URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[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\Segment2\Rating EB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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 (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	-0.833	-0.786	-0.813	2.000	13852	16	515	-12071	11	2764	-9506	Y	-2574	58.46	102.02	1498	0	0.13	0.237	0.00	0.18	0.53	1030				-21.24	-7.26
1	2	-0.816	-0.743	-0.785	2.000	14417	-4124	529	-11813	-24642	3409	-9190	Y	-2548	101.41	105.89	1514	0	0.13	0.220	0.00	0.17	0.53	1069	2325	1272	4.00	-19.93	-6.81
2	2	-0.816	-0.744	-0.785	2.000	14417	-4043	529	-11840	-24579	3409	-9356	Y	-2578	101.41	105.89	1524	0	0.13	0.224	0.00	0.18	0.53	1069	2334	1274	4.01	-20.29	-6.94
2	3	-0.765	-0.746	-0.757	2.000	14960	-5259	568	-1650	-49737	3674	892	N	-2486	117.61	110.07	1509	0	0.13	Not Reqd	0.00	0.06	0.53	1109	2357	1225	6.97	0.00	0.00
3	3	-0.765	-0.746	-0.757	2.000	14960	-5247	568	-1686	-49742	3674	554	N	-2514	117.61	110.07	1519	0	0.13	Not Reqd	0.00	0.06	0.53	1109	2365	1225	7.02	0.00	0.00
3	4	-0.699	-0.775	-0.733	2.000	15542	-7340	618	-2839	-77622	3958	-541	N	-2276	133.19	119.87	1443	23	0.13	Not Reqd	0.00	0.06	0.53	1194	2374	1319	6.12	0.00	0.00
4	4	-0.698	-0.775	-0.733	2.000	15542	-7321	618	-2889	-77616	3958	-1068	N	-2306	133.19	119.87	1454	12	0.13	Not Reqd	0.00	0.06	0.53	1194	2383	1319	6.16	0.00	0.00
4	5	-0.612	-0.836	-0.715	2.000	16160	-10895	699	-2874	-108888	4282	-995	N	-1843	146.74	132.07	1318	268	0.22	Not Reqd	0.00	0.11	0.53	1301	2357	1427	4.99	0.00	0.00
5	5	-0.610	-0.836	-0.714	2.000	16160	-10875	700	-2949	-108879	4285	-1728	N	-1568	146.74	132.07	1222	365	0.30	Not Reqd	0.00	0.15	0.53	1300	2270	1428	4.61	0.00	0.00
5	6	-0.491	-0.987	-0.720	2.000	16896	-14368	756	-3560	-141995	4590	-2281	N	-867	157.30	141.57	993	707	0.54	Not Reqd	0.00	0.27	0.53	1379				0.00	0.00
6	6	-0.486	-0.983	-0.716	2.000	16896	-14352	756	-3627	-141983	4593	-2919	N	-279	157.30	141.57	789	912	0.70	Not Reqd	0.00	0.35	0.53	1377				0.00	0.00
6	7	-0.426	-1.066	-0.722	2.000	16896	-15619	775	-3822	-153177	4691	-3095	N	0	157.56	141.80	681	1057	0.81	Not Reqd	0.00	0.41	0.37	967				0.00	0.00
7	7	-0.426	-1.066	-0.722	2.000	16896	8066	134	458	-129492	-3110	205	N	0	157.56	141.80	727	425	0.32	Not Reqd	0.00	0.16	0.37	978				0.00	0.00
7	8	-0.486	-0.996	-0.721	2.000	16896	7729	134	457	-121624	-3030	224	N	172	157.47	141.72	797	325	0.25	Not Reqd	0.00	0.12	0.37	981				0.00	0.00
8	8	-0.489	-1.000	-0.725	2.000	16896	7727	134	493	-121624	-3028	-320	N	764	157.47	141.72	1003	118	0.13	Not Reqd	0.00	0.06	0.37	983				0.00	0.00
8	9	-0.612	-0.881	-0.736	2.000	16160	6747	135	489	-98313	-2779	-266	N	1286	148.19	133.37	1168	0	0.13	Not Reqd	0.00	0.06	0.37	932	1890	926	22.43	0.00	0.00
9	9	-0.613	-0.882	-0.737	2.000	16160	6744	135	535	-98309	-2777	-924	N	1578	148.19	133.37	1270	0	0.13	Not Reqd	0.00	0.06	0.37	933	1983	926	24.53	0.00	0.00
9	10	-0.691	-0.858	-0.765	2.000	15542	5864	136	525	-76865	-2532	-876	N	2059	136.51	122.86	1411	0	0.13	Not Reqd	0.00	0.06	0.37	867	2050	844	27.62	0.00	0.00
10	10	-0.691	-0.857	-0.765	2.000	15542	5860	136	564	-76857	-2533	-1398	N	2029	136.51	122.86	1401	0	0.13	Not Reqd	0.00	0.06	0.37	867	2040	844	27.40	0.00	0.00
10	11	-0.718	-0.884	-0.790	2.000	14960	5069	138	550	-57234	-2296	-1355	N	2336	122.61	110.35	1466	0	0.13	Not Reqd	0.00	0.06	0.37	784	2026	765	28.44	0.00	0.00
11	11	-0.718	-0.884	-0.790	2.000	14960	5065	138	584	-57223	-2297	-1744	N	2307	122.61	110.35	1457	0	0.13	Not Reqd	0.00	0.06	0.37	785	2018	766	28.27	0.00	0.00
11	12	-0.737	-0.936	-0.821	2.000	14421	4351	140	566	-39366	-2068	-1704	N	2165	108.85	105.89	1386	0	0.13	Not Reqd	0.00	0.06	0.37	753	1926	689	27.44	0.00	0.00
12	12	-0.737	-0.936	-0.821	2.000	14421	4347	140	595	-39354	-2068	-1972	N	2135	108.85	105.89	1376	0	0.13	Not Reqd	0.00	0.06	0.37	753	1917	689	27.25	0.00	0.00
12	13	-0.752	-0.998	-0.852	2.000	13928	3696	143	575	-23210	-1847	-1933	N	2005	96.26	102.02	1309	0	0.13	Not Reqd	0.00	0.06	0.37	726	1831	616	26.42	0.00	0.00
13	13	-0.752	-0.998	-0.852	2.000	13928	3692	143	600	-23196	-1847	-2092	N	1979	96.26	102.02	1300	0	0.13	Not Reqd	0.00	0.06	0.37	726	1823	616	26.25	0.00	0.00
13	14	-0.762	-1.072	-0.883	2.000	13471	11545	152	-174	-261	-1628	-2807	N	1862	84.64	98.42	1238	0	0.13	Not Reqd	0.00	0.06	0.37	700	1745	543	24.65	0.00	0.00
14	14	-0.762	-1.072	-0.883	2.000	13471	11546	152	-95	-241	-1628	-2809	N	1849	84.64	98.42	1234	0	0.13	Not Reqd	0.00	0.06	0.37	700	1741	543	24.57	0.00	0.00
14	15	-0.764	-1.163	-0.912	2.000	13063	12757	171	-216	14401	-1407	-2871	N	1741	58.02	95.13	1177	0	0.13	Not Reqd	0.00	0.06	0.25	451	1466	469	18.53	0.00	0.00
15	15	-0.764	-1.162	-0.912	2.000	13063	12758	171	-129	14420	-1407	-2774	N	1723	58.02	95.13	1171	0	0.13	Not Reqd	0.00	0.06	0.25	451	1460	469	18.44	0.00	0.00
15	16	-0.759	-1.270	-0.938	2.000	12695	13855	190	-240	27360	-1193	-2827	N	1614	63.32	92.12	1116	0	0.13	Not Reqd	0.00	0.06	0.25	437	1398	398	16.81	0.00	0.00
16	16	-0.760	-1.270	-0.939	2.000	12695	13856	190	-144	27379	-1194	-2657	N	1145	63.32	92.12	960	0	0.13	Not Reqd	0.00	0.06	0.25	437	1257	398	14.57	0.00	0.00
16	17	-0.775	-1.242	-0.938	2.000	12301	14825	210	-246	38650	-984	-2701	N	1034	68.10	89.42	906	0	0.13	Not Reqd	0.00	0.06	0.25	424	1197	328	13.40	0.00	0.00
17	17	-0.775	-1.242	-0.939	2.000	12301	14826	210	-145	38667	-984	-2439	N	1004	68.10	89.42	896	0	0.13	Not Reqd	0.00	0.06	0.25	424	1188	328	13.26	0.00	0.00
17	18	-0.790	-1.211	-0.937	2.000	11939	15647	232	-238	48277	-773	-2473	N	891	72.21	86.94	843	0	0.13	Not Reqd	0.00	0.06	0.21	344	1068	258	11.47	0.00	0.00
18	18	-0.790	-1.211	-0.937	2.000	11939	15648	232	-131	48292	-773	-2146	N	865	72.21	86.94	834	0	0.13	Not Reqd	0.00	0.06	0.21	344	1060	258	11.37	0.00	0.00
18	19	-0.803	-1.179	-0.934	2.000	11623	16305	255	-215	56235	-563	-2171	N	754	75.72	84.78	783	0	0.13	Not Reqd	0.00	0.06	0.21	335	1006	188	10.63	0.00	0.00
19	19	-0.803	-1.179	-0.934	2.000	11623	16306	255	-104	56248	-563	-1789	N	724	75.72	84.78	773	0	0.13	Not Reqd	0.00	0.06	0.21	335	998	188	10.53	0.00	0.00
19	20	-0.814	-1.148	-0.930	2.000	11354	16778	279	-178	62515	-353	-1805	N	614	78.61	82.94	725	0	0.13	Not Reqd	0.00	0.06	0.21	328	948	118	9.92	0.00	0.00
20	20	-0.815	-1.148	-0.931	2.000	11354	16779	279	-64	62526	-353	-1381	N	589	78.61	82.94	717	0	0.13	Not Reqd	0.00	0.06	0.21	328	940	118	9.84	0.00	0.00
20	21	-0.823	-1.122	-0.926	2.000	11124	17048	304	-129	67109	-143	-1388	N	481	80.88	81.36	658	0	0.13	Not Reqd	0.00	0.06	0.21	321	881	48	9.21	0.00	0.00
21	21	-0.823	-1.122	-0.927	2.000	11124	17048	304	-13	67116	-143	-932	N	457	80.88	81.36	650	0	0.13	Not Reqd	0.00	0.06	0.21	321	874	48	9.15	0.00	0.00
21	22	-0.827	-1.103	-0.923	2.000	10933	17097	331	-70	70004	67	-931	N	349	82.54	80.06	599	0	0.13	Not Reqd	0.00	0.06	0.21	315	822	22	8.26	0.00	0.00
22	22	-0.827	-1.104	-0.923	2.000	10933	17097	331	47	70009	67	-456	N	321	82.54	80.06	590	0	0.13	Not Reqd	0.00	0.06	0.21	315	814	22	8.19	0.00	0.00
22	23	-0.826	-1.094	-0.919	2.000	10788	16909	358	-2	71192	278	-446	N	215	83.59	79.07	548	0	0.13	Not Reqd	0.00	0.06	0.21	311	772	93	6.70	0.00	0.00
23	23	-0.826	-1.095	-0.919	2.000	10788	16908	358	113	71193	278	37	N	191	83.59	79.07	539	0	0.13	Not Reqd	0.00	0.06	0.21	311	765	93	6.63	0.00	0.00
23	24	-0.819	-1.097	-0.916	2.000	10617	16467	386	71	70662	489	53	N	85	83.80	77.90	492	0	0.13	Not Reqd	0.00	0.06	0.21	306	718	163	5.31	0.00	0.00
24	24	-0.819	-1.098	-0.916	2.000	10617	16466	386	151	70660	489	390	N	22	83.80	77.90	470	0	0.13	Not Reqd	0.00	0.06	0.21	306	698	163	5.16	0.00	0.00
24	25	-0.817	-1.099	-0.914	2.000	10617	16214	399	135	69934	578	399	N	-22	83.80	77.90	470	0	0.13	Not Reqd	0.00	0.06	0.21	306	698	193	4.81	0.00	0.00
25	25	-0.817	-1.099	-0.914	2.000	10617	16213	398	214	69931	578	733	N	-85	83.80	77.90	492	0	0.13	Not Reqd	0.00	0.06	0.21	306	718	193	4.96	0.00	0.00
25	26	-0.810	-1.103	-0.912	2.000	10788	15393	428	180	66947	790	758	N	-189	83.59	79.07	541	0	0.13	Not Reqd	0.00	0.06	0.21	311	766	263	4.53	0.00	0.00
26	26	-0.810	-1.102	-0.911	2.000	10788	15391	428	285	66940	790	1212	N	-213	83.59	79.07	549	0	0.13	Not Reqd	0.00	0.06	0.21	311	774	263	4.58	0.00	0.00
26	27	-0.798	-1.118	-0.909	2.000	10933	14296	458	257	62218	1003	1241	N	-316	82.54	80.06	599	0	0.13	Not Reqd	0.00	0.06	0.21	316	824	334	4.21	0.00	0.00
27	27	-0.797	-1.117	-0.908	2.000	10933	14294	458	354	62208	1003	1662	N	-343	82.54	80.06	609	0	0.13	Not Reqd	0.00	0.06	0.21	316	832	334	4.26	0.00	0.00
27	28	-0.780	-1.142	-0.906	2.000	11124	12919	489	329	55740	1218	1696	N	-445	80.88	81.36	659	0	0.13	Not Reqd	0.00	0.06	0.21	322	882	406	3.93	0.00	0.00
28	28	-0.780	-1.142	-0.905	2.000	11124	12916	489	417	55727	1218	2073	N	-469	80.88	81.36	667	0	0.13	Not Reqd	0.00	0.06	0.21	322	890	406	3.97	0.00	0.00
28	29	-0.757	-1.174	-0.902	2.000	11354	11253	520	395	47496	1434	2108	N	-570	78.61	82.94	710	0	0.13	Not Reqd	0.00	0.06	0.21	328	934	478	3.64	0.00	0.00
29	29	-0.757	-1.174	-0.902	2.000	11354	11250	520	471	47480	1434	2429	N	-594	78.61	82.94	718	0	0.13	Not Reqd	0.00	0.06	0.21	328	942	478	3.68	0.00	0.00
29	30	-0.730	-1.212	-0.898	2.000	11623	9294	551	450	37475	1651	2466	N	-695	75.72	84.78	764	0	0.13	Not Reqd	0.00	0.06	0.21	335	989	550	3.39	0.00	0.00
30	30	-0.730	-1.212	-0.898	2.000	11623	9291	551	514	37457	1651	2718	N	-723	75.72	84.78	773	0	0.13	Not Reqd	0.00	0.06	0.21	335	997	550	3.43	0.00	0.00
30	31	-0.700	-1.252	-0.893	2.000	11939	7040	583	493	25666	1870	2756	N	-824	72.21	86.94	820	0	0.13	Not Reqd	0.00	0.06	0.21	344	1047	623	3.18	0.00	0.00
31	31	-0.700	-1.252	-0.893	2.000	11939	7037	583	541	25646	1870	2927	N	-849	72.21	86.94	828	0	0.13	Not Reqd	0.00	0.06	0.21	344	1055	623	3.22	0.00	0.00
31	32	-0.667	-1.294	-0.887	2.000	12301	4493	615	520	12059	2091	2965	N	-948	68.10	89.42	877	0	0.13	Not Reqd	0.00	0.06	0.25	424	1171	697	3.31	0.00	0.00
32	32	-0.667	-1.294	-0.886	2.000	12301	4489	615	550	12039	2091	3043	N	-977	68.10	89.42	887	0	0.13	Not Reqd	0.00	0.06	0.25	424	1180	697	3.36	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\Segment2\Rating EB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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																									
32	33	-0.632	-1.336	-0.879	2.000	12695	1653	647	528	-3355	2313	3078	N	-1073	64.58	92.12	936	0	0.13	Not Reqd	0.00	0.06	0.25	437	1235	771	3.15	0.00	0.00
33	33	-0.632	-1.336	-0.879	2.000	12695	1650	646	539	-3376	2311	2989	N	-1513	64.58	92.12	1082	0	0.13	Not Reqd	0.00	0.06	0.25	437	1367	770	3.77	0.00	0.00
33	34	-0.617	-1.237	-0.847	2.000	13063	-1476	678	514	-20600	2538	3022	N	-1603	74.11	95.13	1131	0	0.13	Not Reqd	0.00	0.06	0.25	451	1424	846	3.56	0.00	0.00
34	34	-0.617	-1.238	-0.847	2.000	13063	-1480	678	504	-20620	2538	2880	N	-1619	74.11	95.13	1137	0	0.13	Not Reqd	0.00	0.06	0.25	451	1429	846	3.58	0.00	0.00
34	35	-0.594	-1.158	-0.813	2.000	13471	-4896	710	476	-39724	2772	2910	N	-1707	84.64	98.42	1186	0	0.13	Not Reqd	0.00	0.06	0.37	700	1698	924	4.27	0.00	0.00
35	35	-0.594	-1.158	-0.814	2.000	13471	-4899	710	442	-39743	2772	2638	N	-1719	84.64	98.42	1191	0	0.13	Not Reqd	0.00	0.06	0.37	700	1702	924	4.29	0.00	0.00
35	36	-0.510	-1.053	-0.730	2.000	13928	-8607	742	410	-60843	3028	2664	N	-1813	93.92	102.02	1244	0	0.13	Not Reqd	0.00	0.06	0.37	726	1773	1009	4.09	0.00	0.00
36	36	-0.944	-1.403	-1.130	2.000	13928	-8610	742	351	-60861	3028	2246	N	-4071	93.92	102.02	1997	0	0.13	Not Reqd	0.00	0.06	0.37	726	2451	1009	6.83	0.00	0.00
36	37	-1.069	-1.106	-1.084	2.000	14427	-12613	774	313	-84193	3320	2266	N	-4067	112.32	105.89	2020	0	0.13	Not Reqd	0.00	0.06	0.37	753	2496	1107	6.39	0.00	0.00
37	37	-1.068	-1.106	-1.084	2.000	14427	-12615	774	227	-84208	3320	1690	N	-4107	112.32	105.89	2033	0	0.13	Not Reqd	0.00	0.06	0.37	753	2508	1107	6.43	0.00	0.00
37	38	-1.158	-0.953	-1.069	2.000	14960	-16917	805	183	-109957	3621	1704	N	-2467	127.88	115.09	1545	0	0.13	Not Reqd	0.00	0.06	0.37	819	2127	1207	4.43	0.00	0.00
38	38	-1.158	-0.953	-1.069	2.000	14960	-16918	805	68	-109967	3620	952	N	-2506	127.88	115.09	1557	0	0.13	Not Reqd	0.00	0.06	0.37	819	2139	1207	4.47	0.00	0.00
38	39	-1.093	-0.943	-1.025	2.000	15542	-21522	837	16	-138204	3929	959	N	-2209	139.16	125.24	1522	0	0.13	Not Reqd	0.00	0.06	0.37	891	2172	1310	4.09	0.00	0.00
39	39	-1.092	-0.943	-1.025	2.000	15542	-21522	837	-130	-138208	3929	15	N	-2251	139.16	125.24	1536	0	0.13	Not Reqd	0.00	0.06	0.37	891	2185	1310	4.14	0.00	0.00
39	40	-0.994	-0.980	-0.987	2.000	16160	-26432	869	-189	-169001	4246	14	N	-1818	148.99	134.09	1410	162	0.13	Not Reqd	0.00	0.06	0.37	948	2122	1415	3.44	0.00	0.00
40	40	-0.992	-0.979	-0.986	2.000	16160	-26430	869	-365	-168998	4249	-1067	N	-1421	148.99	134.09	1271	303	0.24	Not Reqd	0.00	0.12	0.37	947	1996	1416	3.00	0.00	0.00
40	41	-0.859	-1.113	-0.976	2.000	16896	-31648	901	-434	-202407	4572	-1077	N	-954	157.47	141.72	1109	584	0.44	Not Reqd	0.00	0.22	0.37	991				0.00	0.00
41	41	-0.855	-1.109	-0.972	2.000	16896	-31646	902	-571	-202401	4575	-1867	N	-147	157.47	141.72	827	868	0.65	Not Reqd	0.00	0.33	0.37	989				0.00	0.00
41	42	-0.792	-1.186	-0.974	2.000	16896	-33375	912	-595	-213639	4666	-1872	N	9	157.56	141.80	764	964	0.73	Not Reqd	0.00	0.36	0.37	986				0.00	0.00
42	42	-0.858	-1.084	-0.962	2.000	16896	13218	148	-137	-155441	-3674	-1412	N	9	157.56	141.80	860	501	0.37	Not Reqd	0.00	0.19	0.37	1004				0.00	0.00
42	43	-0.920	-1.004	-0.958	2.000	16896	12844	148	-137	-146131	-3594	-1393	N	205	157.48	141.73	944	387	0.29	Not Reqd	0.00	0.14	0.37	1006				0.00	0.00
43	43	-0.924	-1.008	-0.962	2.000	16896	12845	144	-75	-146123	-3605	-1941	N	1002	157.48	141.73	1223	112	0.13	Not Reqd	0.00	0.06	0.37	1008				0.00	0.00
43	44	-1.055	-0.863	-0.966	2.000	16160	11752	144	-77	-118108	-3310	-1884	N	1512	148.61	133.75	1343	0	0.13	Not Reqd	0.00	0.06	0.37	952	2065	1103	20.98	0.00	0.00
44	44	-1.056	-0.863	-0.967	2.000	16160	11752	143	6	-118092	-3314	-2630	N	1857	148.61	133.75	1458	0	0.13	Not Reqd	0.00	0.06	0.37	952	2169	1105	23.38	0.00	0.00
44	45	-1.147	-0.800	-0.990	2.000	15532	10762	144	0	-92571	-3027	-2577	N	2188	138.35	124.51	1511	0	0.13	Not Reqd	0.00	0.06	0.37	886	2157	1009	24.99	0.00	0.00
45	45	-1.147	-0.800	-0.991	2.000	15532	10762	144	73	-92550	-3027	-3214	N	2143	138.35	124.51	1495	0	0.13	Not Reqd	0.00	0.06	0.37	886	2143	1009	24.67	0.00	0.00
45	46	-1.209	-0.767	-1.015	2.000	14943	9840	145	64	-69222	-2747	-3164	N	2534	127.10	114.39	1562	0	0.13	Not Reqd	0.00	0.06	0.37	814	2139	916	26.29	0.00	0.00
46	46	-1.210	-0.767	-1.015	2.000	14943	9839	145	130	-69197	-2747	-3642	N	2492	127.10	114.39	1548	0	0.13	Not Reqd	0.00	0.06	0.37	814	2126	916	25.99	0.00	0.00
46	47	-1.139	-0.866	-1.023	2.000	14394	8978	147	120	-48007	-2474	-3594	N	3981	111.08	105.89	1991	0	0.13	Not Reqd	0.00	0.06	0.37	753	2470	825	34.54	0.00	0.00
47	47	-1.140	-0.866	-1.023	2.000	14394	8977	147	180	-47980	-2474	-3929	N	3937	111.08	105.89	1977	0	0.13	Not Reqd	0.00	0.06	0.37	753	2457	825	34.22	0.00	0.00
47	48	-1.053	-1.085	-1.066	2.000	13891	8169	150	168	-28876	-2208	-3882	N	3839	92.92	102.02	1920	0	0.13	Not Reqd	0.00	0.06	0.37	726	2381	736	33.94	0.00	0.00
48	48	-1.054	-1.085	-1.066	2.000	13891	8168	150	222	-28847	-2208	-4087	N	3798	92.92	102.02	1906	0	0.13	Not Reqd	0.00	0.06	0.37	726	2369	736	33.65	0.00	0.00
48	49	-0.766	-0.829	-0.791	2.000	13428	7405	153	210	-11662	-1978	-4041	Y	1710	82.67	98.42	1188	0	0.13	0.104	0.00	0.12	0.37	700	1699	719	19.12	-9.25	-3.16
49	49	-0.766	-0.829	-0.791	2.000	13428	7403	153	260	-11632	-1977	-4125	Y	1693	82.67	98.42	1182	0	0.13	0.106	0.00	0.12	0.37	700	1694	720	18.75	-9.44	-3.23
49	50	-0.805	-0.837	-0.817	2.000	13011	6678	157	248	3856	-1768	-4079	Y	1591	60.51	95.13	1127	0	0.13	0.108	0.00	0.12	0.25	451	1421	649	14.80	-9.56	-3.27
50	50	-0.805	-0.836	-0.817	2.000	13011	6676	157	292	3885	-1767	-4060	Y	1568	60.51	95.13	1120	0	0.13	0.108	0.00	0.12	0.25	451	1414	649	14.51	-9.52	-3.25
50	51	-0.842	-0.848	-0.844	2.000	12633	13770	166	-244	25568	-1558	-4538	Y	1479	66.40	92.12	1071	0	0.13	0.124	0.00	0.13	0.25	437	1357	587	14.07	-10.88	-3.72
51	51	-0.842	-0.847	-0.844	2.000	12633	13772	166	-151	25600	-1558	-4369	Y	1463	66.40	92.12	1066	0	0.13	0.119	0.00	0.12	0.25	437	1352	584	14.34	-10.48	-3.58
51	52	-0.875	-0.866	-0.872	2.000	12301	14599	182	-234	39445	-1349	-4394	Y	1373	71.72	89.42	1019	0	0.13	0.123	0.00	0.13	0.25	424	1298	515	13.20	-10.75	-3.68
52	52	-0.875	-0.865	-0.872	2.000	12301	14601	183	-140	39476	-1343	-4235	Y	1003	71.72	89.42	895	0	0.13	0.119	0.00	0.12	0.25	424	1188	510	11.76	-10.37	-3.54
52	53	-0.919	-0.801	-0.878	2.000	11939	15359	200	-218	51674	-1137	-4255	Y	912	76.48	86.94	850	0	0.13	0.123	0.00	0.13	0.25	412	1136	442	10.93	-10.66	-3.64
53	53	-0.919	-0.801	-0.878	2.000	11939	15360	200	-114	51703	-1137	-3910	Y	889	76.48	86.94	842	0	0.13	0.113	0.00	0.12	0.25	412	1129	437	11.13	-9.80	-3.35
53	54	-0.958	-0.744	-0.883	2.000	11623	16036	219	-187	62313	-931	-3925	Y	797	80.70	84.78	798	0	0.13	0.117	0.00	0.12	0.21	335	1020	368	9.61	-10.04	-3.43
54	54	-0.959	-0.744	-0.884	2.000	11623	16037	219	-78	62338	-930	-3508	Y	771	80.70	84.78	789	0	0.13	0.104	0.00	0.12	0.21	335	1012	362	9.78	-8.98	-3.07
54	55	-0.993	-0.694	-0.888	2.000	11354	16614	238	-146	71355	-725	-3518	Y	680	84.36	82.94	730	0	0.13	0.107	0.00	0.12	0.21	326	950	294	9.05	-9.17	-3.13
55	55	-0.993	-0.694	-0.889	2.000	11354	16615	238	-33	71377	-724	-3039	N	657	84.36	82.94	722	0	0.13	Not Reqd	0.00	0.06	0.21	326	943	241	9.83	0.00	0.00
55	56	-1.021	-0.652	-0.893	2.000	11124	17075	259	-96	78792	-518	-3044	N	565	87.46	81.36	664	0	0.13	Not Reqd	0.00	0.06	0.21	318	884	173	9.23	0.00	0.00
56	56	-1.021	-0.652	-0.893	2.000	11124	17075	259	20	78811	-518	-2514	N	543	87.46	81.36	657	0	0.13	Not Reqd	0.00	0.06	0.21	318	878	173	9.16	0.00	0.00
56	57	-1.043	-0.621	-0.896	2.000	10933	17399	282	-38	84611	-312	-2513	N	450	89.97	80.97	610	0	0.13	Not Reqd	0.00	0.06	0.21	316	833	104	8.77	0.00	0.00
57	57	-1.043	-0.621	-0.896	2.000	10933	17398	282	80	84627	-311	-1945	N	425	89.97	80.97	602	0	0.13	Not Reqd	0.00	0.06	0.21	316	826	104	8.69	0.00	0.00
57	58	-1.058	-0.598	-0.898	2.000	10788	17567	305	27	88801	-105	-1939	N	332	91.90	82.71	575	0	0.13	Not Reqd	0.00	0.06	0.21	322	807	35	8.60	0.00	0.00
58	58	-1.058	-0.598	-0.898	2.000	10788	17566	305	147	88812	-104	-1341	N	311	91.90	82.71	568	0	0.13	Not Reqd	0.00	0.06	0.21	322	801	35	8.54	0.00	0.00
58	59	-1.065	-0.586	-0.899	2.000	10683	17560	329	99	91346	103	-1330	N	220	93.24	83.92	544	0	0.13	Not Reqd	0.00	0.06	0.21	326	784	34	7.82	0.00	0.00
59	59	-1.065	-0.586	-0.899	2.000	10683	17559	329	219	91353	103	-714	N	199	93.24	83.92	537	0	0.13	Not Reqd	0.00	0.06	0.21	326	777	34	7.77	0.00	0.00
59	60	-1.064	-0.584	-0.898	2.000	10617	17361	355	176	92234	311	-699	N	112	94.02	84.62	511	0	0.13	Not Reqd	0.00	0.06	0.21	329	756	104	6.51	0.00	0.00
60	60	-1.064	-0.584	-0.898	2.000	10617	17359	355	283	92236	312	-140	N	76	94.02	84.62	498	0	0.13	Not Reqd	0.00	0.06	0.21	329	745	104	6.42	0.00	0.00
60	61	-1.058	-0.588	-0.895	2.000	10617	17044	376	252	91722	481	-124	N	8	94.24	84.81	475	0	0.13	Not Reqd	0.00	0.06	0.21	329	724	160	5.50	0.00	0.00
61	61	-1.058	-0.588	-0.895	2.000	10617	17042	376	357	91721	481	431	N	-27	94.24	84.81	482	0	0.13	Not Reqd	0.00	0.06	0.21	329	730	160	5.54	0.00	0.00
61	62	-1.043	-0.602	-0.890	2.000	10683	16457	403	322	89567	691	454	N	-111	94.02	84.62	510	0	0.13	Not Reqd	0.00	0.06	0.21	329	755	230	4.91	0.00	0.00
62	62	-1.043	-0.602	-0.890	2.000	10683	16454	403	434	89561	691	1058	N	-132	94.02	84.62	518	0	0.13	Not Reqd	0.00	0.06	0.21	329	762	230	4.96	0.00	0.00
62	63	-1.019	-0.628	-0.884	2.000	10788	15641	431	402	85717	902	1084	N	-217	93.24	83.92	546	0	0.13	Not Reqd	0.00	0.06	0.21	327	785	301	4.37	0.00	0.00
63	63	-1.019	-0.628	-0.883	2.000	10788	15638	431	509	85707	902	1662	N	-238	93.24	83.92	553	0	0.13	Not Reqd	0.00	0.06	0.21	327	792	301	4.42	0.00	0.00
63	64	-0.988	-0.663	-0.875	2.000	10933	14574	460	479	80147	1114	1691	N	-325	91.90	82.71	582	0	0.13	Not Reqd	0.00	0.06	0.21	323	814	371	3.89	0.00	0.00

URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[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\Segment2\Rating EB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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																											
64	64	-0.988	-0.663	-0.875	2.000	10933	14570	460	579	80133	1115	2231	N	-349	91.90	82.71	590	0	0.13	Not Reqd	0.00	0.06	0.21	323	822	372	3.94	0.00	0.00
64	65	-0.949	-0.708	-0.865	2.000	11124	13251	489	552	72846	1328	2262	N	-437	89.98	81.36	622	0	0.13	Not Reqd	0.00	0.06	0.21	318	846	443	3.47	0.00	0.00
65	65	-0.949	-0.708	-0.865	2.000	11124	13247	489	642	72829	1328	2752	N	-458	89.98	81.36	629	0	0.13	Not Reqd	0.00	0.06	0.21	318	853	443	3.51	0.00	0.00
65	66	-0.904	-0.762	-0.854	2.000	11354	11663	519	616	63799	1543	2784	N	-544	87.47	82.94	687	0	0.13	Not Reqd	0.00	0.06	0.21	326	912	514	3.30	0.00	0.00
66	66	-0.903	-0.762	-0.854	2.000	11354	11658	519	696	63779	1543	3213	N	-566	87.47	82.94	694	0	0.13	Not Reqd	0.00	0.06	0.21	327	919	514	3.34	0.00	0.00
66	67	-0.851	-0.825	-0.842	2.000	11623	9803	549	671	52993	1760	3246	N	-649	84.37	84.78	748	0	0.13	Not Reqd	0.00	0.06	0.25	402	1036	587	3.45	0.00	0.00
67	67	-0.851	-0.825	-0.842	2.000	11623	9798	549	738	52969	1760	3601	Y	-675	84.37	84.78	757	0	0.13	0.107	0.00	0.12	0.25	402	1043	640	3.08	9.21	3.15
67	68	-0.793	-0.897	-0.829	2.000	11939	7666	580	712	40412	1978	3633	Y	-756	80.71	86.94	798	0	0.13	0.105	0.00	0.12	0.25	412	1089	713	2.84	9.10	3.11
68	68	-0.793	-0.897	-0.829	2.000	11939	7661	580	765	40386	1978	3903	Y	-778	80.71	86.94	805	0	0.13	0.113	0.00	0.12	0.25	412	1096	717	2.85	9.78	3.34
68	69	-0.730	-0.977	-0.816	2.000	12301	5248	611	738	26043	2198	3935	Y	-859	76.51	89.42	847	0	0.13	0.111	0.00	0.12	0.25	424	1144	791	2.65	9.63	3.29
69	69	-0.730	-0.978	-0.816	2.000	12301	5243	611	774	26015	2198	4106	Y	-885	76.51	89.42	856	0	0.13	0.115	0.00	0.12	0.25	424	1152	793	2.67	10.05	3.44
69	70	-0.663	-1.063	-0.803	2.000	12695	2549	642	746	9872	2420	4136	Y	-963	71.75	92.12	899	0	0.13	0.113	0.00	0.12	0.25	437	1202	868	**2.49**	9.88	3.38
70	70	-0.663	-1.064	-0.804	2.000	12695	2544	639	769	9842	2423	4113	Y	-1345	71.75	92.12	1026	0	0.13	0.112	0.00	0.12	0.25	437	1317	869	3.00	9.82	3.36
70	71	-0.610	-1.040	-0.769	2.000	13066	-420	671	739	-8170	2650	4141	Y	-1418	65.73	95.13	1070	0	0.13	0.109	0.00	0.12	0.37	677	1572	944	3.68	9.68	3.31
71	71	-0.610	-1.041	-0.769	2.000	13066	-425	671	736	-8199	2650	4082	Y	-1434	65.73	95.13	1075	0	0.13	0.108	0.00	0.12	0.37	677	1577	944	3.70	9.54	3.26
71	72	-0.553	-1.026	-0.737	2.000	13477	-3679	702	702	-28091	2883	4106	Y	-1504	76.21	98.42	1119	0	0.13	0.105	0.00	0.12	0.37	700	1637	1022	3.52	9.37	3.20
72	72	-0.553	-1.027	-0.737	2.000	13477	-3684	702	677	-28120	2883	3913	N	-1516	76.21	98.42	1123	0	0.13	Not Reqd	0.00	0.06	0.37	700	1641	961	3.90	0.00	0.00
72	73	-0.493	-1.019	-0.706	2.000	13934	-7232	734	639	-49956	3125	3933	N	-1595	87.64	102.02	1168	0	0.13	Not Reqd	0.00	0.06	0.37	725	1704	1042	3.71	0.00	0.00
73	73	-0.493	-1.020	-0.706	2.000	13934	-7236	734	590	-49982	3125	3589	N	-1618	87.64	102.02	1176	0	0.13	Not Reqd	0.00	0.06	0.37	725	1711	1042	3.74	0.00	0.00
73	74	-0.387	-0.987	-0.638	2.000	14431	-11086	765	546	-73888	3388	3604	N	-1697	98.06	105.89	1230	25	0.13	Not Reqd	0.00	0.06	0.37	753	1785	1129	3.57	0.00	0.00
74	74	-0.837	-1.291	-1.027	2.000	14431	-11090	765	471	-73912	3388	3097	N	-3964	98.06	105.89	1986	0	0.13	Not Reqd	0.00	0.06	0.37	753	2465	1129	6.24	0.00	0.00
74	75	-0.926	-1.063	-0.985	2.000	14973	-15248	797	421	-100136	3690	3106	N	-4047	117.46	110.07	2040	0	0.13	Not Reqd	0.00	0.06	0.37	783	2541	1230	5.93	0.00	0.00
75	75	-0.925	-1.063	-0.985	2.000	14973	-15250	797	327	-100154	3690	2481	N	-4093	117.46	110.07	2055	0	0.13	Not Reqd	0.00	0.06	0.37	783	2555	1230	5.99	0.00	0.00
75	76	-1.001	-0.956	-0.981	2.000	15555	-19680	828	270	-128593	3997	2482	N	-2408	134.12	120.71	1560	0	0.13	Not Reqd	0.00	0.06	0.37	859	2177	1332	4.06	0.00	0.00
76	76	-1.001	-0.956	-0.981	2.000	15555	-19681	828	247	-128596	3997	2328	N	-2464	134.12	120.71	1579	0	0.13	Not Reqd	0.00	0.06	0.37	859	2194	1332	4.12	0.00	0.00
76	77	-0.922	-0.975	-0.946	2.000	16176	-24364	859	180	-159128	4307	2319	N	-2091	145.41	130.86	1495	100	0.13	Not Reqd	0.00	0.06	0.37	927	2180	1436	3.60	0.00	0.00
77	77	-0.921	-0.976	-0.946	2.000	16176	-24364	859	180	-159128	4307	2315	N	-2141	145.41	130.86	1513	83	0.13	Not Reqd	0.00	0.06	0.37	928	2196	1436	3.66	0.00	0.00
77	78	-0.821	-1.023	-0.916	2.000	16843	-29351	890	103	-192183	4626	2295	N	-1828	155.75	140.18	1412	301	0.23	Not Reqd	0.00	0.11	0.37	984	2157	1542	3.07	0.00	0.00
78	78	-0.820	-1.022	-0.914	2.000	16843	-29351	891	110	-192183	4625	2346	N	-1465	155.75	140.18	1284	429	0.32	Not Reqd	0.00	0.16	0.37	983	2041	1542	2.68	0.00	0.00
78	79	-0.688	-1.153	-0.906	2.000	17619	-34657	922	30	-227791	4950	2322	N	-1001	164.81	148.33	1130	703	0.51	Not Reqd	0.00	0.25	0.37	1031				0.00	0.00
79	79	-0.684	-1.148	-0.902	2.000	17619	-34657	924	44	-227791	4945	2400	N	-177	164.81	148.33	842	989	0.72	Not Reqd	0.00	0.36	0.37	1028				0.00	0.00
79	80	-0.619	-1.225	-0.904	2.000	17619	-36426	934	18	-239711	5035	2392	N	0	164.93	148.44	767	1098	0.80	Not Reqd	0.00	0.40	0.37	1025				0.00	0.00
80	80	-0.563	-1.315	-0.916	2.000	17619	16608	168	-69	-196802	-3893	-1380	N	0	164.93	148.44	837	605	0.43	Not Reqd	0.00	0.22	0.37	1040				0.00	0.00
80	81	-0.623	-1.240	-0.913	2.000	17619	16192	168	-68	-187165	-3812	-1361	N	139	164.90	148.41	900	512	0.37	Not Reqd	0.00	0.18	0.37	1043				0.00	0.00
81	81	-0.627	-1.245	-0.917	2.000	17619	16192	168	-87	-187165	-3810	-1316	N	960	164.90	148.41	1189	222	0.16	Not Reqd	0.00	0.08	0.37	1046				0.00	0.00
81	82	-0.748	-1.118	-0.922	2.000	16843	14943	169	-3	-158501	-3516	-1175	N	1311	156.24	140.62	1304	0	0.13	Not Reqd	0.00	0.06	0.37	998	2072	1172	17.02	0.00	0.00
82	82	-0.750	-1.119	-0.923	2.000	16843	14943	168	-13	-158501	-3513	-1147	N	1672	156.24	140.62	1432	0	0.13	Not Reqd	0.00	0.06	0.37	999	2188	1171	19.12	0.00	0.00
82	83	-0.850	-1.073	-0.952	2.000	16176	13764	169	-14	-132036	-3225	-1090	N	1905	146.58	131.92	1463	0	0.13	Not Reqd	0.00	0.06	0.37	939	2161	1075	20.27	0.00	0.00
83	83	-0.850	-1.073	-0.952	2.000	16176	13764	169	-13	-132036	-3225	-1091	N	1855	146.58	131.92	1446	0	0.13	Not Reqd	0.00	0.06	0.37	939	2146	1075	20.00	0.00	0.00
83	84	-0.933	-1.042	-0.982	2.000	15555	12649	170	-14	-107723	-2945	-1035	N	1962	136.60	122.94	1425	0	0.13	Not Reqd	0.00	0.06	0.37	875	2070	982	20.19	0.00	0.00
84	84	-0.934	-1.042	-0.982	2.000	15555	12649	170	-13	-107723	-2945	-1036	N	1922	136.60	122.94	1412	0	0.13	Not Reqd	0.00	0.06	0.37	875	2058	982	19.97	0.00	0.00
84	85	-0.884	-1.121	-0.987	2.000	14973	11593	172	-14	-85501	-2672	-980	N	3543	122.22	110.07	1872	0	0.13	Not Reqd	0.00	0.06	0.37	783	2389	891	27.17	0.00	0.00
85	85	-0.884	-1.121	-0.987	2.000	14973	11593	172	-13	-85502	-2673	-980	N	3507	122.22	110.07	1860	0	0.13	Not Reqd	0.00	0.06	0.37	783	2379	891	26.98	0.00	0.00
85	86	-0.819	-1.308	-1.024	2.000	14431	10590	174	-14	-65316	-2407	-924	N	3458	105.30	105.89	1817	0	0.13	Not Reqd	0.00	0.06	0.37	753	2314	802	27.09	0.00	0.00
86	86	-0.819	-1.308	-1.024	2.000	14431	10590	174	-14	-65316	-2407	-925	N	3420	105.30	105.89	1804	0	0.13	Not Reqd	0.00	0.06	0.37	753	2302	802	26.89	0.00	0.00
86	87	-0.571	-1.112	-0.790	2.000	13934	9635	176	-15	-46994	-2179	-869	N	1629	98.21	102.02	1183	0	0.13	Not Reqd	0.00	0.06	0.37	726	1718	726	17.89	0.00	0.00
87	87	-0.571	-1.112	-0.790	2.000	13934	9635	176	-15	-46994	-2179	-870	N	1604	98.21	102.02	1175	0	0.13	Not Reqd	0.00	0.06	0.37	726	1711	726	17.76	0.00	0.00
87	88	-0.614	-1.136	-0.816	2.000	13477	8720	179	-16	-30315	-1971	-815	N	1562	87.67	98.42	1138	0	0.13	Not Reqd	0.00	0.06	0.37	700	1655	657	17.71	0.00	0.00
88	88	-0.614	-1.136	-0.816	2.000	13477	8720	179	-16	-30315	-1971	-815	N	1549	87.67	98.42	1134	0	0.13	Not Reqd	0.00	0.06	0.37	700	1651	657	17.64	0.00	0.00
88	89	-0.661	-1.158	-0.845	2.000	13066	7840	183	-18	-15171	-1770	-759	N	1385	78.39	95.13	1059	0	0.13	Not Reqd	0.00	0.06	0.25	451	1359	590	13.63	0.00	0.00
89	89	-0.661	-1.157	-0.845	2.000	13066	7840	183	-17	-15171	-1771	-760	N	1368	78.39	95.13	1053	0	0.13	Not Reqd	0.00	0.06	0.25	451	1354	590	13.55	0.00	0.00
89	90	-0.705	-1.187	-0.874	2.000	12695	6988	187	-19	-1514	-1576	-705	N	1327	69.92	92.12	1020	0	0.13	Not Reqd	0.00	0.06	0.25	437	1311	525	13.64	0.00	0.00
90	90	-0.704	-1.187	-0.874	2.000	12695	6988	187	-8	-1514	-1578	-725	N	909	69.92	92.12	881	0	0.13	Not Reqd	0.00	0.06	0.25	437	1186	526	11.61	0.00	0.00
90	91	-0.763	-1.095	-0.879	2.000	12301	16672	198	-63	21214	-1380	-722	N	868	62.10	89.42	850	0	0.13	Not Reqd	0.00	0.06	0.25	424	1147	460	11.40	0.00	0.00
91	91	-0.763	-1.095	-0.879	2.000	12301	16672	198	-62	21214	-1381	-723	N	840	62.10	89.42	841	0	0.13	Not Reqd	0.00	0.06	0.25	424	1139	460	11.28	0.00	0.00
91	92	-0.818	-1.011	-0.885	2.000	11939	17327	215	-66	33467	-1180	-670	N	677	65.83	86.94	771	0	0.13	Not Reqd	0.00	0.06	0.21	344	1003	393	9.53	0.00	0.00
92	92	-0.818	-1.011	-0.885	2.000	11939	17327	215	-66	33467	-1180	-671	N	653	65.83	86.94	763	0	0.13	Not Reqd	0.00	0.06	0.21	344	996	393	9.43	0.00	0.00
92	93	-0.877	-0.916	-0.891	2.000	11623	17915	232	-69	44221	-979	-618	N	613	68.64	84.78	736	0	0.13	Not Reqd	0.00	0.06	0.21	335	964	326	9.24	0.00	0.00
93	93	-0.877	-0.917	-0.891	2.000	11623	17915	232	-69	44221	-980	-619	N	586	68.64	84.78	727	0	0.13	Not Reqd	0.00	0.06	0.21	335	956	327	9.14	0.00	0.00
93	94	-0.929	-0.836	-0.897	2.000	11354	18416	251	-72	53469	-779	-565	N	546	71.20	82.94	702	0	0.13	Not Reqd	0.00	0.06	0.21	328	927	260	8.98	0.00	0.00
94	94	-0.929	-0.836	-0.897	2.000	11354	18416	251	-72	53469	-779	-567	N	523	71.20	82.94	695	0	0.13	Not Reqd	0.00	0.06	0.21	328	920	260	8.90	0.00	0.00
94	95	-0.970	-0.773	-0.901	2.000	11124	18814	271	-75	61200	-579	-512	N	483	73.53	81.36	671	0	0.13	Not Reqd	0.00	0.06	0.21	322	894	193	8.76	0.00	0.00
95	95	-0.970	-0.774	-0.901	2.000	11124	18814	271	-75	61200	-579	-513	N	460	73.53	81.36	664	0	0.13	Not Reqd	0.00	0.06	0.21	322	887	193	8.68	0.00	0.00

URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[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\Segment2\Rating EB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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																									
95	96	-1.004	-0.721	-0.906	2.000	10933	19088	292	-77	67402	-378	-459	N	309	75.36	80.06	595	0	0.13	Not Reqd	0.00	0.06	0.21	316	819	126	8.12	0.00	0.00
96	96	-1.004	-0.721	-0.906	2.000	10933	19088	292	-77	67402	-378	-460	N	282	75.36	80.06	586	0	0.13	Not Reqd	0.00	0.06	0.21	315	811	126	8.03	0.00	0.00
96	97	-1.034	-0.674	-0.909	2.000	10788	19219	315	-79	72062	-177	-405	N	254	76.55	79.07	558	0	0.13	Not Reqd	0.00	0.06	0.21	311	782	59	7.90	0.00	0.00
97	97	-1.034	-0.674	-0.909	2.000	10788	19219	315	-79	72062	-177	-405	N	232	76.55	79.07	551	0	0.13	Not Reqd	0.00	0.06	0.21	311	776	59	7.84	0.00	0.00
97	98	-1.052	-0.647	-0.911	2.000	10683	19187	338	-81	75166	25	-350	N	178	77.48	78.35	520	0	0.13	Not Reqd	0.00	0.06	0.21	307	744	8	7.53	0.00	0.00
98	98	-1.052	-0.647	-0.911	2.000	10683	19187	338	-81	75166	25	-351	N	156	77.48	78.35	513	0	0.13	Not Reqd	0.00	0.06	0.21	307	738	8	7.47	0.00	0.00
98	99	-1.059	-0.635	-0.912	2.000	10617	18976	363	-82	76699	228	-295	N	76	77.99	77.90	479	0	0.13	Not Reqd	0.00	0.06	0.21	305	706	76	6.21	0.00	0.00
99	99	-1.059	-0.635	-0.912	2.000	10617	18976	363	-82	76699	228	-296	N	39	77.99	77.90	467	0	0.13	Not Reqd	0.00	0.06	0.21	305	694	76	6.12	0.00	0.00
99	100	-1.060	-0.629	-0.910	2.000	10617	18656	383	-82	76775	393	-250	N	-39	77.99	77.90	464	0	0.13	Not Reqd	0.00	0.06	0.21	304	692	131	5.39	0.00	0.00
100	100	-1.060	-0.629	-0.910	2.000	10617	18656	383	-82	76775	393	-251	N	-76	77.99	77.90	477	0	0.13	Not Reqd	0.00	0.06	0.21	304	703	131	5.48	0.00	0.00
100	101	-1.055	-0.629	-0.907	2.000	10683	18076	409	-83	75426	597	-194	N	-154	77.48	78.35	508	0	0.13	Not Reqd	0.00	0.06	0.21	306	733	199	4.91	0.00	0.00
101	101	-1.055	-0.629	-0.907	2.000	10683	18076	409	-83	75426	597	-195	N	-176	77.48	78.35	515	0	0.13	Not Reqd	0.00	0.06	0.21	306	739	199	4.96	0.00	0.00
101	102	-1.040	-0.646	-0.903	2.000	10788	17273	436	-83	72465	802	-138	N	-229	76.55	79.07	542	0	0.13	Not Reqd	0.00	0.06	0.21	310	767	267	4.43	0.00	0.00
102	102	-1.040	-0.646	-0.903	2.000	10788	17273	436	-83	72465	802	-139	N	-251	76.55	79.07	550	0	0.13	Not Reqd	0.00	0.06	0.21	310	774	267	4.48	0.00	0.00
102	103	-1.011	-0.683	-0.897	2.000	10933	16229	464	-82	67868	1009	-81	N	-277	75.36	80.06	573	0	0.13	Not Reqd	0.00	0.06	0.21	315	799	336	3.99	0.00	0.00
103	103	-1.011	-0.682	-0.897	2.000	10933	16229	464	-82	67868	1009	-82	N	-303	75.36	80.06	582	0	0.13	Not Reqd	0.00	0.06	0.21	315	807	336	4.04	0.00	0.00
103	104	-0.978	-0.724	-0.890	2.000	11124	14936	493	-81	61622	1217	-24	N	-450	73.53	81.36	654	0	0.13	Not Reqd	0.00	0.06	0.21	321	877	406	3.87	0.00	0.00
104	104	-0.978	-0.724	-0.890	2.000	11124	14936	493	-81	61622	1217	-24	N	-472	73.53	81.36	662	0	0.13	Not Reqd	0.00	0.06	0.21	321	884	406	3.92	0.00	0.00
104	105	-0.937	-0.777	-0.882	2.000	11354	13382	522	-80	53712	1427	34	N	-509	71.20	82.94	690	0	0.13	Not Reqd	0.00	0.06	0.21	328	916	476	3.53	0.00	0.00
105	105	-0.937	-0.777	-0.882	2.000	11354	13382	522	-80	53712	1427	33	N	-531	71.20	82.94	697	0	0.13	Not Reqd	0.00	0.06	0.21	328	923	476	3.57	0.00	0.00
105	106	-0.885	-0.848	-0.872	2.000	11623	11560	551	-79	44121	1638	91	N	-567	68.64	84.78	721	0	0.13	Not Reqd	0.00	0.06	0.21	335	951	546	3.20	0.00	0.00
106	106	-0.885	-0.848	-0.872	2.000	11623	11560	551	-79	44121	1638	91	N	-594	68.64	84.78	730	0	0.13	Not Reqd	0.00	0.06	0.21	335	959	546	3.25	0.00	0.00
106	107	-0.823	-0.933	-0.861	2.000	11939	9463	581	-77	32833	1850	149	N	-630	65.83	86.94	756	0	0.13	Not Reqd	0.00	0.06	0.21	344	989	617	2.92	0.00	0.00
107	107	-0.823	-0.933	-0.861	2.000	11939	9463	581	-77	32833	1850	149	N	-653	65.83	86.94	763	0	0.13	Not Reqd	0.00	0.06	0.21	344	996	617	2.96	0.00	0.00
107	108	-0.764	-1.011	-0.850	2.000	12301	7087	611	-76	19835	2065	208	N	-807	62.10	89.42	830	0	0.13	Not Reqd	0.00	0.06	0.25	424	1129	688	3.16	0.00	0.00
108	108	-0.764	-1.011	-0.850	2.000	12301	7087	611	-76	19835	2065	207	N	-834	62.10	89.42	839	0	0.13	Not Reqd	0.00	0.06	0.25	424	1137	688	3.20	0.00	0.00
108	109	-0.699	-1.098	-0.839	2.000	12695	4428	642	-74	5110	2281	266	N	-869	58.05	92.12	868	0	0.13	Not Reqd	0.00	0.06	0.25	437	1174	760	2.94	0.00	0.00
109	109	-0.699	-1.099	-0.840	2.000	12695	4428	641	-74	5110	2279	256	N	-1268	58.05	92.12	1001	0	0.13	Not Reqd	0.00	0.06	0.25	437	1294	760	3.50	0.00	0.00
109	110	-0.646	-1.075	-0.805	2.000	13066	1482	672	-71	-11370	2500	316	N	-1302	78.40	95.13	1031	0	0.13	Not Reqd	0.00	0.06	0.25	451	1334	833	3.24	0.00	0.00
110	110	-0.646	-1.075	-0.805	2.000	13066	1482	672	-71	-11370	2500	316	N	-1318	78.40	95.13	1036	0	0.13	Not Reqd	0.00	0.06	0.25	451	1339	833	3.26	0.00	0.00
110	111	-0.587	-1.062	-0.771	2.000	13477	-1755	702	-69	-29654	2728	375	N	-1468	87.67	98.42	1107	0	0.13	Not Reqd	0.00	0.06	0.37	700	1627	909	4.06	0.00	0.00
111	111	-0.587	-1.062	-0.771	2.000	13477	-1755	702	-69	-29654	2728	375	N	-1481	87.67	98.42	1111	0	0.13	Not Reqd	0.00	0.06	0.37	700	1630	909	4.08	0.00	0.00
111	112	-0.531	-1.048	-0.740	2.000	13934	-5289	733	-67	-49806	2963	434	N	-1514	98.22	102.02	1144	0	0.13	Not Reqd	0.00	0.06	0.37	726	1683	988	3.84	0.00	0.00
112	112	-0.531	-1.048	-0.740	2.000	13934	-5289	733	-67	-49806	2963	434	N	-1538	98.22	102.02	1152	0	0.13	Not Reqd	0.00	0.06	0.37	726	1690	988	3.87	0.00	0.00
112	113	-0.832	-1.300	-1.028	2.000	14431	-9127	764	-64	-71943	3220	494	N	-3840	104.27	105.89	1945	0	0.13	Not Reqd	0.00	0.06	0.37	753	2428	1073	6.32	0.00	0.00
113	113	-0.832	-1.300	-1.028	2.000	14431	-9127	764	-64	-71943	3220	494	N	-3880	104.27	105.89	1958	0	0.13	Not Reqd	0.00	0.06	0.37	753	2440	1073	6.37	0.00	0.00
113	114	-0.901	-1.085	-0.981	2.000	14973	-13274	795	-62	-96303	3514	554	N	-3919	122.47	110.22	1998	0	0.13	Not Reqd	0.00	0.06	0.37	784	2504	1171	6.03	0.00	0.00
114	114	-0.901	-1.085	-0.981	2.000	14973	-13274	795	-62	-96303	3514	554	N	-3956	122.47	110.22	2010	0	0.13	Not Reqd	0.00	0.06	0.37	784	2515	1171	6.07	0.00	0.00
114	115	-0.956	-1.000	-0.976	2.000	15555	-17738	826	-59	-123068	3817	614	N	-1901	137.38	123.65	1409	4	0.13	Not Reqd	0.00	0.06	0.37	880	2060	1272	3.86	0.00	0.00
115	115	-0.956	-1.000	-0.975	2.000	15555	-17738	826	-59	-123068	3816	615	N	-1942	137.38	123.65	1423	0	0.13	Not Reqd	0.00	0.06	0.37	880	2073	1272	3.91	0.00	0.00
115	116	-0.860	-1.040	-0.943	2.000	16176	-22526	858	-57	-152308	4127	674	N	-1836	147.02	132.32	1433	96	0.13	Not Reqd	0.00	0.06	0.37	940	2135	1376	3.66	0.00	0.00
116	116	-0.859	-1.041	-0.942	2.000	16176	-22526	858	-57	-152308	4127	675	N	-1887	147.02	132.32	1451	77	0.13	Not Reqd	0.00	0.06	0.37	940	2152	1376	3.72	0.00	0.00
116	117	-0.754	-1.093	-0.913	2.000	16843	-27642	889	-54	-184091	4446	735	N	-1669	156.32	140.69	1376	271	0.20	Not Reqd	0.00	0.10	0.37	990	2130	1482	3.19	0.00	0.00
117	117	-0.752	-1.092	-0.912	2.000	16843	-27642	890	-51	-184091	4449	753	N	-1297	156.32	140.69	1245	403	0.30	Not Reqd	0.00	0.15	0.37	989	2011	1483	2.78	0.00	0.00
117	118	-0.624	-1.221	-0.905	2.000	17619	-33093	921	-49	-218479	4774	812	N	-969	164.85	148.36	1134	634	0.46	Not Reqd	0.00	0.23	0.37	1034				0.00	0.00
118	118	-0.620	-1.217	-0.900	2.000	17619	-33093	922	-47	-218478	4778	825	N	-127	164.85	148.36	840	930	0.67	Not Reqd	0.00	0.34	0.37	1032				0.00	0.00
118	119	-0.558	-1.292	-0.903	2.000	17619	-34910	932	-46	-230035	4868	845	N	0	164.93	148.44	781	1022	0.74	Not Reqd	0.00	0.37	0.37	1029				0.00	0.00
119	119	-0.558	-1.292	-0.903	2.000	17619	9361	39	7	-185765	-4136	-1152	N	0	164.93	148.44	848	684	0.49	Not Reqd	0.00	0.24	0.37	1042				0.00	0.00
119	120	-0.621	-1.213	-0.899	2.000	17619	9270	39	8	-175520	-4056	-1133	N	98	164.93	148.44	898	604	0.43	Not Reqd	0.00	0.22	0.37	1045				0.00	0.00
120	120	-0.626	-1.218	-0.904	2.000	17619	9270	39	8	-175520	-4053	-1123	N	939	164.93	148.44	1194	306	0.22	Not Reqd	0.00	0.11	0.37	1048				0.00	0.00
120	121	-0.760	-1.076	-0.908	2.000	16843	9040	39	11	-144953	-3759	-1062	N	1357	156.44	140.80	1336	57	0.13	Not Reqd	0.00	0.06	0.37	1002	2104	1253	66.70	0.00	0.00
121	121	-0.762	-1.077	-0.910	2.000	16843	9040	39	10	-144953	-3756	-1048	N	1726	156.44	140.80	1459	0	0.13	Not Reqd	0.00	0.06	0.37	1002	2215	1252	75.41	0.00	0.00
121	122	-0.861	-1.025	-0.936	2.000	16176	8887	39	15	-116576	-3468	-987	N	2309	146.13	131.52	1595	0	0.13	Not Reqd	0.00	0.06	0.37	936	2278	1156	86.19	0.00	0.00
122	122	-0.861	-1.025	-0.936	2.000	16176	8887	39	15	-116576	-3468	-986	N	2258	146.13	131.52	1578	0	0.13	Not Reqd	0.00	0.06	0.37	936	2262	1156	85.03	0.00	0.00
122	123	-0.921	-1.019	-0.964	2.000	15555	8808	41	20	-90341	-3188	-924	N	2537	133.87	120.48	1602	0	0.13	Not Reqd	0.00	0.06	0.37	857	2213	1063	86.12	0.00	0.00
123	123	-0.921	-1.019	-0.965	2.000	15555	8808	41	20	-90341	-3188	-923	N	2496	133.87	120.48	1588	0	0.13	Not Reqd	0.00	0.06	0.37	857	2201	1063	85.21	0.00	0.00
123	124	-0.872	-1.112	-0.976	2.000	14973	9835	47	127	-65149	-2911	-758	N	3847	117.97	110.07	1973	0	0.13	Not Reqd	0.00	0.06	0.37	783	2481	970	97.46	0.00	0.00
124	124	-0.872	-1.113	-0.976	2.000	14973	9835	47	127	-65149	-2911	-758	N	3810	117.97	110.07	1961	0	0.13	Not Reqd	0.00	0.06	0.37	783	2470	970	96.72	0.00	0.00
124	125	-0.805	-1.304	-1.014	2.000	14431	11419	57	152	-41490	-2638	-675	N	3697	100.16	105.89	1897	0	0.13	Not Reqd	0.00	0.06	0.37	753	2385	879	80.73	0.00	0.00
125	125	-0.805	-1.305	-1.015	2.000	14431	11419	57	152	-41490	-2638	-675	N	3658	100.16	105.89	1884	0	0.13	Not Reqd	0.00	0.06	0.37	753	2373	879	80.10	0.00	0.00
125	126	-0.551	-1.105	-0.775	2.000	13934	13008	67	181	-19736	-2401	-590	N	1787	90.29	102.02	1236	0	0.13	Not Reqd	0.00	0.06	0.25	484	1548	800	34.39	0.00	0.00
126	126	-0.551	-1.105	-0.775	2.000	13934	13008	67	181	-19736	-2402	-589	N	1762	90.29	102.02	1227	0	0.13	Not Reqd	0.00	0.06	0.25	484	1540	801	34.04	0.00	0.00
126	127	-0.597	-1.118	-0.800	2.000	13477	14594	79	213	332	-2186	-500	N	1692	57.67	98.42	1181	0	0.13	Not Reqd	0.00	0.06	0.25	467	1483	729	29.84	0.00	0.00

URS

FILE: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[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\Segment2\Rating EB\[Forces.xls]
Props&Reinf Worksheet: V:\Projects\Cline Avenue\Load Rating Analysis\Revised LL Long Rating\Orig Ab with increased Vc AASHTO\Segment2\Rating EB\[Props&Reinf.xls]

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09
DESCRIPTION: **Ultimate Shear Check** CHECKED BY: DATE:

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

Material Properties:

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

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

Reinforcement
fy = ***60.0*** ksi

Box Girder Properties:

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

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

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

Calc All RF

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Maximum LL Shear @ t=00																									
127	127	-0.597	-1.118	-0.799	2.000	13477	14594	79	213	332	-2186	-500	N	1678	57.67	98.42	1177	0	0.13	Not Reqd	0.00	0.06	0.25	467	1479	729	29.69	0.00	0.00
127	128	-0.640	-1.133	-0.823	2.000	13066	16170	91	249	18819	-1976	-407	N	1598	63.55	95.13	1130	0	0.13	Not Reqd	0.00	0.06	0.25	451	1423	659	26.25	0.00	0.00
128	128	-0.640	-1.133	-0.823	2.000	13066	16170	91	249	18819	-1976	-407	N	1581	63.55	95.13	1124	0	0.13	Not Reqd	0.00	0.06	0.25	451	1418	659	26.07	0.00	0.00
128	129	-0.681	-1.144	-0.844	2.000	12695	17725	104	291	35773	-1772	-308	N	1492	68.86	92.12	1075	0	0.13	Not Reqd	0.00	0.06	0.21	364	1295	591	21.30	0.00	0.00
129	129	-0.681	-1.143	-0.843	2.000	12695	17725	104	294	35773	-1774	-302	N	1068	68.86	92.12	934	0	0.13	Not Reqd	0.00	0.06	0.21	364	1168	591	17.61	0.00	0.00
129	130	-0.745	-1.026	-0.843	2.000	12301	19249	119	343	51227	-1574	-197	N	977	73.68	89.42	887	0	0.13	Not Reqd	0.00	0.06	0.21	353	1116	525	15.97	0.00	0.00
130	130	-0.745	-1.027	-0.843	2.000	12301	19249	119	343	51227	-1574	-196	N	949	73.68	89.42	877	0	0.13	Not Reqd	0.00	0.06	0.21	353	1108	525	15.75	0.00	0.00
130	131	-0.809	-0.906	-0.843	2.000	11939	20727	134	397	65192	-1374	-85	N	862	77.92	86.94	827	0	0.13	Not Reqd	0.00	0.06	0.21	343	1054	458	14.32	0.00	0.00
131	131	-0.809	-0.906	-0.843	2.000	11939	20727	134	397	65192	-1374	-85	N	838	77.92	86.94	819	0	0.13	Not Reqd	0.00	0.06	0.21	343	1046	458	14.14	0.00	0.00
131	132	-0.872	-0.786	-0.842	2.000	11623	22142	151	457	77661	-1174	31	N	755	81.68	84.78	750	0	0.13	Not Reqd	0.00	0.06	0.21	332	974	391	12.58	0.00	0.00
132	132	-0.872	-0.787	-0.842	2.000	11623	22142	151	457	77661	-1174	32	N	728	81.68	84.78	741	0	0.13	Not Reqd	0.00	0.06	0.21	332	966	391	12.41	0.00	0.00
132	133	-0.931	-0.670	-0.840	2.000	11354	23471	169	521	88624	-975	153	N	648	84.96	82.94	681	0	0.13	Not Reqd	0.00	0.06	0.21	322	903	325	11.26	0.00	0.00
133	133	-0.931	-0.671	-0.841	2.000	11354	23471	169	521	88624	-975	154	N	624	84.96	82.94	673	0	0.13	Not Reqd	0.00	0.06	0.21	322	895	325	11.13	0.00	0.00
133	134	-0.986	-0.562	-0.839	2.000	11124	24691	188	590	98065	-775	280	N	543	87.75	81.36	618	0	0.13	Not Reqd	0.00	0.06	0.21	314	839	258	10.26	0.00	0.00
134	134	-0.986	-0.563	-0.839	2.000	11124	24691	188	590	98065	-775	280	N	521	87.75	81.36	611	0	0.13	Not Reqd	0.00	0.06	0.21	314	832	258	10.14	0.00	0.00
134	135	-1.035	-0.465	-0.837	2.000	10933	25775	209	664	105965	-575	411	N	439	90.04	81.04	569	0	0.13	Not Reqd	0.00	0.06	0.21	312	793	192	9.62	0.00	0.00
135	135	-1.035	-0.466	-0.838	2.000	10933	25775	209	664	105965	-575	412	N	412	90.04	81.04	560	0	0.13	Not Reqd	0.00	0.06	0.21	312	784	192	9.51	0.00	0.00
135	136	-1.077	-0.382	-0.836	2.000	10788	26695	231	742	112302	-374	546	N	330	91.84	82.65	535	0	0.13	Not Reqd	0.00	0.06	0.21	317	767	125	9.34	0.00	0.00
136	136	-1.077	-0.382	-0.836	2.000	10788	26695	231	742	112302	-374	547	N	307	91.84	82.65	528	0	0.13	Not Reqd	0.00	0.06	0.21	317	760	125	9.25	0.00	0.00
136	137	-1.110	-0.315	-0.834	2.000	10683	27420	255	824	117051	-172	686	N	222	93.11	83.80	501	0	0.13	Not Reqd	0.00	0.06	0.21	321	739	57	9.03	0.00	0.00
137	137	-1.110	-0.315	-0.834	2.000	10683	27420	255	824	117051	-172	687	N	200	93.11	83.80	494	0	0.13	Not Reqd	0.00	0.06	0.21	321	733	57	8.96	0.00	0.00
137	138	-1.134	-0.265	-0.833	2.000	10617	27919	280	910	120182	31	830	N	114	93.86	84.48	464	0	0.13	Not Reqd	0.00	0.06	0.21	323	708	10	8.49	0.00	0.00
138	138	-1.134	-0.266	-0.833	2.000	10617	27919	280	910	120182	31	831	N	77	93.86	84.48	452	0	0.13	Not Reqd	0.00	0.06	0.21	323	698	10	8.38	0.00	0.00
138	139	-1.148	-0.236	-0.832	2.000	10617	28159	306	1000	121667	235	978	N	1	94.09	84.68	424	0	0.13	Not Reqd	0.00	0.06	0.21	323	673	78	6.83	0.00	0.00
139	139	-1.148	-0.236	-0.832	2.000	10617	28159	306	1000	121667	235	979	N	-44	94.09	84.68	439	0	0.13	Not Reqd	0.00	0.06	0.21	323	686	78	6.96	0.00	0.00
139	140	-1.150	-0.228	-0.830	2.000	10683	28139	328	1075	121636	402	1100	N	-110	93.93	84.53	459	0	0.13	Not Reqd	0.00	0.06	0.21	323	703	134	6.20	0.00	0.00
140	140	-1.150	-0.228	-0.830	2.000	10683	28139	328	1075	121636	402	1100	N	-123	93.93	84.53	463	0	0.13	Not Reqd	0.00	0.06	0.21	323	707	134	6.24	0.00	0.00
140	141	-1.144	-0.236	-0.829	2.000	10788	27824	357	1170	120051	609	1252	N	-202	93.27	83.94	486	0	0.13	Not Reqd	0.00	0.06	0.21	320	726	203	5.39	0.00	0.00
141	141	-1.144	-0.236	-0.829	2.000	10788	27824	357	1170	120051	609	1253	N	-224	93.27	83.94	494	0	0.13	Not Reqd	0.00	0.06	0.21	320	733	203	5.45	0.00	0.00
141	142	-1.127	-0.263	-0.827	2.000	10933	27157	387	1267	116719	818	1406	N	-301	92.12	82.91	515	0	0.13	Not Reqd	0.00	0.06	0.25	380	806	273	5.13	0.00	0.00
142	142	-1.127	-0.263	-0.827	2.000	10933	27157	387	1267	116719	818	1407	N	-327	92.12	82.91	524	0	0.13	Not Reqd	0.00	0.06	0.25	380	814	273	5.19	0.00	0.00
142	143	-1.100	-0.307	-0.824	2.000	11124	26101	419	1365	111600	1029	1562	N	-404	90.49	81.44	546	0	0.13	Not Reqd	0.00	0.06	0.25	374	827	343	4.47	0.00	0.00
143	143	-1.100	-0.306	-0.824	2.000	11124	26101	419	1365	111600	1029	1563	N	-426	90.49	81.44	553	0	0.13	Not Reqd	0.00	0.06	0.25	374	834	343	4.52	0.00	0.00
143	144	-1.065	-0.364	-0.821	2.000	11354	24624	452	1464	104655	1243	1719	N	-505	88.35	82.94	600	0	0.13	Not Reqd	0.00	0.06	0.25	382	884	414	4.12	0.00	0.00
144	144	-1.065	-0.364	-0.821	2.000	11354	24624	452	1464	104655	1243	1720	N	-527	88.35	82.94	607	0	0.13	Not Reqd	0.00	0.06	0.25	382	891	414	4.17	0.00	0.00
144	145	-1.022	-0.433	-0.817	2.000	11623	22695	486	1565	95844	1458	1877	N	-607	85.70	84.78	660	0	0.13	Not Reqd	0.00	0.06	0.25	393	948	486	3.86	0.00	0.00
145	145	-1.022	-0.433	-0.817	2.000	11623	22695	486	1565	95844	1458	1877	N	-634	85.70	84.78	670	0	0.13	Not Reqd	0.00	0.06	0.25	393	957	486	3.91	0.00	0.00
145	146	-0.974	-0.511	-0.812	2.000	11939	20281	521	1665	85127	1676	2035	N	-712	82.52	86.94	728	0	0.13	Not Reqd	0.00	0.06	0.25	406	1021	559	3.66	0.00	0.00
146	146	-0.974	-0.511	-0.812	2.000	11939	20281	521	1665	85127	1676	2035	N	-735	82.52	86.94	737	0	0.13	Not Reqd	0.00	0.06	0.25	406	1028	559	3.70	0.00	0.00
146	147	-0.920	-0.596	-0.807	2.000	12301	17353	557	1766	72465	1897	2193	N	-808	78.88	89.42	802	0	0.13	Not Reqd	0.00	0.06	0.25	421	1100	632	3.52	0.00	0.00
147	147	-0.920	-0.596	-0.807	2.000	12301	17352	557	1766	72465	1897	2193	N	-836	78.88	89.42	811	0	0.13	Not Reqd	0.00	0.06	0.25	421	1109	632	3.57	0.00	0.00
147	148	-0.862	-0.686	-0.800	2.000	12695	13882	595	1866	57816	2121	2351	N	-906	74.76	92.12	880	0	0.13	Not Reqd	0.00	0.06	0.25	437	1185	707	3.41	0.00	0.00
148	148	-0.862	-0.687	-0.800	2.000	12695	13881	595	1867	57815	2119	2358	N	-1307	74.76	92.12	1014	0	0.13	Not Reqd	0.00	0.06	0.25	437	1306	706	4.02	0.00	0.00
148	149	-0.815	-0.704	-0.774	2.000	13066	9840	633	1966	41128	2348	2514	N	-1404	70.03	95.13	1065	0	0.13	Not Reqd	0.00	0.06	0.25	451	1365	783	3.76	0.00	0.00
149	149	-0.815	-0.704	-0.774	2.000	13066	9840	633	1966	41128	2348	2514	N	-1421	70.03	95.13	1070	0	0.13	Not Reqd	0.00	0.06	0.25	451	1370	783	3.78	0.00	0.00
149	150	-0.766	-0.716	-0.746	2.000	13477	5201	673	2063	22331	2585	2668	N	-1484	64.69	98.42	1112	0	0.13	Not Reqd	0.00	0.06	0.25	467	1421	862	3.49	0.00	0.00
150	150	-0.766	-0.716	-0.747	2.000	13477	5201	673	2063	22331	2585	2667	N	-1497	64.69	98.42	1116	0	0.13	Not Reqd	0.00	0.06	0.25	467	1425	862	3.51	0.00	0.00
150	151	-0.695	-0.757	-0.719	2.000	14003	-60	714	2157	-271	3243	2819	N	-1516	84.78	102.02	1146	56	0.13	Not Reqd	0.00	0.06	0.25	484				0.00	0.00

2.49

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Minimum LL Shear @ t=00																									
1	1	-0.833	-0.786	-0.813	2.000	13852	-22	-284	8897	-27	1964	11462	Y	-2574	83.23	102.02	1498	0	0.13	0.286	0.00	0.21	0.53	1030				25.62	8.76
1	2	-0.816	-0.743	-0.785	2.000	14417	1909	-241	7466	-18609	2639	10089	Y	-2548	101.41	105.89	1514	0	0.13	0.242	0.00	0.19	0.53	1069	2325	1029	7.80	21.88	7.48
2	2	-0.816	-0.744	-0.785	2.000	14417	1858	-241	7478	-18678	2639	9962	Y	-2578	101.41	105.89	1524	0	0.13	0.239	0.00	0.18	0.53	1069	2334	1027	7.85	21.60	7.39
2	3	-0.765	-0.746	-0.757	2.000	14960	3245	-206	5352	-41234	2900	7894	Y	-2486	117.61	110.07	1519	0	0.13	0.182	0.00	0.16	0.53	1112	2368	1083	9.70	16.65	5.69
3	3	-0.765	-0.746	-0.757	2.000	14960	3208	-206	5373	-41286	2900	7613	Y	-2514	117.61	110.07	1529	0	0.13	0.176	0.00	0.15	0.53	1112	2376	1079	9.77	16.06	5.49
3	4	-0.699	-0.775	-0.733	2.000	15542	4689	-198	4489	-65592	3142	6787	Y	-2276	133.19	119.87	1475	0	0.13	0.151	0.00	0.14	0.53	1202	2410	1148	10.53	13.92	4.76
4	4	-0.698	-0.775	-0.733	2.000	15542	4659	-198	4520	-65637	3142	6341	Y	-2306	133.19	119.87	1486	0	0.13	0.141	0.00	0.14	0.53	1203	2419	1141	10.62	13.01	4.45
4	5	-0.612	-0.836	-0.715	2.000	16160	6137	-195	4459	-91856	3388	6338	Y	-1843	146.74	132.07	1354	0	0.13	0.135	0.00	0.13	0.53	1312	2399	1223	9.99	12.64	4.32
5	5	-0.610	-0.836	-0.714	2.000	16160	6107	-195	4504	-91897	3391	5725	Y	-1568	146.74	132.07	1257	0	0.13	0.122	0.00	0.13	0.53	1310	2311	1215	9.33	11.41	3.90
5	6	-0.491	-0.987	-0.720	2.000	16896	7603	-193	4480	-120025	3641	5760	Y	-867	157.30	141.57	1032	317	0.24	0.118	0.00	0.18	0.53	1392				11.12	3.80
6	6	-0.486	-0.983	-0.716	2.000	16896	7583	-193	4519	-120049	3643	5226	Y	-279	157.30	141.57	826	523	0.40	0.107	0.00	0.25	0.53	1389				10.09	3.45
6	7	-0.426	-1.066	-0.722	2.000	16896	8073	-193	4512	-129485	3723	5238	Y	0	157.56	141.80	719	660	0.50	0.107	0.00	0.31	0.37	977				10.11	3.46
7	7	-0.426	-1.066	-0.722	2.000	16896	-15906	-805	-1077	-153465	-4049	-1330	N	0	157.56	141.80	688	811	0.62	Not Reqd	0.00	0.31	0.37	969				0.00	0.00
7	8	-0.486	-0.996	-0.721	2.000	16896	-14256	-793	-1113	-143610	-3958	-1347	N	172	157.47	141.72	759	707	0.54	Not Reqd	0.00	0.27	0.37	972				0.00	0.00
8	8	-0.489	-1.000	-0.725	2.000	16896	-14251	-793	-1177	-143602	-3955	-1990	N	764	157.47	141.72	965	500	0.38	Not Reqd	0.00	0.19	0.37	974				0.00	0.00
8	9	-0.612	-0.881	-0.736	2.000	16160	-9352	-758	-1277	-114412	-3671	-2032	N	1286	148.19	133.37	1134	226	0.18	Not Reqd	0.00	0.09	0.37	925	1853	1224	3.49	0.00	0.00
9	9	-0.613	-0.882	-0.737	2.000	16160	-9343	-757	-1339	-114396	-3668	-2798	N	1578	148.19	133.37	1235	123	0.13	Not Reqd	0.00	0.06	0.37	926	1945	1223	3.86	0.00	0.00
9	10	-0.691	-0.858	-0.765	2.000	15542	-4852	-722	-1422	-87581	-3390	-2822	N	2059	136.51	122.86	1381	0	0.13	Not Reqd	0.00	0.06	0.37	861	2018	1130	4.69	0.00	0.00
10	10	-0.691	-0.857	-0.765	2.000	15542	-4843	-722	-1455	-87560	-3391	-3417	N	2029	136.51	122.86	1370	0	0.13	Not Reqd	0.00	0.06	0.37	861	2008	1130	4.65	0.00	0.00
10	11	-0.718	-0.884	-0.790	2.000	14960	-751	-687	-1521	-63054	-3121	-3426	N	2336	122.61	110.35	1443	0	0.13	Not Reqd	0.00	0.06	0.37	781	2002	1040	5.20	0.00	0.00
11	11	-0.718	-0.884	-0.790	2.000	14960	-740	-687	-1526	-63029	-3122	-3854	N	2307	122.61	110.35	1433	0	0.13	Not Reqd	0.00	0.06	0.37	781	1993	1041	5.16	0.00	0.00
11	12	-0.737	-0.936	-0.821	2.000	14421	2962	-653	-1579	-40755	-2861	-3848	N	2165	108.85	105.89	1386	0	0.13	Not Reqd	0.00	0.06	0.37	753	1926	954	5.47	0.00	0.00
12	12	-0.737	-0.936	-0.821	2.000	14421	2972	-653	-1559	-40728	-2861	-4126	N	2135	108.85	105.89	1376	0	0.13	Not Reqd	0.00	0.06	0.37	753	1917	954	5.43	0.00	0.00
12	13	-0.752	-0.998	-0.852	2.000	13928	6295	-618	-1599	-20610	-2609	-4107	N	2005	96.26	102.02	1309	0	0.13	Not Reqd	0.00	0.06	0.37	726	1831	870	5.67	0.00	0.00
13	13	-0.752	-0.998	-0.852	2.000	13928	6306	-618	-1556	-20582	-2609	-4248	Y	1979	96.26	102.02	1300	0	0.13	0.105	0.00	0.12	0.37	726	1823	932	4.89	-9.45	-3.23
13	14	-0.762	-1.072	-0.883	2.000	13471	9259	-584	-1585	-2546	-2365	-4219	Y	1862	84.64	98.42	1238	0	0.13	0.108	0.00	0.12	0.37	700	1745	851	5.10	-9.63	-3.29
14	14	-0.762	-1.072	-0.883	2.000	13471	9270	-584	-1522	-2517	-2365	-4237	Y	1849	84.64	98.42	1234	0	0.13	0.109	0.00	0.12	0.37	700	1741	851	5.10	-9.67	-3.31
14	15	-0.764	-1.163	-0.912	2.000	13063	11863	-551	-1542	13508	-2128	-4198	Y	1741	58.02	95.13	1177	0	0.13	0.111	0.00	0.12	0.25	451	1466	772	4.36	-9.81	-3.35
15	15	-0.764	-1.162	-0.912	2.000	13063	11874	-551	-1462	13536	-2129	-4107	Y	1723	58.02	95.13	1171	0	0.13	0.109	0.00	0.12	0.25	451	1460	770	4.36	-9.60	-3.28
15	16	-0.759	-1.270	-0.938	2.000	12695	14114	-517	-1474	27619	-1900	-4061	Y	1614	63.32	92.12	1116	0	0.13	0.110	0.00	0.12	0.25	437	1398	693	4.63	-9.70	-3.32
16	16	-0.760	-1.270	-0.939	2.000	12695	14124	-518	-1375	27647	-1902	-3887	Y	1145	63.32	92.12	960	0	0.13	0.106	0.00	0.12	0.25	437	1257	691	3.93	-9.29	-3.17
16	17	-0.775	-1.242	-0.938	2.000	12301	16022	-485	-1381	39847	-1679	-3835	Y	1034	68.10	89.42	906	0	0.13	0.108	0.00	0.12	0.25	424	1197	616	4.19	-9.39	-3.21
17	17	-0.775	-1.242	-0.939	2.000	12301	16031	-485	-1272	39872	-1679	-3565	N	1004	68.10	89.42	896	0	0.13	Not Reqd	0.00	0.06	0.25	424	1188	560	4.89	0.00	0.00
17	18	-0.790	-1.211	-0.937	2.000	11939	17594	-452	-1273	50223	-1458	-3508	N	891	72.21	86.94	843	0	0.13	Not Reqd	0.00	0.06	0.21	344	1068	486	4.86	0.00	0.00
18	18	-0.790	-1.211	-0.937	2.000	11939	17602	-452	-1153	50246	-1458	-3167	N	865	72.21	86.94	834	0	0.13	Not Reqd	0.00	0.06	0.21	344	1060	486	4.81	0.00	0.00
18	19	-0.803	-1.179	-0.934	2.000	11623	18841	-421	-1152	58771	-1239	-3108	N	754	75.72	84.78	783	0	0.13	Not Reqd	0.00	0.06	0.21	335	1006	413	5.23	0.00	0.00
19	19	-0.803	-1.179	-0.934	2.000	11623	18848	-421	-1024	58791	-1239	-2709	N	724	75.72	84.78	773	0	0.13	Not Reqd	0.00	0.06	0.21	335	998	413	5.17	0.00	0.00
19	20	-0.814	-1.148	-0.930	2.000	11354	19777	-390	-1021	65514	-1022	-2648	N	614	78.61	82.94	717	0	0.13	Not Reqd	0.00	0.06	0.21	327	939	341	5.61	0.00	0.00
20	20	-0.815	-1.148	-0.931	2.000	11354	19783	-390	-886	65531	-1022	-2203	N	589	78.61	82.94	708	0	0.13	Not Reqd	0.00	0.06	0.21	327	932	341	5.55	0.00	0.00
20	21	-0.823	-1.122	-0.926	2.000	11124	20414	-360	-884	70474	-807	-2143	N	481	80.88	81.36	651	0	0.13	Not Reqd	0.00	0.06	0.21	320	874	269	6.04	0.00	0.00
21	21	-0.823	-1.122	-0.927	2.000	11124	20419	-360	-745	70487	-807	-1664	N	457	80.88	81.36	642	0	0.13	Not Reqd	0.00	0.06	0.21	320	866	269	5.98	0.00	0.00
21	22	-0.827	-1.103	-0.923	2.000	10933	20772	-331	-744	73680	-594	-1605	N	349	82.54	80.06	592	0	0.13	Not Reqd	0.00	0.06	0.21	314	815	198	6.60	0.00	0.00
22	22	-0.827	-1.104	-0.923	2.000	10933	20777	-331	-602	73689	-594	-1104	N	321	82.54	80.06	582	0	0.13	Not Reqd	0.00	0.06	0.21	314	806	198	6.52	0.00	0.00
22	23	-0.826	-1.094	-0.919	2.000	10788	20874	-303	-603	75158	-383	-1047	N	215	83.59	79.07	537	0	0.13	Not Reqd	0.00	0.06	0.21	310	762	128	7.30	0.00	0.00
23	23	-0.826	-1.095	-0.919	2.000	10788	20878	-303	-461	75163	-383	-537	N	191	83.59	79.07	529	0	0.13	Not Reqd	0.00	0.06	0.21	310	755	128	7.22	0.00	0.00
23	24	-0.819	-1.097	-0.916	2.000	10617	20737	-276	-466	74932	-173	-484	N	85	83.80	77.90	487	0	0.13	Not Reqd	0.00	0.06	0.21	305	713	58	8.13	0.00	0.00
24	24	-0.819	-1.098	-0.916	2.000	10617	20739	-276	-365	74933	-173	-126	N	22	83.80	77.90	465	0	0.13	Not Reqd	0.00	0.06	0.21	305	693	58	7.92	0.00	0.00
24	25	-0.817	-1.099	-0.914	2.000	10617	20599	-265	-369	74319	-85	-105	N	-22	83.80	77.90	468	0	0.13	Not Reqd	0.00	0.06	0.21	305	696	28	8.57	0.00	0.00
25	25	-0.817	-1.099	-0.914	2.000	10617	20601	-265	-269	74319	-85	250	N	-85	83.80	77.90	490	0	0.13	Not Reqd	0.00	0.06	0.21	305	716	28	8.79	0.00	0.00
25	26	-0.810	-1.103	-0.912	2.000	10788	20149	-239	-281	71703	123	296	N	-189	83.59	79.07	538	0	0.13	Not Reqd	0.00	0.06	0.21	311	764	41	10.06	0.00	0.00
26	26	-0.810	-1.102	-0.911	2.000	10788	20151	-239	-144	71699	123	782	N	-213	83.59	79.07	545	0	0.13	Not Reqd	0.00	0.06	0.21	311	770	41	10.14	0.00	0.00
26	27	-0.798	-1.118	-0.909	2.000	10933	19509	-215	-162	67432	330	822	N	-316	82.54	80.06	598	0	0.13	Not Reqd	0.00	0.06	0.21	316	822	110	10.91	0.00	0.00
27	27	-0.797	-1.117	-0.908	2.000	10933	19510	-215	-29	67425	330	1279	N	-343	82.54	80.06	607	0	0.13	Not Reqd	0.00	0.06	0.21	316	830	110	11.03	0.00	0.00
27	28	-0.780	-1.142	-0.906	2.000	11124	18704	-193	-54	61525	536	1312	N	-445	80.88	81.36	659	0	0.13	Not Reqd	0.00	0.06	0.21	322	882	179	11.94	0.00	0.00
28	28	-0.780	-1.142	-0.905	2.000	11124	18704	-193	73	61515	536	1729	N	-469	80.88	81.36	667	0	0.13	Not Reqd	0.00	0.06	0.21	322	890	179	12.05	0.00	0.00
28	29	-0.757	-1.174	-0.902	2.000	11354	17757	-172	42	54000	742	1756	N	-570	78.61	82.94	710	0	0.13	Not Reqd	0.00	0.06	0.21	328	934	247	13.00	0.00	0.00
29	29	-0.757	-1.174	-0.902	2.000	11354	17757	-172	163	53987	742	2121	N	-594	78.61	82.94	718	0	0.13	Not Reqd	0.00	0.06	0.21	328	942	247	13.12	0.00	0.00
29	30	-0.730	-1.212	-0.898	2.000	11623	16693	-152	124	44873	948	2141	N	-695	75.72	84.78	764	0	0.13	Not Reqd	0.00	0.06	0.21	335	989	316	14.27	0.00	0.00
30	30	-0.730	-1.212	-0.898	2.000	11623	16691	-152	238	44858	948	2443	N	-723	75.72	84.78	773	0	0.13	Not Reqd	0.00	0.06	0.21	335	997	316	14.44	0.00	0.00
30	31	-0.700	-1.252	-0.893	2.000	11939	15532	-134	193	34157	1154	2456	N	-824	72.21	86.94	820	0	0.13	Not Reqd	0.00	0.06	0.21	344	1047	385	15.87	0.00	0.00
31	31	-0.700	-1.252	-0.893	2.000	11939	15530	-134	299	34139	1154	2685	N	-849	72.21	86.94	828	0	0.13	Not Reqd	0.00	0.06	0.21	344	1055	385	16.04	0.00	0.00
31	32	-0.667	-1.294	-0.887	2.000	12301	14294	-117	247	21860	1359	2692	N	-948	68.10	89.42	877	0	0.13	Not Reqd	0.00	0.06	0.25	424	1171	453	19.45	0.00	0.00
32	32	-0.667	-1.294	-0.886	2.000	12301	14292	-117	345	21841	1359	2837	N	-977	68.10	89.42	887	0	0.13	Not Reqd	0.00	0.06	0.25	424	1180	453	19.67	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Minimum LL Shear @ t=00																									
32	33	-0.632	-1.336	-0.879	2.000	12695	12995	-101	287	7987	1565	2837	N	-1073	63.36	92.12	936	0	0.13	Not Reqd	0.00	0.06	0.25	437	1235	522	22.18	0.00	0.00
33	33	-0.632	-1.336	-0.879	2.000	12695	12992	-101	377	7966	1564	2827	N	-1513	63.36	92.12	1082	0	0.13	Not Reqd	0.00	0.06	0.25	437	1367	521	26.13	0.00	0.00
33	34	-0.617	-1.237	-0.847	2.000	13063	11866	-88	107	-7258	1772	2615	N	-1603	74.11	95.13	1131	0	0.13	Not Reqd	0.00	0.06	0.25	451	1424	591	29.47	0.00	0.00
34	34	-0.617	-1.238	-0.847	2.000	13063	11865	-88	188	-7276	1772	2563	N	-1619	74.11	95.13	1137	0	0.13	Not Reqd	0.00	0.06	0.25	451	1429	591	29.64	0.00	0.00
34	35	-0.594	-1.158	-0.813	2.000	13471	8364	-80	408	-26463	1982	2843	N	-1707	84.64	98.42	1186	0	0.13	Not Reqd	0.00	0.06	0.37	700	1698	661	39.80	0.00	0.00
35	35	-0.594	-1.158	-0.814	2.000	13471	8361	-80	465	-26483	1982	2661	N	-1719	84.64	98.42	1191	0	0.13	Not Reqd	0.00	0.06	0.37	700	1702	661	39.93	0.00	0.00
35	36	-0.510	-1.053	-0.730	2.000	13928	5920	-78	88	-46316	2208	2342	N	-1813	93.92	102.02	1244	0	0.13	Not Reqd	0.00	0.06	0.37	726	1773	736	41.07	0.00	0.00
36	36	-0.944	-1.403	-1.130	2.000	13928	5919	-78	128	-46331	2208	2023	N	-4071	93.92	102.02	1997	0	0.13	Not Reqd	0.00	0.06	0.37	726	2451	736	67.27	0.00	0.00
36	37	-1.069	-1.106	-1.084	2.000	14427	6158	-75	136	-65423	2471	2089	N	-4067	112.32	105.89	2020	0	0.13	Not Reqd	0.00	0.06	0.37	753	2496	824	67.55	0.00	0.00
37	37	-1.068	-1.106	-1.084	2.000	14427	6157	-75	177	-65436	2471	1640	N	-4107	112.32	105.89	2033	0	0.13	Not Reqd	0.00	0.06	0.37	753	2508	824	68.03	0.00	0.00
37	38	-1.158	-0.953	-1.069	2.000	14960	6451	-74	183	-86589	2742	1704	N	-2467	127.88	115.09	1545	0	0.13	Not Reqd	0.00	0.06	0.37	819	2127	914	50.42	0.00	0.00
38	38	-1.158	-0.953	-1.069	2.000	14960	6450	-74	226	-86600	2741	1111	N	-2506	127.88	115.09	1557	0	0.13	Not Reqd	0.00	0.06	0.37	819	2139	914	50.89	0.00	0.00
38	39	-1.093	-0.943	-1.025	2.000	15542	6808	-72	231	-109873	3020	1173	N	-2209	139.16	125.24	1522	0	0.13	Not Reqd	0.00	0.06	0.37	891	2172	1007	49.29	0.00	0.00
39	39	-1.092	-0.943	-1.025	2.000	15542	6806	-72	277	-109880	3019	422	N	-2251	139.16	125.24	1536	0	0.13	Not Reqd	0.00	0.06	0.37	891	2185	1006	49.83	0.00	0.00
39	40	-0.994	-0.980	-0.987	2.000	16160	7234	-72	281	-135335	3306	485	N	-1818	148.99	134.09	1448	0	0.13	Not Reqd	0.00	0.06	0.37	954	2162	1102	45.38	0.00	0.00
40	40	-0.992	-0.979	-0.986	2.000	16160	7232	-72	335	-135336	3308	-367	N	-1421	148.99	134.09	1315	0	0.13	Not Reqd	0.00	0.06	0.37	954	2042	1103	40.32	0.00	0.00
40	41	-0.859	-1.113	-0.976	2.000	16896	7736	-71	341	-163022	3600	-303	N	-954	157.47	141.72	1184	150	0.13	Not Reqd	0.00	0.06	0.37	1005				0.00	0.00
41	41	-0.855	-1.109	-0.972	2.000	16896	7734	-71	386	-163020	3602	-910	N	-147	157.47	141.72	899	435	0.32	Not Reqd	0.00	0.16	0.37	1002				0.00	0.00
41	42	-0.792	-1.186	-0.974	2.000	16896	7913	-71	388	-172350	3682	-889	N	9	157.56	141.80	835	528	0.39	Not Reqd	0.00	0.20	0.37	999				0.00	0.00
42	42	-0.858	-1.084	-0.962	2.000	16896	-37833	-937	280	-206492	-4759	-995	N	9	157.56	141.80	770	992	0.75	Not Reqd	0.00	0.37	0.37	987				0.00	0.00
42	43	-0.920	-1.004	-0.958	2.000	16896	-36004	-927	259	-194979	-4669	-998	N	205	157.48	141.73	854	875	0.66	Not Reqd	0.00	0.33	0.37	990				0.00	0.00
43	43	-0.924	-1.008	-0.962	2.000	16896	-36005	-924	104	-194972	-4673	-1762	N	1002	157.48	141.73	1133	597	0.45	Not Reqd	0.00	0.22	0.37	993				0.00	0.00
43	44	-1.055	-0.863	-0.966	2.000	16160	-30442	-891	45	-160302	-4345	-1763	N	1512	148.61	133.75	1310	299	0.24	Not Reqd	0.00	0.12	0.37	946	2031	1448	2.96	0.00	0.00
44	44	-1.056	-0.863	-0.967	2.000	16160	-30441	-889	-159	-160286	-4346	-2795	N	1857	148.61	133.75	1432	178	0.14	Not Reqd	0.00	0.07	0.37	947	2141	1449	3.34	0.00	0.00
44	45	-1.147	-0.800	-0.990	2.000	15532	-25270	-856	-209	-128604	-4027	-2786	N	2188	138.35	124.51	1511	0	0.13	Not Reqd	0.00	0.06	0.37	886	2157	1342	3.85	0.00	0.00
45	45	-1.147	-0.800	-0.991	2.000	15532	-25268	-857	-380	-128581	-4027	-3667	N	2143	138.35	124.51	1495	0	0.13	Not Reqd	0.00	0.06	0.37	886	2143	1342	3.80	0.00	0.00
45	46	-1.209	-0.767	-1.015	2.000	14943	-20413	-824	-422	-99475	-3716	-3651	N	2534	127.10	114.39	1562	0	0.13	Not Reqd	0.00	0.06	0.37	814	2139	1239	4.28	0.00	0.00
46	46	-1.210	-0.767	-1.015	2.000	14943	-20410	-824	-561	-99447	-3716	-4333	N	2492	127.10	114.39	1548	0	0.13	Not Reqd	0.00	0.06	0.37	814	2126	1239	4.23	0.00	0.00
46	47	-1.139	-0.866	-1.023	2.000	14394	-15866	-792	-596	-72851	-3413	-4310	N	3981	111.08	105.89	1991	0	0.13	Not Reqd	0.00	0.06	0.37	753	2470	1138	6.05	0.00	0.00
47	47	-1.140	-0.866	-1.023	2.000	14394	-15862	-792	-704	-72819	-3413	-4812	Y	3937	111.08	105.89	1977	0	0.13	0.115	0.00	0.12	0.37	753	2457	1209	5.55	-10.45	-3.57
47	48	-1.053	-1.085	-1.066	2.000	13891	-11623	-760	-733	-48668	-3118	-4783	Y	3839	92.92	102.02	1920	0	0.13	0.119	0.00	0.12	0.37	726	2381	1110	5.81	-10.67	-3.65
48	48	-1.054	-1.085	-1.066	2.000	13891	-11618	-760	-812	-48633	-3118	-5121	Y	3798	92.92	102.02	1906	0	0.13	0.127	0.00	0.13	0.37	726	2369	1115	5.73	-11.42	-3.90
48	49	-0.766	-0.829	-0.791	2.000	13428	-7678	-728	-836	-26744	-2858	-5087	Y	1710	82.67	98.42	1188	0	0.13	0.131	0.00	0.13	0.37	700	1699	1028	3.63	-11.64	-3.98
49	49	-0.766	-0.829	-0.791	2.000	13428	-7672	-728	-888	-26708	-2858	-5273	Y	1693	82.67	98.42	1182	0	0.13	0.136	0.00	0.13	0.37	700	1694	1031	3.59	-12.07	-4.12
49	50	-0.805	-0.837	-0.817	2.000	13011	-4028	-695	-908	-6850	-2620	-5235	Y	1591	71.62	95.13	1127	0	0.13	0.139	0.00	0.13	0.25	451	1421	951	2.92	-12.27	-4.20
50	50	-0.805	-0.836	-0.817	2.000	13011	-4022	-696	-935	-6813	-2620	-5287	Y	1568	71.62	95.13	1120	0	0.13	0.140	0.00	0.13	0.25	451	1414	951	2.88	-12.39	-4.24
50	51	-0.842	-0.848	-0.844	2.000	12633	-669	-663	-953	11129	-2388	-5246	Y	1479	66.40	92.12	1071	0	0.13	0.143	0.00	0.14	0.25	437	1357	873	3.06	-12.58	-4.30
51	51	-0.842	-0.847	-0.844	2.000	12633	-663	-663	-957	11165	-2388	-5175	Y	1463	66.40	92.12	1066	0	0.13	0.142	0.00	0.14	0.25	437	1352	872	3.04	-12.41	-4.24
51	52	-0.875	-0.866	-0.872	2.000	12301	2400	-631	-972	27246	-2163	-5132	Y	1373	71.72	89.42	1019	0	0.13	0.144	0.00	0.14	0.25	424	1298	797	3.23	-12.56	-4.29
52	52	-0.875	-0.865	-0.872	2.000	12301	2406	-634	-940	27282	-2160	-5036	Y	1003	71.72	89.42	895	0	0.13	0.141	0.00	0.14	0.25	424	1188	794	2.74	-12.33	-4.21
52	53	-0.919	-0.801	-0.878	2.000	11939	5201	-603	-954	41516	-1940	-4991	Y	912	76.48	86.94	850	0	0.13	0.144	0.00	0.14	0.25	412	1136	720	2.93	-12.50	-4.27
53	53	-0.919	-0.801	-0.878	2.000	11939	5207	-603	-917	41550	-1939	-4714	Y	889	76.48	86.94	842	0	0.13	0.136	0.00	0.13	0.25	412	1129	716	2.92	-11.81	-4.04
53	54	-0.958	-0.744	-0.883	2.000	11623	7714	-571	-930	53991	-1721	-4668	Y	797	80.70	84.78	798	0	0.13	0.139	0.00	0.13	0.21	335	1020	643	2.85	-11.94	-4.08
54	54	-0.959	-0.744	-0.884	2.000	11623	7720	-571	-876	54022	-1720	-4306	Y	771	80.70	84.78	789	0	0.13	0.128	0.00	0.13	0.21	335	1012	637	2.84	-11.02	-3.77
54	55	-0.993	-0.694	-0.888	2.000	11354	9943	-540	-889	64684	-1503	-4261	Y	680	84.36	82.94	733	0	0.13	0.130	0.00	0.13	0.21	327	953	564	3.01	-11.10	-3.80
55	55	-0.993	-0.694	-0.889	2.000	11354	9949	-540	-820	64712	-1503	-3825	Y	657	84.36	82.94	725	0	0.13	0.116	0.00	0.12	0.21	327	946	558	3.02	-9.97	-3.41
55	56	-1.021	-0.652	-0.893	2.000	11124	11890	-510	-833	73608	-1287	-3780	Y	565	87.46	81.36	665	0	0.13	0.117	0.00	0.12	0.21	318	885	485	3.20	-10.01	-3.42
56	56	-1.021	-0.652	-0.893	2.000	11124	11896	-510	-750	73632	-1287	-3284	N	543	87.46	81.36	658	0	0.13	Not Reqd	0.00	0.06	0.21	318	878	429	3.64	0.00	0.00
56	57	-1.043	-0.621	-0.896	2.000	10933	13559	-480	-765	80772	-1073	-3241	N	450	89.97	80.97	611	0	0.13	Not Reqd	0.00	0.06	0.21	316	834	358	3.98	0.00	0.00
57	57	-1.043	-0.621	-0.896	2.000	10933	13564	-480	-671	80793	-1073	-2696	N	425	89.97	80.97	603	0	0.13	Not Reqd	0.00	0.06	0.21	316	826	358	3.93	0.00	0.00
57	58	-1.058	-0.598	-0.898	2.000	10788	14964	-450	-688	86198	-860	-2655	N	332	91.90	82.71	576	0	0.13	Not Reqd	0.00	0.06	0.21	322	808	287	4.48	0.00	0.00
58	58	-1.058	-0.598	-0.898	2.000	10788	14969	-450	-585	86215	-860	-2072	N	311	91.90	82.71	569	0	0.13	Not Reqd	0.00	0.06	0.21	322	802	287	4.43	0.00	0.00
58	59	-1.065	-0.586	-0.899	2.000	10683	16105	-422	-605	89892	-648	-2034	N	220	93.24	83.92	543	0	0.13	Not Reqd	0.00	0.06	0.21	326	782	216	5.03	0.00	0.00
59	59	-1.065	-0.586	-0.899	2.000	10683	16109	-422	-493	89903	-648	-1427	N	199	93.24	83.92	535	0	0.13	Not Reqd	0.00	0.06	0.21	326	775	216	4.98	0.00	0.00
59	60	-1.064	-0.584	-0.898	2.000	10617	17005	-394	-517	91878	-438	-1391	N	112	94.02	84.62	510	0	0.13	Not Reqd	0.00	0.06	0.21	329	755	146	5.64	0.00	0.00
60	60	-1.064	-0.584	-0.898	2.000	10617	17008	-394	-409	91885	-437	-833	N	76	94.02	84.62	497	0	0.13	Not Reqd	0.00	0.06	0.21	329	744	146	5.55	0.00	0.00
60	61	-1.058	-0.588	-0.895	2.000	10617	17565	-372	-431	92243	-268	-807	N	8	94.24	84.81	477	0	0.13	Not Reqd	0.00	0.06	0.21	330	726	89	6.13	0.00	0.00
61	61	-1.058	-0.588	-0.895	2.000	10617	17568	-372	-320	92247	-267	-246	N	-27	94.24	84.81	484	0	0.13	Not Reqd	0.00	0.06	0.21	330	732	89	6.18	0.00	0.00
61	62	-1.043	-0.602	-0.890	2.000	10683	18052	-346	-351	91161	-59	-219	N	-111	94.02	84.62	514	0	0.13	Not Reqd	0.00	0.06	0.21	329	759	20	7.41	0.00	0.00
62	62	-1.043	-0.602	-0.890	2.000	10683	18054	-346	-227	91161	-59	397	N	-132	94.02	84.62	521	0	0.13	Not Reqd	0.00	0.06	0.21	329	765	20	7.46	0.00	0.00
62	63	-1.019	-0.628	-0.884	2.000	10788	18331	-321	-263	88407	149	419	N	-217	93.24	83.92	549	0	0.13	Not Reqd	0.00	0.06	0.21	327	789	50	7.90	0.00	0.00
63	63	-1.019	-0.628	-0.883	2.000	10788	18333	-322	-137	88402	150	1017	N	-238	93.24	83.92	556	0	0.13	Not Reqd	0.00	0.06	0.21	327	795	50	7.95	0.00	0.00
63	64	-0.988	-0.663	-0.875	2.000	10933	18422	-298	-179	83994	357	1033	N	-325	91.90	82.71	585	0	0.13	Not Reqd	0.00	0.06	0.21	323	817	119	8.03	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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	-0.988	-0.663	-0.875	2.000	10933	18423	-298	-52	83985	357	1600	N	-349	91.90	82.71	593	0	0.13	Not Reqd	0.00	0.06	0.21	323	825	119	8.11	0.00	0.00
64	65	-0.949	-0.708	-0.865	2.000	11124	18342	-275	-99	77937	564	1611	N	-437	89.98	81.36	622	0	0.13	Not Reqd	0.00	0.06	0.21	318	846	188	8.18	0.00	0.00
65	65	-0.949	-0.708	-0.865	2.000	11124	18342	-275	27	77924	564	2137	N	-458	89.98	81.36	629	0	0.13	Not Reqd	0.00	0.06	0.21	318	853	188	8.25	0.00	0.00
65	66	-0.904	-0.762	-0.854	2.000	11354	18110	-254	-26	70247	770	2142	N	-544	87.47	82.94	684	0	0.13	Not Reqd	0.00	0.06	0.21	326	909	257	8.72	0.00	0.00
66	66	-0.903	-0.762	-0.854	2.000	11354	18110	-254	98	70231	771	2615	N	-566	87.47	82.94	692	0	0.13	Not Reqd	0.00	0.06	0.21	326	916	257	8.79	0.00	0.00
66	67	-0.851	-0.825	-0.842	2.000	11623	17747	-234	39	60937	977	2615	N	-649	84.37	84.78	748	0	0.13	Not Reqd	0.00	0.06	0.25	402	1036	326	10.12	0.00	0.00
67	67	-0.851	-0.825	-0.842	2.000	11623	17746	-234	162	60918	977	3024	N	-675	84.37	84.78	757	0	0.13	Not Reqd	0.00	0.06	0.25	402	1043	326	10.21	0.00	0.00
67	68	-0.793	-0.897	-0.829	2.000	11939	17269	-215	97	50015	1183	3018	N	-756	80.71	86.94	798	0	0.13	Not Reqd	0.00	0.06	0.25	412	1089	394	10.70	0.00	0.00
68	68	-0.793	-0.897	-0.829	2.000	11939	17268	-215	215	49993	1184	3354	N	-778	80.71	86.94	805	0	0.13	Not Reqd	0.00	0.06	0.25	412	1096	395	10.79	0.00	0.00
68	69	-0.730	-0.977	-0.816	2.000	12301	16693	-197	145	37488	1390	3342	N	-859	76.51	89.42	847	0	0.13	Not Reqd	0.00	0.06	0.25	424	1144	463	11.37	0.00	0.00
69	69	-0.730	-0.978	-0.816	2.000	12301	16692	-197	260	37464	1391	3592	N	-885	76.51	89.42	856	0	0.13	Not Reqd	0.00	0.06	0.25	424	1152	464	11.48	0.00	0.00
69	70	-0.663	-1.063	-0.803	2.000	12695	16032	-181	184	23355	1597	3574	N	-963	71.75	92.12	899	0	0.13	Not Reqd	0.00	0.06	0.25	437	1202	532	12.13	0.00	0.00
70	70	-0.663	-1.064	-0.804	2.000	12695	16031	-181	313	23329	1603	3657	N	-1345	71.75	92.12	1026	0	0.13	Not Reqd	0.00	0.06	0.25	437	1317	534	13.96	0.00	0.00
70	71	-0.610	-1.040	-0.769	2.000	13066	10778	-167	87	3028	1812	3489	N	-1418	66.40	95.13	1070	0	0.13	Not Reqd	0.00	0.06	0.37	677	1572	604	18.36	0.00	0.00
71	71	-0.610	-1.041	-0.769	2.000	13066	10777	-167	160	3003	1812	3506	N	-1434	66.40	95.13	1075	0	0.13	Not Reqd	0.00	0.06	0.37	677	1577	604	18.45	0.00	0.00
71	72	-0.553	-1.026	-0.737	2.000	13477	9997	-163	-221	-14416	2018	3183	N	-1504	76.21	98.42	1119	0	0.13	Not Reqd	0.00	0.06	0.37	700	1637	673	18.76	0.00	0.00
72	72	-0.553	-1.027	-0.737	2.000	13477	9998	-163	-153	-14438	2019	3083	N	-1516	76.21	98.42	1123	0	0.13	Not Reqd	0.00	0.06	0.37	700	1641	673	18.83	0.00	0.00
72	73	-0.493	-1.019	-0.706	2.000	13934	10772	-159	-167	-31951	2232	3127	N	-1595	87.64	102.02	1172	0	0.13	Not Reqd	0.00	0.06	0.37	726	1708	744	19.15	0.00	0.00
73	73	-0.493	-1.020	-0.706	2.000	13934	10773	-159	-93	-31972	2232	2906	N	-1618	87.64	102.02	1179	0	0.13	Not Reqd	0.00	0.06	0.37	726	1715	744	19.29	0.00	0.00
73	74	-0.387	-0.987	-0.638	2.000	14431	11586	-156	-108	-51216	2467	2950	N	-1697	98.06	105.89	1230	0	0.13	Not Reqd	0.00	0.06	0.37	753	1785	822	19.49	0.00	0.00
74	74	-0.837	-1.291	-1.027	2.000	14431	11586	-156	-28	-51236	2467	2598	N	-3964	98.06	105.89	1986	0	0.13	Not Reqd	0.00	0.06	0.37	753	2465	822	32.56	0.00	0.00
74	75	-0.926	-1.063	-0.985	2.000	14973	12446	-154	-42	-72442	2739	2643	N	-4047	117.46	110.07	2040	0	0.13	Not Reqd	0.00	0.06	0.37	783	2541	913	32.75	0.00	0.00
75	75	-0.925	-1.063	-0.985	2.000	14973	12446	-154	36	-72458	2740	2190	N	-4093	117.46	110.07	2055	0	0.13	Not Reqd	0.00	0.06	0.37	783	2555	913	33.05	0.00	0.00
75	76	-1.001	-0.956	-0.981	2.000	15555	13353	-152	24	-95560	3017	2236	N	-2408	134.12	120.71	1560	0	0.13	Not Reqd	0.00	0.06	0.37	859	2177	1006	24.15	0.00	0.00
76	76	-1.001	-0.956	-0.981	2.000	15555	13353	-152	41	-95563	3017	2122	N	-2464	134.12	120.71	1579	0	0.13	Not Reqd	0.00	0.06	0.37	859	2194	1006	24.51	0.00	0.00
76	77	-0.922	-0.975	-0.946	2.000	16176	14307	-150	33	-120457	3298	2171	N	-2091	145.41	130.86	1518	0	0.13	Not Reqd	0.00	0.06	0.37	931	2204	1099	23.05	0.00	0.00
77	77	-0.921	-0.976	-0.946	2.000	16176	14307	-150	34	-120457	3298	2169	N	-2141	145.41	130.86	1535	0	0.13	Not Reqd	0.00	0.06	0.37	931	2219	1099	23.38	0.00	0.00
77	78	-0.821	-1.023	-0.916	2.000	16843	15327	-149	29	-147505	3587	2222	N	-1828	155.75	140.18	1489	0	0.13	Not Reqd	0.00	0.06	0.37	997	2238	1196	21.94	0.00	0.00
78	78	-0.820	-1.022	-0.914	2.000	16843	15327	-151	19	-147504	3584	2254	N	-1465	155.75	140.18	1368	0	0.13	Not Reqd	0.00	0.06	0.37	997	2129	1195	19.60	0.00	0.00
78	79	-0.688	-1.153	-0.906	2.000	17619	16431	-150	18	-176702	3877	2311	N	-1001	164.81	148.33	1215	221	0.16	Not Reqd	0.00	0.08	0.37	1047				0.00	0.00
79	79	-0.684	-1.148	-0.902	2.000	17619	16431	-153	-6	-176702	3867	2350	N	-177	164.81	148.33	925	507	0.36	Not Reqd	0.00	0.18	0.37	1045				0.00	0.00
79	80	-0.619	-1.225	-0.904	2.000	17619	16809	-153	-6	-186475	3948	2369	N	0	164.93	148.44	849	613	0.44	Not Reqd	0.00	0.22	0.37	1042				0.00	0.00
80	80	-0.563	-1.315	-0.916	2.000	17619	-37568	-921	-2672	-250977	-4982	-3983	N	0	164.93	148.44	756	1089	0.79	Not Reqd	0.00	0.40	0.37	1023				0.00	0.00
80	81	-0.623	-1.240	-0.913	2.000	17619	-35842	-911	-2646	-239199	-4892	-3939	N	139	164.90	148.41	818	993	0.72	Not Reqd	0.00	0.36	0.37	1027				0.00	0.00
81	81	-0.627	-1.245	-0.917	2.000	17619	-35842	-910	-2634	-239199	-4888	-3864	N	960	164.90	148.41	1105	705	0.51	Not Reqd	0.00	0.25	0.37	1029				0.00	0.00
81	82	-0.748	-1.118	-0.922	2.000	16843	-30643	-880	-2549	-204087	-4564	-3722	N	1311	156.24	140.62	1221	470	0.36	Not Reqd	0.00	0.18	0.37	983	1983	1521	2.57	0.00	0.00
82	82	-0.750	-1.119	-0.923	2.000	16843	-30643	-879	-2540	-204087	-4561	-3674	N	1672	156.24	140.62	1347	342	0.26	Not Reqd	0.00	0.13	0.37	984	2098	1520	2.97	0.00	0.00
82	83	-0.850	-1.073	-0.952	2.000	16176	-25726	-849	-2453	-171526	-4243	-3530	N	1905	146.58	131.92	1421	151	0.13	Not Reqd	0.00	0.06	0.37	932	2117	1414	3.49	0.00	0.00
83	83	-0.850	-1.073	-0.952	2.000	16176	-25726	-849	-2454	-171527	-4243	-3532	N	1855	146.58	131.92	1403	168	0.13	Not Reqd	0.00	0.07	0.37	932	2101	1414	3.43	0.00	0.00
83	84	-0.933	-1.042	-0.982	2.000	15555	-21089	-818	-2365	-141460	-3933	-3386	N	1962	136.60	122.94	1425	31	0.13	Not Reqd	0.00	0.06	0.37	875	2070	1311	3.78	0.00	0.00
84	84	-0.934	-1.042	-0.982	2.000	15555	-21089	-818	-2365	-141461	-3934	-3388	N	1922	136.60	122.94	1412	45	0.13	Not Reqd	0.00	0.06	0.37	875	2058	1311	3.74	0.00	0.00
84	85	-0.884	-1.121	-0.987	2.000	14973	-16727	-788	-2274	-113822	-3632	-3240	N	3543	122.22	110.07	1872	0	0.13	Not Reqd	0.00	0.06	0.37	783	2389	1211	5.49	0.00	0.00
85	85	-0.884	-1.121	-0.987	2.000	14973	-16727	-788	-2275	-113822	-3632	-3242	N	3507	122.22	110.07	1860	0	0.13	Not Reqd	0.00	0.06	0.37	783	2379	1211	5.45	0.00	0.00
85	86	-0.819	-1.308	-1.024	2.000	14431	-12637	-757	-2181	-88543	-3338	-3091	N	3458	105.30	105.89	1817	0	0.13	Not Reqd	0.00	0.06	0.37	753	2314	1113	5.76	0.00	0.00
86	86	-0.819	-1.308	-1.024	2.000	14431	-12637	-757	-2181	-88543	-3339	-3093	N	3420	105.30	105.89	1804	0	0.13	Not Reqd	0.00	0.06	0.37	753	2302	1113	5.71	0.00	0.00
86	87	-0.571	-1.112	-0.790	2.000	13934	-8816	-727	-2084	-65445	-3082	-2938	N	1629	98.21	102.02	1152	0	0.13	Not Reqd	0.00	0.06	0.37	721	1685	1027	3.72	0.00	0.00
87	87	-0.571	-1.112	-0.790	2.000	13934	-8816	-727	-2085	-65445	-3082	-2940	N	1604	98.21	102.02	1143	0	0.13	Not Reqd	0.00	0.06	0.37	721	1677	1027	3.68	0.00	0.00
87	88	-0.614	-1.136	-0.816	2.000	13477	-5259	-696	-1985	-44294	-2846	-2783	N	1562	87.67	98.42	1138	0	0.13	Not Reqd	0.00	0.06	0.37	700	1655	949	4.04	0.00	0.00
88	88	-0.614	-1.136	-0.816	2.000	13477	-5259	-696	-1985	-44294	-2846	-2784	N	1549	87.67	98.42	1134	0	0.13	Not Reqd	0.00	0.06	0.37	700	1651	949	4.03	0.00	0.00
88	89	-0.661	-1.158	-0.845	2.000	13066	-1967	-665	-1882	-24978	-2618	-2624	N	1385	78.39	95.13	1059	0	0.13	Not Reqd	0.00	0.06	0.25	451	1359	873	3.19	0.00	0.00
89	89	-0.661	-1.157	-0.845	2.000	13066	-1967	-665	-1883	-24978	-2618	-2626	N	1368	78.39	95.13	1053	0	0.13	Not Reqd	0.00	0.06	0.25	451	1354	873	3.17	0.00	0.00
89	90	-0.705	-1.187	-0.874	2.000	12695	1060	-634	-1779	-7442	-2397	-2464	N	1327	69.92	92.12	1020	0	0.13	Not Reqd	0.00	0.06	0.25	437	1311	799	3.42	0.00	0.00
90	90	-0.704	-1.187	-0.874	2.000	12695	1060	-635	-1789	-7441	-2399	-2505	N	909	69.92	92.12	881	8	0.13	Not Reqd	0.00	0.06	0.25	437	1186	800	2.83	0.00	0.00
90	91	-0.763	-1.095	-0.879	2.000	12301	3820	-604	-1684	8361	-2183	-2344	N	868	62.10	89.42	850	0	0.13	Not Reqd	0.00	0.06	0.25	424	1147	728	3.08	0.00	0.00
91	91	-0.763	-1.095	-0.879	2.000	12301	3820	-604	-1685	8361	-2183	-2346	N	840	62.10	89.42	841	0	0.13	Not Reqd	0.00	0.06	0.25	424	1139	728	3.04	0.00	0.00
91	92	-0.818	-1.011	-0.885	2.000	11939	6309	-573	-1580	22449	-1968	-2184	N	677	65.83	86.94	771	0	0.13	Not Reqd	0.00	0.06	0.21	344	1003	656	2.82	0.00	0.00
92	92	-0.818	-1.011	-0.885	2.000	11939	6309	-573	-1580	22449	-1968	-2186	N	653	65.83	86.94	763	0	0.13	Not Reqd	0.00	0.06	0.21	344	996	656	2.78	0.00	0.00
92	93	-0.877	-0.916	-0.891	2.000	11623	8528	-543	-1475	34835	-1755	-2024	N	613	68.64	84.78	736	0	0.13	Not Reqd	0.00	0.06	0.21	335	964	585	3.10	0.00	0.00
93	93	-0.877	-0.917	-0.891	2.000	11623	8528	-543	-1476	34835	-1755	-2026	N	586	68.64	84.78	727	0	0.13	Not Reqd	0.00	0.06	0.21	335	956	585	3.05	0.00	0.00
93	94	-0.929	-0.836	-0.897	2.000	11354	10475	-513	-1371	45528	-1543	-1864	N	546	71.20	82.94	702	0	0.13	Not Reqd	0.00	0.06	0.21	328	927	514	3.42	0.00	0.00
94	94	-0.929	-0.836	-0.897	2.000	11354	10475	-513	-1371	45528	-1543	-1865	N	523	71.20	82.94	695	0	0.13	Not Reqd	0.00	0.06	0.21	328	920	514	3.37	0.00	0.00
94	95	-0.970	-0.773	-0.901	2.000	11124	12153	-483	-1267	54539	-1332	-1704	N	483	73.53	81.36	671	0	0.13	Not Reqd	0.00	0.06	0.21	322	894	444	3.79	0.00	0.00
95	95	-0.970	-0.774	-0.901	2.000	11124	12153	-483	-1267	54539	-1332	-1706	N	460	73.53	81.36	664	0	0.13	Not Reqd	0.00	0.06	0.21	322	887	444	3.75	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Minimum LL Shear @ t=00																											
95	96	-1.004	-0.721	-0.906	2.000	10933	13562	-454	-1164	61876	-1124	-1546	N	309	75.36	80.06	596	0	0.13	Not Reqd	0.00	0.06	0.21	316	820	375	3.95	0.00	0.00
96	96	-1.004	-0.721	-0.906	2.000	10933	13562	-454	-1165	61876	-1124	-1547	N	282	75.36	80.06	587	0	0.13	Not Reqd	0.00	0.06	0.21	316	812	375	3.89	0.00	0.00
96	97	-1.034	-0.674	-0.909	2.000	10788	14714	-425	-1064	67557	-916	-1389	N	254	76.55	79.07	560	0	0.13	Not Reqd	0.00	0.06	0.21	311	784	305	4.38	0.00	0.00
97	97	-1.034	-0.674	-0.909	2.000	10788	14714	-425	-1064	67557	-916	-1390	N	232	76.55	79.07	552	0	0.13	Not Reqd	0.00	0.06	0.21	311	777	305	4.33	0.00	0.00
97	98	-1.052	-0.647	-0.911	2.000	10683	15608	-397	-965	71586	-709	-1234	N	178	77.48	78.35	522	0	0.13	Not Reqd	0.00	0.06	0.21	307	746	236	4.86	0.00	0.00
98	98	-1.052	-0.647	-0.911	2.000	10683	15608	-397	-966	71586	-709	-1235	N	156	77.48	78.35	515	0	0.13	Not Reqd	0.00	0.06	0.21	307	739	236	4.80	0.00	0.00
98	99	-1.059	-0.635	-0.912	2.000	10617	16260	-369	-870	73983	-504	-1083	N	76	77.99	77.90	481	0	0.13	Not Reqd	0.00	0.06	0.21	305	708	168	5.38	0.00	0.00
99	99	-1.059	-0.635	-0.912	2.000	10617	16260	-369	-870	73983	-504	-1084	N	39	77.99	77.90	469	0	0.13	Not Reqd	0.00	0.06	0.21	305	696	168	5.29	0.00	0.00
99	100	-1.060	-0.629	-0.910	2.000	10617	16621	-348	-795	74740	-338	-963	N	-39	77.99	77.90	469	0	0.13	Not Reqd	0.00	0.06	0.21	305	697	113	6.04	0.00	0.00
100	100	-1.060	-0.629	-0.910	2.000	10617	16621	-348	-796	74740	-338	-965	N	-76	77.99	77.90	482	0	0.13	Not Reqd	0.00	0.06	0.21	305	708	113	6.14	0.00	0.00
100	101	-1.055	-0.629	-0.907	2.000	10683	16858	-322	-707	74209	-134	-819	N	-154	77.48	78.35	516	0	0.13	Not Reqd	0.00	0.06	0.21	307	741	45	7.49	0.00	0.00
101	101	-1.055	-0.629	-0.907	2.000	10683	16858	-322	-707	74209	-134	-819	N	-176	77.48	78.35	523	0	0.13	Not Reqd	0.00	0.06	0.21	307	747	45	7.54	0.00	0.00
101	102	-1.040	-0.646	-0.903	2.000	10788	16886	-297	-622	72077	69	-678	N	-229	76.55	79.07	549	0	0.13	Not Reqd	0.00	0.06	0.21	310	773	23	8.57	0.00	0.00
102	102	-1.040	-0.646	-0.903	2.000	10788	16886	-297	-622	72077	69	-678	N	-251	76.55	79.07	556	0	0.13	Not Reqd	0.00	0.06	0.21	310	780	23	8.64	0.00	0.00
102	103	-1.011	-0.683	-0.897	2.000	10933	16719	-274	-542	68357	271	-541	N	-277	75.36	80.06	583	0	0.13	Not Reqd	0.00	0.06	0.21	315	809	90	8.88	0.00	0.00
103	103	-1.011	-0.682	-0.897	2.000	10933	16719	-274	-542	68357	271	-542	N	-303	75.36	80.06	591	0	0.13	Not Reqd	0.00	0.06	0.21	315	816	90	8.96	0.00	0.00
103	104	-0.978	-0.724	-0.890	2.000	11124	16375	-251	-467	63061	473	-409	N	-450	73.53	81.36	660	0	0.13	Not Reqd	0.00	0.06	0.21	322	884	158	9.68	0.00	0.00
104	104	-0.978	-0.724	-0.890	2.000	11124	16375	-251	-467	63061	473	-410	N	-472	73.53	81.36	668	0	0.13	Not Reqd	0.00	0.06	0.21	322	891	158	9.76	0.00	0.00
104	105	-0.937	-0.777	-0.882	2.000	11354	15870	-230	-396	56200	675	-282	N	-509	71.20	82.94	690	0	0.13	Not Reqd	0.00	0.06	0.21	328	916	225	10.03	0.00	0.00
105	105	-0.937	-0.777	-0.882	2.000	11354	15870	-230	-396	56200	675	-283	N	-531	71.20	82.94	697	0	0.13	Not Reqd	0.00	0.06	0.21	328	923	225	10.12	0.00	0.00
105	106	-0.885	-0.848	-0.872	2.000	11623	15224	-209	-331	47785	877	-161	N	-567	68.64	84.78	721	0	0.13	Not Reqd	0.00	0.06	0.21	335	951	292	10.43	0.00	0.00
106	106	-0.885	-0.848	-0.872	2.000	11623	15224	-209	-331	47785	877	-161	N	-594	68.64	84.78	730	0	0.13	Not Reqd	0.00	0.06	0.21	335	959	292	10.55	0.00	0.00
106	107	-0.823	-0.933	-0.861	2.000	11939	14452	-190	-271	37823	1079	-44	N	-630	65.83	86.94	756	0	0.13	Not Reqd	0.00	0.06	0.21	344	989	360	10.93	0.00	0.00
107	107	-0.823	-0.933	-0.861	2.000	11939	14452	-190	-271	37823	1079	-45	N	-653	65.83	86.94	763	0	0.13	Not Reqd	0.00	0.06	0.21	344	996	360	11.04	0.00	0.00
107	108	-0.764	-1.011	-0.850	2.000	12301	13571	-172	-218	26319	1281	65	N	-807	62.10	89.42	830	0	0.13	Not Reqd	0.00	0.06	0.25	424	1129	427	13.22	0.00	0.00
108	108	-0.764	-1.011	-0.850	2.000	12301	13571	-172	-218	26319	1281	65	N	-834	62.10	89.42	839	0	0.13	Not Reqd	0.00	0.06	0.25	424	1137	427	13.36	0.00	0.00
108	109	-0.699	-1.098	-0.839	2.000	12695	12594	-155	-171	13276	1484	169	N	-869	58.05	92.12	868	0	0.13	Not Reqd	0.00	0.06	0.25	437	1174	495	14.11	0.00	0.00
109	109	-0.699	-1.099	-0.840	2.000	12695	12594	-155	-169	13276	1483	161	N	-1268	58.05	92.12	1001	0	0.13	Not Reqd	0.00	0.06	0.25	437	1294	494	16.45	0.00	0.00
109	110	-0.646	-1.075	-0.805	2.000	13066	11533	-140	-128	-1318	1688	259	N	-1302	78.40	95.13	1031	0	0.13	Not Reqd	0.00	0.06	0.25	451	1334	563	17.57	0.00	0.00
110	110	-0.646	-1.075	-0.805	2.000	13066	11533	-140	-128	-1318	1688	259	N	-1318	78.40	95.13	1036	0	0.13	Not Reqd	0.00	0.06	0.25	451	1339	563	17.67	0.00	0.00
110	111	-0.587	-1.062	-0.771	2.000	13477	4514	-133	138	-23385	1893	582	N	-1468	87.67	98.42	1107	0	0.13	Not Reqd	0.00	0.06	0.37	700	1627	631	23.47	0.00	0.00
111	111	-0.587	-1.062	-0.771	2.000	13477	4514	-133	138	-23385	1892	582	N	-1481	87.67	98.42	1111	0	0.13	Not Reqd	0.00	0.06	0.37	700	1630	631	23.56	0.00	0.00
111	112	-0.531	-1.048	-0.740	2.000	13934	4998	-129	148	-39519	2101	649	N	-1514	98.22	102.02	1145	0	0.13	Not Reqd	0.00	0.06	0.37	726	1684	700	23.79	0.00	0.00
112	112	-0.531	-1.048	-0.740	2.000	13934	4998	-129	148	-39519	2101	650	N	-1538	98.22	102.02	1153	0	0.13	Not Reqd	0.00	0.06	0.37	726	1691	700	23.96	0.00	0.00
112	113	-0.832	-1.300	-1.028	2.000	14431	5523	-126	157	-57293	2330	715	N	-3840	104.27	105.89	1945	0	0.13	Not Reqd	0.00	0.06	0.37	753	2428	777	40.18	0.00	0.00
113	113	-0.832	-1.300	-1.028	2.000	14431	5523	-126	157	-57293	2329	716	N	-3880	104.27	105.89	1958	0	0.13	Not Reqd	0.00	0.06	0.37	753	2440	776	40.46	0.00	0.00
113	114	-0.901	-1.085	-0.981	2.000	14973	6099	-124	165	-76930	2595	780	N	-3919	122.47	110.22	1998	0	0.13	Not Reqd	0.00	0.06	0.37	784	2504	865	40.63	0.00	0.00
114	114	-0.901	-1.085	-0.981	2.000	14973	6099	-124	165	-76930	2595	781	N	-3956	122.47	110.22	2010	0	0.13	Not Reqd	0.00	0.06	0.37	784	2515	865	40.90	0.00	0.00
114	115	-0.956	-1.000	-0.976	2.000	15555	6733	-122	171	-98597	2868	844	N	-1901	137.38	123.65	1409	0	0.13	Not Reqd	0.00	0.06	0.37	880	2060	956	28.11	0.00	0.00
115	115	-0.956	-1.000	-0.975	2.000	15555	6733	-122	171	-98597	2868	845	N	-1942	137.38	123.65	1423	0	0.13	Not Reqd	0.00	0.06	0.37	880	2073	956	28.42	0.00	0.00
115	116	-0.860	-1.040	-0.943	2.000	16176	7434	-121	177	-122348	3149	907	N	-1836	147.02	132.32	1442	0	0.13	Not Reqd	0.00	0.06	0.37	942	2145	1050	28.20	0.00	0.00
116	116	-0.859	-1.041	-0.942	2.000	16176	7434	-121	177	-122348	3148	908	N	-1887	147.02	132.32	1459	0	0.13	Not Reqd	0.00	0.06	0.37	942	2161	1049	28.59	0.00	0.00
116	117	-0.754	-1.093	-0.913	2.000	16843	8209	-120	181	-148240	3437	970	N	-1669	156.32	140.69	1439	0	0.13	Not Reqd	0.00	0.06	0.37	1001	2196	1146	27.27	0.00	0.00
117	117	-0.752	-1.092	-0.912	2.000	16843	8209	-120	180	-148240	3439	985	N	-1297	156.32	140.69	1315	0	0.13	Not Reqd	0.00	0.06	0.37	1001	2085	1146	24.44	0.00	0.00
117	118	-0.624	-1.221	-0.905	2.000	17619	9067	-120	184	-176318	3733	1045	N	-969	164.85	148.36	1209	174	0.13	Not Reqd	0.00	0.06	0.37	1048				0.00	0.00
118	118	-0.620	-1.217	-0.900	2.000	17619	9067	-120	184	-176318	3736	1056	N	-127	164.85	148.36	912	472	0.34	Not Reqd	0.00	0.17	0.37	1045				0.00	0.00
118	119	-0.558	-1.292	-0.903	2.000	17619	9361	-120	185	-185765	3817	1075	N	0	164.93	148.44	853	560	0.40	Not Reqd	0.00	0.20	0.37	1043				0.00	0.00
119	119	-0.558	-1.292	-0.903	2.000	17619	-37060	-908	-22	-232186	-5083	-1182	N	0	164.93	148.44	776	1107	0.80	Not Reqd	0.00	0.40	0.37	1027				0.00	0.00
119	120	-0.621	-1.213	-0.899	2.000	17619	-35320	-899	-22	-220109	-4993	-1163	N	98	164.93	148.44	825	1024	0.74	Not Reqd	0.00	0.37	0.37	1031				0.00	0.00
120	120	-0.626	-1.218	-0.904	2.000	17619	-35320	-898	-20	-220109	-4989	-1151	N	939	164.93	148.44	1119	729	0.52	Not Reqd	0.00	0.26	0.37	1034				0.00	0.00
120	121	-0.760	-1.076	-0.908	2.000	16843	-30083	-868	-20	-184075	-4666	-1093	N	1357	156.44	140.80	1263	465	0.35	Not Reqd	0.00	0.17	0.37	990	2028	1555	2.63	0.00	0.00
121	121	-0.762	-1.077	-0.910	2.000	16843	-30083	-867	-17	-184075	-4662	-1076	N	1726	156.44	140.80	1393	334	0.25	Not Reqd	0.00	0.13	0.37	991	2146	1554	3.05	0.00	0.00
121	122	-0.861	-1.025	-0.936	2.000	16176	-25141	-837	-17	-150604	-4345	-1018	N	2309	146.13	131.52	1592	17	0.13	Not Reqd	0.00	0.06	0.37	935	2274	1448	3.96	0.00	0.00
122	122	-0.861	-1.025	-0.936	2.000	16176	-25141	-837	-17	-150604	-4345	-1017	N	2258	146.13	131.52	1574	36	0.13	Not Reqd	0.00	0.06	0.37	935	2258	1448	3.90	0.00	0.00
122	123	-0.921	-1.019	-0.964	2.000	15555	-20489	-807	-16	-119638	-4036	-960	N	2537	133.87	120.48	1602	0	0.13	Not Reqd	0.00	0.06	0.37	857	2213	1345	4.22	0.00	0.00
123	123	-0.921	-1.019	-0.965	2.000	15555	-20489	-807	-16	-119638	-4036	-959	N	2496	133.87	120.48	1588	0	0.13	Not Reqd	0.00	0.06	0.37	857	2201	1345	4.18	0.00	0.00
123	124	-0.872	-1.112	-0.976	2.000	14973	-16123	-777	-16	-91108	-3735	-902	N	3847	117.97	110.07	1973	0	0.13	Not Reqd	0.00	0.06	0.37	783	2481	1245	5.77	0.00	0.00
124	124	-0.872	-1.113	-0.976	2.000	14973	-16123	-777	-16	-91108	-3735	-901	N	3810	117.97	110.07	1961	0	0.13	Not Reqd	0.00	0.06	0.37	783	2470	1245	5.72	0.00	0.00
124	125	-0.805	-1.304	-1.014	2.000	14431	-12038	-747	-16	-64947	-3442	-843	N	3697	100.16	105.89	1897	0	0.13	Not Reqd	0.00	0.06	0.37	753	2385	1147	5.97	0.00	0.00
125	125	-0.805	-1.305	-1.015	2.000	14431	-12038	-747	-15	-64947	-3442	-843	N	3658	100.16	105.89	1884	0	0.13	Not Reqd	0.00	0.06	0.37	753	2373	1147	5.92	0.00	0.00
125	126	-0.551	-1.105	-0.775	2.000	13934	-8231	-717	-15	-40975	-3186	-785	N	1787	90.29	102.02	1236	0	0.13	Not Reqd	0.00	0.06	0.25	484	1548	1062	3.03	0.00	0.00
126	126	-0.551	-1.105	-0.775	2.000	13934	-8231	-717	-15	-40975	-3186	-785	N	1762	90.29	102.02	1227	0	0.13	Not Reqd	0.00	0.06	0.25	484	1540	1062	3.00	0.00	0.00
126	127	-0.597	-1.118	-0.800	2.000	13477	-4700	-687	-15	-18962	-2951	-728	N	1692	79.02	98.42	1181	0	0.13	Not Reqd	0.00	0.06	0.25	467	1483	984	3.18	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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																														
		(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	Resistance	Ultimate	Rating	Required	PT Steel Req'd
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	per web	Shear	Factor, RF	for Torsion	for Torsion
Number	Number			(fpc)		(Tcr)				(Mu)	(Vu)	(Tu)		(Vp)	d_e	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	-0.597	-1.118	-0.799	2.000	13477	-4700	-687	-14	-18962	-2951	-727	N	1678	79.02	98.42	1177	0	0.13	Not Reqd	0.00	0.06	0.25	467	1479	984	3.17	0.00	0.00
127	128	-0.640	-1.133	-0.823	2.000	13066	-1445	-656	-14	1204	-2723	-670	N	1598	63.55	95.13	1130	0	0.13	Not Reqd	0.00	0.06	0.25	451	1423	908	3.35	0.00	0.00
128	128	-0.640	-1.133	-0.823	2.000	13066	-1445	-657	-14	1204	-2723	-670	N	1581	63.55	95.13	1124	0	0.13	Not Reqd	0.00	0.06	0.25	451	1418	908	3.33	0.00	0.00
128	129	-0.681	-1.144	-0.844	2.000	12695	1529	-626	-13	19577	-2503	-612	N	1492	68.86	92.12	1075	0	0.13	Not Reqd	0.00	0.06	0.21	364	1295	834	3.21	0.00	0.00
129	129	-0.681	-1.143	-0.843	2.000	12695	1529	-626	-13	19577	-2505	-609	N	1068	68.86	92.12	934	0	0.13	Not Reqd	0.00	0.06	0.21	364	1168	835	2.60	0.00	0.00
129	130	-0.745	-1.026	-0.843	2.000	12301	4219	-596	-12	36197	-2288	-552	N	977	73.68	89.42	887	0	0.13	Not Reqd	0.00	0.06	0.21	353	1116	763	2.78	0.00	0.00
130	130	-0.745	-1.027	-0.843	2.000	12301	4219	-596	-12	36197	-2288	-552	N	949	73.68	89.42	877	0	0.13	Not Reqd	0.00	0.06	0.21	353	1108	763	2.74	0.00	0.00
130	131	-0.809	-0.906	-0.843	2.000	11939	6617	-565	-12	51082	-2073	-494	N	862	77.92	86.94	833	0	0.13	Not Reqd	0.00	0.06	0.21	344	1059	691	2.95	0.00	0.00
131	131	-0.809	-0.906	-0.843	2.000	11939	6617	-565	-12	51082	-2073	-494	N	838	77.92	86.94	825	0	0.13	Not Reqd	0.00	0.06	0.21	344	1052	691	2.91	0.00	0.00
131	132	-0.872	-0.786	-0.842	2.000	11623	8717	-534	-12	64236	-1860	-437	N	755	81.68	84.78	769	0	0.13	Not Reqd	0.00	0.06	0.21	334	992	620	3.09	0.00	0.00
132	132	-0.872	-0.787	-0.842	2.000	11623	8717	-534	-12	64236	-1860	-436	N	728	81.68	84.78	759	0	0.13	Not Reqd	0.00	0.06	0.21	334	984	620	3.04	0.00	0.00
132	133	-0.931	-0.670	-0.840	2.000	11354	10512	-504	-11	75664	-1648	-379	N	648	84.96	82.94	697	0	0.13	Not Reqd	0.00	0.06	0.21	324	919	549	3.20	0.00	0.00
133	133	-0.931	-0.671	-0.841	2.000	11354	10512	-504	-11	75664	-1648	-378	N	624	84.96	82.94	689	0	0.13	Not Reqd	0.00	0.06	0.21	324	912	549	3.16	0.00	0.00
133	134	-0.986	-0.562	-0.839	2.000	11124	11995	-473	-11	85368	-1436	-321	N	543	87.75	81.36	633	0	0.13	Not Reqd	0.00	0.06	0.21	316	854	479	3.38	0.00	0.00
134	134	-0.986	-0.563	-0.839	2.000	11124	11995	-473	-11	85368	-1436	-321	N	521	87.75	81.36	625	0	0.13	Not Reqd	0.00	0.06	0.21	316	847	479	3.34	0.00	0.00
134	135	-1.035	-0.465	-0.837	2.000	10933	13161	-442	-10	93351	-1226	-263	N	439	90.04	81.04	583	0	0.13	Not Reqd	0.00	0.06	0.21	313	807	409	3.70	0.00	0.00
135	135	-1.035	-0.466	-0.838	2.000	10933	13161	-442	-10	93351	-1226	-263	N	412	90.04	81.04	574	0	0.13	Not Reqd	0.00	0.06	0.21	313	799	409	3.64	0.00	0.00
135	136	-1.077	-0.382	-0.836	2.000	10788	14005	-412	-10	99612	-1017	-205	N	330	91.84	82.65	549	0	0.13	Not Reqd	0.00	0.06	0.21	319	781	339	4.22	0.00	0.00
136	136	-1.077	-0.382	-0.836	2.000	10788	14005	-412	-10	99612	-1017	-205	N	307	91.84	82.65	542	0	0.13	Not Reqd	0.00	0.06	0.21	319	774	339	4.17	0.00	0.00
136	137	-1.110	-0.315	-0.834	2.000	10683	14526	-382	-10	104157	-808	-147	N	222	93.11	83.80	516	0	0.13	Not Reqd	0.00	0.06	0.21	323	755	269	4.81	0.00	0.00
137	137	-1.110	-0.315	-0.834	2.000	10683	14526	-382	-9	104157	-808	-147	N	200	93.11	83.80	508	0	0.13	Not Reqd	0.00	0.06	0.21	323	748	269	4.76	0.00	0.00
137	138	-1.134	-0.265	-0.833	2.000	10617	14720	-352	-9	106983	-601	-89	N	114	93.86	84.48	481	0	0.13	Not Reqd	0.00	0.06	0.21	325	725	200	5.47	0.00	0.00
138	138	-1.134	-0.266	-0.833	2.000	10617	14720	-352	-9	106983	-601	-88	N	77	93.86	84.48	468	0	0.13	Not Reqd	0.00	0.06	0.21	325	714	200	5.37	0.00	0.00
138	139	-1.148	-0.236	-0.832	2.000	10617	14591	-323	-9	108099	-394	-31	N	1	94.09	84.68	444	0	0.13	Not Reqd	0.00	0.06	0.21	326	693	131	6.22	0.00	0.00
139	139	-1.148	-0.236	-0.832	2.000	10617	14591	-323	-9	108099	-393	-30	N	-44	94.09	84.68	459	0	0.13	Not Reqd	0.00	0.06	0.21	326	706	131	6.34	0.00	0.00
139	140	-1.150	-0.228	-0.830	2.000	10683	14251	-299	-8	107749	-226	17	N	-110	93.93	84.53	483	0	0.13	Not Reqd	0.00	0.06	0.21	326	728	75	7.54	0.00	0.00
140	140	-1.150	-0.228	-0.830	2.000	10683	14251	-299	-8	107749	-226	17	N	-123	93.93	84.53	488	0	0.13	Not Reqd	0.00	0.06	0.21	326	732	75	7.58	0.00	0.00
140	141	-1.144	-0.236	-0.829	2.000	10788	13544	-271	-8	105770	-19	74	N	-202	93.27	83.94	512	0	0.13	Not Reqd	0.00	0.06	0.21	323	752	6	9.25	0.00	0.00
141	141	-1.144	-0.236	-0.829	2.000	10788	13544	-271	-8	105770	-19	75	N	-224	93.27	83.94	519	0	0.13	Not Reqd	0.00	0.06	0.21	323	758	6	9.32	0.00	0.00
141	142	-1.127	-0.263	-0.827	2.000	10933	12526	-243	-8	102088	188	132	N	-301	92.12	82.91	544	0	0.13	Not Reqd	0.00	0.06	0.25	384	835	63	10.53	0.00	0.00
142	142	-1.127	-0.263	-0.827	2.000	10933	12526	-243	-8	102088	188	133	N	-327	92.12	82.91	552	0	0.13	Not Reqd	0.00	0.06	0.25	384	843	63	10.62	0.00	0.00
142	143	-1.100	-0.307	-0.824	2.000	11124	11209	-216	-8	96708	394	190	N	-404	90.49	81.44	578	0	0.13	Not Reqd	0.00	0.06	0.25	378	860	131	11.11	0.00	0.00
143	143	-1.100	-0.306	-0.824	2.000	11124	11209	-216	-8	96708	394	190	N	-426	90.49	81.44	585	0	0.13	Not Reqd	0.00	0.06	0.25	378	867	131	11.20	0.00	0.00
143	144	-1.065	-0.364	-0.821	2.000	11354	9606	-190	-8	89636	601	247	N	-505	88.35	82.94	634	0	0.13	Not Reqd	0.00	0.06	0.25	387	919	200	12.36	0.00	0.00
144	144	-1.065	-0.364	-0.821	2.000	11354	9606	-190	-8	89636	601	248	N	-527	88.35	82.94	642	0	0.13	Not Reqd	0.00	0.06	0.25	387	926	200	12.47	0.00	0.00
144	145	-1.022	-0.433	-0.817	2.000	11623	8800	-169	-6	81949	803	307	N	-607	85.70	84.78	695	0	0.13	Not Reqd	0.00	0.06	0.25	398	984	268	13.69	0.00	0.00
145	145	-1.022	-0.433	-0.817	2.000	11623	8800	-169	-6	81949	803	307	N	-634	85.70	84.78	705	0	0.13	Not Reqd	0.00	0.06	0.25	398	992	268	13.84	0.00	0.00
145	146	-0.974	-0.511	-0.812	2.000	11939	7517	-151	-5	72363	1005	364	N	-712	82.52	86.94	765	0	0.13	Not Reqd	0.00	0.06	0.25	410	1058	335	15.39	0.00	0.00
146	146	-0.974	-0.511	-0.812	2.000	11939	7517	-151	-5	72363	1005	365	N	-735	82.52	86.94	773	0	0.13	Not Reqd	0.00	0.06	0.25	411	1065	335	15.54	0.00	0.00
146	147	-0.920	-0.596	-0.807	2.000	12301	-2772	-134	-1	52340	1205	426	N	-808	78.88	89.42	831	0	0.13	Not Reqd	0.00	0.06	0.25	424	1129	402	17.24	0.00	0.00
147	147	-0.920	-0.596	-0.807	2.000	12301	-2772	-134	-1	52340	1205	426	N	-836	78.88	89.42	840	0	0.13	Not Reqd	0.00	0.06	0.25	424	1137	402	17.42	0.00	0.00
147	148	-0.862	-0.686	-0.800	2.000	12695	-2254	-131	-1	41680	1395	483	N	-906	74.76	92.12	880	0	0.13	Not Reqd	0.00	0.06	0.25	437	1185	465	17.55	0.00	0.00
148	148	-0.862	-0.687	-0.800	2.000	12695	-2254	-130	-2	41680	1394	490	N	-1307	74.76	92.12	1014	0	0.13	Not Reqd	0.00	0.06	0.25	437	1306	465	20.34	0.00	0.00
148	149	-0.815	-0.704	-0.774	2.000	13066	-1633	-128	-1	29656	1587	547	N	-1404	70.03	95.13	1065	0	0.13	Not Reqd	0.00	0.06	0.25	451	1365	529	20.63	0.00	0.00
149	149	-0.815	-0.704	-0.774	2.000	13066	-1633	-128	-1	29656	1587	547	N	-1421	70.03	95.13	1070	0	0.13	Not Reqd	0.00	0.06	0.25	451	1370	529	20.75	0.00	0.00
149	150	-0.766	-0.716	-0.746	2.000	13477	-886	-126	-1	16244	1786	604	N	-1484	64.69	98.42	1112	0	0.13	Not Reqd	0.00	0.06	0.25	467	1421	595	20.69	0.00	0.00
150	150	-0.766	-0.716	-0.747	2.000	13477	-886	-126	-1	16244	1786	604	N	-1497	64.69	98.42	1116	0	0.13	Not Reqd	0.00	0.06	0.25	467	1425	595	20.78	0.00	0.00
150	151	-0.695	-0.757	-0.719	2.000	14003	10	-125	-1	-201	2404	661	N	-1516	84.78	102.02	1146	0	0.13	Not Reqd	0.00	0.06	0.25	484				0.00	0.00

2.57

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
		Permanent Loads + Maximum LL Torsion @ t=00																											
1	1	-0.833	-0.786	-0.813	2.000	13852	-22	-282	8946	-28	1966	11511	Y	-2574	83.23	102.02	1498	0	0.13	0.287	0.00	0.21	0.53	1030				25.73	8.80
1	2	-0.816	-0.743	-0.785	2.000	14417	983	-76	8423	-19535	2804	11046	Y	-2548	101.41	105.89	1514	0	0.13	0.265	0.00	0.20	0.53	1069	2325	1098	9.19	23.96	8.19
2	2	-0.816	-0.744	-0.785	2.000	14417	1205	-73	8430	-19331	2806	10914	Y	-2578	101.41	105.89	1524	0	0.13	0.261	0.00	0.20	0.53	1069	2334	1097	9.31	23.67	8.09
2	3	-0.765	-0.746	-0.757	2.000	14960	1537	-7	8135	-42941	3099	10677	Y	-2486	117.61	110.07	1519	0	0.13	0.247	0.00	0.19	0.53	1112	2368	1191	10.61	22.53	7.70
3	3	-0.765	-0.746	-0.757	2.000	14960	1482	-7	8145	-43012	3099	10385	Y	-2514	117.61	110.07	1529	0	0.13	0.240	0.00	0.18	0.53	1112	2376	1186	10.70	21.91	7.49
3	4	-0.699	-0.775	-0.733	2.000	15542	-335	198	8236	-70616	3538	10534	Y	-2276	133.19	119.87	1461	0	0.13	0.234	0.00	0.18	0.53	1199	2393	1335	6.64	21.61	7.39
4	4	-0.698	-0.775	-0.733	2.000	15542	-391	198	8232	-70686	3538	10053	Y	-2306	133.19	119.87	1471	0	0.13	0.223	0.00	0.18	0.53	1199	2403	1328	6.73	20.62	7.05
4	5	-0.612	-0.836	-0.715	2.000	16160	-2035	220	8420	-100028	3803	10299	Y	-1843	146.74	132.07	1336	72	0.13	0.220	0.00	0.17	0.53	1307	2379	1420	5.85	20.53	7.02
5	5	-0.610	-0.836	-0.714	2.000	16160	-2091	220	8412	-100095	3805	9633	Y	-1568	146.74	132.07	1240	170	0.14	0.206	0.00	0.17	0.53	1306	2291	1411	5.45	19.21	6.57
5	6	-0.491	-0.987	-0.720	2.000	16896	-3109	265	8828	-130736	4099	10108	Y	-867	157.30	141.57	1012	506	0.39	0.207	0.00	0.30	0.53	1386				19.52	6.67
6	6	-0.486	-0.983	-0.716	2.000	16896	-3148	266	8821	-130779	4102	9528	Y	-279	157.30	141.57	808	712	0.54	0.195	0.00	0.37	0.53	1383				18.40	6.29
6	7	-0.426	-1.066	-0.722	2.000	16896	-3836	271	8880	-141394	4187	9606	Y	0	157.56	141.80	699	851	0.65	0.196	0.00	0.42	0.37	972				18.55	6.34
7	7	-0.426	-1.066	-0.722	2.000	16896	-7007	-544	9085	-144566	-3789	8833	Y	0	157.56	141.80	701	702	0.54	0.181	0.00	0.36	0.37	972				17.05	5.83
7	8	-0.486	-0.996	-0.721	2.000	16896	-5932	-535	8947	-135285	-3700	8713	Y	172	157.47	141.72	772	599	0.46	0.178	0.00	0.32	0.37	975				16.82	5.75
8	8	-0.489	-1.000	-0.725	2.000	16896	-5962	-535	8914	-135313	-3697	8101	Y	764	157.47	141.72	978	392	0.30	0.166	0.00	0.23	0.37	977				15.64	5.35
8	9	-0.612	-0.881	-0.736	2.000	16160	-2789	-508	8495	-107850	-3421	7740	Y	1286	148.19	133.37	1145	122	0.13	0.165	0.00	0.15	0.37	927	1866	1255	3.07	15.43	5.28
9	9	-0.613	-0.882	-0.737	2.000	16160	-2832	-507	8469	-107885	-3419	7010	Y	1578	148.19	133.37	1247	19	0.13	0.150	0.00	0.14	0.37	928	1958	1243	3.43	13.98	4.78
9	10	-0.691	-0.858	-0.765	2.000	15542	27	-481	8057	-82702	-3149	6656	Y	2059	136.51	122.86	1392	0	0.13	0.148	0.00	0.14	0.37	863	2030	1148	4.16	13.65	4.67
10	10	-0.691	-0.857	-0.765	2.000	15542	-11	-481	8058	-82728	-3149	6095	Y	2029	136.51	122.86	1381	0	0.13	0.135	0.00	0.13	0.37	863	2020	1140	4.15	12.50	4.27
10	11	-0.718	-0.884	-0.790	2.000	14960	2543	-454	7650	-59760	-2888	5746	Y	2336	122.61	110.35	1453	0	0.13	0.133	0.00	0.13	0.37	782	2012	1048	4.65	12.12	4.14
11	11	-0.718	-0.884	-0.790	2.000	14960	2507	-454	7668	-59781	-2888	5340	Y	2307	122.61	110.35	1443	0	0.13	0.123	0.00	0.13	0.37	782	2003	1042	4.63	11.27	3.85
11	12	-0.737	-0.936	-0.821	2.000	14421	4763	-427	7261	-38954	-2636	4992	Y	2165	108.85	105.89	1386	0	0.13	0.120	0.00	0.12	0.37	753	1926	952	4.90	10.82	3.70
12	12	-0.737	-0.936	-0.821	2.000	14421	4733	-427	7294	-38968	-2636	4727	Y	2135	108.85	105.89	1376	0	0.13	0.113	0.00	0.12	0.37	753	1917	948	4.87	10.25	3.50
12	13	-0.752	-0.998	-0.852	2.000	13928	6697	-401	6886	-20208	-2391	4377	Y	2005	96.26	102.02	1309	0	0.13	0.109	0.00	0.12	0.37	726	1831	862	5.12	9.74	3.33
13	13	-0.752	-0.998	-0.852	2.000	13928	6672	-401	6932	-20215	-2391	4240	Y	1979	96.26	102.02	1300	0	0.13	0.105	0.00	0.12	0.37	726	1823	860	5.08	9.44	3.23
13	14	-0.762	-1.072	-0.883	2.000	13471	8353	-375	6521	-3452	-2155	3887	N	1862	84.64	98.42	1238	0	0.13	Not Reqd	0.00	0.06	0.37	700	1745	718	9.22	0.00	0.00
14	14	-0.762	-1.072	-0.883	2.000	13471	8334	-375	6577	-3453	-2155	3863	N	1849	84.64	98.42	1234	0	0.13	Not Reqd	0.00	0.06	0.37	700	1741	718	9.19	0.00	0.00
14	15	-0.764	-1.163	-0.912	2.000	13063	9739	-349	6166	11383	-1927	3510	N	1741	58.02	95.13	1177	0	0.13	Not Reqd	0.00	0.06	0.25	451	1466	642	8.08	0.00	0.00
15	15	-0.764	-1.162	-0.912	2.000	13063	9728	-348	6232	11390	-1927	3587	N	1723	58.02	95.13	1171	0	0.13	Not Reqd	0.00	0.06	0.25	451	1460	642	8.04	0.00	0.00
15	16	-0.759	-1.270	-0.938	2.000	12695	10861	-323	5821	24366	-1706	3234	N	1614	63.32	92.12	1116	0	0.13	Not Reqd	0.00	0.06	0.25	437	1398	569	8.70	0.00	0.00
16	16	-0.760	-1.270	-0.939	2.000	12695	10856	-323	5902	24379	-1707	3389	N	1145	63.32	92.12	960	0	0.13	Not Reqd	0.00	0.06	0.25	437	1257	569	7.39	0.00	0.00
16	17	-0.775	-1.242	-0.938	2.000	12301	11725	-298	5493	35550	-1492	3039	N	1034	68.10	89.42	906	0	0.13	Not Reqd	0.00	0.06	0.25	424	1197	497	8.05	0.00	0.00
17	17	-0.775	-1.242	-0.939	2.000	12301	11729	-298	5573	35570	-1491	3280	N	1004	68.10	89.42	896	0	0.13	Not Reqd	0.00	0.06	0.25	424	1188	497	7.96	0.00	0.00
17	18	-0.790	-1.211	-0.937	2.000	11939	12339	-273	5169	44969	-1278	2934	N	891	72.21	86.94	843	0	0.13	Not Reqd	0.00	0.06	0.21	344	1068	426	8.06	0.00	0.00
18	18	-0.790	-1.211	-0.937	2.000	11939	12352	-272	5253	44996	-1278	3239	N	865	72.21	86.94	834	0	0.13	Not Reqd	0.00	0.06	0.21	344	1060	426	7.98	0.00	0.00
18	19	-0.803	-1.179	-0.934	2.000	11623	12712	-248	4853	52642	-1066	2897	N	754	75.72	84.78	783	0	0.13	Not Reqd	0.00	0.06	0.21	335	1006	355	8.87	0.00	0.00
19	19	-0.803	-1.179	-0.934	2.000	11623	12732	-248	4939	52675	-1066	3254	N	724	75.72	84.78	773	0	0.13	Not Reqd	0.00	0.06	0.21	335	998	355	8.78	0.00	0.00
19	20	-0.814	-1.148	-0.930	2.000	11354	12850	-224	4543	58588	-856	2916	N	614	78.61	82.94	725	0	0.13	Not Reqd	0.00	0.06	0.21	328	948	285	9.88	0.00	0.00
20	20	-0.815	-1.148	-0.931	2.000	11354	12882	-223	4631	58630	-855	3314	N	589	78.61	82.94	717	0	0.13	Not Reqd	0.00	0.06	0.21	328	940	285	9.80	0.00	0.00
20	21	-0.823	-1.122	-0.926	2.000	11124	13196	3	4432	63257	-444	3173	N	481	80.88	81.36	671	0	0.13	Not Reqd	0.00	0.06	0.21	322	893	148	748.03	0.00	0.00
21	21	-0.823	-1.122	-0.927	2.000	11124	13258	1	4522	63326	-446	3602	Y	457	80.88	81.36	663	0	0.13	0.112	0.00	0.12	0.21	322	886	202	11.17	9.54	3.26
21	22	-0.827	-1.103	-0.923	2.000	10933	13252	23	4441	66159	-241	3580	Y	349	82.54	80.06	611	0	0.13	0.113	0.00	0.12	0.21	316	834	133	10.57	9.61	3.29
22	22	-0.827	-1.104	-0.923	2.000	10933	13366	20	4532	66277	-243	4029	Y	321	82.54	80.06	601	0	0.13	0.127	0.00	0.13	0.21	316	825	141	10.29	10.82	3.70
22	23	-0.826	-1.094	-0.919	2.000	10788	13193	41	4474	67477	-39	4030	Y	215	83.59	79.07	554	0	0.13	0.129	0.00	0.13	0.21	311	779	72	9.84	10.94	3.74
23	23	-0.826	-1.095	-0.919	2.000	10788	13440	37	4565	67725	-43	4489	Y	191	83.59	79.07	546	0	0.13	0.144	0.00	0.14	0.21	311	772	81	9.66	12.18	4.16
23	24	-0.819	-1.097	-0.916	2.000	10617	13112	58	4532	67306	161	4514	Y	85	83.80	77.90	504	0	0.13	0.147	0.00	0.14	0.21	307	730	120	8.05	12.41	4.24
24	24	-0.819	-1.098	-0.916	2.000	10617	13642	50	4597	67837	153	4836	Y	22	83.80	77.90	481	0	0.13	0.157	0.00	0.14	0.21	307	709	123	7.92	13.29	4.54
24	25	-0.817	-1.099	-0.914	2.000	10617	13469	60	4589	67189	239	4853	Y	-22	83.80	77.90	481	0	0.13	0.158	0.00	0.14	0.21	307	709	151	7.36	13.34	4.56
25	25	-0.817	-1.099	-0.914	2.000	10617	13459	59	4654	67177	239	5173	Y	-85	83.80	77.90	503	0	0.13	0.168	0.00	0.15	0.21	307	729	156	7.47	14.22	4.86
25	26	-0.810	-1.103	-0.912	2.000	10788	12927	80	4652	64481	443	5230	Y	-189	83.59	79.07	551	0	0.13	0.167	0.00	0.15	0.21	312	777	225	6.78	14.19	4.85
26	26	-0.810	-1.102	-0.911	2.000	10788	12926	80	4740	64475	442	5667	Y	-213	83.59	79.07	560	0	0.13	0.181	0.00	0.16	0.21	312	784	231	6.72	15.38	5.26
26	27	-0.798	-1.118	-0.909	2.000	10933	12221	101	4759	60144	646	5744	Y	-316	82.54	80.06	608	0	0.13	0.181	0.00	0.16	0.21	316	832	300	6.11	15.42	5.27
27	27	-0.797	-1.117	-0.908	2.000	10933	12270	100	4842	60185	645	6151	Y	-343	82.54	80.06	617	0	0.13	0.194	0.00	0.16	0.21	316	840	306	6.09	16.52	5.65
27	28	-0.780	-1.142	-0.906	2.000	11124	11400	120	4880	54220	850	6247	Y	-445	80.88	81.36	659	0	0.13	0.194	0.00	0.16	0.21	322	882	376	5.51	16.55	5.66
28	28	-0.780	-1.142	-0.905	2.000	11124	11653	117	4958	54464	847	6614	Y	-469	80.88	81.36	667	0	0.13	0.205	0.00	0.17	0.21	322	890	380	5.53	17.52	5.99
28	29	-0.757	-1.174	-0.902	2.000	11354	14027	340	5058	50270	1254	6772	Y	-570	78.61	82.94	710	0	0.13	0.206	0.00	0.17	0.21	328	934	518	3.21	17.65	6.03
29	29	-0.757	-1.174	-0.902	2.000	11354	14020	340	5154	50250	1254	7112	Y	-594	78.61	82.94	718	0	0.13	0.216	0.00	0.17	0.21	328	942	523	3.21	18.53	6.34
29	30	-0.730	-1.212	-0.898	2.000	11623	13013	364	5525	41194	1464	7541	Y	-695	75.72	84.78	764	0	0.13	0.224	0.00	0.18	0.21	335	989	600	2.92	19.29	6.60
30	30	-0.730	-1.212	-0.898	2.000	11623	14065	354	5617	42231	1455	7822	Y	-723	75.72	84.78	773	0	0.13	0.232	0.00	0.18	0.21	335	997	600	2.97	20.01	6.84
30	31	-0.700	-1.252	-0.893	2.000	11939	12908	379	5990	31533	1666	8253	Y	-824	72.21	86.94	820	0	0.13	0.239	0.00	0.18	0.21	344	1047	677	2.72	20.68	7.07
31	31	-0.700	-1.252	-0.893	2.000	11939	13851	371	6082	32461	1658	8468	Y	-849	72.21	86.94	828	0	0.13	0.245	0.00	0.19	0.21	344	1055	678	2.77	21.22	7.25
31	32	-0.667	-1.294	-0.887	2.000	12301	12533	395	6456	20099	1872	8900	Y	-948	68.10	89.42	877	0	0.13	0.250	0.00	0.19	0.25	424	1171	755	2.83	21.79	7.45
32	32	-0.667	-1.294	-0.886	2.000	12301	12784	393	6542	20333	1869	9034	Y	-977	68.10	89.42	887	0	0.13	0.254	0.00	0.19	0.25	424	1180	757	2.86	22.11	7.56

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
				Permanent Loads + Maximum LL Torsion @ t=00																									
32	33	-0.632	-1.336	-0.879	2.000	12695	11258	418	6915	6250	2084	9465	Y	-1073	63.36	92.12	936	0	0.13	0.258	0.00	0.19	0.25	437	1235	835	2.66	22.61	7.73
33	33	-0.632	-1.336	-0.879	2.000	12695	11241	417	6991	6215	2082	9441	Y	-1513	63.36	92.12	1082	0	0.13	0.257	0.00	0.19	0.25	437	1367	834	3.20	22.55	7.71
33	34	-0.617	-1.237	-0.847	2.000	13063	9495	442	7357	-9629	2302	9866	Y	-1603	74.11	95.13	1131	0	0.13	0.261	0.00	0.20	0.25	451	1424	913	3.00	23.05	7.88
34	34	-0.617	-1.238	-0.847	2.000	13063	9520	441	7422	-9621	2301	9797	Y	-1619	74.11	95.13	1137	0	0.13	0.259	0.00	0.19	0.25	451	1429	912	3.01	22.89	7.83
34	35	-0.594	-1.158	-0.813	2.000	13471	7554	466	7778	-27274	2528	10212	Y	-1707	84.64	98.42	1186	0	0.13	0.262	0.00	0.20	0.37	700	1698	994	3.61	23.31	7.97
35	35	-0.594	-1.158	-0.814	2.000	13471	7540	466	7829	-27305	2528	10025	Y	-1719	84.64	98.42	1191	0	0.13	0.257	0.00	0.19	0.37	700	1702	991	3.62	22.88	7.82
35	36	-0.510	-1.053	-0.730	2.000	13928	5351	490	8172	-46885	2776	10426	Y	-1813	93.92	102.02	1244	0	0.13	0.259	0.00	0.19	0.37	726	1773	1080	3.44	23.21	7.93
36	36	-0.944	-1.403	-1.130	2.000	13928	5317	490	8208	-46934	2776	10103	Y	-4071	93.92	102.02	1997	0	0.13	0.251	0.00	0.19	0.37	726	2451	1075	5.83	22.49	7.69
36	37	-1.069	-1.106	-1.084	2.000	14427	2902	515	8537	-68678	3061	10491	Y	-4067	112.32	105.89	2020	0	0.13	0.251	0.00	0.19	0.37	753	2496	1175	5.44	22.74	7.77
37	37	-1.068	-1.106	-1.084	2.000	14427	2858	515	8556	-68735	3061	10019	Y	-4107	112.32	105.89	2033	0	0.13	0.240	0.00	0.18	0.37	753	2508	1168	5.50	21.72	7.42
37	38	-1.158	-0.953	-1.069	2.000	14960	-429	535	8865	-93469	3350	10386	Y	-2467	127.88	115.09	1545	0	0.13	0.240	0.00	0.18	0.37	819	2127	1270	3.77	21.91	7.49
38	38	-1.158	-0.953	-1.069	2.000	14960	-479	535	8862	-93529	3350	9747	Y	-2506	127.88	115.09	1557	0	0.13	0.225	0.00	0.18	0.37	819	2139	1261	3.84	20.56	7.03
38	39	-1.093	-0.943	-1.025	2.000	15542	-3368	560	9175	-120050	3652	10118	Y	-2209	139.16	125.24	1522	0	0.13	0.225	0.00	0.18	0.37	891	2172	1367	3.50	20.76	7.10
39	39	-1.092	-0.943	-1.025	2.000	15542	-3424	560	9152	-120110	3652	9297	Y	-2251	139.16	125.24	1536	0	0.13	0.207	0.00	0.17	0.37	891	2185	1355	3.58	19.07	6.52
39	40	-0.994	-0.980	-0.987	2.000	16160	-6056	587	9452	-148625	3964	9656	Y	-1818	148.99	134.09	1448	21	0.13	0.206	0.00	0.17	0.37	954	2162	1464	3.08	19.25	6.58
40	40	-0.992	-0.979	-0.986	2.000	16160	-6599	585	9408	-149167	3965	8706	Y	-1421	148.99	134.09	1307	161	0.13	0.186	0.00	0.16	0.37	953	2034	1450	2.75	17.36	5.93
40	41	-0.859	-1.113	-0.976	2.000	16896	-10602	606	9695	-181361	4277	9051	Y	-954	157.47	141.72	1144	441	0.33	0.185	0.00	0.26	0.37	998				17.48	5.98
41	41	-0.855	-1.109	-0.972	2.000	16896	-9493	612	9638	-180247	4286	8342	Y	-147	157.47	141.72	861	726	0.54	0.171	0.00	0.36	0.37	995				16.11	5.51
41	42	-0.792	-1.186	-0.974	2.000	16896	-10833	619	9730	-191096	4373	8452	Y	9	157.56	141.80	797	822	0.62	0.173	0.00	0.39	0.37	992				16.32	5.58
42	42	-0.858	-1.084	-0.962	2.000	16896	-22824	-658	10004	-191483	-4480	8729	Y	9	157.56	141.80	794	865	0.65	0.178	0.00	0.41	0.37	992				16.85	5.76
42	43	-0.920	-1.004	-0.958	2.000	16896	-21577	-650	9881	-180552	-4391	8625	Y	205	157.48	141.73	878	748	0.56	0.176	0.00	0.37	0.37	995				16.65	5.69
43	43	-0.924	-1.008	-0.962	2.000	16896	-20729	-638	9797	-179697	-4388	7931	Y	1002	157.48	141.73	1160	465	0.35	0.162	0.00	0.25	0.37	998				15.31	5.24
43	44	-1.055	-0.863	-0.966	2.000	16160	-17010	-613	9414	-146870	-4068	7606	Y	1512	148.61	133.75	1337	170	0.13	0.163	0.00	0.15	0.37	951	2059	1468	2.72	15.17	5.18
44	44	-1.056	-0.863	-0.967	2.000	16160	-16315	-604	9304	-146159	-4060	6667	Y	1857	148.61	133.75	1458	45	0.13	0.143	0.00	0.14	0.37	952	2169	1452	3.12	13.29	4.54
44	45	-1.147	-0.800	-0.990	2.000	15532	-12957	-579	8925	-116291	-3749	6348	Y	2188	138.35	124.51	1511	0	0.13	0.141	0.00	0.14	0.37	886	2157	1344	3.50	13.03	4.45
45	45	-1.147	-0.800	-0.991	2.000	15532	-12874	-577	8838	-116186	-3748	5551	Y	2143	138.35	124.51	1495	0	0.13	0.123	0.00	0.13	0.37	886	2143	1331	3.51	11.39	3.89
45	46	-1.209	-0.767	-1.015	2.000	14943	-9770	-553	8460	-88832	-3445	5232	Y	2534	127.10	114.39	1562	0	0.13	0.121	0.00	0.13	0.37	814	2139	1226	3.95	11.05	3.78
46	46	-1.210	-0.767	-1.015	2.000	14943	-9680	-552	8394	-88717	-3444	4622	Y	2492	127.10	114.39	1548	0	0.13	0.107	0.00	0.12	0.37	814	2126	1216	3.95	9.76	3.34
46	47	-1.139	-0.866	-1.023	2.000	14394	-6824	-527	8014	-63809	-3148	4301	N	3981	111.08	105.89	1991	0	0.13	Not Reqd	0.00	0.06	0.37	753	2470	1049	9.09	0.00	0.00
47	47	-1.140	-0.866	-1.023	2.000	14394	-6685	-525	7969	-63643	-3147	3860	N	3937	111.08	105.89	1977	0	0.13	Not Reqd	0.00	0.06	0.37	753	2457	1049	9.04	0.00	0.00
47	48	-1.053	-1.085	-1.066	2.000	13891	-4075	-501	7585	-41119	-2858	3535	N	3839	92.92	102.02	1920	0	0.13	Not Reqd	0.00	0.06	0.37	726	2381	953	9.56	0.00	0.00
48	48	-1.054	-1.085	-1.066	2.000	13891	-3839	-499	7558	-40855	-2856	3249	N	3798	92.92	102.02	1906	0	0.13	Not Reqd	0.00	0.06	0.37	726	2369	952	9.52	0.00	0.00
48	49	-0.766	-0.829	-0.791	2.000	13428	-1475	-474	7169	-20541	-2605	2918	N	1710	82.67	98.42	1188	0	0.13	Not Reqd	0.00	0.06	0.37	700	1699	868	6.26	0.00	0.00
49	49	-0.766	-0.829	-0.791	2.000	13428	-1104	-471	7160	-20140	-2601	2775	N	1693	82.67	98.42	1182	0	0.13	Not Reqd	0.00	0.06	0.37	700	1694	867	6.27	0.00	0.00
49	50	-0.805	-0.837	-0.817	2.000	13011	1009	-446	6765	-1812	-2370	2438	N	1591	71.62	95.13	1127	0	0.13	Not Reqd	0.00	0.06	0.25	451	1421	790	5.24	0.00	0.00
50	50	-0.805	-0.836	-0.817	2.000	13011	1676	-441	6774	-1115	-2365	2422	N	1568	71.62	95.13	1120	0	0.13	Not Reqd	0.00	0.06	0.25	451	1414	788	5.25	0.00	0.00
50	51	-0.842	-0.848	-0.844	2.000	12633	3523	-416	6375	15320	-2141	2082	N	1479	66.40	92.12	1071	0	0.13	Not Reqd	0.00	0.06	0.25	437	1357	714	5.64	0.00	0.00
51	51	-0.842	-0.847	-0.844	2.000	12633	4660	-407	6403	16488	-2131	2185	N	1463	66.40	92.12	1066	0	0.13	Not Reqd	0.00	0.06	0.25	437	1352	710	5.73	0.00	0.00
51	52	-0.875	-0.866	-0.872	2.000	12301	6210	-382	6003	31056	-1914	1844	N	1373	71.72	89.42	1019	0	0.13	Not Reqd	0.00	0.06	0.25	424	1298	638	6.18	0.00	0.00
52	52	-0.875	-0.865	-0.872	2.000	12301	7408	-374	6061	32283	-1899	1966	N	1003	71.72	89.42	895	0	0.13	Not Reqd	0.00	0.06	0.25	424	1188	633	5.45	0.00	0.00
52	53	-0.919	-0.801	-0.878	2.000	11939	8661	-349	5663	44977	-1686	1626	N	912	76.48	86.94	850	0	0.13	Not Reqd	0.00	0.06	0.25	412	1136	562	5.93	0.00	0.00
53	53	-0.919	-0.801	-0.878	2.000	11939	10347	-334	5726	46690	-1671	1930	N	889	76.48	86.94	842	0	0.13	Not Reqd	0.00	0.06	0.25	412	1129	557	6.13	0.00	0.00
53	54	-0.958	-0.744	-0.883	2.000	11623	11260	-310	5330	57537	-1459	1593	N	797	80.70	84.78	798	0	0.13	Not Reqd	0.00	0.06	0.21	335	1020	486	6.16	0.00	0.00
54	54	-0.959	-0.744	-0.884	2.000	11623	11438	-308	5409	57740	-1457	1979	N	771	80.70	84.78	789	0	0.13	Not Reqd	0.00	0.06	0.21	335	1012	486	6.12	0.00	0.00
54	55	-0.993	-0.694	-0.888	2.000	11354	12116	-284	5016	66857	-1247	1644	N	680	84.36	82.94	732	0	0.13	Not Reqd	0.00	0.06	0.21	326	952	416	6.67	0.00	0.00
55	55	-0.993	-0.694	-0.889	2.000	11354	12157	-283	5099	66920	-1246	2094	N	657	84.36	82.94	724	0	0.13	Not Reqd	0.00	0.06	0.21	326	945	415	6.61	0.00	0.00
55	56	-1.021	-0.652	-0.893	2.000	11124	10873	-79	4784	72590	-857	1836	N	565	87.46	81.36	674	0	0.13	Not Reqd	0.00	0.06	0.21	319	894	286	23.97	0.00	0.00
56	56	-1.021	-0.652	-0.893	2.000	11124	10900	-81	4859	72636	-858	2325	N	543	87.46	81.36	666	0	0.13	Not Reqd	0.00	0.06	0.21	319	887	286	23.35	0.00	0.00
56	57	-1.043	-0.621	-0.896	2.000	10933	11559	-60	4758	78772	-654	2283	N	450	89.97	80.97	621	0	0.13	Not Reqd	0.00	0.06	0.21	317	844	218	32.09	0.00	0.00
57	57	-1.043	-0.621	-0.896	2.000	10933	11595	-63	4838	78823	-656	2813	N	425	89.97	80.97	612	0	0.13	Not Reqd	0.00	0.06	0.21	317	836	219	30.52	0.00	0.00
57	58	-1.058	-0.598	-0.898	2.000	10788	12111	-42	4756	83346	-452	2790	N	332	91.90	82.71	588	0	0.13	Not Reqd	0.00	0.06	0.21	323	820	151	48.38	0.00	0.00
58	58	-1.058	-0.598	-0.898	2.000	10788	12219	-47	4840	83465	-456	3352	Y	311	91.90	82.71	580	0	0.13	0.107	0.00	0.12	0.21	323	812	201	8.02	9.10	3.11
58	59	-1.065	-0.586	-0.899	2.000	10683	12600	-26	4777	86387	-253	3347	Y	220	93.24	83.92	555	0	0.13	0.108	0.00	0.12	0.21	328	794	134	9.34	9.16	3.13
59	59	-1.065	-0.586	-0.899	2.000	10683	12878	-22	4864	86673	-248	3931	Y	199	93.24	83.92	547	0	0.13	0.127	0.00	0.13	0.21	327	787	141	9.17	10.75	3.68
59	60	-1.064	-0.584	-0.898	2.000	10617	13057	-1	4821	87930	-45	3946	Y	112	94.02	84.62	521	0	0.13	0.128	0.00	0.13	0.21	330	766	73	10.68	10.85	3.71
60	60	-1.064	-0.584	-0.898	2.000	10617	13227	2	4903	88104	-41	4479	Y	76	94.02	84.62	509	0	0.13	0.146	0.00	0.14	0.21	330	756	80	10.24	12.31	4.21
60	61	-1.058	-0.588	-0.895	2.000	10617	13231	19	4882	87909	123	4506	Y	8	94.24	84.81	487	0	0.13	0.147	0.00	0.14	0.21	331	736	108	9.02	12.39	4.23
61	61	-1.058	-0.588	-0.895	2.000	10617	13349	21	4965	88028	126	5039	Y	-27	94.24	84.81	494	0	0.13	0.164	0.00	0.15	0.21	331	742	117	8.79	13.85	4.74
61	62	-1.043	-0.602	-0.890	2.000	10683	13175	41	4955	86285	329	5088	Y	-111	94.02	84.62	522	0	0.13	0.165	0.00	0.15	0.21	330	767	185	7.69	13.92	4.76
62	62	-1.043	-0.602	-0.890	2.000	10683	13277	43	5046	86384	331	5670	Y	-132	94.02	84.62	529	0	0.13	0.183	0.00	0.16	0.21	330	773	194	7.52	15.51	5.30
62	63	-1.019	-0.628	-0.884	2.000	10788	12925	63	5054	83000	534	5736	Y	-217	93.24	83.92	557	0	0.13	0.184	0.00	0.16	0.21	328	796	263	6.57	15.57	5.32
63	63	-1.019	-0.628	-0.883	2.000	10788	13218	61	5143	83288	532	6297	Y	-238	93.24	83.92	563	0	0.13	0.202	0.00	0.17	0.21	328	802	270	6.52	17.09	5.84
63	64	-0.988	-0.663	-0.875	2.000	10933	12716	81	5167	78288	736	6379	Y	-325	91.90	82.71	591	0	0.13	0.202	0.00	0.17	0.21	324	823	339	5.68	17.13	5.86

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

		Permanent Loads + Maximum LL Torsion @ t=00															(kip)	(kip)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(kip)	(kip)	(kip)		Total Long.	Equivalent
		(ksi)	(ksi)	(ksi)		(k-ft)	Ultimate	Ultimate	Ultimate				Investigate	Shear from	(in)	(in)	Concrete	Required	Required	Additional	Additional	Total		Provided	Nominal			Mild Steel	PT Steel Req'd
		Perm Load	Perm Load	Dead Load	Stress	Torsional	Corresp.	Max	Corresp.	TOTAL	TOTAL	TOTAL	Torsional	Primary	Depth	Effective	Shear	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Shear	Ultimate	Shear	Required	for Torsion
		Stress	Stress	Stress	Variable	Cracking	Live Load	Live Load	Live Load	Ultimate	Ultimate	Ultimate	Effects?	Post Tensioning	to Tensile	Shear	Resistance	Resistance	Area	Required	Req'd from	Required	Resistance	Resistance	Resistance	Shear	Rating	for Torsion	(based on fpe)
Member	Node	(top fiber)	(bott. fiber)	(neutr. axis)	'K'	Moment	Moment	Shear	Torsion	Moment	Shear	Torsion	(Y/N)	Effect	Reinforcement	Depth	per web	per web	per web	for Torsion	Transverse	per leg	Provided	per leg	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
64	64	-0.988	-0.663	-0.875	2.000	10933	13147	77	5257	78710	731	6909	Y	-349	91.90	82.71	599	0	0.13	0.218	0.00	0.17	0.21	324	830	346	5.69	18.55	6.34
64	65	-0.949	-0.708	-0.865	2.000	11124	15167	302	5365	74761	1141	7075	Y	-437	89.98	81.36	620	0	0.13	0.220	0.00	0.17	0.21	318	845	485	3.00	18.74	6.41
65	65	-0.949	-0.708	-0.865	2.000	11124	16715	285	5476	76297	1124	7586	Y	-458	89.98	81.36	625	0	0.13	0.236	0.00	0.18	0.21	318	848	487	3.06	20.09	6.87
65	66	-0.904	-0.762	-0.854	2.000	11354	16247	308	5824	68384	1332	7992	Y	-544	87.47	82.94	680	0	0.13	0.243	0.00	0.19	0.21	326	905	562	2.82	20.83	7.12
66	66	-0.903	-0.762	-0.854	2.000	11354	16426	306	5936	68546	1330	8454	Y	-566	87.47	82.94	687	0	0.13	0.257	0.00	0.19	0.21	326	911	568	2.81	22.03	7.53
66	67	-0.851	-0.825	-0.842	2.000	11623	15763	329	6288	58953	1540	8864	Y	-649	84.37	84.78	748	0	0.13	0.263	0.00	0.20	0.25	402	1035	644	2.93	22.68	7.75
67	67	-0.851	-0.825	-0.842	2.000	11623	15767	329	6397	58938	1540	9260	Y	-675	84.37	84.78	757	0	0.13	0.275	0.00	0.20	0.25	402	1043	650	2.92	23.69	8.10
67	68	-0.793	-0.897	-0.829	2.000	11939	14894	353	6750	47640	1751	9671	Y	-756	80.71	86.94	798	0	0.13	0.280	0.00	0.20	0.25	412	1089	726	2.67	24.23	8.28
68	68	-0.793	-0.897	-0.829	2.000	11939	14865	352	6853	47590	1751	9991	Y	-778	80.71	86.94	805	0	0.13	0.289	0.00	0.21	0.25	412	1096	731	2.67	25.03	8.56
68	69	-0.730	-0.977	-0.816	2.000	12301	13778	376	7207	34573	1963	10403	Y	-859	76.51	89.42	847	0	0.13	0.292	0.00	0.21	0.25	424	1144	808	2.45	25.46	8.71
69	69	-0.730	-0.978	-0.816	2.000	12301	13741	375	7302	34513	1963	10633	Y	-885	76.51	89.42	856	0	0.13	0.299	0.00	0.21	0.25	424	1152	812	2.46	26.03	8.90
69	70	-0.663	-1.063	-0.803	2.000	12695	12442	400	7654	19764	2178	11044	Y	-963	71.75	92.12	899	0	0.13	0.301	0.00	0.22	0.25	437	1202	889	2.27	26.38	9.02
70	70	-0.663	-1.064	-0.804	2.000	12695	12399	396	7759	19697	2180	11103	Y	-1345	71.75	92.12	1026	0	0.13	0.302	0.00	0.22	0.25	437	1317	891	2.73	26.52	9.07
70	71	-0.610	-1.040	-0.769	2.000	13066	10907	420	8106	3157	2399	11508	Y	-1418	66.40	95.13	1070	0	0.13	0.304	0.00	0.22	0.37	677	1572	970	3.32	26.89	9.19
71	71	-0.610	-1.041	-0.769	2.000	13066	10880	419	8180	3106	2398	11526	Y	-1434	66.40	95.13	1075	0	0.13	0.305	0.00	0.22	0.37	677	1577	970	3.33	26.93	9.21
71	72	-0.553	-1.026	-0.737	2.000	13477	9174	443	8518	-15239	2624	11922	Y	-1504	76.21	98.42	1119	0	0.13	0.306	0.00	0.22	0.37	700	1637	1051	3.14	27.20	9.30
72	72	-0.553	-1.027	-0.737	2.000	13477	9167	442	8580	-15269	2623	11816	Y	-1516	76.21	98.42	1123	0	0.13	0.303	0.00	0.22	0.37	700	1641	1049	3.16	26.96	9.22
72	73	-0.493	-1.019	-0.706	2.000	13934	6616	462	8895	-36108	2853	12190	Y	-1595	87.64	102.02	1172	0	0.13	0.302	0.00	0.22	0.37	726	1708	1131	3.02	27.12	9.27
73	73	-0.493	-1.020	-0.706	2.000	13934	7271	464	8956	-35475	2855	11955	Y	-1618	87.64	102.02	1179	0	0.13	0.296	0.00	0.21	0.37	726	1715	1128	3.04	26.60	9.09
73	74	-0.387	-0.987	-0.638	2.000	14431	4497	484	9264	-58305	3107	12321	Y	-1697	98.06	105.89	1230	0	0.13	0.295	0.00	0.21	0.37	753	1785	1218	2.90	26.70	9.13
74	74	-0.837	-1.291	-1.027	2.000	14431	4642	481	9295	-58181	3104	11921	Y	-3964	98.06	105.89	1986	0	0.13	0.285	0.00	0.21	0.37	753	2465	1211	5.22	25.84	8.83
74	75	-0.926	-1.063	-0.985	2.000	14973	2692	509	9605	-82196	3402	12289	Y	-4047	117.46	110.07	2040	0	0.13	0.284	0.00	0.21	0.37	783	2541	1316	4.93	25.91	8.86
75	75	-0.925	-1.063	-0.985	2.000	14973	2435	502	9620	-82469	3395	11774	Y	-4093	117.46	110.07	2055	0	0.13	0.272	0.00	0.20	0.37	783	2555	1306	5.04	24.83	8.49
75	76	-1.001	-0.956	-0.981	2.000	15555	303	529	9909	-108610	3698	12121	Y	-2408	134.12	120.71	1560	0	0.13	0.269	0.00	0.20	0.37	859	2177	1412	3.37	24.85	8.50
76	76	-1.001	-0.956	-0.981	2.000	15555	345	528	9910	-108570	3697	11991	Y	-2464	134.12	120.71	1579	0	0.13	0.266	0.00	0.20	0.37	859	2194	1410	3.43	24.58	8.40
76	77	-0.922	-0.975	-0.946	2.000	16176	-3033	548	10185	-137797	3997	12324	Y	-2091	145.41	130.86	1518	0	0.13	0.263	0.00	0.20	0.37	931	2204	1514	3.07	24.55	8.39
77	77	-0.921	-0.976	-0.946	2.000	16176	-3032	548	10185	-137796	3997	12321	Y	-2141	145.41	130.86	1535	0	0.13	0.263	0.00	0.20	0.37	931	2219	1514	3.12	24.55	8.39
77	78	-0.821	-1.023	-0.916	2.000	16843	-6624	569	10453	-169456	4305	12646	Y	-1828	155.75	140.18	1450	144	0.13	0.259	0.00	0.19	0.37	991	2197	1622	2.67	24.47	8.37
78	78	-0.820	-1.022	-0.914	2.000	16843	-6650	571	10450	-169482	4305	12685	Y	-1465	155.75	140.18	1322	272	0.20	0.260	0.00	0.23	0.37	990	2081	1622	2.33	24.55	8.39
78	79	-0.688	-1.153	-0.906	2.000	17619	-10474	591	10713	-203607	4619	13006	Y	-1001	164.81	148.33	1165	545	0.39	0.255	0.00	0.32	0.37	1038				24.37	8.33
79	79	-0.684	-1.148	-0.902	2.000	17619	-10549	596	10694	-203682	4616	13050	Y	-177	164.81	148.33	876	833	0.60	0.256	0.00	0.43	0.37	1035				24.46	8.36
79	80	-0.619	-1.225	-0.904	2.000	17619	-11830	602	10777	-215115	4703	13152	Y	0	164.93	148.44	800	942	0.68	0.258	0.00	0.47	0.37	1033				24.65	8.43
80	80	-0.563	-1.315	-0.916	2.000	17619	-13083	-598	9815	-226492	-4660	8504	Y	0	164.93	148.44	788	938	0.68	0.167	0.00	0.42	0.37	1030				15.94	5.45
80	81	-0.623	-1.240	-0.913	2.000	17619	-12031	-591	9714	-215388	-4572	8421	Y	139	164.90	148.41	851	842	0.61	0.165	0.00	0.39	0.37	1033				15.78	5.40
81	81	-0.627	-1.245	-0.917	2.000	17619	-12030	-590	9744	-215387	-4568	8515	Y	960	164.90	148.41	1139	553	0.40	0.167	0.00	0.28	0.37	1036				15.96	5.46
81	82	-0.748	-1.118	-0.922	2.000	16843	-8891	-567	9425	-182335	-4251	8253	Y	1311	156.24	140.62	1255	319	0.24	0.169	0.00	0.20	0.37	990	2020	1539	2.47	15.97	5.46
82	82	-0.750	-1.119	-0.923	2.000	16843	-8890	-567	9434	-182334	-4248	8300	Y	1672	156.24	140.62	1382	191	0.14	0.170	0.00	0.16	0.37	991	2136	1539	2.82	16.06	5.49
82	83	-0.850	-1.073	-0.952	2.000	16176	-5968	-543	9111	-151768	-3937	8035	Y	1905	146.58	131.92	1458	0	0.13	0.172	0.00	0.15	0.37	938	2157	1431	3.30	16.01	5.47
83	83	-0.850	-1.073	-0.952	2.000	16176	-5968	-543	9110	-151768	-3938	8032	Y	1855	146.58	131.92	1441	18	0.13	0.172	0.00	0.15	0.37	938	2141	1431	3.25	16.00	5.47
83	84	-0.933	-1.042	-0.982	2.000	15555	-3261	-520	8782	-123633	-3635	7761	Y	1962	136.60	122.94	1425	0	0.13	0.172	0.00	0.15	0.37	875	2070	1326	3.45	15.91	5.44
84	84	-0.934	-1.042	-0.982	2.000	15555	-3261	-520	8782	-123633	-3635	7759	Y	1922	136.60	122.94	1412	0	0.13	0.172	0.00	0.15	0.37	875	2058	1326	3.41	15.91	5.44
84	85	-0.884	-1.121	-0.987	2.000	14973	-766	-496	8447	-97860	-3340	7482	Y	3543	122.22	110.07	1872	0	0.13	0.173	0.00	0.15	0.37	783	2389	1224	5.01	15.77	5.39
85	85	-0.884	-1.121	-0.987	2.000	14973	-766	-496	8447	-97860	-3341	7480	Y	3507	122.22	110.07	1860	0	0.13	0.173	0.00	0.15	0.37	783	2379	1224	4.98	15.77	5.39
85	86	-0.819	-1.308	-1.024	2.000	14431	1520	-473	8103	-74385	-3054	7194	Y	3458	105.30	105.89	1817	0	0.13	0.172	0.00	0.15	0.37	753	2314	1124	5.29	15.59	5.33
86	86	-0.819	-1.308	-1.024	2.000	14431	1521	-473	8103	-74385	-3054	7192	Y	3420	105.30	105.89	1804	0	0.13	0.172	0.00	0.15	0.37	753	2302	1124	5.25	15.59	5.33
86	87	-0.571	-1.112	-0.790	2.000	13934	3601	-449	7751	-53028	-2804	6896	Y	1629	98.21	102.02	1180	0	0.13	0.171	0.00	0.15	0.37	725	1715	1037	3.57	15.34	5.25
87	87	-0.571	-1.112	-0.790	2.000	13934	3601	-449	7750	-53028	-2804	6895	Y	1604	98.21	102.02	1172	0	0.13	0.171	0.00	0.15	0.37	725	1707	1037	3.54	15.34	5.24
87	88	-0.614	-1.136	-0.816	2.000	13477	5477	-426	7389	-33558	-2576	6590	Y	1562	87.67	98.42	1138	0	0.13	0.169	0.00	0.15	0.37	700	1655	956	3.78	15.04	5.14
88	88	-0.614	-1.136	-0.816	2.000	13477	5477	-426	7388	-33558	-2576	6590	Y	1549	87.67	98.42	1134	0	0.13	0.169	0.00	0.15	0.37	700	1651	956	3.77	15.04	5.14
88	89	-0.661	-1.158	-0.845	2.000	13066	7150	-402	7021	-15861	-2355	6279	Y	1385	78.39	95.13	1059	0	0.13	0.166	0.00	0.15	0.25	451	1359	878	3.02	14.67	5.02
89	89	-0.661	-1.157	-0.845	2.000	13066	7151	-402	7021	-15861	-2355	6278	Y	1368	78.39	95.13	1053	0	0.13	0.166	0.00	0.15	0.25	451	1354	878	3.00	14.67	5.01
89	90	-0.705	-1.187	-0.874	2.000	12695	8620	-378	6650	118	-2141	5964	Y	1327	58.02	92.12	1020	0	0.13	0.162	0.00	0.15	0.25	437	1311	802	3.27	14.25	4.87
90	90	-0.704	-1.187	-0.874	2.000	12695	8618	-379	6644	117	-2143	5928	Y	909	58.02	92.12	881	0	0.13	0.161	0.00	0.15	0.25	437	1186	802	2.71	14.16	4.84
90	91	-0.763	-1.095	-0.879	2.000	12301	9882	-355	6273	14423	-1933	5613	Y	868	62.10	89.42	850	0	0.13	0.158	0.00	0.14	0.25	424	1147	727	2.99	13.74	4.70
91	91	-0.763	-1.095	-0.879	2.000	12301	9882	-355	6272	14423	-1933	5611	Y	840	62.10	89.42	841	0	0.13	0.158	0.00	0.14	0.25	424	1139	727	2.95	13.73	4.70
91	92	-0.818	-1.011	-0.885	2.000	11939	10938	-331	5901	27078	-1726	5297	Y	677	65.83	86.94	771	0	0.13	0.153	0.00	0.14	0.21	344	1003	654	2.77	13.27	4.54
92	92	-0.818	-1.011	-0.885	2.000	11939	10938	-331	5901	27078	-1726	5295	Y	653	65.83	86.94	763	0	0.13	0.153	0.00	0.14	0.21	344	996	653	2.73	13.27	4.54
92	93	-0.877	-0.916	-0.891	2.000	11623	11786	-308	5532	38093	-1519	4983	Y	613	68.64	84.78	736	0	0.13	0.148	0.00	0.14	0.21	335	964	580	3.08	12.75	4.36
93	93	-0.877	-0.917	-0.891	2.000	11623	11786	-308	5531	38093	-1519	4981	Y	586	68.64	84.78	727	0	0.13	0.148	0.00	0.14	0.21	335	956	580	3.04	12.74	4.36
93	94	-0.929	-0.836	-0.897	2.000	11354	12426	-285	5165	47479	-1315	4672	Y	546	71.20	82.94	702	0	0.13	0.142	0.00	0.14	0.21	328	927	507	3.45	12.18	4.16
94	94	-0.929	-0.836	-0.897	2.000	11354	12426	-285	5165	47478	-1315	4671	Y	523	71.20	82.94	695	0	0.13	0.142	0.00	0.14	0.21	328	920	507	3.41	12.17	4.16
94	95	-0.970	-0.773	-0.901	2.000	11124	11369	-87	5022	53755	-936	4585	Y	483	73.53	81.36	671	0	0.13	0.142	0.00	0.14	0.21	322	894	380	5.98	12.14	4.15
95	95	-0.970	-0.774	-0.901	2.000	11124	11370	-87	5022	53755	-936	4584	Y	460	73.53	81.36	664	0	0.13	0.142	0.00	0.14	0.21	322	887	380	5.92	12.14	4.15

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Cracking Moment (Tcr)	Permanent Loads + Maximum 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	-1.004	-0.721	-0.906	2.000	10933	12058	-67	4958	60371	-737	4577	Y	309	75.36	80.06	605	0	0.13	0.145	0.00	0.14	0.21	316	829	313	6.39	12.29	4.20
96	96	-1.004	-0.721	-0.906	2.000	10933	12058	-67	4959	60372	-737	4576	Y	282	75.36	80.06	596	0	0.13	0.145	0.00	0.14	0.21	316	822	313	6.31	12.29	4.20
96	97	-1.034	-0.674	-0.909	2.000	10788	12592	-48	4912	65435	-539	4586	Y	254	76.55	79.07	570	0	0.13	0.147	0.00	0.14	0.21	312	794	247	7.18	12.45	4.26
97	97	-1.034	-0.674	-0.909	2.000	10788	12593	-48	4912	65436	-539	4586	Y	232	76.55	79.07	563	0	0.13	0.147	0.00	0.14	0.21	312	787	247	7.10	12.45	4.26
97	98	-1.052	-0.647	-0.911	2.000	10683	12965	-28	4882	68943	-341	4613	Y	178	77.48	78.35	533	0	0.13	0.149	0.00	0.14	0.21	308	757	182	8.07	12.62	4.31
98	98	-1.052	-0.647	-0.911	2.000	10683	12965	-28	4883	68944	-341	4613	Y	156	77.48	78.35	526	0	0.13	0.149	0.00	0.14	0.21	308	750	182	7.98	12.62	4.31
98	99	-1.059	-0.635	-0.912	2.000	10617	13176	-8	4872	70899	-143	4659	Y	76	77.99	77.90	493	0	0.13	0.152	0.00	0.14	0.21	306	719	116	9.08	12.81	4.38
99	99	-1.059	-0.635	-0.912	2.000	10617	13176	-8	4872	70900	-143	4658	Y	39	77.99	77.90	480	0	0.13	0.152	0.00	0.14	0.21	306	708	116	8.93	12.80	4.38
99	100	-1.060	-0.629	-0.910	2.000	10617	13226	8	4876	71345	18	4709	Y	-39	77.99	77.90	481	0	0.13	0.153	0.00	0.14	0.21	306	708	76	9.45	12.94	4.43
100	100	-1.060	-0.629	-0.910	2.000	10617	13226	8	4877	71345	18	4708	Y	-76	77.99	77.90	492	0	0.13	0.153	0.00	0.14	0.21	306	718	76	9.59	12.94	4.42
100	101	-1.055	-0.629	-0.907	2.000	10683	13135	28	4899	70486	216	4787	Y	-154	77.48	78.35	524	0	0.13	0.155	0.00	0.14	0.21	308	748	143	8.40	13.09	4.48
101	101	-1.055	-0.629	-0.907	2.000	10683	13135	28	4899	70486	216	4786	Y	-176	77.48	78.35	531	0	0.13	0.155	0.00	0.14	0.21	308	755	143	8.49	13.09	4.48
101	102	-1.040	-0.646	-0.903	2.000	10788	12878	48	4938	68070	414	4883	Y	-229	76.55	79.07	557	0	0.13	0.156	0.00	0.14	0.21	311	782	210	7.42	13.25	4.53
102	102	-1.040	-0.646	-0.903	2.000	10788	12879	48	4939	68070	414	4883	Y	-251	76.55	79.07	565	0	0.13	0.156	0.00	0.14	0.21	311	789	210	7.50	13.25	4.53
102	103	-1.011	-0.683	-0.897	2.000	10933	12454	68	4995	64093	613	4996	Y	-277	75.36	80.06	588	0	0.13	0.158	0.00	0.14	0.21	316	813	278	6.55	13.42	4.59
103	103	-1.011	-0.682	-0.897	2.000	10933	12454	68	4995	64093	613	4995	Y	-303	75.36	80.06	597	0	0.13	0.158	0.00	0.14	0.21	316	821	278	6.63	13.41	4.59
103	104	-0.978	-0.724	-0.890	2.000	11124	15140	258	5178	61827	982	5236	Y	-450	73.53	81.36	657	0	0.13	0.163	0.00	0.15	0.21	321	881	405	3.93	13.87	4.74
104	104	-0.978	-0.724	-0.890	2.000	11124	15140	258	5178	61827	982	5235	Y	-472	73.53	81.36	665	0	0.13	0.163	0.00	0.15	0.21	321	888	405	3.97	13.87	4.74
104	105	-0.937	-0.777	-0.882	2.000	11354	14891	280	5539	55221	1185	5653	Y	-509	71.20	82.94	690	0	0.13	0.172	0.00	0.15	0.21	328	916	479	3.50	14.73	5.04
105	105	-0.937	-0.777	-0.882	2.000	11354	14891	280	5539	55221	1185	5653	Y	-531	71.20	82.94	697	0	0.13	0.172	0.00	0.15	0.21	328	923	479	3.54	14.73	5.04
105	106	-0.885	-0.848	-0.872	2.000	11623	14435	303	5903	46996	1389	6074	Y	-567	68.64	84.78	721	0	0.13	0.181	0.00	0.16	0.21	335	951	553	3.11	15.54	5.31
106	106	-0.885	-0.848	-0.872	2.000	11623	14435	303	5903	46996	1389	6073	Y	-594	68.64	84.78	730	0	0.13	0.180	0.00	0.15	0.21	335	959	553	3.16	15.54	5.31
106	107	-0.823	-0.933	-0.861	2.000	11939	13768	326	6269	37139	1595	6496	Y	-630	65.83	86.94	756	0	0.13	0.188	0.00	0.16	0.21	344	989	628	2.80	16.27	5.56
107	107	-0.823	-0.933	-0.861	2.000	11939	13768	326	6269	37139	1595	6495	Y	-653	65.83	86.94	763	0	0.13	0.188	0.00	0.16	0.21	344	996	628	2.83	16.27	5.56
107	108	-0.764	-1.011	-0.850	2.000	12301	12886	349	6636	25634	1802	6919	Y	-807	62.10	89.42	830	0	0.13	0.194	0.00	0.16	0.25	424	1129	703	2.99	16.94	5.79
108	108	-0.764	-1.011	-0.850	2.000	12301	12886	349	6636	25634	1802	6918	Y	-834	62.10	89.42	839	0	0.13	0.194	0.00	0.16	0.25	424	1137	703	3.02	16.93	5.79
108	109	-0.699	-1.098	-0.839	2.000	12695	11786	372	7002	12468	2012	7342	Y	-869	58.05	92.12	868	0	0.13	0.200	0.00	0.16	0.25	437	1174	779	2.74	17.54	6.00
109	109	-0.699	-1.099	-0.840	2.000	12695	11785	372	6998	12467	2010	7329	Y	-1268	58.05	92.12	1001	0	0.13	0.199	0.00	0.16	0.25	437	1294	778	3.27	17.51	5.98
109	110	-0.646	-1.075	-0.805	2.000	13066	10464	396	7360	-2388	2224	7747	Y	-1302	78.40	95.13	1031	0	0.13	0.205	0.00	0.17	0.25	451	1334	856	2.99	18.10	6.19
110	110	-0.646	-1.075	-0.805	2.000	13066	10464	396	7359	-2388	2224	7746	Y	-1318	78.40	95.13	1036	0	0.13	0.205	0.00	0.17	0.25	451	1339	856	3.01	18.10	6.19
110	111	-0.587	-1.062	-0.771	2.000	13477	8918	419	7714	-18980	2445	8158	Y	-1468	87.67	98.42	1107	0	0.13	0.209	0.00	0.17	0.37	700	1627	935	3.72	18.61	6.36
111	111	-0.587	-1.062	-0.771	2.000	13477	8918	419	7713	-18980	2445	8157	Y	-1481	87.67	98.42	1111	0	0.13	0.209	0.00	0.17	0.37	700	1630	935	3.74	18.61	6.36
111	112	-0.531	-1.048	-0.740	2.000	13934	7145	443	8059	-37372	2673	8560	Y	-1514	98.22	102.02	1145	0	0.13	0.212	0.00	0.17	0.37	726	1684	1018	3.50	19.05	6.51
112	112	-0.531	-1.048	-0.740	2.000	13934	7145	443	8058	-37372	2673	8560	Y	-1538	98.22	102.02	1153	0	0.13	0.212	0.00	0.17	0.37	726	1691	1017	3.52	19.04	6.51
112	113	-0.832	-1.300	-1.028	2.000	14431	5137	467	8395	-57679	2923	8953	Y	-3840	104.27	105.89	1945	0	0.13	0.214	0.00	0.17	0.37	753	2428	1107	5.72	19.40	6.63
113	113	-0.832	-1.300	-1.028	2.000	14431	5137	467	8394	-57680	2923	8953	Y	-3880	104.27	105.89	1958	0	0.13	0.214	0.00	0.17	0.37	753	2440	1107	5.77	19.40	6.63
113	114	-0.901	-1.085	-0.981	2.000	14973	2891	491	8724	-80138	3210	9339	Y	-3919	122.47	110.22	1998	0	0.13	0.215	0.00	0.17	0.37	784	2504	1208	5.43	19.69	6.73
114	114	-0.901	-1.085	-0.981	2.000	14973	2891	491	8723	-80138	3210	9339	Y	-3956	122.47	110.22	2010	0	0.13	0.215	0.00	0.17	0.37	784	2515	1208	5.47	19.69	6.73
114	115	-0.956	-1.000	-0.976	2.000	15555	401	515	9047	-104929	3505	9720	Y	-1901	137.38	123.65	1409	0	0.13	0.216	0.00	0.17	0.37	880	2060	1312	3.45	19.93	6.81
115	115	-0.956	-1.000	-0.975	2.000	15555	401	515	9046	-104929	3505	9719	Y	-1942	137.38	123.65	1423	0	0.13	0.216	0.00	0.17	0.37	880	2073	1312	3.49	19.93	6.81
115	116	-0.860	-1.040	-0.943	2.000	16176	-2337	539	9364	-132119	3808	10095	Y	-1836	147.02	132.32	1442	0	0.13	0.216	0.00	0.17	0.37	942	2145	1419	3.29	20.11	6.88
116	116	-0.859	-1.041	-0.942	2.000	16176	-2337	539	9363	-132119	3808	10095	Y	-1887	147.02	132.32	1459	0	0.13	0.216	0.00	0.17	0.37	942	2161	1418	3.33	20.11	6.88
116	117	-0.754	-1.093	-0.913	2.000	16843	-5328	563	9678	-161778	4120	10466	Y	-1669	156.32	140.69	1415	111	0.13	0.215	0.00	0.17	0.37	997	2171	1528	2.94	20.25	6.92
117	117	-0.752	-1.092	-0.912	2.000	16843	-5329	563	9686	-161778	4123	10490	Y	-1297	156.32	140.69	1284	243	0.18	0.215	0.00	0.20	0.37	996	2052	1529	2.58	20.30	6.94
117	118	-0.624	-1.221	-0.905	2.000	17619	-8578	588	9998	-193963	4441	10859	Y	-969	164.85	148.36	1172	473	0.34	0.213	0.00	0.28	0.37	1042				20.35	6.96
118	118	-0.620	-1.217	-0.900	2.000	17619	-8578	588	10006	-193964	4444	10878	Y	-127	164.85	148.36	875	770	0.55	0.213	0.00	0.38	0.37	1039				20.39	6.97
118	119	-0.558	-1.292	-0.903	2.000	17619	-9673	596	10105	-204799	4532	10996	Y	0	164.93	148.44	817	862	0.62	0.216	0.00	0.42	0.37	1036				20.61	7.05
119	119	-0.558	-1.292	-0.903	2.000	17619	-15432	-645	9626	-210558	-4820	8466	Y	0	164.93	148.44	805	980	0.71	0.166	0.00	0.44	0.37	1034				15.87	5.42
119	120	-0.621	-1.213	-0.899	2.000	17619	-14228	-637	9525	-199018	-4732	8384	Y	98	164.93	148.44	855	898	0.64	0.164	0.00	0.40	0.37	1037				15.71	5.37
120	120	-0.626	-1.218	-0.904	2.000	17619	-14228	-637	9519	-199018	-4728	8389	Y	939	164.93	148.44	1150	601	0.43	0.164	0.00	0.30	0.37	1040				15.72	5.37
120	121	-0.760	-1.076	-0.908	2.000	16843	-10620	-614	9202	-164612	-4412	8129	Y	1357	156.44	140.80	1296	338	0.25	0.167	0.00	0.21	0.37	995	2062	1591	2.38	15.73	5.38
121	121	-0.762	-1.077	-0.910	2.000	16843	-10620	-613	9196	-164612	-4408	8138	Y	1726	156.44	140.80	1426	206	0.15	0.167	0.00	0.16	0.37	997	2181	1590	2.74	15.75	5.38
121	122	-0.861	-1.025	-0.936	2.000	16176	-7238	-590	8875	-132701	-4098	7873	Y	2309	146.13	131.52	1595	0	0.13	0.168	0.00	0.15	0.37	936	2278	1482	3.43	15.69	5.36
122	122	-0.861	-1.025	-0.936	2.000	16176	-7238	-590	8876	-132701	-4098	7875	Y	2258	146.13	131.52	1578	0	0.13	0.168	0.00	0.15	0.37	936	2262	1482	3.38	15.69	5.36
122	123	-0.921	-1.019	-0.964	2.000	15555	-4080	-567	8550	-103229	-3796	7606	Y	2537	133.87	120.48	1602	0	0.13	0.169	0.00	0.15	0.37	857	2213	1378	3.65	15.59	5.33
123	123	-0.921	-1.019	-0.965	2.000	15555	-4080	-567	8550	-103229	-3796	7608	Y	2496	133.87	120.48	1588	0	0.13	0.169	0.00	0.15	0.37	857	2201	1378	3.61	15.60	5.33
123	124	-0.872	-1.112	-0.976	2.000	14973	-1141	-544	8217	-76126	-3502	7331	Y	3847	117.97	110.07	1973	0	0.13	0.169	0.00	0.15	0.37	783	2481	1276	4.98	15.46	5.28
124	124	-0.872	-1.113	-0.976	2.000	14973	-1142	-544	8218	-76126	-3502	7333	Y	3810	117.97	110.07	1961	0	0.13	0.169	0.00	0.15	0.37	783	2470	1276	4.94	15.46	5.29
124	125	-0.805	-1.304	-1.014	2.000	14431	1580	-521	7875	-51328	-3216	7047	Y	3697	100.16	105.89	1897	0	0.13	0.169	0.00	0.15	0.37	753	2385	1176	5.17	15.27	5.22
125	125	-0.805	-1.305	-1.015	2.000	14431	1580	-521	7876	-51328	-3216	7049	Y	3658	100.16	105.89	1884	0	0.13	0.169	0.00	0.15	0.37	753	2373	1176	5.13	15.28	5.22
125	126	-0.551	-1.105	-0.775	2.000	13934	4089	-498	7524	-28655	-2966	6754	Y	1787	90.29	102.02	1236	0	0.13	0.167	0.00	0.15	0.25	484	1548	1089	2.66	15.03	5.14
126	126	-0.551	-1.105	-0.775	2.000	13934	4088	-498	7524	-28656	-2967	6754	Y	1762	90.29	102.02	1227	0	0.13	0.167	0.00	0.15	0.25	484	1540	1089	2.63	15.03	5.14
126	127	-0.597	-1.118	-0.800	2.000	13477	6384	-475	7163	-7878	-2739	6450	Y	1692	79.02	98.42	1181	0	0.13	0.165	0.00	0.15	0.25	467	1483	1008	2.80	14.72	5.03

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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																									
127	127	-0.597	-1.118	-0.799	2.000	13477	6384	-475	7163	-7879	-2739	6450	Y	1678	79.02	98.42	1177	0	0.13	0.165	0.00	0.15	0.25	467	1479	1008	2.78	14.72	5.03
127	128	-0.640	-1.133	-0.823	2.000	13066	8467	-451	6795	11117	-2518	6139	Y	1598	63.55	95.13	1130	0	0.13	0.162	0.00	0.15	0.25	451	1423	930	2.97	14.34	4.90
128	128	-0.640	-1.133	-0.823	2.000	13066	8466	-451	6795	11115	-2518	6139	Y	1581	63.55	95.13	1124	0	0.13	0.162	0.00	0.15	0.25	451	1418	930	2.94	14.34	4.90
128	129	-0.681	-1.144	-0.844	2.000	12695	10334	-428	6423	28382	-2304	5824	Y	1492	68.86	92.12	1075	0	0.13	0.158	0.00	0.14	0.21	364	1295	854	2.86	13.91	4.76
129	129	-0.681	-1.143	-0.843	2.000	12695	10337	-428	6430	28384	-2306	5834	Y	1068	68.86	92.12	934	0	0.13	0.159	0.00	0.14	0.21	364	1168	855	2.32	13.93	4.76
129	130	-0.745	-1.026	-0.843	2.000	12301	11986	-404	6055	43963	-2097	5516	Y	977	73.68	89.42	887	0	0.13	0.155	0.00	0.14	0.21	353	1116	780	2.50	13.50	4.62
130	130	-0.745	-1.027	-0.843	2.000	12301	11985	-404	6056	43963	-2097	5516	Y	949	73.68	89.42	877	0	0.13	0.155	0.00	0.14	0.21	353	1108	780	2.46	13.50	4.62
130	131	-0.809	-0.906	-0.843	2.000	11939	13410	-381	5681	57875	-1889	5199	Y	862	77.92	86.94	833	0	0.13	0.150	0.00	0.14	0.21	344	1059	707	2.67	13.03	4.45
131	131	-0.809	-0.906	-0.843	2.000	11939	13410	-381	5682	57875	-1889	5200	Y	838	77.92	86.94	825	0	0.13	0.150	0.00	0.14	0.21	344	1052	707	2.64	13.03	4.45
131	132	-0.872	-0.786	-0.842	2.000	11623	14605	-357	5309	70125	-1683	4884	Y	755	81.68	84.78	759	0	0.13	0.145	0.00	0.14	0.21	333	982	633	2.77	12.49	4.27
132	132	-0.872	-0.787	-0.842	2.000	11623	14605	-357	5309	70125	-1683	4884	Y	728	81.68	84.78	749	0	0.13	0.145	0.00	0.14	0.21	333	974	633	2.72	12.50	4.27
132	133	-0.931	-0.670	-0.840	2.000	11354	15565	-334	4939	80718	-1477	4571	Y	648	84.96	82.94	689	0	0.13	0.139	0.00	0.13	0.21	323	911	560	2.91	11.91	4.07
133	133	-0.931	-0.671	-0.841	2.000	11354	15565	-334	4939	80718	-1477	4572	Y	624	84.96	82.94	681	0	0.13	0.139	0.00	0.13	0.21	323	904	560	2.87	11.91	4.07
133	134	-0.986	-0.562	-0.839	2.000	11124	14244	-108	4809	87618	-1072	4499	Y	543	87.75	81.36	634	0	0.13	0.140	0.00	0.13	0.21	316	855	424	5.02	11.92	4.07
134	134	-0.986	-0.563	-0.839	2.000	11124	14246	-108	4810	87620	-1072	4500	Y	521	87.75	81.36	626	0	0.13	0.140	0.00	0.13	0.21	316	848	424	4.95	11.92	4.07
134	135	-1.035	-0.465	-0.837	2.000	10933	15104	-89	4744	95293	-872	4491	Y	439	90.04	81.04	584	0	0.13	0.142	0.00	0.14	0.21	313	808	357	5.52	12.06	4.12
135	135	-1.035	-0.466	-0.838	2.000	10933	15106	-89	4744	95295	-872	4491	Y	412	90.04	81.04	575	0	0.13	0.142	0.00	0.14	0.21	313	799	357	5.44	12.06	4.12
135	136	-1.077	-0.382	-0.836	2.000	10788	15776	-69	4694	101383	-673	4499	Y	330	91.84	82.65	550	0	0.13	0.144	0.00	0.14	0.21	319	782	291	6.33	12.21	4.17
136	136	-1.077	-0.382	-0.836	2.000	10788	15778	-69	4694	101384	-673	4500	Y	307	91.84	82.65	543	0	0.13	0.144	0.00	0.14	0.21	319	775	291	6.25	12.21	4.18
136	137	-1.110	-0.315	-0.834	2.000	10683	16249	-48	4662	105879	-474	4524	Y	222	93.11	83.80	517	0	0.13	0.146	0.00	0.14	0.21	323	756	225	7.25	12.38	4.23
137	137	-1.110	-0.315	-0.834	2.000	10683	16250	-48	4662	105880	-474	4525	Y	200	93.11	83.80	509	0	0.13	0.146	0.00	0.14	0.21	323	749	225	7.17	12.38	4.23
137	138	-1.134	-0.265	-0.833	2.000	10617	16508	-27	4648	108771	-275	4568	Y	114	93.86	84.48	482	0	0.13	0.149	0.00	0.14	0.21	325	726	159	8.30	12.56	4.29
138	138	-1.134	-0.266	-0.833	2.000	10617	16510	-27	4648	108773	-275	4569	Y	77	93.86	84.48	469	0	0.13	0.149	0.00	0.14	0.21	325	715	159	8.15	12.56	4.29
138	139	-1.148	-0.236	-0.832	2.000	10617	16544	-5	4653	110052	-76	4630	Y	1	94.09	84.68	445	0	0.13	0.151	0.00	0.14	0.21	326	693	94	9.50	12.73	4.35
139	139	-1.148	-0.236	-0.832	2.000	10617	16546	-5	4653	110054	-76	4631	Y	-44	94.09	84.68	460	0	0.13	0.151	0.00	0.14	0.21	326	707	94	9.69	12.73	4.35
139	140	-1.150	-0.228	-0.830	2.000	10683	16400	12	4669	109898	86	4694	Y	-110	93.93	84.53	481	0	0.13	0.152	0.00	0.14	0.21	325	725	98	9.59	12.84	4.39
140	140	-1.150	-0.228	-0.830	2.000	10683	16401	12	4669	109899	86	4695	Y	-123	93.93	84.53	485	0	0.13	0.152	0.00	0.14	0.21	325	729	98	9.64	12.84	4.39
140	141	-1.144	-0.236	-0.829	2.000	10788	15999	34	4706	108226	286	4788	Y	-202	93.27	83.94	509	0	0.13	0.153	0.00	0.14	0.21	323	749	166	8.20	12.99	4.44
141	141	-1.144	-0.236	-0.829	2.000	10788	16000	34	4706	108227	286	4789	Y	-224	93.27	83.94	517	0	0.13	0.153	0.00	0.14	0.21	323	756	166	8.28	13.00	4.44
141	142	-1.127	-0.263	-0.827	2.000	10933	17307	247	4771	106869	678	4910	Y	-301	92.12	82.91	533	0	0.13	0.155	0.00	0.14	0.25	382	824	298	4.44	13.19	4.51
142	142	-1.127	-0.263	-0.827	2.000	10933	17308	247	4771	106870	678	4911	Y	-327	92.12	82.91	542	0	0.13	0.155	0.00	0.14	0.25	383	832	299	4.49	13.19	4.51
142	143	-1.100	-0.307	-0.824	2.000	11124	16894	271	5127	102393	882	5324	Y	-404	90.49	81.44	562	0	0.13	0.165	0.00	0.15	0.25	376	844	373	3.84	14.10	4.82
143	143	-1.100	-0.306	-0.824	2.000	11124	16895	271	5127	102394	882	5324	Y	-426	90.49	81.44	570	0	0.13	0.165	0.00	0.15	0.25	376	851	373	3.88	14.10	4.82
143	144	-1.065	-0.364	-0.821	2.000	11354	16158	296	5487	96188	1087	5742	Y	-505	88.35	82.94	616	0	0.13	0.175	0.00	0.15	0.25	385	900	447	3.52	14.96	5.12
144	144	-1.065	-0.364	-0.821	2.000	11354	16158	296	5487	96188	1087	5742	Y	-527	88.35	82.94	624	0	0.13	0.175	0.00	0.15	0.25	385	908	447	3.56	14.96	5.12
144	145	-1.022	-0.433	-0.817	2.000	11623	15072	323	5850	88221	1295	6162	Y	-607	85.70	84.78	676	0	0.13	0.183	0.00	0.16	0.25	395	965	523	3.28	15.76	5.39
145	145	-1.022	-0.433	-0.817	2.000	11623	15072	323	5849	88221	1295	6162	Y	-634	85.70	84.78	686	0	0.13	0.183	0.00	0.16	0.25	395	973	523	3.32	15.77	5.39
145	146	-0.974	-0.511	-0.812	2.000	11939	13614	350	6214	78460	1505	6584	Y	-712	82.52	86.94	744	0	0.13	0.190	0.00	0.16	0.25	408	1037	599	3.10	16.49	5.64
146	146	-0.974	-0.511	-0.812	2.000	11939	13614	350	6214	78460	1505	6584	Y	-735	82.52	86.94	752	0	0.13	0.191	0.00	0.16	0.25	408	1044	599	3.14	16.49	5.64
146	147	-0.920	-0.596	-0.807	2.000	12301	11760	378	6579	66872	1717	7006	Y	-808	78.88	89.42	817	0	0.13	0.197	0.00	0.16	0.25	423	1115	676	2.97	17.15	5.86
147	147	-0.920	-0.596	-0.807	2.000	12301	11760	378	6579	66872	1717	7006	Y	-836	78.88	89.42	826	0	0.13	0.197	0.00	0.16	0.25	423	1124	676	3.01	17.15	5.86
147	148	-0.862	-0.686	-0.800	2.000	12695	9488	407	6943	53422	1932	7428	Y	-906	74.76	92.12	880	0	0.13	0.202	0.00	0.17	0.25	437	1185	754	2.81	17.74	6.07
148	148	-0.862	-0.687	-0.800	2.000	12695	9490	407	6939	53424	1931	7431	Y	-1307	74.76	92.12	1014	0	0.13	0.202	0.00	0.17	0.25	437	1306	753	3.32	17.75	6.07
148	149	-0.815	-0.704	-0.774	2.000	13066	6778	436	7298	38066	2151	7847	Y	-1404	70.03	95.13	1065	0	0.13	0.207	0.00	0.17	0.25	451	1365	833	3.10	18.33	6.27
149	149	-0.815	-0.704	-0.774	2.000	13066	6778	436	7298	38066	2151	7846	Y	-1421	70.03	95.13	1070	0	0.13	0.207	0.00	0.17	0.25	451	1370	833	3.12	18.33	6.27
149	150	-0.766	-0.716	-0.746	2.000	13477	3607	467	7650	20736	2379	8255	Y	-1484	64.69	98.42	1112	0	0.13	0.212	0.00	0.17	0.25	467	1421	915	2.88	18.84	6.44
150	150	-0.766	-0.716	-0.747	2.000	13477	3607	467	7650	20736	2379	8255	Y	-1497	64.69	98.42	1116	0	0.13	0.212	0.00	0.17	0.25	467	1425	915	2.90	18.84	6.44
150	151	-0.695	-0.757	-0.719	2.000	14003	-43	498	7993	-254	3027	8655	Y	-1516	84.78	102.02	1146	0	0.13	0.214	0.00	0.17	0.25	484				19.19	6.56
																											2.27		

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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	-0.833	-0.786	-0.813	2.000	13852	22	505	-12975	17	2754	-10411	Y	-2574	58.46	102.02	1498	0	0.13	0.260	0.00	0.19	0.53	1030				-23.27	-7.95
1	2	-0.816	-0.743	-0.785	2.000	14417	-4038	508	-12953	-24556	3387	-10330	Y	-2548	101.41	105.89	1514	0	0.13	0.248	0.00	0.19	0.53	1069	2325	1282	3.89	-22.40	-7.66
2	2	-0.816	-0.744	-0.785	2.000	14417	-3963	509	-12979	-24499	3389	-10496	Y	-2578	101.41	105.89	1524	0	0.13	0.251	0.00	0.19	0.53	1069	2334	1285	3.90	-22.76	-7.78
2	3	-0.765	-0.746	-0.757	2.000	14960	-8070	511	-12957	-52548	3617	-10415	Y	-2486	117.61	110.07	1505	0	0.13	0.240	0.00	0.18	0.53	1108	2352	1360	3.74	-21.97	-7.51
3	3	-0.765	-0.746	-0.757	2.000	14960	-7981	511	-13010	-52476	3617	-10770	Y	-2514	117.61	110.07	1515	0	0.13	0.249	0.00	0.19	0.53	1109	2361	1365	3.75	-22.72	-7.77
3	4	-0.699	-0.775	-0.733	2.000	15542	-12106	513	-12986	-82387	3853	-10687	Y	-2276	133.19	119.87	1438	0	0.13	0.238	0.00	0.18	0.53	1193	2367	1442	3.55	-21.92	-7.50
4	4	-0.698	-0.775	-0.733	2.000	15542	-12017	513	-13066	-82313	3853	-11245	Y	-2306	133.19	119.87	1448	0	0.13	0.250	0.00	0.19	0.53	1193	2377	1450	3.55	-23.07	-7.89
4	5	-0.612	-0.836	-0.715	2.000	16160	-16147	513	-13039	-114141	4096	-11160	Y	-1843	146.74	132.07	1314	204	0.17	0.239	0.00	0.20	0.53	1300	2352	1530	3.26	-22.25	-7.61
5	5	-0.610	-0.836	-0.714	2.000	16160	-16059	514	-13157	-114063	4099	-11936	Y	-1568	146.74	132.07	1218	301	0.24	0.255	0.00	0.25	0.53	1299	2265	1543	2.97	-23.80	-8.14
5	6	-0.491	-0.987	-0.720	2.000	16896	-20192	519	-13125	-147820	4353	-11846	Y	-867	157.30	141.57	990	622	0.48	0.242	0.00	0.36	0.53	1378				-22.87	-7.82
6	6	-0.486	-0.983	-0.716	2.000	16896	-20134	519	-13224	-147766	4355	-12516	Y	-279	157.30	141.57	786	827	0.64	0.256	0.00	0.45	0.53	1375				-24.17	-8.26
6	7	-0.426	-1.066	-0.722	2.000	16896	-21464	521	-13213	-159022	4438	-12487	Y	0	157.56	141.80	678	966	0.74	0.255	0.00	0.50	0.37	967				-24.11	-8.24
7	7	-0.426	-1.066	-0.722	2.000	16896	-12042	-582	-10425	-149600	-3826	-10678	Y	0	157.56	141.80	695	722	0.55	0.218	0.00	0.39	0.37	971				-20.62	-7.05
7	8	-0.486	-0.996	-0.721	2.000	16896	-10562	-576	-10339	-139915	-3740	-10572	Y	172	157.47	141.72	766	619	0.47	0.216	0.00	0.34	0.37	974				-20.41	-6.98
8	8	-0.489	-1.000	-0.725	2.000	16896	-10347	-582	-10377	-139698	-3744	-11190	Y	764	157.47	141.72	972	415	0.32	0.229	0.00	0.27	0.37	976				-21.61	-7.39
8	9	-0.612	-0.881	-0.736	2.000	16160	-6633	-555	-10069	-111694	-3469	-10824	Y	1286	148.19	133.37	1140	145	0.13	0.231	0.00	0.18	0.37	926	1859	1316	2.63	-21.58	-7.38
9	9	-0.613	-0.882	-0.737	2.000	16160	-7415	-548	-10109	-112468	-3460	-11568	Y	1578	148.19	133.37	1241	41	0.13	0.247	0.00	0.19	0.37	927	1951	1324	2.89	-23.07	-7.89
9	10	-0.691	-0.858	-0.765	2.000	15542	-3180	-531	-9837	-85909	-3199	-11238	Y	2059	136.51	122.86	1387	0	0.13	0.250	0.00	0.19	0.37	862	2024	1232	3.46	-23.05	-7.88
10	10	-0.691	-0.857	-0.765	2.000	15542	-3183	-532	-9860	-85901	-3201	-11822	Y	2029	136.51	122.86	1376	0	0.13	0.263	0.00	0.20	0.37	862	2014	1242	3.39	-24.25	-8.29
10	11	-0.718	-0.884	-0.790	2.000	14960	385	-510	-9553	-61918	-2944	-11457	Y	2336	122.61	110.35	1448	0	0.13	0.265	0.00	0.20	0.37	782	2007	1151	3.75	-24.17	-8.26
11	11	-0.718	-0.884	-0.790	2.000	14960	398	-511	-9551	-61890	-2945	-11879	Y	2307	122.61	110.35	1438	0	0.13	0.274	0.00	0.20	0.37	781	1998	1157	3.70	-25.06	-8.57
11	12	-0.737	-0.936	-0.821	2.000	14421	2909	-479	-9211	-40808	-2687	-11480	Y	2165	108.85	105.89	1386	0	0.13	0.275	0.00	0.20	0.37	753	1926	1065	3.91	-24.89	-8.51
12	12	-0.737	-0.936	-0.821	2.000	14421	3259	-484	-9203	-40441	-2692	-11770	Y	2135	108.85	105.89	1376	0	0.13	0.282	0.00	0.21	0.37	753	1917	1071	3.84	-25.52	-8.73
12	13	-0.752	-0.998	-0.852	2.000	13928	5505	-452	-8836	-21401	-2442	-11345	Y	2005	96.26	102.02	1309	0	0.13	0.281	0.00	0.21	0.37	726	1831	982	4.02	-25.25	-8.63
13	13	-0.752	-0.998	-0.852	2.000	13928	5480	-453	-8799	-21408	-2443	-11491	Y	1979	96.26	102.02	1300	0	0.13	0.285	0.00	0.21	0.37	726	1823	984	3.99	-25.58	-8.74
13	14	-0.762	-1.072	-0.883	2.000	13471	8289	-431	-8455	-3517	-2211	-11089	Y	1862	84.64	98.42	1238	0	0.13	0.284	0.00	0.21	0.37	700	1745	901	4.14	-25.31	-8.65
14	14	-0.762	-1.072	-0.883	2.000	13471	7868	-434	-8400	-3920	-2215	-11114	Y	1849	84.64	98.42	1234	0	0.13	0.285	0.00	0.21	0.37	700	1741	902	4.12	-25.37	-8.67
14	15	-0.764	-1.163	-0.912	2.000	13063	9733	-408	-8019	11378	-1986	-10674	Y	1741	58.02	95.13	1177	0	0.13	0.282	0.00	0.21	0.25	451	1466	820	3.54	-24.94	-8.53
15	15	-0.764	-1.162	-0.912	2.000	13063	9738	-409	-7953	11400	-1987	-10598	Y	1723	58.02	95.13	1171	0	0.13	0.280	0.00	0.20	0.25	451	1460	819	3.53	-24.77	-8.47
15	16	-0.759	-1.270	-0.938	2.000	12695	11332	-383	-7561	24837	-1766	-10148	Y	1614	63.32	92.12	1116	0	0.13	0.276	0.00	0.20	0.25	437	1398	739	3.75	-24.24	-8.29
16	16	-0.760	-1.270	-0.939	2.000	12695	11383	-383	-7486	24906	-1767	-9999	Y	1145	63.32	92.12	960	0	0.13	0.272	0.00	0.20	0.25	437	1257	737	3.18	-23.88	-8.17
16	17	-0.775	-1.242	-0.938	2.000	12301	12710	-357	-7087	36535	-1551	-9542	Y	1034	68.10	89.42	906	0	0.13	0.268	0.00	0.20	0.25	424	1197	658	3.41	-23.36	-7.98
17	17	-0.775	-1.242	-0.939	2.000	12301	12752	-357	-7001	36594	-1551	-9294	Y	1004	68.10	89.42	896	0	0.13	0.261	0.00	0.20	0.25	424	1188	654	3.40	-22.75	-7.78
17	18	-0.790	-1.211	-0.937	2.000	11939	13817	-332	-6599	46447	-1337	-8834	Y	891	72.21	86.94	843	0	0.13	0.256	0.00	0.19	0.21	344	1068	576	3.36	-22.13	-7.57
18	18	-0.790	-1.211	-0.937	2.000	11939	13847	-331	-6505	46491	-1337	-8519	Y	865	72.21	86.94	834	0	0.13	0.246	0.00	0.19	0.21	344	1060	571	3.36	-21.34	-7.30
18	19	-0.803	-1.179	-0.934	2.000	11623	14656	-307	-6102	54586	-1125	-8058	Y	754	75.72	84.78	783	0	0.13	0.239	0.00	0.18	0.21	335	1006	494	3.66	-20.62	-7.05
19	19	-0.803	-1.179	-0.934	2.000	11623	14668	-306	-6002	54611	-1124	-7688	Y	724	75.72	84.78	773	0	0.13	0.228	0.00	0.18	0.21	335	998	488	3.67	-19.67	-6.72
19	20	-0.814	-1.148	-0.930	2.000	11354	15229	-282	-5602	60967	-914	-7229	Y	614	78.61	82.94	725	0	0.13	0.220	0.00	0.17	0.21	328	948	412	4.03	-18.84	-6.44
20	20	-0.815	-1.148	-0.931	2.000	11354	15213	-281	-5498	60961	-913	-6815	Y	589	78.61	82.94	717	0	0.13	0.207	0.00	0.17	0.21	328	940	405	4.06	-17.76	-6.07
20	21	-0.823	-1.122	-0.926	2.000	11124	15669	-46	-5211	65729	-493	-6470	Y	481	80.88	81.36	667	0	0.13	0.201	0.00	0.17	0.21	321	889	260	7.82	-17.14	-5.86
21	21	-0.823	-1.122	-0.927	2.000	11124	15611	-44	-5105	65679	-491	-6024	Y	457	80.88	81.36	658	0	0.13	0.187	0.00	0.16	0.21	321	881	253	7.97	-15.96	-5.46
21	22	-0.827	-1.103	-0.923	2.000	10933	15926	-23	-5067	68833	-286	-5928	Y	349	82.54	80.06	605	0	0.13	0.187	0.00	0.16	0.21	315	828	183	8.83	-15.92	-5.44
22	22	-0.827	-1.104	-0.923	2.000	10933	15816	-20	-4958	68728	-283	-5461	Y	321	82.54	80.06	596	0	0.13	0.173	0.00	0.15	0.21	315	820	175	9.07	-14.66	-5.01
22	23	-0.826	-1.094	-0.919	2.000	10788	15918	1	-4940	70201	-79	-5385	Y	215	83.59	79.07	549	0	0.13	0.172	0.00	0.15	0.21	311	774	106	10.09	-14.61	-5.00
23	23	-0.826	-1.095	-0.919	2.000	10788	15674	6	-4832	69959	-74	-4909	Y	191	83.59	79.07	542	0	0.13	0.157	0.00	0.14	0.21	311	767	97	10.13	-13.32	-4.55
23	24	-0.819	-1.097	-0.916	2.000	10617	15554	27	-4836	69748	130	-4854	Y	85	83.80	77.90	499	0	0.13	0.158	0.00	0.14	0.21	306	725	115	8.58	-13.34	-4.56
24	24	-0.819	-1.098	-0.916	2.000	10617	15024	35	-4761	69218	137	-4522	Y	22	83.80	77.90	478	0	0.13	0.147	0.00	0.14	0.21	306	706	113	8.24	-12.43	-4.25
24	25	-0.817	-1.099	-0.914	2.000	10617	14894	44	-4769	68614	223	-4505	Y	-22	83.80	77.90	478	0	0.13	0.147	0.00	0.14	0.21	306	706	141	7.64	-12.38	-4.23
25	25	-0.817	-1.099	-0.914	2.000	10617	14904	44	-4696	68622	223	-4177	Y	-85	83.80	77.90	500	0	0.13	0.136	0.00	0.13	0.21	306	726	136	8.02	-11.48	-3.93
25	26	-0.810	-1.103	-0.912	2.000	10788	14454	65	-4729	66008	427	-4152	Y	-189	83.59	79.07	548	0	0.13	0.133	0.00	0.13	0.21	312	774	204	7.22	-11.27	-3.85
26	26	-0.810	-1.102	-0.911	2.000	10788	14454	65	-4631	66003	428	-3704	Y	-213	83.59	79.07	556	0	0.13	0.119	0.00	0.12	0.21	312	781	197	7.47	-10.05	-3.44
26	27	-0.798	-1.118	-0.909	2.000	10933	13819	86	-4686	61741	632	-3701	Y	-316	82.54	80.06	606	0	0.13	0.117	0.00	0.12	0.21	316	831	265	6.77	-9.94	-3.40
27	27	-0.797	-1.117	-0.908	2.000	10933	13768	87	-4592	61683	632	-3283	Y	-343	82.54	80.06	616	0	0.13	0.104	0.00	0.12	0.21	316	839	259	6.99	-8.82	-3.01
27	28	-0.780	-1.142	-0.906	2.000	11124	12957	108	-4668	55778	837	-3301	N	-445	80.88	81.36	659	0	0.13	Not Reqd	0.00	0.06	0.21	322	882	279	17.83	0.00	0.00
28	28	-0.780	-1.142	-0.905	2.000	11124	12702	110	-4580	55512	840	-2924	N	-469	80.88	81.36	667	0	0.13	Not Reqd	0.00	0.06	0.21	322	890	280	17.56	0.00	0.00
28	29	-0.757	-1.174	-0.902	2.000	11354	11701	131	-4675	47944	1045	-2961	N	-570	78.61	82.94	710	0	0.13	Not Reqd	0.00	0.06	0.21	328	934	348	14.47	0.00	0.00
29	29	-0.757	-1.174	-0.902	2.000	11354	11365	134	-4597	47596	1048	-2639	N	-594	78.61	82.94	718	0	0.13	Not Reqd	0.00	0.06	0.21	328	942	349	14.26	0.00	0.00
29	30	-0.730	-1.212	-0.898	2.000	11623	13706	361	-4901	41887	1461	-2885	N	-695	75.72	84.78	764	0	0.13	Not Reqd	0.00	0.06	0.21	335	989	487	5.17	0.00	0.00
30	30	-0.730	-1.212	-0.898	2.000	11623	13110	367	-4810	41276	1467	-2605	N	-723	75.72	84.78	773	0	0.13	Not Reqd	0.00	0.06	0.21	335	997	489	5.16	0.00	0.00
30	31	-0.700	-1.252	-0.893	2.000	11939	11818	391	-5215	30444	1678	-2952	N	-824	72.21	86.94	820	0	0.13	Not Reqd	0.00	0.06	0.21	344	1047	559	4.74	0.00	0.00
31	31	-0.700	-1.252	-0.893	2.000	11939	11845	391	-5134	30455	1678	-2747	N	-849	72.21	86.94	828	0	0.13	Not Reqd	0.00	0.06	0.21	344	1055	559	4.80	0.00	0.00
31	32	-0.667	-1.294	-0.887	2.000	12301	10327	416	-5540	17893	1892	-3096	N	-948	68.10	89.42	877	0	0.13	Not Reqd	0.00	0.06	0.25	424	1171	631	4.90	0.00	0.00
32	32	-0.667	-1.294	-0.886	2.000	12301	8991	426	-5472	16540	1902	-2980	N	-977	68.10	89.42	887	0	0.13	Not Reqd	0.00	0.06	0.25	424	1180	634	4.84	0.00	0.00

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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														(kip)	(kip)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(in^2/ft)	(kip)	(kip)	(kip)		Total Long.	Equivalent
		(ksi)	(ksi)	(ksi)		(k-ft)	Ultimate	Ultimate	Ultimate				Investigate	Shear from	(in)	(in)	Concrete	Required	Required	Additional	Additional	Total		Provided	Nominal			Mild Steel	PT Steel Req'd
		Perm Load	Perm Load	Dead Load	Stress	Torsional	Corresp.	Max	Corresp.	TOTAL	TOTAL	TOTAL	Torsional	Primary	Depth	Effective	Shear	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Shear	Ultimate	Shear	Required	for Torsion
		Stress	Stress	Stress	Variable	Cracking	Live Load	Live Load	Live Load	Ultimate	Ultimate	Ultimate	Effects?	Post Tensioning	to Tensile	Shear	Resistance	Resistance	Area	Required	Req'd from	Required	Resistance	Resistance	Resistance	Shear	Rating	for Torsion	(based on fpe)
Member	Node	(top fiber)	(bott. fiber)	(neutr. axis)	'K'	Moment	Moment	Shear	Torsion	Moment	Shear	Torsion	(Y/N)	Effect	Reinforcement	Depth	per web	per web	per web	for Torsion	Transverse	per leg	per leg	Provided	Resistance	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	-0.632	-1.336	-0.879	2.000	12695	7164	451	-5879	2156	2117	-3329	N	-1073	63.36	92.12	936	0	0.13	Not Reqd	0.00	0.06	0.25	437	1235	706	4.53		0.00	0.00
33	33	-0.632	-1.336	-0.879	2.000	12695	5916	459	-5833	890	2125	-3383	N	-1513	63.36	92.12	1082	0	0.13	Not Reqd	0.00	0.06	0.25	437	1367	708	5.30		0.00	0.00
33	34	-0.617	-1.237	-0.847	2.000	13063	3792	484	-6238	-15331	2344	-3729	N	-1603	74.11	95.13	1131	0	0.13	Not Reqd	0.00	0.06	0.25	451	1424	781	4.98		0.00	0.00
34	34	-0.617	-1.238	-0.847	2.000	13063	3442	487	-6213	-15699	2347	-3838	N	-1619	74.11	95.13	1137	0	0.13	Not Reqd	0.00	0.06	0.25	451	1429	782	4.99		0.00	0.00
34	35	-0.594	-1.158	-0.813	2.000	13471	1073	511	-6613	-33755	2574	-4179	Y	-1707	84.64	98.42	1186	0	0.13	0.107	0.00	0.12	0.37	700	1698	920	3.90		-9.54	-3.26
35	35	-0.594	-1.158	-0.814	2.000	13471	-1054	525	-6614	-35899	2588	-4418	Y	-1719	84.64	98.42	1191	0	0.13	0.113	0.00	0.12	0.37	700	1702	928	3.84		-10.09	-3.45
35	36	-0.510	-1.053	-0.730	2.000	13928	-3760	550	-7008	-55996	2836	-4754	Y	-1813	93.92	102.02	1244	0	0.13	0.118	0.00	0.12	0.37	726	1773	1016	3.64		-10.58	-3.62
36	36	-0.944	-1.403	-1.130	2.000	13928	-4582	555	-7036	-56833	2841	-5141	Y	-4071	93.92	102.02	1997	0	0.13	0.128	0.00	0.13	0.37	726	2451	1023	5.94		-11.44	-3.91
36	37	-1.069	-1.106	-1.084	2.000	14427	-7558	580	-7424	-79138	3126	-5470	Y	-4067	112.32	105.89	2020	0	0.13	0.131	0.00	0.13	0.37	753	2496	1123	5.53		-11.86	-4.05
37	37	-1.068	-1.106	-1.084	2.000	14427	-7992	582	-7477	-79585	3129	-6014	Y	-4107	112.32	105.89	2033	0	0.13	0.144	0.00	0.14	0.37	753	2508	1132	5.52		-13.04	-4.46
37	38	-1.158	-0.953	-1.069	2.000	14960	-11220	607	-7861	-104261	3422	-6340	Y	-2467	127.88	115.09	1545	0	0.13	0.146	0.00	0.14	0.37	819	2127	1234	3.80		-13.38	-4.57
38	38	-1.158	-0.953	-1.069	2.000	14960	-11481	608	-7938	-104530	3424	-7054	Y	-2506	127.88	115.09	1557	0	0.13	0.163	0.00	0.15	0.37	819	2139	1245	3.79		-14.88	-5.09
38	39	-1.093	-0.943	-1.025	2.000	15542	-14955	633	-8321	-131636	3725	-7378	Y	-2209	139.16	125.24	1522	0	0.13	0.164	0.00	0.15	0.37	891	2172	1351	3.46		-15.14	-5.17
39	39	-1.092	-0.943	-1.025	2.000	15542	-15103	634	-8423	-131789	3726	-8278	Y	-2251	139.16	125.24	1536	0	0.13	0.184	0.00	0.16	0.37	891	2185	1364	3.44		-16.98	-5.81
39	40	-0.994	-0.980	-0.987	2.000	16160	-18821	658	-8807	-161390	4036	-8603	Y	-1818	148.99	134.09	1426	69	0.13	0.184	0.00	0.16	0.37	951	2139	1472	2.91		-17.15	-5.86
40	40	-0.992	-0.979	-0.986	2.000	16160	-18889	660	-8928	-161457	4040	-9630	Y	-1421	148.99	134.09	1286	210	0.16	0.206	0.00	0.19	0.37	949	2012	1489	2.49		-19.20	-6.56
40	41	-0.859	-1.113	-0.976	2.000	16896	-22851	684	-9313	-193609	4355	-9957	Y	-954	157.47	141.72	1125	488	0.37	0.204	0.00	0.28	0.37	994					-19.23	-6.57
41	41	-0.855	-1.109	-0.972	2.000	16896	-22855	685	-9394	-193610	4358	-10690	Y	-147	157.47	141.72	842	772	0.58	0.219	0.00	0.40	0.37	992					-20.64	-7.06
41	42	-0.792	-1.186	-0.974	2.000	16896	-24170	693	-9519	-204433	4446	-10797	Y	9	157.56	141.80	779	868	0.65	0.221	0.00	0.44	0.37	989					-20.85	-7.13
42	42	-0.858	-1.084	-0.962	2.000	16896	-14905	-601	-10420	-183564	-4423	-11695	Y	9	157.56	141.80	806	833	0.62	0.239	0.00	0.43	0.37	994					-22.58	-7.72
42	43	-0.920	-1.004	-0.958	2.000	16896	-13384	-595	-10334	-172359	-4337	-11590	Y	205	157.48	141.73	891	716	0.53	0.237	0.00	0.39	0.37	997					-22.38	-7.65
43	43	-0.924	-1.008	-0.962	2.000	16896	-13981	-590	-10362	-172949	-4339	-12229	Y	1002	157.48	141.73	1170	437	0.32	0.250	0.00	0.29	0.37	1000					-23.61	-8.07
43	44	-1.055	-0.863	-0.966	2.000	16160	-9355	-572	-10091	-139215	-4026	-11899	Y	1512	148.61	133.75	1343	148	0.13	0.254	0.00	0.19	0.37	952	2065	1518	2.61		-23.72	-8.11
44	44	-1.056	-0.863	-0.967	2.000	16160	-9905	-566	-10144	-139750	-4023	-12780	Y	1857	148.61	133.75	1458	32	0.13	0.273	0.00	0.20	0.37	952	2169	1530	2.89		-25.48	-8.71
44	45	-1.147	-0.800	-0.990	2.000	15532	-6229	-545	-9843	-109562	-3716	-12421	Y	2188	138.35	124.51	1511	0	0.13	0.276	0.00	0.20	0.37	886	2157	1422	3.25		-25.49	-8.72
45	45	-1.147	-0.800	-0.991	2.000	15532	-6914	-556	-9888	-110227	-3726	-13175	Y	2143	138.35	124.51	1495	0	0.13	0.293	0.00	0.21	0.37	886	2143	1437	3.13		-27.04	-9.24
45	46	-1.209	-0.767	-1.015	2.000	14943	-4461	-528	-9561	-83522	-3420	-12789	Y	2534	127.10	114.39	1562	0	0.13	0.296	0.00	0.21	0.37	814	2139	1329	3.55		-27.01	-9.23
46	46	-1.210	-0.767	-1.015	2.000	14943	-4412	-538	-9603	-83449	-3430	-13375	Y	2492	127.10	114.39	1548	0	0.13	0.309	0.00	0.22	0.37	814	2126	1341	3.44		-28.24	-9.66
46	47	-1.139	-0.866	-1.023	2.000	14394	-2132	-510	-9259	-59117	-3131	-12973	Y	3981	111.08	105.89	1991	0	0.13	0.311	0.00	0.22	0.37	753	2470	1235	5.03		-28.17	-9.63
47	47	-1.140	-0.866	-1.023	2.000	14394	-2269	-514	-9275	-59227	-3135	-13384	Y	3937	111.08	105.89	1977	0	0.13	0.321	0.00	0.23	0.37	753	2457	1243	4.94		-29.06	-9.93
47	48	-1.053	-1.085	-1.066	2.000	13891	833	-493	-8951	-36212	-2851	-13001	Y	3839	92.92	102.02	1920	0	0.13	0.323	0.00	0.23	0.37	726	2381	1142	5.18		-28.99	-9.91
48	48	-1.054	-1.085	-1.066	2.000	13891	66	-494	-8926	-36950	-2851	-13236	Y	3798	92.92	102.02	1906	0	0.13	0.329	0.00	0.23	0.37	726	2369	1146	5.12		-29.52	-10.09
48	49	-0.766	-0.829	-0.791	2.000	13428	2967	-473	-8595	-16099	-2604	-12846	Y	1710	82.67	98.42	1188	0	0.13	0.330	0.00	0.23	0.37	700	1699	1058	3.25		-29.39	-10.05
49	49	-0.766	-0.829	-0.791	2.000	13428	2863	-477	-8576	-16173	-2608	-12961	Y	1693	82.67	98.42	1182	0	0.13	0.333	0.00	0.23	0.37	700	1694	1061	3.21		-29.66	-10.14
49	50	-0.805	-0.837	-0.817	2.000	13011	4987	-453	-8212	2165	-2377	-12538	Y	1591	60.51	95.13	1127	0	0.13	0.333	0.00	0.23	0.25	451	1421	978	2.63		-29.39	-10.05
50	50	-0.805	-0.836	-0.817	2.000	13011	4951	-456	-8178	2160	-2379	-12530	Y	1568	60.51	95.13	1120	0	0.13	0.333	0.00	0.23	0.25	451	1414	978	2.60		-29.37	-10.04
50	51	-0.842	-0.848	-0.844	2.000	12633	6874	-431	-7806	18672	-2155	-12100	Y	1479	66.40	92.12	1071	0	0.13	0.331	0.00	0.23	0.25	437	1357	897	2.78		-29.01	-9.92
51	51	-0.842	-0.847	-0.844	2.000	12633	6877	-433	-7759	18705	-2157	-11977	Y	1463	66.40	92.12	1066	0	0.13	0.328	0.00	0.23	0.25	437	1352	896	2.76		-28.72	-9.82
51	52	-0.875	-0.866	-0.872	2.000	12301	8593	-408	-7383	33439	-1940	-11542	Y	1373	71.72	89.42	1019	0	0.13	0.324	0.00	0.23	0.25	424	1298	817	2.96		-28.25	-9.66
52	52	-0.875	-0.865	-0.872	2.000	12301	8661	-409	-7319	33536	-1935	-11414	Y	1003	71.72	89.42	895	0	0.13	0.321	0.00	0.23	0.25	424	1188	814	2.53		-27.94	-9.55
52	53	-0.919	-0.801	-0.878	2.000	11939	10162	-385	-6941	46478	-1722	-10978	Y	912	76.48	86.94	850	0	0.13	0.318	0.00	0.22	0.25	412	1136	736	2.73		-27.50	-9.40
53	53	-0.919	-0.801	-0.878	2.000	11939	10179	-386	-6871	46521	-1722	-10668	Y	889	76.48	86.94	842	0	0.13	0.309	0.00	0.22	0.25	412	1129	732	2.73		-26.72	-9.14
53	54	-0.958	-0.744	-0.883	2.000	11623	11466	-361	-6495	57743	-1511	-10233	Y	797	80.70	84.78	798	0	0.13	0.304	0.00	0.22	0.21	335	1020	655	2.69		-26.18	-8.95
54	54	-0.959	-0.744	-0.884	2.000	11623	11356	-363	-6416	57658	-1512	-9847	Y	771	80.70	84.78	789	0	0.13	0.293	0.00	0.21	0.21	335	1012	649	2.68		-25.19	-8.61
54	55	-0.993	-0.694	-0.888	2.000	11354	12434	-339	-6043	67175	-1302	-9415	Y	680	84.36	82.94	730	0	0.13	0.286	0.00	0.21	0.21	326	951	573	2.87		-24.54	-8.39
55	55	-0.993	-0.694	-0.889	2.000	11354	12438	-338	-5957	67201	-1301	-8963	Y	657	84.36	82.94	722	0	0.13	0.273	0.00	0.20	0.21	326	944	566	2.88		-23.36	-7.99
55	56	-1.021	-0.652	-0.893	2.000	11124	13293	-314	-5589	75010	-1092	-8536	Y	565	87.46	81.36	665	0	0.13	0.265	0.00	0.20	0.21	318	885	490	3.11		-22.61	-7.73
56	56	-1.021	-0.652	-0.893	2.000	11124	13104	-315	-5497	74840	-1092	-8031	Y	543	87.46	81.36	658	0	0.13	0.249	0.00	0.19	0.21	318	879	483	3.13		-21.27	-7.27
56	57	-1.043	-0.621	-0.896	2.000	10933	12291	-93	-5378	79504	-686	-7853	Y	450	89.97	80.97	619	0	0.13	0.248	0.00	0.19	0.21	316	842	345	5.51		-21.09	-7.21
57	57	-1.043	-0.621	-0.896	2.000	10933	12259	-90	-5294	79487	-683	-7319	Y	425	89.97	80.97	610	0	0.13	0.231	0.00	0.18	0.21	316	834	336	5.60		-19.65	-6.72
57	58	-1.058	-0.598	-0.898	2.000	10788	12953	-70	-5266	84187	-480	-7232	Y	332	91.90	82.71	586	0	0.13	0.232	0.00	0.18	0.21	323	817	267	6.45		-19.63	-6.71
58	58	-1.058	-0.598	-0.898	2.000	10788	12848	-66	-5177	84094	-475	-6665	Y	311	91.90	82.71	578	0	0.13	0.213	0.00	0.17	0.21	323	811	257	6.63		-18.09	-6.18
58	59	-1.065	-0.586	-0.899	2.000	10683	13340	-45	-5166	87126	-272	-6596	Y	220	93.24	83.92	553	0	0.13	0.213	0.00	0.17	0.21	327	793	188	7.61		-18.04	-6.17
59	59	-1.065	-0.586	-0.899	2.000	10683	13065	-50	-5076	86859	-276	-6009	Y	199	93.24	83.92	547	0	0.13	0.194	0.00	0.16	0.21	327	786	181	7.61		-16.44	-5.62
59	60	-1.064	-0.584	-0.898	2.000	10617	13426	-29	-5084	88299	-73	-5958	Y	112	94.02	84.62	521	0	0.13	0.194	0.00	0.16	0.21	330	766	112	8.69		-16.38	-5.60
60	60	-1.064	-0.584	-0.898	2.000	10617	13256	-33	-5001	88133	-76	-5424	Y	76	94.02	84.62	510	0	0.13	0.176	0.00	0.15	0.21	330	756	105	8.67		-14.91	-5.10
60	61	-1.058	-0.588	-0.895	2.000	10617	13441	-16	-5020	88119	89	-5396	Y	8	94.24	84.81	487	0	0.13	0.176	0.00	0.15	0.21	331	736	109	8.89		-14.83	-5.07
61	61	-1.058	-0.588	-0.895	2.000	10617	13323	-18	-4937	88002	87	-4863	Y	-27	94.24	84.81	494	0	0.13	0.158	0.00	0.14	0.21	331	743	101	9.12		-13.37	-4.57
61	62	-1.043	-0.602	-0.890	2.000	10683	13421	2	-4978	86530	290	-4846	Y	-111	94.02	84.62	522	0	0.13	0.157	0.00	0.14	0.21	330	767	168	9.06		-13.26	-4.53
62	62	-1.043	-0.602	-0.890	2.000	10683	13318	1	-4887	86425	289	-4262	Y	-132	94.02	84.62	529	0	0.13	0.138	0.00	0.13	0.21	330	774	159	9.49		-11.66	-3.99
62	63	-1.019	-0.628	-0.884	2.000	10788	13260	21	-4947	83335	492	-4265	Y	-217	93.24	83.92	557	0	0.13	0.137	0.00	0.13	0.21	328	796	227	8.10		-11.57	-3.96
63	63	-1.019	-0.628	-0.883	2.000	10788	12965	23	-4857	83034	494	-3703	Y	-238	93.24	83.92	565	0	0.13	0.119	0.00	0.12	0.21	328	803	220	8.34		-10.05	-3.44
63	64	-0.988	-0.663	-0.875	2.000	10933	12718	44	-4936	78290	698	-3724	Y	-325	91.90	82.71	591	0	0.13	0.118	0.00	0.12	0.21	324	824	288	7.13		-10.00	-3.42

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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	-0.988	-0.663	-0.875	2.000	10933	12284	48	-4851	77847	703	-3200	N	-349	91.90	82.71	601	0	0.13	Not Reqd	0.00	0.06	0.21	324	832	234	38.40	0.00	0.00
64	65	-0.949	-0.708	-0.865	2.000	11124	11838	68	-4948	71433	907	-3238	N	-437	89.98	81.36	631	0	0.13	Not Reqd	0.00	0.06	0.21	319	855	302	25.37	0.00	0.00
65	65	-0.949	-0.708	-0.865	2.000	11124	11162	75	-4868	70744	914	-2759	N	-458	89.98	81.36	639	0	0.13	Not Reqd	0.00	0.06	0.21	319	863	305	23.24	0.00	0.00
65	66	-0.904	-0.762	-0.854	2.000	11354	14055	287	-5141	66192	1312	-2973	N	-544	87.47	82.94	685	0	0.13	Not Reqd	0.00	0.06	0.21	326	910	437	5.94	0.00	0.00
66	66	-0.903	-0.762	-0.854	2.000	11354	13218	297	-5045	65338	1321	-2528	N	-566	87.47	82.94	694	0	0.13	Not Reqd	0.00	0.06	0.21	327	919	440	5.84	0.00	0.00
66	67	-0.851	-0.825	-0.842	2.000	11623	12590	320	-5436	55780	1530	-2860	N	-649	84.37	84.78	748	0	0.13	Not Reqd	0.00	0.06	0.25	402	1036	510	5.93	0.00	0.00
67	67	-0.851	-0.825	-0.842	2.000	11623	11481	331	-5354	54652	1542	-2491	N	-675	84.37	84.78	757	0	0.13	Not Reqd	0.00	0.06	0.25	402	1043	514	5.80	0.00	0.00
67	68	-0.793	-0.897	-0.829	2.000	11939	10551	355	-5746	43297	1753	-2825	N	-756	80.71	86.94	798	0	0.13	Not Reqd	0.00	0.06	0.25	412	1089	584	5.27	0.00	0.00
68	68	-0.793	-0.897	-0.829	2.000	11939	9397	365	-5677	42122	1764	-2539	N	-778	80.71	86.94	805	0	0.13	Not Reqd	0.00	0.06	0.25	412	1096	588	5.17	0.00	0.00
68	69	-0.730	-0.977	-0.816	2.000	12301	8165	389	-6071	28959	1976	-2875	N	-859	76.51	89.42	847	0	0.13	Not Reqd	0.00	0.06	0.25	424	1144	659	4.74	0.00	0.00
69	69	-0.730	-0.978	-0.816	2.000	12301	6975	400	-6019	27747	1987	-2688	N	-885	76.51	89.42	856	0	0.13	Not Reqd	0.00	0.06	0.25	424	1152	662	4.68	0.00	0.00
69	70	-0.663	-1.063	-0.803	2.000	12695	5443	424	-6415	12765	2201	-3025	N	-963	71.75	92.12	899	0	0.13	Not Reqd	0.00	0.06	0.25	437	1202	734	4.32	0.00	0.00
70	70	-0.663	-1.064	-0.804	2.000	12695	4470	431	-6371	11768	2215	-3027	N	-1345	71.75	92.12	1026	0	0.13	Not Reqd	0.00	0.06	0.25	437	1317	738	5.03	0.00	0.00
70	71	-0.610	-1.040	-0.769	2.000	13066	2658	455	-6764	-5092	2434	-3362	N	-1418	65.73	95.13	1070	0	0.13	Not Reqd	0.00	0.06	0.37	677	1572	811	6.02	0.00	0.00
71	71	-0.610	-1.041	-0.769	2.000	13066	2251	458	-6747	-5523	2437	-3402	N	-1434	65.73	95.13	1075	0	0.13	Not Reqd	0.00	0.06	0.37	677	1577	812	6.01	0.00	0.00
71	72	-0.553	-1.026	-0.737	2.000	13477	189	482	-7137	-24223	2663	-3732	N	-1504	76.21	98.42	1119	0	0.13	Not Reqd	0.00	0.06	0.37	700	1637	888	5.66	0.00	0.00
72	72	-0.553	-1.027	-0.737	2.000	13477	-77	484	-7136	-24512	2666	-3900	N	-1516	76.21	98.42	1123	0	0.13	Not Reqd	0.00	0.06	0.37	700	1641	889	5.66	0.00	0.00
72	73	-0.493	-1.019	-0.706	2.000	13934	-2383	509	-7521	-45106	2900	-4226	Y	-1595	87.64	102.02	1172	0	0.13	0.105	0.00	0.12	0.37	726	1708	1029	3.42	-9.40	-3.21
73	73	-0.493	-1.020	-0.706	2.000	13934	-2554	510	-7537	-45300	2902	-4538	Y	-1618	87.64	102.02	1179	0	0.13	0.113	0.00	0.12	0.37	726	1715	1034	3.42	-10.10	-3.45
73	74	-0.387	-0.987	-0.638	2.000	14431	-5105	535	-7916	-67907	3158	-4859	Y	-1697	98.06	105.89	1230	0	0.13	0.116	0.00	0.12	0.37	753	1785	1124	3.24	-10.53	-3.60
74	74	-0.837	-1.291	-1.027	2.000	14431	-5212	536	-7951	-68034	3159	-5325	Y	-3964	98.06	105.89	1986	0	0.13	0.127	0.00	0.13	0.37	753	2465	1132	5.50	-11.54	-3.95
74	75	-0.926	-1.063	-0.985	2.000	14973	-8008	560	-8328	-92896	3453	-5643	Y	-4047	117.46	110.07	2040	0	0.13	0.130	0.00	0.13	0.37	783	2541	1234	5.22	-11.90	-4.07
75	75	-0.925	-1.063	-0.985	2.000	14973	-8068	561	-8377	-92972	3454	-6223	Y	-4093	117.46	110.07	2055	0	0.13	0.144	0.00	0.14	0.37	783	2555	1243	5.22	-13.12	-4.49
75	76	-1.001	-0.956	-0.981	2.000	15555	-11082	585	-8749	-119995	3753	-6537	Y	-2408	134.12	120.71	1560	0	0.13	0.145	0.00	0.14	0.37	859	2177	1348	3.56	-13.40	-4.58
76	76	-1.001	-0.956	-0.981	2.000	15555	-11095	585	-8761	-120010	3754	-6680	Y	-2464	134.12	120.71	1579	0	0.13	0.148	0.00	0.14	0.37	859	2194	1350	3.60	-13.69	-4.68
76	77	-0.922	-0.975	-0.946	2.000	16176	-14304	609	-9129	-149068	4057	-6991	Y	-2091	145.41	130.86	1516	0	0.13	0.149	0.00	0.14	0.37	931	2202	1456	3.21	-13.93	-4.76
77	77	-0.921	-0.976	-0.946	2.000	16176	-14309	609	-9129	-149073	4057	-6994	Y	-2141	145.41	130.86	1534	0	0.13	0.149	0.00	0.14	0.37	931	2218	1456	3.26	-13.93	-4.76
77	78	-0.821	-1.023	-0.916	2.000	16843	-17747	632	-9501	-180579	4368	-7309	Y	-1828	155.75	140.18	1433	185	0.14	0.150	0.00	0.14	0.37	988	2179	1564	2.75	-14.14	-4.84
78	78	-0.820	-1.022	-0.914	2.000	16843	-17708	633	-9498	-180540	4367	-7262	Y	-1465	155.75	140.18	1305	313	0.24	0.149	0.00	0.19	0.37	987	2063	1563	2.42	-14.05	-4.80
78	79	-0.688	-1.153	-0.906	2.000	17619	-21384	657	-9869	-214517	4684	-7577	Y	-1001	164.81	148.33	1150	585	0.42	0.149	0.00	0.28	0.37	1035				-14.20	-4.85
79	79	-0.684	-1.148	-0.902	2.000	17619	-21281	656	-9851	-214414	4677	-7495	Y	-177	164.81	148.33	862	870	0.63	0.147	0.00	0.39	0.37	1033				-14.05	-4.80
79	80	-0.619	-1.225	-0.904	2.000	17619	-22506	664	-9970	-225791	4765	-7595	Y	0	164.93	148.44	786	978	0.71	0.149	0.00	0.43	0.37	1030				-14.23	-4.87
80	80	-0.563	-1.315	-0.916	2.000	17619	-10973	-588	-9957	-224383	-4650	-11268	Y	0	164.93	148.44	791	931	0.67	0.221	0.00	0.45	0.37	1031				-21.12	-7.22
80	81	-0.623	-1.240	-0.913	2.000	17619	-9944	-581	-9858	-213301	-4562	-11151	Y	139	164.90	148.41	854	836	0.60	0.219	0.00	0.41	0.37	1034				-20.90	-7.14
81	81	-0.627	-1.245	-0.917	2.000	17619	-9850	-580	-9869	-213207	-4558	-11098	Y	960	164.90	148.41	1142	547	0.39	0.218	0.00	0.30	0.37	1037				-20.80	-7.11
81	82	-0.748	-1.118	-0.922	2.000	16843	-6787	-557	-9554	-180231	-4241	-10726	Y	1311	156.24	140.62	1258	312	0.23	0.220	0.00	0.23	0.37	990	2024	1572	2.38	-20.76	-7.10
82	82	-0.750	-1.119	-0.923	2.000	16843	-6759	-556	-9553	-180203	-4238	-10686	Y	1672	156.24	140.62	1385	184	0.14	0.219	0.00	0.18	0.37	992	2139	1571	2.74	-20.68	-7.07
82	83	-0.850	-1.073	-0.952	2.000	16176	-3914	-533	-9232	-149715	-3927	-10309	Y	1905	146.58	131.92	1462	0	0.13	0.220	0.00	0.17	0.37	939	2161	1461	3.23	-20.54	-7.02
83	83	-0.850	-1.073	-0.952	2.000	16176	-3916	-533	-9233	-149716	-3927	-10311	Y	1855	146.58	131.92	1444	10	0.13	0.220	0.00	0.17	0.37	938	2145	1461	3.18	-20.54	-7.02
83	84	-0.933	-1.042	-0.982	2.000	15555	-1287	-509	-8906	-121658	-3624	-9928	Y	1962	136.60	122.94	1425	0	0.13	0.220	0.00	0.17	0.37	875	2070	1355	3.37	-20.35	-6.96
84	84	-0.934	-1.042	-0.982	2.000	15555	-1288	-509	-8907	-121660	-3625	-9929	Y	1922	136.60	122.94	1412	0	0.13	0.221	0.00	0.18	0.37	875	2058	1355	3.33	-20.36	-6.96
84	85	-0.884	-1.121	-0.987	2.000	14973	1130	-486	-8573	-95965	-3330	-9539	Y	3543	122.22	110.07	1872	0	0.13	0.220	0.00	0.17	0.37	783	2389	1251	4.94	-20.11	-6.88
85	85	-0.884	-1.121	-0.987	2.000	14973	1129	-486	-8574	-95966	-3330	-9541	Y	3507	122.22	110.07	1860	0	0.13	0.220	0.00	0.17	0.37	783	2379	1251	4.91	-20.12	-6.88
85	86	-0.819	-1.308	-1.024	2.000	14431	3337	-462	-8231	-72569	-3043	-9141	Y	3458	105.30	105.89	1817	0	0.13	0.219	0.00	0.17	0.37	753	2314	1149	5.22	-19.81	-6.77
86	86	-0.819	-1.308	-1.024	2.000	14431	3336	-462	-8232	-72570	-3043	-9143	Y	3420	105.30	105.89	1804	0	0.13	0.219	0.00	0.17	0.37	753	2302	1150	5.18	-19.81	-6.77
86	87	-0.571	-1.112	-0.790	2.000	13934	5338	-439	-7879	-51292	-2794	-8734	Y	1629	98.21	102.02	1183	0	0.13	0.217	0.00	0.17	0.37	726	1718	1060	3.50	-19.43	-6.64
87	87	-0.571	-1.112	-0.790	2.000	13934	5337	-439	-7880	-51292	-2794	-8735	Y	1604	98.21	102.02	1175	0	0.13	0.217	0.00	0.17	0.37	726	1711	1060	3.48	-19.44	-6.64
87	88	-0.614	-1.136	-0.816	2.000	13477	7135	-415	-7518	-31901	-2565	-8316	Y	1562	87.67	98.42	1138	0	0.13	0.213	0.00	0.17	0.37	700	1655	978	3.71	-18.98	-6.49
88	88	-0.614	-1.136	-0.816	2.000	13477	7135	-415	-7518	-31901	-2566	-8317	Y	1549	87.67	98.42	1134	0	0.13	0.213	0.00	0.17	0.37	700	1651	978	3.70	-18.98	-6.49
88	89	-0.661	-1.158	-0.845	2.000	13066	8729	-391	-7149	-14283	-2344	-7891	Y	1385	78.39	95.13	1059	0	0.13	0.209	0.00	0.17	0.25	451	1359	898	2.95	-18.44	-6.30
89	89	-0.661	-1.157	-0.845	2.000	13066	8729	-391	-7149	-14283	-2345	-7892	Y	1368	78.39	95.13	1053	0	0.13	0.209	0.00	0.17	0.25	451	1354	898	2.93	-18.44	-6.30
89	90	-0.705	-1.187	-0.874	2.000	12695	10119	-368	-6776	1617	-2131	-7462	Y	1327	58.02	92.12	1020	0	0.13	0.203	0.00	0.17	0.25	437	1311	820	3.20	-17.82	-6.09
90	90	-0.704	-1.187	-0.874	2.000	12695	10090	-368	-6781	1588	-2133	-7497	Y	909	58.02	92.12	881	0	0.13	0.204	0.00	0.17	0.25	437	1186	822	2.64	-17.91	-6.12
90	91	-0.763	-1.095	-0.879	2.000	12301	11275	-344	-6406	15816	-1923	-7065	Y	868	62.10	89.42	850	0	0.13	0.198	0.00	0.16	0.25	424	1147	745	2.92	-17.29	-5.91
91	91	-0.763	-1.095	-0.879	2.000	12301	11273	-344	-6406	15815	-1923	-7067	Y	840	62.10	89.42	841	0	0.13	0.198	0.00	0.16	0.25	424	1139	745	2.88	-17.30	-5.91
91	92	-0.818	-1.011	-0.885	2.000	11939	12252	-321	-6032	28392	-1715	-6636	Y	677	65.83	86.94	771	0	0.13	0.192	0.00	0.16	0.21	344	1003	670	2.70	-16.62	-5.68
92	92	-0.818	-1.011	-0.885	2.000	11939	12250	-321	-6032	28390	-1715	-6637	Y	653	65.83	86.94	763	0	0.13	0.192	0.00	0.16	0.21	344	996	670	2.66	-16.63	-5.68
92	93	-0.877	-0.916	-0.891	2.000	11623	13020	-297	-5658	39327	-1509	-6207	Y	613	68.64	84.78	736	0	0.13	0.184	0.00	0.16	0.21	335	964	595	3.02	-15.88	-5.43
93	93	-0.877	-0.917	-0.891	2.000	11623	13018	-297	-5658	39325	-1509	-6208	Y	586	68.64	84.78	727	0	0.13	0.185	0.00	0.16	0.21	335	956	595	2.98	-15.88	-5.43
93	94	-0.929	-0.836	-0.897	2.000	11354	13579	-274	-5287	48632	-1304	-5780	Y	546	71.20	82.94	702	0	0.13	0.176	0.00	0.15	0.21	328	927	520	3.40	-15.06	-5.15
94	94	-0.929	-0.836	-0.897	2.000	11354	13578	-274	-5287	48630	-1304	-5781	Y	523	71.20	82.94	695	0	0.13	0.176	0.00	0.15	0.21	328	920	520	3.36	-15.07	-5.15
94	95	-0.970	-0.773	-0.901	2.000	11124	12446	-76	-5116	54831	-926	-5554	Y	483	73.53	81.36	671	0	0.13	0.172	0.00	0.15	0.21	322	894	391	5.98	-14.71	-5.03
95	95	-0.970	-0.774	-0.901	2.000	11124	12445	-76	-5117	54831	-926	-5555	Y	460	73.53	81.36	664	0	0.13	0.173	0.00	0.15	0.21	322	887	391	5.91	-14.71	-5.03

PROJECT: **Cline Avenue Mainline Seg 2 EB** CALCS BY: TSP DATE: 01/21/09

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

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

Material Properties:

Concrete

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

ϕ_v = ***0.90***

P-T Strands

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

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

Reinforcement

fy = ***60.0*** ksi

Box Girder Properties:

Web Thickness

b_v = ***15.00*** in

Effective Width of Shear Flow Path

be= ***5.50*** in

Notes:

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

Calc RF

Member Number	Node Number	(ksi) Perm Load Stress (top fiber)	(ksi) Perm Load Stress (bott. fiber)	(ksi) Dead Load Stress (neutr. axis) (fpc)	Stress Variable 'K'	(k-ft) Torsional Moment (Tcr)	Ultimate Corresp. Live Load Moment	Ultimate Max Live Load Shear	Ultimate Corresp. Live Load Torsion	TOTAL Ultimate Moment (Mu)	TOTAL Ultimate Shear (Vu)	TOTAL Ultimate Torsion (Tu)	Investigate Torsional Effects? (Y/N)	Shear from Primary Post Tensioning Effect (Vp)	(in) Depth to Tensile Reinforcement d_e	(in) Effective Shear Depth d_v	(kip) Concrete Shear Resistance per web (Vc)	(kip) Required Steel Resistance per web (Vs-req'd)	(in^2/ft) Required Steel Area per web (Av)	(in^2/ft) Additional Steel Required for Torsion (At)	(in^2/ft) Additional Steel Req'd from Transverse A_v (trans)	(in^2/ft) Total Steel Required per leg (As_req'd)	(in^2/ft) Steel Provided per leg As_prov'd)	(kip) Provided Steel Resistance per web (Vs_prov)	(kip) Nominal Shear Resistance per web (ϕVn)	(kip) Ultimate Shear per web (Vu)	Shear Rating Factor, RF	Total Long. Mild Steel Required for Torsion (Al) in^2	Equivalent PT Steel Req'd for Torsion (based on fpe) (Al) in^2
										Permanent Loads + Minimum LL Torsion @ t=00																			
95	96	-1.004	-0.721	-0.906	2.000	10933	13052	-57	-5052	61366	-727	-5433	Y	309	75.36	80.06	603	0	0.13	0.172	0.00	0.15	0.21	316	828	323	6.40	-14.59	-4.99
96	96	-1.004	-0.721	-0.906	2.000	10933	13052	-57	-5053	61365	-727	-5435	Y	282	75.36	80.06	594	0	0.13	0.172	0.00	0.15	0.21	316	819	323	6.31	-14.59	-4.99
96	97	-1.034	-0.674	-0.909	2.000	10788	13505	-37	-5004	66348	-528	-5329	Y	254	76.55	79.07	568	0	0.13	0.171	0.00	0.15	0.21	311	792	255	7.22	-14.46	-4.94
97	97	-1.034	-0.674	-0.909	2.000	10788	13504	-37	-5004	66347	-528	-5330	Y	232	76.55	79.07	561	0	0.13	0.171	0.00	0.15	0.21	311	785	255	7.14	-14.47	-4.95
97	98	-1.052	-0.647	-0.911	2.000	10683	13795	-17	-4972	69774	-330	-5242	Y	178	77.48	78.35	532	0	0.13	0.169	0.00	0.15	0.21	308	756	187	8.17	-14.34	-4.90
98	98	-1.052	-0.647	-0.911	2.000	10683	13795	-17	-4973	69773	-330	-5243	Y	156	77.48	78.35	524	0	0.13	0.170	0.00	0.15	0.21	308	749	187	8.08	-14.34	-4.90
98	99	-1.059	-0.635	-0.912	2.000	10617	13924	3	-4959	71647	-132	-5172	Y	76	77.99	77.90	492	0	0.13	0.168	0.00	0.15	0.21	306	718	120	9.05	-14.22	-4.86
99	99	-1.059	-0.635	-0.912	2.000	10617	13923	3	-4959	71647	-132	-5173	Y	39	77.99	77.90	479	0	0.13	0.168	0.00	0.15	0.21	306	706	120	8.90	-14.22	-4.86
99	100	-1.060	-0.629	-0.910	2.000	10617	13906	19	-4961	72025	28	-5129	Y	-39	77.99	77.90	479	0	0.13	0.167	0.00	0.15	0.21	306	707	85	8.81	-14.10	-4.82
100	100	-1.060	-0.629	-0.910	2.000	10617	13906	19	-4962	72025	28	-5131	Y	-76	77.99	77.90	491	0	0.13	0.167	0.00	0.15	0.21	306	717	85	8.94	-14.10	-4.82
100	101	-1.055	-0.629	-0.907	2.000	10683	13733	39	-4980	71084	226	-5092	Y	-154	77.48	78.35	522	0	0.13	0.165	0.00	0.15	0.21	308	747	151	7.89	-13.93	-4.76
101	101	-1.055	-0.629	-0.907	2.000	10683	13733	39	-4980	71083	226	-5093	Y	-176	77.48	78.35	530	0	0.13	0.165	0.00	0.15	0.21	308	754	151	7.97	-13.93	-4.76
101	102	-1.040	-0.646	-0.903	2.000	10788	13394	59	-5016	68586	425	-5072	Y	-229	76.55	79.07	556	0	0.13	0.162	0.00	0.15	0.21	311	780	217	7.02	-13.76	-4.71
102	102	-1.040	-0.646	-0.903	2.000	10788	13394	59	-5016	68585	425	-5072	Y	-251	76.55	79.07	564	0	0.13	0.162	0.00	0.15	0.21	311	787	217	7.09	-13.77	-4.71
102	103	-1.011	-0.683	-0.897	2.000	10933	12887	79	-5068	64526	623	-5067	Y	-277	75.36	80.06	587	0	0.13	0.160	0.00	0.14	0.21	316	812	283	6.24	-13.61	-4.65
103	103	-1.011	-0.682	-0.897	2.000	10933	12887	79	-5069	64525	623	-5068	Y	-303	75.36	80.06	596	0	0.13	0.160	0.00	0.14	0.21	316	820	283	6.32	-13.61	-4.65
103	104	-0.978	-0.724	-0.890	2.000	11124	15567	271	-5262	62253	995	-5205	Y	-450	73.53	81.36	656	0	0.13	0.162	0.00	0.15	0.21	321	879	409	3.80	-13.79	-4.71
104	104	-0.978	-0.724	-0.890	2.000	11124	15567	271	-5262	62253	995	-5206	Y	-472	73.53	81.36	664	0	0.13	0.162	0.00	0.15	0.21	321	886	409	3.84	-13.79	-4.71
104	105	-0.937	-0.777	-0.882	2.000	11354	15217	293	-5622	55547	1198	-5508	Y	-509	71.20	82.94	690	0	0.13	0.168	0.00	0.15	0.21	328	916	481	3.41	-14.35	-4.91
105	105	-0.937	-0.777	-0.882	2.000	11354	15217	293	-5622	55547	1198	-5509	Y	-531	71.20	82.94	697	0	0.13	0.168	0.00	0.15	0.21	328	923	481	3.45	-14.36	-4.91
105	106	-0.885	-0.848	-0.872	2.000	11623	14661	315	-5984	47222	1402	-5814	Y	-567	68.64	84.78	721	0	0.13	0.173	0.00	0.15	0.21	335	951	553	3.05	-14.87	-5.08
106	106	-0.885	-0.848	-0.872	2.000	11623	14661	315	-5984	47222	1402	-5814	Y	-594	68.64	84.78	730	0	0.13	0.173	0.00	0.15	0.21	335	959	553	3.09	-14.88	-5.09
106	107	-0.823	-0.933	-0.861	2.000	11939	13894	338	-6348	37265	1608	-6121	Y	-630	65.83	86.94	756	0	0.13	0.177	0.00	0.15	0.21	344	989	626	2.76	-15.33	-5.24
107	107	-0.823	-0.933	-0.861	2.000	11939	13894	338	-6348	37265	1608	-6121	Y	-653	65.83	86.94	763	0	0.13	0.177	0.00	0.15	0.21	344	996	626	2.79	-15.34	-5.24
107	108	-0.764	-1.011	-0.850	2.000	12301	12912	362	-6711	25660	1815	-6428	Y	-807	62.10	89.42	830	0	0.13	0.181	0.00	0.16	0.25	424	1129	700	2.95	-15.73	-5.38
108	108	-0.764	-1.011	-0.850	2.000	12301	12912	362	-6711	25660	1815	-6429	Y	-834	62.10	89.42	839	0	0.13	0.181	0.00	0.16	0.25	424	1137	700	2.99	-15.74	-5.38
108	109	-0.699	-1.098	-0.839	2.000	12695	11712	385	-7075	12395	2024	-6735	Y	-869	58.05	92.12	868	0	0.13	0.183	0.00	0.16	0.25	437	1174	774	2.72	-16.09	-5.50
109	109	-0.699	-1.099	-0.840	2.000	12695	11714	385	-7070	12396	2023	-6740	Y	-1268	58.05	92.12	1001	0	0.13	0.183	0.00	0.16	0.25	437	1294	774	3.24	-16.10	-5.50
109	110	-0.646	-1.075	-0.805	2.000	13066	10293	408	-7427	-2558	2236	-7040	Y	-1302	78.40	95.13	1031	0	0.13	0.186	0.00	0.16	0.25	451	1334	850	2.97	-16.45	-5.62
110	110	-0.646	-1.075	-0.805	2.000	13066	10293	408	-7427	-2558	2236	-7040	Y	-1318	78.40	95.13	1036	0	0.13	0.186	0.00	0.16	0.25	451	1339	849	2.99	-16.45	-5.62
110	111	-0.587	-1.062	-0.771	2.000	13477	8649	432	-7778	-19250	2457	-7334	Y	-1468	87.67	98.42	1107	0	0.13	0.188	0.00	0.16	0.37	700	1627	928	3.70	-16.74	-5.72
111	111	-0.587	-1.062	-0.771	2.000	13477	8649	432	-7778	-19250	2457	-7334	Y	-1481	87.67	98.42	1111	0	0.13	0.188	0.00	0.16	0.37	700	1630	927	3.71	-16.73	-5.72
111	112	-0.531	-1.048	-0.740	2.000	13934	6777	456	-8121	-37740	2686	-7619	Y	-1514	98.22	102.02	1145	0	0.13	0.189	0.00	0.16	0.37	726	1684	1008	3.49	-16.95	-5.80
112	112	-0.531	-1.048	-0.740	2.000	13934	6777	456	-8120	-37740	2686	-7619	Y	-1538	98.22	102.02	1153	0	0.13	0.189	0.00	0.16	0.37	726	1691	1008	3.51	-16.95	-5.80
112	113	-0.832	-1.300	-1.028	2.000	14431	4671	480	-8453	-58146	2936	-7895	Y	-3840	104.27	105.89	1945	0	0.13	0.189	0.00	0.16	0.37	753	2428	1095	5.68	-17.11	-5.85
113	113	-0.832	-1.300	-1.028	2.000	14431	4671	479	-8453	-58146	2935	-7894	Y	-3880	104.27	105.89	1958	0	0.13	0.189	0.00	0.16	0.37	753	2440	1095	5.72	-17.11	-5.85
113	114	-0.901	-1.085	-0.981	2.000	14973	2326	503	-8778	-80703	3223	-8163	Y	-3919	122.47	110.22	1998	0	0.13	0.188	0.00	0.16	0.37	784	2504	1195	5.40	-17.21	-5.88
114	114	-0.901	-1.085	-0.981	2.000	14973	2326	503	-8778	-80703	3222	-8162	Y	-3956	122.47	110.22	2010	0	0.13	0.188	0.00	0.16	0.37	784	2515	1195	5.44	-17.21	-5.88
114	115	-0.956	-1.000	-0.976	2.000	15555	-262	527	-9097	-105592	3518	-8424	Y	-1901	137.38	123.65	1409	0	0.13	0.187	0.00	0.16	0.37	880	2060	1297	3.46	-17.27	-5.90
115	115	-0.956	-1.000	-0.975	2.000	15555	-262	527	-9097	-105592	3517	-8423	Y	-1942	137.38	123.65	1423	0	0.13	0.187	0.00	0.16	0.37	880	2073	1297	3.50	-17.27	-5.90
115	116	-0.860	-1.040	-0.943	2.000	16176	-3098	551	-9411	-132880	3821	-8681	Y	-1836	147.02	132.32	1442	0	0.13	0.185	0.00	0.16	0.37	942	2145	1402	3.30	-17.30	-5.91
116	116	-0.859	-1.041	-0.942	2.000	16176	-3098	551	-9410	-132880	3820	-8679	Y	-1887	147.02	132.32	1459	0	0.13	0.185	0.00	0.16	0.37	942	2161	1402	3.35	-17.29	-5.91
116	117	-0.754	-1.093	-0.913	2.000	16843	-6188	576	-9721	-162637	4132	-8932	Y	-1669	156.32	140.69	1413	117	0.13	0.183	0.00	0.16	0.37	997	2169	1509	2.97	-17.29	-5.91
117	117	-0.752	-1.092	-0.912	2.000	16843	-6189	576	-9728	-162638	4135	-8923	Y	-1297	156.32	140.69	1282	250	0.19	0.183	0.00	0.18	0.37	996	2050	1510	2.61	-17.27	-5.90
117	118	-0.624	-1.221	-0.905	2.000	17619	-9535	600	-10036	-194921	4453	-9175	Y	-969	164.85	148.36	1170	479	0.34	0.180	0.00	0.26	0.37	1041				-17.19	-5.88
118	118	-0.620	-1.217	-0.900	2.000	17619	-9536	601	-10043	-194921	4456	-9170	Y	-127	164.85	148.36	874	776	0.56	0.180	0.00	0.37	0.37	1038				-17.19	-5.88
118	119	-0.558	-1.292	-0.903	2.000	17619	-10662	609	-10141	-205788	4545	-9250	Y	0	164.93	148.44	815	868	0.62	0.181	0.00	0.40	0.37	1036				-17.34	-5.93
119	119	-0.558	-1.292	-0.903	2.000	17619	-16119	-648	-9658	-211245	-4823	-10818	Y	0	164.93	148.44	804	982	0.71	0.212	0.00	0.46	0.37	1033				-20.27	-6.93
119	120	-0.621	-1.213	-0.899	2.000	17619	-14908	-640	-9558	-199698	-4734	-10699	Y	98	164.93	148.44	854	900	0.65	0.210	0.00	0.43	0.37	1037				-20.05	-6.85
120	120	-0.626	-1.218	-0.904	2.000	17619	-14808	-639	-9550	-199598	-4731	-10681	Y	939	164.93	148.44	1149	603	0.43	0.209	0.00	0.32	0.37	1040				-20.02	-6.84
120	121	-0.760	-1.076	-0.908	2.000	16843	-11181	-616	-9232	-165173	-4414	-10306	Y	1357	156.44	140.80	1295	340	0.25	0.211	0.00	0.23	0.37	995	2061	1624	2.28	-19.94	-6.82
121	121	-0.762	-1.077	-0.910	2.000	16843	-10936	-615	-9224	-164929	-4410	-10283	Y	1726	156.44	140.80	1426	207	0.15	0.211	0.00	0.18	0.37	996	2180	1622	2.64	-19.90	-6.80
121	122	-0.861	-1.025	-0.936	2.000	16176	-7544	-592	-8903	-133008	-4099	-9904	Y	2309	146.13	131.52	1595	0	0.13	0.212	0.00	0.17	0.37	936	2278	1513	3.33	-19.73	-6.75
122	122	-0.861	-1.025	-0.936	2.000	16176	-7519	-592	-8904	-132983	-4099	-9904	Y	2258	146.13	131.52	1578	0	0.13	0.212	0.00	0.17	0.37	936	2262	1513	3.28	-19.73	-6.75
122	123	-0.921	-1.019	-0.964	2.000	15555	-4351	-569	-8577	-103500	-3797	-9520	Y	2537	133.87	120.48	1602	0	0.13	0.211	0.00	0.17	0.37	857	2213	1406	3.55	-19.52	-6.67
123	123	-0.921	-1.019	-0.965	2.000	15555	-4323	-568	-8578	-103472	-3797	-9520	Y	2496	133.87	120.48	1588	0	0.13	0.211	0.00	0.17	0.37	857	2201	1406	3.51	-19.52	-6.67
123	124	-0.872	-1.112	-0.976	2.000	14973	-1376	-545	-8244	-76361	-3503	-9130	Y	3847	117.97	110.07	1973	0	0.13	0.211	0.00	0.17	0.37	783	2481	1303	4.88	-19.25	-6.58
124	124	-0.872	-1.113	-0.976	2.000	14973	-1348	-545	-8245	-76333	-3503	-9130	Y	3810	117.97	110.07	1961	0	0.13	0.211	0.00	0.17	0.37	783	2470	1303	4.84	-19.25	-6.58
124	125	-0.805	-1.304	-1.014	2.000	14431	1382	-522	-7902	-51527	-3217	-8730	Y	3697	100.16	105.89	1897	0	0.13	0.209	0.00	0.17	0.37	753	2385	1201	5.07	-18.92	-6.47
125	125	-0.805	-1.305	-1.015	2.000	14431	1411	-522	-7903	-51498	-3217	-8730	Y	3658	100.16	105.89	1884	0	0.13	0.209	0.00	0.17	0.37	753	2373	1201	5.03	-18.92	-6.47
125	126	-0.551	-1.105	-0.775	2.000	13934	3926	-499	-7550	-28818	-2967	-8320	Y	1787	90.29	102.02	1236	0	0.13	0.206	0.00	0.17	0.25	484	1548	1112	2.57	-18.51	-6.33
126	126	-0.551	-1.105	-0.775	2.000	13934	3957	-499	-7551	-28787	-2967	-8321	Y	1762	90.29	102.02	1227	0	0.13	0.206	0.00	0.17	0.25	484	1540	1112	2.54	-18.51	-6.33
126	127	-0.597	-1.118	-0.800	2.000	13477	6258	-475	-7188	-8004	-2739	-7901	Y	1692	79.02	98.42	1181	0	0.13	0.203	0.00	0.17	0.25	467	1483	1030	2.71	-18.03	-6.16

PROJECT: **Cline Avenue Mainline Seg 2 EB** 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 (Permanent Loads + Minimum LL Torsion @ t=00)	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
127	127	-0.597	-1.118	-0.799	2.000	13477	6293	-475	-7189	-7969	-2739	-7902	Y	1678	79.02	98.42	1177	0	0.13	0.203	0.00	0.17	0.25	467	1479	1030	2.70	-18.03	-6.16
127	128	-0.640	-1.133	-0.823	2.000	13066	8380	-452	-6819	11030	-2518	-7475	Y	1598	63.55	95.13	1130	0	0.13	0.198	0.00	0.16	0.25	451	1423	950	2.88	-17.46	-5.97
128	128	-0.640	-1.133	-0.823	2.000	13066	8412	-452	-6820	11062	-2518	-7476	Y	1581	63.55	95.13	1124	0	0.13	0.198	0.00	0.16	0.25	451	1418	950	2.86	-17.47	-5.97
128	129	-0.681	-1.144	-0.844	2.000	12695	10283	-428	-6447	28330	-2305	-7046	Y	1492	68.86	92.12	1075	0	0.13	0.192	0.00	0.16	0.21	364	1295	872	2.78	-16.83	-5.75
129	129	-0.681	-1.143	-0.843	2.000	12695	9984	-430	-6450	28031	-2308	-7047	Y	1068	68.86	92.12	934	0	0.13	0.192	0.00	0.16	0.21	364	1168	874	2.24	-16.83	-5.75
129	130	-0.745	-1.026	-0.843	2.000	12301	11649	-407	-6075	43626	-2099	-6615	Y	977	73.68	89.42	887	0	0.13	0.186	0.00	0.16	0.21	353	1116	797	2.42	-16.19	-5.54
130	130	-0.745	-1.027	-0.843	2.000	12301	11642	-407	-6075	43619	-2099	-6615	Y	949	73.68	89.42	877	0	0.13	0.186	0.00	0.16	0.21	353	1108	797	2.38	-16.19	-5.54
130	131	-0.809	-0.906	-0.843	2.000	11939	13083	-383	-5700	57547	-1891	-6183	Y	862	77.92	86.94	833	0	0.13	0.179	0.00	0.15	0.21	344	1059	722	2.59	-15.49	-5.30
131	131	-0.809	-0.906	-0.843	2.000	11939	13078	-383	-5700	57542	-1891	-6183	Y	838	77.92	86.94	825	0	0.13	0.179	0.00	0.15	0.21	344	1052	722	2.56	-15.49	-5.30
131	132	-0.872	-0.786	-0.842	2.000	11623	14289	-359	-5327	69809	-1685	-5752	Y	755	81.68	84.78	759	0	0.13	0.171	0.00	0.15	0.21	333	983	647	2.70	-14.72	-5.03
132	132	-0.872	-0.787	-0.842	2.000	11623	14284	-359	-5327	69803	-1685	-5752	Y	728	81.68	84.78	750	0	0.13	0.171	0.00	0.15	0.21	333	974	647	2.65	-14.72	-5.03
132	133	-0.931	-0.670	-0.840	2.000	11354	15261	-336	-4956	80414	-1480	-5324	Y	648	84.96	82.94	690	0	0.13	0.162	0.00	0.15	0.21	323	912	572	2.84	-13.87	-4.74
133	133	-0.931	-0.671	-0.841	2.000	11354	15256	-336	-4956	80409	-1480	-5324	Y	624	84.96	82.94	682	0	0.13	0.162	0.00	0.15	0.21	323	905	572	2.80	-13.87	-4.74
133	134	-0.986	-0.562	-0.839	2.000	11124	13980	-110	-4813	87353	-1074	-5123	Y	543	87.75	81.36	634	0	0.13	0.159	0.00	0.14	0.21	316	855	434	4.91	-13.57	-4.64
134	134	-0.986	-0.563	-0.839	2.000	11124	13978	-110	-4813	87351	-1074	-5123	Y	521	87.75	81.36	626	0	0.13	0.159	0.00	0.14	0.21	316	848	434	4.84	-13.57	-4.64
134	135	-1.035	-0.465	-0.837	2.000	10933	14851	-91	-4747	95041	-875	-5000	Y	439	90.04	81.04	585	0	0.13	0.158	0.00	0.14	0.21	313	808	365	5.41	-13.43	-4.59
135	135	-1.035	-0.466	-0.838	2.000	10933	14849	-91	-4747	95039	-875	-4999	Y	412	90.04	81.04	575	0	0.13	0.158	0.00	0.14	0.21	313	800	365	5.33	-13.42	-4.59
135	136	-1.077	-0.382	-0.836	2.000	10788	15535	-71	-4697	101142	-675	-4892	Y	330	91.84	82.65	551	0	0.13	0.157	0.00	0.14	0.21	319	783	297	6.22	-13.28	-4.54
136	136	-1.077	-0.382	-0.836	2.000	10788	15533	-71	-4697	101140	-676	-4892	Y	307	91.84	82.65	543	0	0.13	0.157	0.00	0.14	0.21	319	776	297	6.15	-13.28	-4.54
136	137	-1.110	-0.315	-0.834	2.000	10683	16021	-50	-4664	105651	-476	-4802	Y	222	93.11	83.80	517	0	0.13	0.155	0.00	0.14	0.21	323	756	230	7.15	-13.14	-4.49
137	137	-1.110	-0.315	-0.834	2.000	10683	16020	-50	-4664	105650	-477	-4801	Y	200	93.11	83.80	510	0	0.13	0.155	0.00	0.14	0.21	323	749	230	7.07	-13.13	-4.49
137	138	-1.134	-0.265	-0.833	2.000	10617	16294	-29	-4649	108557	-277	-4730	Y	114	93.86	84.48	482	0	0.13	0.154	0.00	0.14	0.21	325	727	162	8.20	-13.00	-4.45
138	138	-1.134	-0.266	-0.833	2.000	10617	16292	-29	-4649	108556	-278	-4729	Y	77	93.86	84.48	469	0	0.13	0.154	0.00	0.14	0.21	325	715	162	8.05	-13.00	-4.44
138	139	-1.148	-0.236	-0.832	2.000	10617	16343	-8	-4653	109851	-78	-4675	Y	1	94.09	84.68	445	0	0.13	0.152	0.00	0.14	0.21	326	694	95	9.40	-12.85	-4.39
139	139	-1.148	-0.236	-0.832	2.000	10617	16341	-8	-4653	109849	-78	-4674	Y	-44	94.09	84.68	460	0	0.13	0.152	0.00	0.14	0.21	326	707	95	9.58	-12.85	-4.39
139	140	-1.150	-0.228	-0.830	2.000	10683	16210	10	-4669	109708	84	-4644	Y	-110	93.93	84.53	481	0	0.13	0.150	0.00	0.14	0.21	325	726	97	9.70	-12.70	-4.34
140	140	-1.150	-0.228	-0.830	2.000	10683	16209	10	-4669	109707	84	-4644	Y	-123	93.93	84.53	485	0	0.13	0.150	0.00	0.14	0.21	325	729	97	9.75	-12.70	-4.34
140	141	-1.144	-0.236	-0.829	2.000	10788	15825	32	-4705	108052	284	-4623	Y	-202	93.27	83.94	509	0	0.13	0.148	0.00	0.14	0.21	323	749	163	8.31	-12.55	-4.29
141	141	-1.144	-0.236	-0.829	2.000	10788	15824	32	-4705	108051	284	-4622	Y	-224	93.27	83.94	517	0	0.13	0.148	0.00	0.14	0.21	323	756	163	8.40	-12.54	-4.29
141	142	-1.127	-0.263	-0.827	2.000	10933	15185	54	-4757	104747	485	-4618	Y	-301	92.12	82.91	538	0	0.13	0.146	0.00	0.14	0.25	383	830	230	7.78	-12.40	-4.24
142	142	-1.127	-0.263	-0.827	2.000	10933	15184	54	-4757	104746	485	-4617	Y	-327	92.12	82.91	547	0	0.13	0.146	0.00	0.14	0.25	383	838	230	7.88	-12.40	-4.24
142	143	-1.100	-0.307	-0.824	2.000	11124	16698	268	-5112	102197	879	-4915	Y	-404	90.49	81.44	562	0	0.13	0.153	0.00	0.14	0.25	376	845	365	3.91	-13.02	-4.45
143	143	-1.100	-0.306	-0.824	2.000	11124	16698	268	-5112	102197	878	-4914	Y	-426	90.49	81.44	570	0	0.13	0.153	0.00	0.14	0.25	376	852	365	3.95	-13.02	-4.45
143	144	-1.065	-0.364	-0.821	2.000	11354	15985	293	-5472	96015	1084	-5217	Y	-505	88.35	82.94	616	0	0.13	0.159	0.00	0.14	0.25	385	901	439	3.59	-13.60	-4.65
144	144	-1.065	-0.364	-0.821	2.000	11354	15985	293	-5472	96015	1084	-5216	Y	-527	88.35	82.94	624	0	0.13	0.159	0.00	0.14	0.25	385	908	438	3.63	-13.59	-4.65
144	145	-1.022	-0.433	-0.817	2.000	11623	14924	319	-5834	88073	1292	-5522	Y	-607	85.70	84.78	677	0	0.13	0.164	0.00	0.15	0.25	395	965	512	3.35	-14.13	-4.83
145	145	-1.022	-0.433	-0.817	2.000	11623	14924	319	-5834	88073	1292	-5521	Y	-634	85.70	84.78	686	0	0.13	0.164	0.00	0.15	0.25	396	973	512	3.39	-14.13	-4.83
145	146	-0.974	-0.511	-0.812	2.000	11939	13490	347	-6199	78337	1502	-5829	Y	-712	82.52	86.94	744	0	0.13	0.169	0.00	0.15	0.25	408	1037	587	3.17	-14.60	-4.99
146	146	-0.974	-0.511	-0.812	2.000	11939	13490	347	-6198	78337	1502	-5828	Y	-735	82.52	86.94	752	0	0.13	0.169	0.00	0.15	0.25	408	1045	587	3.21	-14.60	-4.99
146	147	-0.920	-0.596	-0.807	2.000	12301	11661	375	-6563	66773	1714	-6136	Y	-808	78.88	89.42	817	0	0.13	0.172	0.00	0.15	0.25	423	1116	662	3.04	-15.02	-5.13
147	147	-0.920	-0.596	-0.807	2.000	12301	11661	375	-6563	66773	1714	-6136	Y	-836	78.88	89.42	826	0	0.13	0.172	0.00	0.15	0.25	423	1124	662	3.08	-15.02	-5.13
147	148	-0.862	-0.686	-0.800	2.000	12695	9414	404	-6928	53348	1929	-6443	Y	-906	74.76	92.12	880	0	0.13	0.175	0.00	0.15	0.25	437	1185	738	2.89	-15.39	-5.26
148	148	-0.862	-0.687	-0.800	2.000	12695	9415	403	-6921	53349	1927	-6429	Y	-1307	74.76	92.12	1014	0	0.13	0.175	0.00	0.15	0.25	437	1306	737	3.40	-15.36	-5.25
148	149	-0.815	-0.704	-0.774	2.000	13066	6729	433	-7280	38018	2147	-6732	Y	-1404	70.03	95.13	1065	0	0.13	0.178	0.00	0.15	0.25	451	1365	815	3.18	-15.73	-5.38
149	149	-0.815	-0.704	-0.774	2.000	13066	6729	433	-7280	38018	2147	-6732	Y	-1421	70.03	95.13	1070	0	0.13	0.178	0.00	0.15	0.25	451	1370	815	3.20	-15.73	-5.38
149	150	-0.766	-0.716	-0.746	2.000	13477	3584	464	-7632	20714	2375	-7028	Y	-1484	64.69	98.42	1112	0	0.13	0.180	0.00	0.15	0.25	467	1421	896	2.97	-16.04	-5.48
150	150	-0.766	-0.716	-0.747	2.000	13477	3584	464	-7632	20714	2375	-7028	Y	-1497	64.69	98.42	1116	0	0.13	0.180	0.00	0.15	0.25	467	1425	896	2.98	-16.04	-5.48
150	151	-0.695	-0.757	-0.719	2.000	14003	-40	495	-7976	-251	3024	-7315	Y	-1516	84.78	102.02	1146	0	0.13	0.180	0.00	0.15	0.25	484				-16.21	-5.54

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