42	-4679	62939	-492	-3928	Y	274	91.00	81.90	531	0	0.13	0.128	0.00	0.13	0.21	316	763	222	7.51	-10.81	-3.70
70	71	-0.767	-0.495	-0.673	2.000	10598	11173	-18	-4633	66172	-288	-3940	Y	163	92.92	83.63	501	0	0.13	0.128	0.00	0.13	0.21	323	742	154	8.88	-10.85	-3.71
71	71	-0.767	-0.495	-0.673	2.000	10598	11238	-17	-4694	66240	-287	-4301	Y	163	92.92	83.63	501	0	0.13	0.140	0.00	0.13	0.21	323	742	159	8.76	-11.84	-4.05
71	72	-0.772	-0.492	-0.675	2.000	10598	11379	6	-4665	67803	-82	-4329	Y	51	93.86	84.47	468	0	0.13	0.141	0.00	0.14	0.21	326	715	91	9.78	-11.92	-4.07
72	72	-0.772	-0.492	-0.675	2.000	10598	11396	7	-4724	67820	-82	-4683	Y	51	93.86	84.47	468	0	0.13	0.153	0.00	0.14	0.21	326	715	96	9.59	-12.89	-4.41
72	73	-0.771	-0.498	-0.677	2.000	10598	11330	28	-4710	67792	106	-4722	Y	-51	93.86	84.47	468	0	0.13	0.154	0.00	0.14	0.21	326	714	105	8.72	-13.00	-4.44
73	73	-0.771	-0.499	-0.677	2.000	10598	11353	28	-4769	67814	106	-5076	Y	-51	93.86	84.47	468	0	0.13	0.165	0.00	0.15	0.21	326	714	110	8.58	-13.97	-4.78
73	74	-0.765	-0.516	-0.678	2.000	10598	11071	51	-4768	66191	310	-5132	Y	-165	92.92	83.63	502	0	0.13	0.167	0.00	0.15	0.21	323	742	179	7.44	-14.13	-4.83
74	74	-0.765	-0.516	-0.678	2.000	10598	11176	49	-4828	66294	308	-5493	Y	-165	92.92	83.63	502	0	0.13	0.179	0.00	0.15	0.21	323	742	184	7.36	-15.12	-5.17
74	75	-0.752	-0.543	-0.680	2.000	10598	10693	72	-4842	63029	513	-5565	Y	-280	91.00	81.90	533	0	0.13	0.181	0.00	0.16	0.21	316	765	253	6.35	-15.32	-5.24
75	75	-0.752	-0.543	-0.680	2.000	10598	10669	72	-4900	63000	513	-5908	Y	-280	91.00	81.90	533	0	0.13	0.193	0.00	0.16	0.21	316	765	258	6.24	-16.27	-5.56
75	76	-0.734	-0.581	-0.681	2.000	10598	9973	95	-4931	58080	717	-5997	Y	-398	88.09	79.28	563	0	0.13	0.195	0.00	0.16	0.21	307	782	328	5.34	-16.51	-5.64
76	76	-0.734	-0.581	-0.681	2.000	10598	9947	95	-4986	58047	717	-6314	Y	-398	88.09	79.28	563	0	0.13	0.206	0.00	0.17	0.21	307	782	332	5.27	-17.38	-5.94
76	77	-0.710	-0.630	-0.683	2.000	10598	11445	304	-5302	53880	1107	-6688	Y	-518	84.18	77.76	597	0	0.13	0.218	0.00	0.17	0.21	301	808	468	2.90	-18.41	-6.29
77	77	-0.710	-0.630	-0.683	2.000	10598	11537	303	-5364	53964	1106	-6981	Y	-518	84.18	77.76	597	0	0.13	0.228	0.00	0.18	0.21	301	808	472	2.86	-19.22	-6.57
77	78	-0.682	-0.689	-0.684	2.000	10598	10627	330	-5733	45948	1314	-7408	Y	-640	79.33	77.76	652	0	0.13	0.241	0.00	0.19	0.21	303	859	548	2.60	-20.39	-6.97
78	78	-0.682	-0.689	-0.684	2.000	10598	10971	326	-5803	46281	1312	-7651	Y	-921	79.33	77.76	749	0	0.13	0.249	0.00	0.19	0.21	303	947	551	3.04	-21.06	-7.20
78	79	-0.661	-0.673	-0.665	2.000	10519	9826	353	-6175	36552	1524	-8082	Y	-1043	73.36	77.76	804	0	0.13	0.265	0.00	0.20	0.21	304	997	627	2.77	-22.38	-7.65
79	79	-0.661	-0.673	-0.665	2.000	10519	9963	351	-6228	36678	1522	-8282	Y	-1017	73.36	77.76	794	0	0.13	0.272	0.00	0.20	0.21	304	989	630	2.72	-22.94	-7.84
79	80	-0.635	-0.667	-0.647	2.000	10440	8563	378	-6600	25205	1740	-8712	Y	-1131	66.43	77.76	850	0	0.13	0.288	0.00	0.21	0.21	306	1040	709	2.48	-24.28	-8.30
80	80	-0.634	-0.667	-0.647	2.000	10440	8585	378	-6646	25215	1739	-8851	Y	-1107	66.43	77.76	841	0	0.13	0.293	0.00	0.21	0.21	306	1033	710	2.44	-24.66	-8.43
80	81	-0.601	-0.671	-0.629	2.000	10361	6924	405	-7014	11944	1963	-9276	Y	-1215	58.59	77.76	893	0	0.13	0.309	0.00	0.22	0.41	615	1357	791	3.37	-26.00	-8.89
81	81	-0.601	-0.671	-0.629	2.000	10361	6927	404	-7051	11935	1962	-9342	Y	-1193	58.59	77.76	886	0	0.13	0.311	0.00	0.22	0.41	615	1350	792	3.34	-26.19	-8.95
81	82	-0.560	-0.685	-0.613	2.000	10282	5009	432	-7412	-3179	2192	-9762	Y	-1316	58.17	77.76	927	0	0.13	0.328	0.00	0.23	0.41	615	1387	875	3.02	-27.54	-9.41
82	82	-0.560	-0.685	-0.613	2.000	10282	5026	430	-7439	-3175	2190	-9745	Y	-1297	58.17	77.76	920	0	0.13	0.327	0.00	0.23	0.41	615	1381	874	3.00	-27.49	-9.40
82	83	-0.757	-0.847	-0.796	2.000	10203	2861	457	-7796	-20290	2457	-10161	Y	-2531	68.40	77.76	1332	0	0.13	0.344	0.00	0.24	0.41	615	1752	969	3.92	-28.84	-9.86
83	83	-0.757	-0.848	-0.797	2.000	10203	2946	454	-7812	-20218	2453	-10051	Y	-2507	68.40	77.76	1324	0	0.13	0.340	0.00	0.23	0.41	615	1744	966	3.92	-28.53	-9.75
83	84	-0.834	-0.727	-0.785	2.000	10124	557	481	-8166	-39495	2728	-10464	Y	-2067	82.28	77.76	1177	0	0.13	0.357	0.00	0.24	0.41	615	1613	1064	2.95	-29.89	-10.22
84	84	-0.834	-0.727	-0.786	2.000	10124	659	478	-8169	-39405	2725	-10250	Y	-2045	82.28	77.76	1170	0	0.13	0.350	0.00	0.24	0.41	615	1606	1060	2.95	-29.28	-10.01
84	85	-0.758	-0.803	-0.779	2.000	10046	-1945	505	-8522	-60894	3007	-10661	Y	-1072	89.52	80.57	823	290	0.38	0.367	0.00	0.37	0.41	630	1307	1160	1.50	-30.64	-10.48
85	85	-0.757	-0.802	-0.778	2.000	10046	-1986	506	-8506	-60946	3006	-10341	Y	-850	89.52	80.57	746	367	0.48	0.356	0.00	0.42	0.41	629	1238	1155	1.28	-29.72	-10.16
85	86	-0.557	-1.054	-0.787	2.000	10046	-4820	532	-8859	-84688	3290	-10752	Y	-226	92.78	83.50	514	704	0.91	0.370	0.00	0.64	0.41	643				-30.90	-10.57
86	86	-0.557	-1.054	-0.787	2.000	10046	-4850	532	-8842	-84724	3290	-10448	Y	-226	92.78	83.50	514	704	0.91	0.359	0.00	0.63	0.41	643				-30.03	-10.27
86	87	-0.471	-1.160	-0.791	2.000	10046	-5797	541	-8956	-92790	3370	-10580	Y	0	93.00	83.70	426	822	1.06	0.364	0.00	0.71	0.41	641				-30.41	-10.40
87	87	-0.413	-1.241	-0.797	2.000	10046	-12042	-562	-8284	-104801	-3487	-6540	Y	0	93.00	83.70	411	880	1.14	0.225	0.00	0.68	0.41	637				-18.80	-6.43
87	88	-0.505	-1.131	-0.795	2.000	10046	-10989	-554	-8145	-96387	-3406	-6419	Y	201	92.81	83.53	489	772	1.00	0.221	0.00	0.61	0.41	639				-18.45	-6.31
88	88	-0.505	-1.131	-0.795	2.000	10046	-10600	-551	-8106	-95992	-3404	-6073	Y	201	92.81	83.53	490	771	1.00	0.209	0.00	0.60	0.41	639				-17.46	-5.97
88	89	-0.728	-0.867	-0.792	2.000	10046	-7454	-524	-7681	-71182	-3119	-5707	Y	765	89.93	80.94	703	452	0.60	0.196	0.00	0.40	0.41	628	1198	1124	1.26	-16.40	-5.61
89	89	-0.729	-0.867	-0.793	2.000	10046	-6620	-518	-7651	-70336	-3113	-5346	Y	991	89.93	80.94	782	371	0.49	0.184	0.00	0.34	0.41	629	1270	1117	1.54	-15.36	-5.25
89	90	-0.827	-0.783	-0.807	2.000	10124	-3748	-491	-7231	-47836	-2831	-4984	Y	2095	83.17	77.76	1186	0	0.13	0.170	0.00	0.15	0.41	615	1621	1017	3.23	-14.24	-4.87
90	90	-0.827	-0.782	-0.807	2.000	10124	-3676	-490	-7212	-47751	-2830	-4726	Y	2118	83.17	77.76	1194	0	0.13	0.161	0.00	0.15	0.41	615	1628	1013	3.28	-13.50	-4.61
90	91	-0.739	-0.926	-0.821	2.000	10203	-1055	-462	-6796	-27500	-2554	-4369	Y	2735	68.51	77.76	1400	0	0.13	0.148	0.00	0.14	0.41	615	1813	916	4.53	-12.40	-4.24
91	91	-0.739	-0.925	-0.821	2.000	10203	-917	-461	-6792	-27348	-2553	-4221	Y	2760	68.51	77.76	1408	0	0.13	0.143	0.00	0.14	0.41	615	1820	913	4.57	-11.98	-4.10
91	92	-0.494	-0.711	-0.586	2.000	10282	1439	-433	-6377	-9301	-2286	-3865	Y	1215	58.17	77.76	879	0	0.13	0.130	0.00	0.13	0.41	612	1342	819	3.19	-10.90	-3.73
92	92	-0.490	-0.705	-0.581	2.000	10282	1720	-430	-6386	-9006	-2283	-3816	Y	1233	58.17	77.76	886	0	0.13	0.128	0.00	0.13	0.41	612	1348	818	3.23	-10.76	-3.68
92	93	-0.550	-0.684	-0.604	2.000	10361	3793	-402	-5972	7001	-2053	-3460	Y	1128	58.59	77.76	864	0	0.13	0.115	0.00	0.12	0.21	307	1054	735	2.43	-9.70	-3.32
93	93	-0.550	-0.683	-0.604	2.000	10361	4867	-393	-5995	8089	-2044	-3501	Y	1148	58.59	77.76	868	0	0.13	0.117	0.00	0.12	0.21	307	1058	733	2.48	-9.82	-3.36
93	94	-0.599	-0.676	-0.629	2.000	10440	6598	-365	-5581	22167	-1819	-3145	Y	1056	66.43	77.76	815	0	0.13	0.104	0.00	0.12	0.21	305	1008	653	2.74	-8.76	-3.00
94	94	-0.599	-0.675	-0.628	2.000	10440	6569	-365	-5617	22151	-1819	-3267	Y	1079	66.43	77.76	823	0	0.13	0.108	0.00	0.12	0.21	305	1015	655	2.76	-9.10	-3.11
94	95	-0.637	-0.683	-0.654	2.000	10519	8025	-338	-5208	34414	-1601	-2916	N	978	73.37	77.76	771	0	0.13	Not Reqd	0.00	0.06	0.21	303	967	534	4.85	0.00	0.00
95	95	-0.637	-0.683	-0.654	2.000	10519	7998	-338	-5252	34400	-1601	-3104	N	1004	73.37	77.76	780	0	0.13	Not Reqd	0.00	0.06	0.21	303	975	534	4.92	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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)	Permanent Loads + Minimum LL Torsion @ 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
95	96	-0.667	-0.707	-0.681	2.000	10598	9173	-310	-4850	44892	-1389	-2761	N	894	79.25	77.76	728	0	0.13	Not Reqd	0.00	0.06	0.21	302	927	463	5.49	0.00	0.00
96	96	-0.667	-0.706	-0.680	2.000	10598	9147	-310	-4898	44877	-1389	-3000	N	621	79.25	77.76	633	0	0.13	Not Reqd	0.00	0.06	0.21	301	841	463	4.66	0.00	0.00
96	97	-0.702	-0.652	-0.685	2.000	10598	9012	-102	-4620	52605	-1000	-2780	N	507	84.18	77.76	584	0	0.13	Not Reqd	0.00	0.06	0.21	300	796	333	14.61	0.00	0.00
97	97	-0.703	-0.651	-0.685	2.000	10598	8999	-102	-4669	52601	-1000	-3067	N	507	84.18	77.76	584	0	0.13	Not Reqd	0.00	0.06	0.21	300	796	333	14.63	0.00	0.00
97	98	-0.732	-0.608	-0.689	2.000	10598	9921	-79	-4587	59944	-796	-3042	N	393	88.09	79.28	544	0	0.13	Not Reqd	0.00	0.06	0.21	305	764	265	19.99	0.00	0.00
98	98	-0.732	-0.608	-0.689	2.000	10598	9986	-78	-4641	60017	-795	-3368	Y	393	88.09	79.28	544	0	0.13	0.110	0.00	0.12	0.21	305	764	315	5.76	-9.27	-3.17
98	99	-0.755	-0.575	-0.693	2.000	10598	10689	-55	-4579	65700	-590	-3364	Y	280	91.00	81.90	515	0	0.13	0.110	0.00	0.12	0.21	314	746	246	6.82	-9.26	-3.17
99	99	-0.755	-0.575	-0.693	2.000	10598	10741	-54	-4637	65757	-589	-3722	Y	280	91.00	81.90	515	0	0.13	0.121	0.00	0.13	0.21	314	746	251	6.73	-10.25	-3.50
99	100	-0.772	-0.552	-0.696	2.000	10598	11217	-30	-4592	69771	-384	-3735	Y	166	92.92	83.63	482	0	0.13	0.122	0.00	0.13	0.21	320	723	183	7.93	-10.28	-3.52
100	100	-0.773	-0.552	-0.696	2.000	10598	11208	-30	-4653	69767	-384	-4115	Y	166	92.92	83.63	482	0	0.13	0.134	0.00	0.13	0.21	320	723	189	7.78	-11.33	-3.87
100	101	-0.784	-0.539	-0.699	2.000	10598	11459	-6	-4623	72114	-179	-4143	Y	52	93.86	84.47	447	0	0.13	0.135	0.00	0.13	0.21	323	693	121	9.14	-11.41	-3.90
101	101	-0.784	-0.539	-0.699	2.000	10598	11437	-6	-4683	72094	-179	-4520	Y	52	93.86	84.47	447	0	0.13	0.147	0.00	0.14	0.21	323	694	126	8.96	-12.44	-4.25
101	102	-0.789	-0.536	-0.702	2.000	10598	11467	16	-4669	72780	9	-4559	Y	-52	93.86	84.47	447	0	0.13	0.149	0.00	0.14	0.21	323	693	70	9.40	-12.55	-4.29
102	102	-0.789	-0.536	-0.702	2.000	10598	11444	16	-4729	72756	9	-4939	Y	-52	93.86	84.47	447	0	0.13	0.161	0.00	0.15	0.21	323	693	76	9.23	-13.60	-4.65
102	103	-0.790	-0.542	-0.704	2.000	10598	11257	39	-4728	71903	213	-4995	Y	-168	92.92	83.63	482	0	0.13	0.163	0.00	0.15	0.21	320	722	145	7.95	-13.75	-4.70
103	103	-0.790	-0.543	-0.704	2.000	10598	11231	39	-4789	71876	213	-5387	Y	-168	92.92	83.63	482	0	0.13	0.176	0.00	0.15	0.21	320	722	151	7.81	-14.83	-5.07
103	104	-0.786	-0.558	-0.707	2.000	10598	10821	63	-4803	69358	418	-5459	Y	-286	91.00	81.90	513	0	0.13	0.178	0.00	0.15	0.21	314	744	220	6.70	-15.03	-5.14
104	104	-0.786	-0.558	-0.707	2.000	10598	10836	64	-4862	69369	419	-5837	Y	-286	91.00	81.90	513	0	0.13	0.190	0.00	0.16	0.21	314	744	226	6.56	-16.07	-5.49
104	105	-0.776	-0.582	-0.709	2.000	10598	10197	87	-4894	65181	624	-5927	Y	-406	88.09	79.28	542	0	0.13	0.193	0.00	0.16	0.21	304	761	295	5.60	-16.32	-5.58
105	105	-0.776	-0.583	-0.709	2.000	10598	10186	87	-4949	65163	624	-6282	Y	-406	88.09	79.28	542	0	0.13	0.205	0.00	0.17	0.21	304	761	301	5.50	-17.29	-5.91
105	106	-0.762	-0.616	-0.711	2.000	10598	11756	290	-5298	61743	1008	-6688	Y	-528	84.18	77.76	575	0	0.13	0.218	0.00	0.17	0.21	298	786	435	3.01	-18.41	-6.30
106	106	-0.761	-0.616	-0.711	2.000	10598	11727	290	-5362	61706	1008	-7025	Y	-528	84.18	77.76	576	0	0.13	0.229	0.00	0.18	0.21	298	786	440	2.97	-19.34	-6.61
106	107	-0.743	-0.658	-0.713	2.000	10598	10923	317	-5732	54470	1216	-7452	Y	-653	79.33	77.76	629	0	0.13	0.243	0.00	0.19	0.21	300	835	516	2.68	-20.52	-7.01
107	107	-0.742	-0.658	-0.713	2.000	10598	10941	320	-5794	54478	1219	-7756	Y	-939	79.33	77.76	728	0	0.13	0.253	0.00	0.19	0.21	300	925	521	3.10	-21.35	-7.30
107	108	-0.732	-0.626	-0.692	2.000	10519	9832	348	-6167	45483	1431	-8186	Y	-1064	73.36	77.76	781	0	0.13	0.269	0.00	0.20	0.21	301	974	598	2.82	-22.67	-7.75
108	108	-0.731	-0.626	-0.693	2.000	10519	9804	349	-6220	45443	1432	-8434	Y	-1037	73.36	77.76	772	0	0.13	0.277	0.00	0.20	0.21	301	966	602	2.75	-23.36	-7.99
108	109	-0.714	-0.606	-0.672	2.000	10440	8409	376	-6592	34672	1650	-8863	Y	-1154	66.43	77.76	826	0	0.13	0.293	0.00	0.21	0.21	303	1016	681	2.50	-24.70	-8.44
109	109	-0.714	-0.606	-0.672	2.000	10440	8374	376	-6638	34624	1650	-9052	Y	-1129	66.43	77.76	818	0	0.13	0.300	0.00	0.21	0.21	303	1008	684	2.45	-25.22	-8.62
109	110	-0.690	-0.598	-0.653	2.000	10361	6704	404	-7005	22038	1874	-9478	Y	-1239	58.59	77.76	873	0	0.13	0.316	0.00	0.22	0.37	549	1279	765	3.16	-26.57	-9.08
110	110	-0.690	-0.599	-0.653	2.000	10361	6679	402	-7042	22000	1873	-9598	Y	-1217	58.59	77.76	865	0	0.13	0.320	0.00	0.22	0.37	549	1272	766	3.12	-26.91	-9.20
110	111	-0.657	-0.601	-0.634	2.000	10282	4747	430	-7403	7564	2103	-10017	Y	-1343	49.83	77.76	930	0	0.13	0.337	0.00	0.23	0.37	552	1334	849	2.92	-28.25	-9.66
111	111	-0.657	-0.602	-0.634	2.000	10282	4755	427	-7429	7558	2100	-10058	Y	-1322	49.83	77.76	923	0	0.13	0.338	0.00	0.23	0.37	552	1328	849	2.90	-28.37	-9.70
111	112	-0.933	-0.796	-0.873	2.000	10203	2576	455	-7785	-8894	2370	-10473	Y	-2803	68.45	77.76	1422	0	0.13	0.355	0.00	0.24	0.37	553	1778	945	4.12	-29.72	-10.16
112	112	-0.933	-0.796	-0.873	2.000	10203	2533	455	-7799	-8951	2370	-10425	Y	-2777	68.45	77.76	1414	0	0.13	0.353	0.00	0.24	0.37	553	1770	944	4.09	-29.59	-10.12
112	113	-1.050	-0.627	-0.859	2.000	10124	94	483	-8152	-27628	2650	-10836	Y	-2224	82.73	77.76	1229	0	0.13	0.370	0.00	0.25	0.47	692	1729	1043	3.44	-30.95	-10.58
113	113	-1.050	-0.627	-0.859	2.000	10124	49	483	-8153	-27687	2650	-10686	Y	-2200	82.73	77.76	1221	0	0.13	0.365	0.00	0.25	0.47	692	1722	1041	3.42	-30.52	-10.43
113	114	-0.985	-0.693	-0.849	2.000	10046	-2639	510	-8504	-48641	2935	-11095	Y	-1105	89.70	80.73	854	233	0.30	0.382	0.00	0.34	0.47	714	1411	1142	1.91	-31.89	-10.90
114	114	-0.984	-0.692	-0.849	2.000	10046	-2684	510	-8491	-48699	2936	-10837	Y	-866	89.70	80.73	771	316	0.41	0.373	0.00	0.39	0.47	713	1336	1139	1.67	-31.15	-10.65
114	115	-0.785	-0.936	-0.855	2.000	10046	-5606	537	-8841	-71950	3224	-11246	Y	-230	92.79	83.51	531	663	0.85	0.387	0.00	0.62	0.47	727				-32.32	-11.05
115	115	-0.785	-0.936	-0.855	2.000	10046	-5638	537	-8821	-71990	3224	-10987	Y	-230	92.79	83.51	531	663	0.85	0.378	0.00	0.61	0.47	727				-31.58	-10.80
115	116	-0.699	-1.041	-0.858	2.000	10046	-6615	546	-8934	-79906	3304	-11119	Y	0	93.00	83.70	441	783	1.00	0.382	0.00	0.69	0.47	725				-31.96	-10.93
116	116	-0.699	-1.041	-0.858	2.000	10046	-12059	-557	-7595	-85350	-3194	-6215	Y	0	93.00	83.70	435	748	0.96	0.214	0.00	0.59	0.47	723				-17.86	-6.11
116	117	-0.785	-0.943	-0.858	2.000	10046	-10961	-548	-7450	-77624	-3113	-6088	Y	230	92.80	83.52	524	629	0.81	0.209	0.00	0.51	0.47	725				-17.50	-5.98
117	117	-0.785	-0.943	-0.858	2.000	10046	-10687	-546	-7411	-77345	-3111	-5810	Y	230	92.80	83.52	524	628	0.81	0.200	0.00	0.50	0.47	726				-16.70	-5.71
117	118	-0.965	-0.736	-0.859	2.000	10046	-7427	-517	-6970	-54721	-2821	-5426	Y	1103	89.27	80.34	841	204	0.27	0.187	0.00	0.23	0.37	567	1267	1021	1.89	-15.60	-5.33
118	118	-0.965	-0.737	-0.859	2.000	10046	-6779	-513	-6931	-54064	-2817	-5137	Y	1345	89.27	80.34	926	118	0.15	0.177	0.00	0.17	0.37	567	1344	1015	2.20	-14.76	-5.05
118	119	-0.964	-0.761	-0.872	2.000	10124	-3824	-484	-6498	-33810	-2530	-4761	Y	2500	80.28	77.76	1321	0	0.13	0.162	0.00	0.15	0.37	553	1687	914	4.01	-13.60	-4.65
119	119	-0.964	-0.761	-0.872	2.000	10124	-2802	-477	-6480	-32777	-2523	-4581	Y	2524	80.28	77.76	1329	0	0.13	0.156	0.00	0.14	0.37	553	1694	909	4.09	-13.08	-4.47
119	120	-0.794	-1.004	-0.886	2.000	10203	-190	-447	-6052	-14893	-2242	-4211	Y	3056	64.46	77.76	1507	0	0.13	0.143	0.00	0.14	0.21	307	1633	809	4.45	-11.95	-4.09
120	120	-0.794	-1.003	-0.886	2.000	10203	-41	-446	-6052	-14733	-2240	-4131	Y	3083	64.46	77.76	1515	0	0.13	0.140	0.00	0.13	0.21	307	1641	808	4.50	-11.72	-4.01
120	121	-0.447	-0.830	-0.609	2.000	10282	2264	-417	-5626	878	-1969	-3763	Y	1337	57.01	77.76	925	0	0.13	0.126	0.00	0.13	0.21	307	1108	712	2.78	-10.62	-3.63
121	121	-0.448	-0.830	-0.609	2.000	10282	2548	-414	-5639	1173	-1966	-3769	Y	1356	57.01	77.76	931	0	0.13	0.127	0.00	0.13	0.21	307	1113	711	2.82	-10.63	-3.63
121	122	-0.453	-0.886	-0.629	2.000	10361	4526	-385	-5215	14688	-1734	-3403	Y	1224	66.63	77.76	866	0	0.13	0.113	0.00	0.12	0.21	305	1053	628	3.07	-9.54	-3.26
122	122	-0.453	-0.885	-0.629	2.000	10361	5232	-379	-5241	15404	-1728	-3484	Y	1245	66.63	77.76	872	0	0.13	0.116	0.00	0.12	0.21	304	1058	627	3.12	-9.77	-3.34
122	123	-0.455	-0.953	-0.648	2.000	10440	6845	-349	-4818	26967	-1502	-3119	N	1072	74.88	77.76	797	0	0.13	Not Reqd	0.00	0.06	0.21	303	989	501	5.20	0.00	0.00
123	123	-0.455	-0.953	-0.648	2.000	10440	7555	-343	-4858	27685	-1495	-3268	Y	1095	74.88	77.76	803	0	0.13	0.108	0.00	0.12	0.21	303	995	547	3.41	-9.11	-3.11
123	124	-0.456	-1.032	-0.668	2.000	10519	8791	-313	-4441	37332	-1275	-2909	N	939	81.61	77.76	738	0	0.13	Not Reqd	0.00	0.06	0.21	301	935	425	5.88	0.00	0.00
124	124	-0.457	-1.032	-0.669	2.000	10519	8771	-313	-4488	37320	-1275	-3112	N	965	81.61	77.76	747	0	0.13	Not Reqd	0.00	0.06	0.21	301	943	425	5.96	0.00	0.00
124	125	-0.452	-1.138	-0.689	2.000	10598	8182	-109	-4256	43652	-887	-2937	N	859	87.08	78.38	711	0	0.13	Not Reqd	0.00	0.06	0.21	303	913	296	17.98	0.00	0.00
125	125	-0.458	-1.007	-0.648	2.000	10598	8349	-107	-4304	43825	-885	-3185	Y	518	87.08	78.38	593	0	0.13	0.104	0.00	0.12	0.21	303	806	342	5.67	-8.77	-3.00
125	126	-0.478	-0.963	-0.646	2.000	10598	9289	-82	-4215	50231	-679	-3154	N	411	91.09	81.98	569	0	0.13	Not Reqd	0.00	0.06	0.21	316	797	226	21.79	0.00	0.00
126	126	-0.478	-0.963	-0.646	2.000	10598	9405	-81	-4266	50352	-677	-3428	Y	411	91.09	81.98	569	0	0.13	0.112	0.00	0.12	0.21	316	796	276	6.78	-9.44	-3.23
126	127	-0.494	-0.933	-0.646	2.000	10598	10063	-55	-4202	55035	-471	-3422	Y	249	93.93	84.53	524	0	0.13	0.112	0.00	0.12	0.21	325	764	207	7.91	-9.42	-3.22

PROJECT: **Cline Avenue Mainline Seg 4 WB** 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 Torsion @ t=00																														
		(ksi)	(ksi)	(ksi)		(k-ft)	Ultimate	Ultimate	Ultimate				Investigate	Shear from	(in)	(in)	(kip)	(kip)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(kip)	(kip)	(kip)		Total Long.	Equivalent
		Perm Load	Perm Load	Dead Load	Stress	Torsional	Corresp.	Max	Corresp.	TOTAL	TOTAL	TOTAL	Torsional	Primary	Depth	Effective	Concrete	Required	Required	Additional	Additional	Total	Steel	Provided	Nominal		Shear	Mild Steel	PT Steel Req'd
		Stress	Stress	Stress	Variable	Cracking	Live Load	Live Load	Live Load	Ultimate	Ultimate	Ultimate	Effects?	Post Tensioning	to Tensile	Shear	Shear	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Ultimate	Rating	Required	for Torsion
Member	Node	(top fiber)	(bott. fiber)	(neutr. axis)	'K'	Moment	Moment	Shear	Torsion	Moment	Shear	Torsion	(Y/N)	Effect	Reinforcement	Depth	Resistance	Resistance	Area	Required	Req'd from	Required	Provided	Resistance	Shear	Factor, RF	for Torsion	(based on fpe)
Number	Number			(fpc)		(Tcr)				(Mu)	(Vu)	(Tu)		(Vp)	d_v	d_v	per web (Vc)	per web (Vs-req'd)	per web (Av)	for Torsion (At)	A_v (trans)	per leg (As_req'd)	per leg As_prov'd)	per web (Vs_prov)	per web (ϕVn)	per web (Vu)		(Al) in^2	(Al) in^2
127	127	-0.494	-0.933	-0.646	2.000	10598	10124	-54	-4257	55099	-470	-3722	Y	249	93.93	84.53	524	0	0.13	0.121	0.00	0.13	0.21	325	764	212	7.82	-10.25	-3.50
127	128	-0.511	-0.900	-0.646	2.000	10598	10489	-28	-4215	58048	-262	-3738	Y	74	95.27	85.74	468	0	0.13	0.122	0.00	0.13	0.21	329	718	143	9.02	-10.29	-3.52
128	128	-0.511	-0.900	-0.646	2.000	10598	10474	-28	-4272	58034	-262	-4054	Y	74	95.27	85.74	468	0	0.13	0.132	0.00	0.13	0.21	329	718	147	8.87	-11.16	-3.82
128	129	-0.526	-0.864	-0.643	2.000	10598	10532	-1	-4249	59234	-54	-4089	Y	-56	95.33	85.79	463	0	0.13	0.133	0.00	0.13	0.21	329	713	79	11.03	-11.26	-3.85
129	129	-0.526	-0.864	-0.643	2.000	10598	10643	1	-4288	59345	-52	-4307	Y	-56	95.33	85.79	463	0	0.13	0.140	0.00	0.13	0.21	329	713	81	10.94	-11.86	-4.05
129	130	-0.531	-0.852	-0.642	2.000	10598	10575	10	-4283	59335	21	-4323	Y	-123	95.06	85.55	482	0	0.13	0.141	0.00	0.14	0.21	328	730	71	10.87	-11.90	-4.07
130	130	-0.531	-0.852	-0.642	2.000	10598	10629	11	-4322	59389	22	-4542	Y	-123	95.06	85.55	482	0	0.13	0.148	0.00	0.14	0.21	328	729	75	10.68	-12.50	-4.27
130	131	-0.544	-0.824	-0.641	2.000	10598	10216	39	-4320	58167	231	-4597	Y	-302	93.23	83.91	534	0	0.13	0.150	0.00	0.14	0.21	322	770	145	9.15	-12.66	-4.33
131	131	-0.544	-0.824	-0.641	2.000	10598	10228	39	-4375	58177	232	-4914	Y	-302	93.23	83.91	534	0	0.13	0.160	0.00	0.14	0.21	322	770	150	8.98	-13.53	-4.63
131	132	-0.557	-0.802	-0.642	2.000	10598	9468	67	-4390	55168	441	-4986	Y	-460	89.95	80.95	574	0	0.13	0.163	0.00	0.15	0.21	311	796	221	7.60	-13.73	-4.69
132	132	-0.557	-0.802	-0.642	2.000	10598	9459	67	-4442	55154	441	-5287	Y	-460	89.95	80.95	574	0	0.13	0.172	0.00	0.15	0.21	311	796	225	7.48	-14.55	-4.98
132	133	-0.568	-0.788	-0.644	2.000	10598	10611	263	-4651	52615	818	-5555	Y	-609	85.33	77.76	605	0	0.13	0.181	0.00	0.16	0.21	299	813	355	3.93	-15.29	-5.23
133	133	-0.568	-0.788	-0.644	2.000	10598	10784	268	-4710	52782	823	-5842	Y	-609	85.33	77.76	605	0	0.13	0.190	0.00	0.16	0.21	298	813	361	3.84	-16.08	-5.50
133	134	-0.578	-0.779	-0.647	2.000	10598	9674	300	-5087	46538	1036	-6277	Y	-752	79.41	77.76	663	0	0.13	0.205	0.00	0.17	0.37	539	1082	438	4.68	-17.28	-5.91
134	134	-0.578	-0.779	-0.647	2.000	10598	9714	302	-5140	46571	1038	-6531	Y	-752	79.41	77.76	663	0	0.13	0.213	0.00	0.17	0.37	539	1082	443	4.62	-17.98	-6.15
134	135	-0.586	-0.771	-0.650	2.000	10598	8111	335	-5525	38393	1253	-6973	Y	-906	72.25	77.76	729	0	0.13	0.227	0.00	0.18	0.37	542	1144	521	4.22	-19.20	-6.56
135	135	-0.586	-0.771	-0.650	2.000	10598	8108	337	-5569	38382	1254	-7188	Y	-1179	72.25	77.76	823	0	0.13	0.234	0.00	0.18	0.37	543	1229	524	4.63	-19.79	-6.77
135	136	-0.610	-0.672	-0.633	2.000	10519	5986	371	-5951	28231	1472	-7628	Y	-1349	63.50	77.76	895	0	0.13	0.251	0.00	0.19	0.37	546	1297	604	4.28	-21.13	-7.22
136	136	-0.610	-0.673	-0.633	2.000	10519	5963	372	-5984	28199	1473	-7782	Y	-1323	63.50	77.76	886	0	0.13	0.256	0.00	0.19	0.37	546	1289	606	4.22	-21.55	-7.37
136	137	-0.633	-0.583	-0.614	2.000	10440	3294	408	-6358	16010	1699	-8214	Y	-1464	53.21	77.76	952	0	0.13	0.272	0.00	0.20	0.37	549	1351	688	3.89	-22.89	-7.83
137	137	-0.633	-0.584	-0.614	2.000	10440	3262	408	-6377	15968	1700	-8302	Y	-1442	53.21	77.76	944	0	0.13	0.275	0.00	0.20	0.37	549	1344	689	3.85	-23.13	-7.91
137	138	-0.621	-0.554	-0.593	2.000	10361	17	445	-6736	22	2346	-8719	Y	-1488	41.99	77.76	581	288	0.69	0.291	0.00	0.49	0.37	309				-24.44	-8.36

0.93