RE-CALCULATION

TRESSES~ERECTION-STRESSES~DESIGN

DETROIT–SUPERIOR BRIDGE

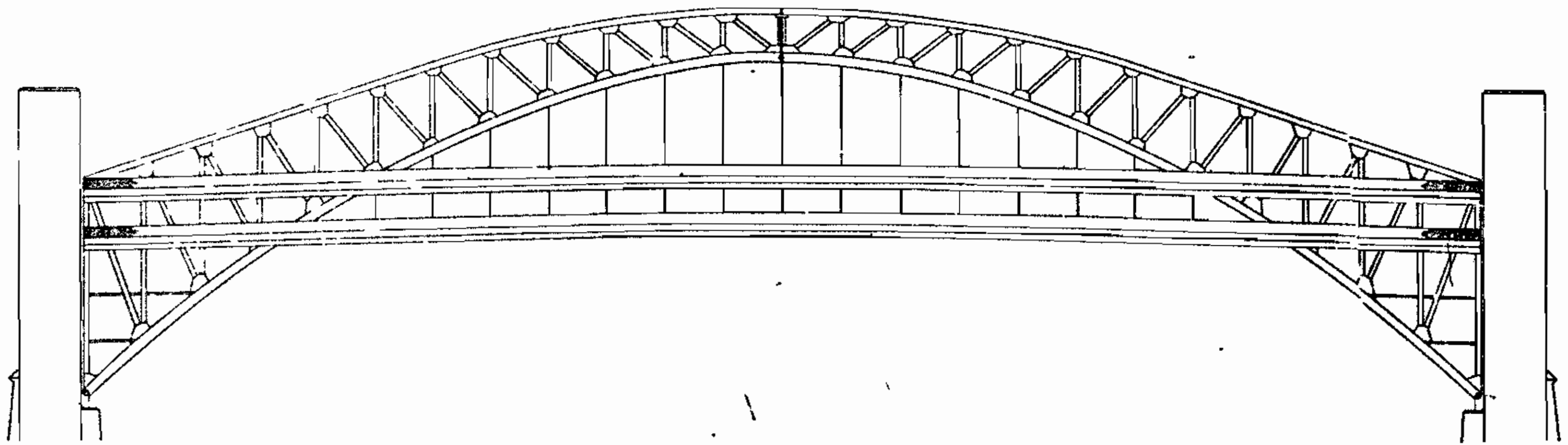
RIVER SPAN

OVER

CUYAHOGA RIVER

CLEVELAND OHIO

CO OF CUYAHOGA



ELEVATION OF RIVER SPAN

SUBMITTED

BY

KING BRIDGE CO

CLEVELAND

OHIO

INDEX

Correct ____________

Bridge Engineer

Plan Approved ________ 1913.

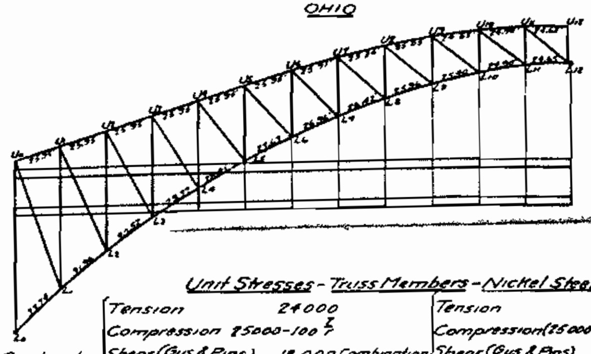
____________ County Commissioners

____________ County Engineer

____________ County Auditor

Stress Sheet
Chord Members

DETROIT-SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO



Members	Dead Load Compt +	Dead Load Tension −	Live Load Loading "A" Compt +	Live Load Loading "A" Tension −	Live Load Loading "B" Compt +	Live Load Loading "B" Tension −	Impact Loading "A" Compt +	Impact Loading "A" Tension −	Impact Loading "B" Compt +	Impact Loading "B" Tension −	Wind Direct Stress	Wind Moment 1000#	Wind Shear	Erection (Cantilever) DL+Trav	Erection (Cantilever) Wind	Stress Proportion for Compt +	Stress Proportion for Tension −	Value $\frac{l}{r}$	Unit Stress Compt +	Unit Stress Tension −	Area Req'd (Square Inches) Gross	Area Req'd Net	Section Used	Area Used (Square Inches) Gross	Area Used Net	Remarks.
L_0L_1	3903	0	2278	0	1816	0	231	0	611	0	± 980	0	0	+ 2366	± 1347	A 6272	0	31	21.4	—	293.0	—	2 Side Pls 26"x1⅜" 4 Ls 8"x8"x1⅛" 4 Web Pls 42"x1"	295.5	—	3 Diaphragms 4 Ls 4"x4"x⅜" 1 Pl 42"x⅜"
L_1L_2	3668	0	2013	43	1945	87	302	22	653	44	± 555	0	0	+ 2164	± 1090	A 5983	0	29	21.6	—	277.0	—	2 Side Pls 26"x1" 4 Ls 8"x8"x1" 4 Web Pls 42"x1"	280.0	—	do
L_2L_3	3342	0	2003	147	2080	285	225	57	700	115	± 237	0	0	+ 1958	± 895	A 5770	0	28	21.7	—	266.0	—	2 Web Pls 42"x⅞" 2 Side Pls 26"x⅞" 4 Ls 8"x8"x1" 2 Web Pls 42"x1"	268.2	—	do
L_3L_4	3234	0	2033	274	2226	548	344	101	748	201	± 184	0	0	+ 1758	± 679	A 5611	0	27	21.8	—	257.3	—	2 Web Pls 42"x⅞" 2 Side Pls 26"x⅞" 4 Ls 8"x8"x⅞" 2 Web Pls 42"x⅞"	257.7	—	do
L_4L_5	3037	0	2064	412	2370	824	364	138	797	2[illegible]7	± 198	0	0	+ 1556	± 654	A 5465	0	26	22.0	—	248.5	—	2 Web Pls 42"x¾" 2 Side Pls 26"x⅞" 4 Ls 8"x8"x⅞" 2 Web Pls 42"x⅞"	250.8	—	do
L_5L_6	2860	0	2030	532	2500	1010	385	165	840	339	± 207	0	0	+ 1323	± 431	A 5335	0	25	22.1	—	241.5	—	2 Side Pls 26"x⅞" 4 Ls 8"x8"x⅞" 4 Web Pls 42"x¾"	242.2	—	do
L_6L_7	2722	0	2077	595	2563	1172	401	171	862	377	± 192	0	0	+ 1073	± 397	A 5200	0	25	22.1	—	235.3	—	2 Side Pls 26"x⅞" 4 Ls 8"x8"x¾" 4 Web Pls 42"x¾"	235.7	—	do
L_7L_8	2636	0	2039	606	2583	1093	394	175	868	267	± 35	0	0	+ 818	± 777	A 5069	0	24	22.2	—	228.5	—	2 Side Pls 26"x⅞" 4 Ls 8"x8"x¾" 4 Web Pls 42"x¾"	229.2	—	do
L_8L_9	[illegible]	0	1968	553	2550	973	398	49	857	327	± 71	0	0	+ 583	± 194	A 4980	0	24	22.2	—	224.5	—	2 Side Pls 26"x¾" 4 Ls 8"x8"x¾" 4 Web Pls 42"x¾"	226.0	—	do
L_9L_{10}	2618	0	1854	421	2452	730	375	113	824	245	± 144	0	0	+ 477	± 0	A 4887	0	24	22.2	—	221.3	—	2 Side Pls 26"x⅞" 4 Ls 8"x8"x¾" 4 Web Pls 42"x¾"	222.7	—	do
$L_{10}L_{11}$	2753	0	1641	169	2247	276	350	43	755	92	± 206	0	0	+ 149	± 0	A 4744	0	23	22.3	—	212.8	—	2 Web Pls 42"x⅞" 4 Ls 8"x8"x¾" 2 Web Pls 42"x1"	215.8	—	do
$L_{11}L_{12}$	2820	0	1503	0	1825	0	211	0	614	0	± 264	0	0	+ 37	± 2	A 4534	0	23	22.3	—	203.5	—	2 Web Pls 42"x¾" 4 Ls 8"x8"x¾" 2 Web Pls 42"x⅞"	205.3	—	do
U_0U_1	25	0	151	153	288	89	44	30	97	64	± 90	0	0	− 1756	± 418	Bw 500	Ew 2174	31	35.0	30.5	14.3	71.4	1 Cov Pl 36"x⅞" 4 Ls 6"x6"x⅞" 2 Web Pls 27"x¾"	82.4	72.[illegible]	Top Chord Mem Direct Stress com-
U_1U_2	78	0	727	313	606	793	94	60	204	132	± 708	0	0	− 1666	± 402	Bw 1096	Ew 2068	31	35.0	30.5	31.3	67.9	1 Cov Pl 36"x⅞" 4 Ls 6"x6"x⅞" 2 Web Pls 27"x¾"	82.4	72.6	bined with Bending from Trav.
U_2U_3	146	0	518	474	929	606	149	97	312	204	± 72	0	0	− 1553	± 243	A 1023	E 1796	31	21.5	30.6	47.6	52.7	4 Ls 6"x6"x⅝" 2 Web Pls 27"x¾"	72.3	60.8	requires less Section than given
U_3U_4	230	0	716	628	1271	813	93	27	427	273	± 62	0	0	− 1420	± 242	A 1402	E 1662	31	21.5	30.6	65.2	54.1	4 Ls 6"x6"x⅝" 2 Web Pls 27"x¾"	72.3	60.8	in this Table
U_4U_5	316	0	893	760	1545	992	240	54	520	333	± 220	0	0	− 1473	± 0	A 1748	E 1423	35	20.9	30.4	83.8	46.9	2 Side Pls 15"x⅝" 4 Ls 6"x6"x⅝" 2 Web Pls 27"x¾"	84.3	71.3	
U_5U_6	83	0	1015	845	1736	125	273	171	584	378	± 204	0	0	− 1205	± 0	A 1988	E 1205	35	20.9	30.5	95.2	39.5	2 Side Pls 15"x¾" 4 Ls 6"x6"x¾" 2 Web Pls 27"x¾"	96.8	81.8	
U_6U_7	410	0	1068	880	1788	1198	270	187	601	403	± 288	0	0	− 956	± 0	A 2077	A 986	34	21.0	23.4	99.0	47.2	2 Side Pls 15"x¾" 4 Ls 6"x6"x¾" 2 Web Pls 27"x¾"	100.2	84.7	
U_7U_8	380	0	1064	885	1751	1224	269	88	589	411	± 211	0	0	− 709	± 0	A 2060	A 1040	34	21.0	23.4	98.2	44.5	2 Side Pls 15"x¾" 4 Ls 6"x6"x¾" 2 Web Pls 27"x¾"	100.2	84.7	
U_8U_9	278	0	974	847	1555	1201	246	180	523	404	± 35	0	0	− 471	± 0	A 1873	A 1124	33	21.2	23.5	88.3	47.9	2 Side Pls 15"x⅝" 4 Ls 6"x6"x⅝" 2 Web Pls 27"x¾"	91.1	77.1	
U_9U_{10}	130	0	767	707	1230	1031	183	138	413	346	± 67	0	0	− 248	± 0	A 1448	A 1103	33	21.2	23.5	68.4	47.0	4 Ls 6"x6"x⅝" 2 Web Pls 27"x¾"	68.9	57.9	
$U_{10}U_{11}$	35	0	444	478	886	625	106	96	230	210	± 18	0	0	− 37	± 3	A 830	A 734	33	21.1	23.4	39.3	31.4	4 Ls 6"x6"x⅝" 2 Web Pls 27"x⅝"	62.2	52.2	
$U_{11}U_{12}$	0	0	0	0	0	0	0	0	0	0	± 2	0	0	0	± 2	—	—	—	—	—	—	—	4 Ls 6"x6"x½" 2 Web Pls 27"x½"	—	—	

Live Load for Trusses –

Loading "A" consists of a uniform load of 10000# per lineal ft of bridge or 5000# per lineal foot of truss. This load must be continuous and covers all that part of the bridge which produces the same kind of stress in any member.

Loading "B" consists of a uniform congested load of 20000# per lineal ft of bridge or 10,000# per lineal foot of truss. This load must be continuous and is assumed to have a [illegible] approx. 150' or less.

Percent of Max Live Load Stress added to itself for Impact = 100 (400 + L); L = loaded length of span in feet producing the maximum stress in any member.

When stresses in Truss Members reverse due to Live Load only each Stress shall be increased by 50% of the smaller stress.

Dead Load for Trusses

Actual weight of the Structure

Wind Load for Trusses.–

The wind load shall be as follows –

50# per sq ft of exposed surface for Floors and Windward Truss

25# per sq ft of exposed surface for Leeward Truss

Material for Trusses

Nickel Steel for all Truss Members (except [illegible] U_{11}; & lacing rivets & stay plates for all members which are to be Carbon Steel)

Carbon Steel for all other parts except castings which are to be Cast Steel

Rivets – One inch diameter for Lower Chord of Trusses and ⅞" dia (generally) for all other parts

Field Rivets shall be increased 20% over Shop Rivets.

The letters A, Aw, Bw, E & Ew in the columns for "Stress Proportion for" designate the following combinations

"A" designates a combination of D.L + L.L (max) + Imp (max) + Reversal

"Aw" designates the combination designated by "A" increased by the Wind Stress

"Bw" designates a combination of D.L + L.L (max) + Impact (max) + Wind Stress. Bw is a very remote but possible combination and for this reason we add nothing for reversal and use an unit stress slightly under the elastic limit of the material

"E" designates a combination of the D.L Stress of the Truss acting as a Cantilever during Erection with the stress produced by the Traveler and its load in such cases as load (wind neglected) controls. "Ew" designates the combination designated by "E" increased by the Erection Wind Stress

The following unit stresses are to be used with the above combinations

Unit Stresses – Truss Members – Nickel Steel

Combination			Combination		
"A"	Tension	24000	Aw E & Ew	Tension	36,200
	Compression 25000−100 $\frac{l}{r}$			Compression (25000 100 $\frac{l}{r}$) 1.3	
	Shear (Gus & Pins)	18 000		Shear (Gus & Pins)	23,400
	Bending Pins	40000		Bending – Pins	52,000
	Bearing Pins	36 000		Bearing – Pins	46,800
			Combin Bw	Tension	40,000
				Compression (25,000−100 $\frac{l}{r}$) 1.6	

Note

The Unit Stresses in Tension and Compression Members which act as beams shall be reduced the following amounts for extreme Fiber Stress

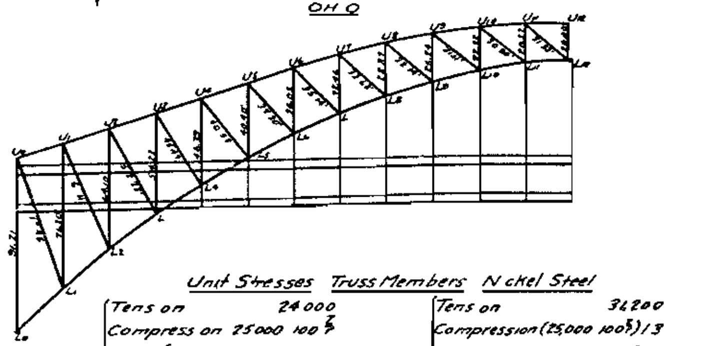
Unit Stresses in Tension & Comp for Combinations A, Aw, Bw and also E & Ew for all members except Top Chord to be reduced for a Fiber Stress obtained by taking ¾ center moment (for simple span) produced by the weight of the Member

Unit Stresses in Tension & Comp for Combin E & Ew (for Top Chord only) to be reduced by a Fiber Stress obtained by taking ¾ center moment (for a simple span) produced by the weight of the Mem plus the weight of Trav Track (3000# per Pan per Truss)

Stress Sheet
Web Members

DETROIT-SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO

Members	Dead Load		Live Load				Impact				Wind			Erection (Cantilever)		Stress Proportion for		Value L/r	Unit Stress		Area Req'd (Square Inches)		Section Used	Area Used (Square Inches)		Remarks
			Loading A		Loading B		Loading A		Loading B		Direct Stress	Moment 1000#	Shear													
	Comp+	Tension	Comp+	Tension−	Comp+	Tension−	Comp+	Tension	Comp+	Tension−				DL+Trav	Wind	Comp+	Tension−		Comp+	Tension−	Gross	Net		Gross	Net	
U0L0	20	0	507	450	905	557	136	87	304	187	303	69	9	+670	±233	Bw 1713	Aw 807	32	349	312	49.1	25.3	4 Ls 6x6x5/8 2 Pls 20x5/8	50.9	41.5	+1713 807 & 0 Mom occur below both decks
U1L1	324	0	585	471	1080	535	168	81	363	180	±338	87	11	+441	+57	B 2105	A 715	32	349	283	60.4	25.3	4 Ls 6x6x5/8 2 Pls 20x11/16	61.3	51.7	+2105 & 0 Mom occurs below both decks 715 & 87 Mom occurs between the decks
U2L2	349	0	530	342	998	443	143	69	335	149	±302	1295	131	+440	+39	Aw 879	Aw 41	33	69	204	128.0	20.4	8 Ls 6x3½x... 2 Pls 24x... 4 Bars ...	Effect. 132.1	Area 107.1	+879 & −41 & 1610 & 1295 M occur at top of U2L2. Excess area for wd. Shear
U3L3	336	0	−480	281	931	374	149	51	313	126	±46	−60	−5	+407	±65	Bw 1610	Bw 194	37	314	379	−51.3	−5.2	4 Ls 4x4x½ 2 Pls 20x½	51.8	41.3	W Load from LD Lat System Transferred directly to Lower Arch Lateral System by Gussets
U4L4	163	0	419	224	827	290	130	41	278	97	+30	308	21	+360	±68	Bw 1298	B 354	46	217	285	61.3	12.5	4 Ls 6x4x7/8 2 Pls 20x11/16	64.5	57.6	+1298 354 & 308 Mom occur above both decks
U5L5	120	0	249	97	497	191	91	33	183	64	+28	766	36	+360	+58	Aw 543	Aw 193	53	66	122	82.2	15.9	4 Bars 6x7/8 8 Ls 6x4x11/16 2 Pls 20x...	85.3	69.0	+543 ... & 66 Mom occur above both decks. Excess area for wind Shear
U6L6	55	0	197	177	394	258	72	30	144	87	±56	0	0	+361	+53	Bw 649	A 228	60	30.4	24.0	21.4	9.5	4 Ls 4x4x½ 2 Pls 20x½	35.0	28.0	
U7L7	0	25	168	187	320	360	31	58	107	121	+61	0	0	+332	±51	Ew 384	A 357	54	25.5	24.0	15.1	14.9	4 Ls 3½x3½x7/16 2 Pls 20x7/16	29.0	22.9	
U8L8	0	102	171	230	283	422	33	66	95	142	±85	0	0	+271	+40	Ew 311	A 449	48	16.3	24.0	11.9	18.7	4 Ls 3½x3½x7/16 2 Pls 20x7/16	29.0	22.9	
U9L9	0	17	225	293	321	507	46	79	108	170	+71	0	0	+235	±38	Bw 393	A 566	47	33.3	24.0	11.8	23.6	4 Ls 3½x3½x½ 2 Pls 20x½	33.0	26.0	
U10L10	0	71	317	357	442	584	68	90	148	196	±44	0	0	+213	±0	A 471	A 675	37	21.3	24.0	22.1	28.2	4 Ls 4x4x½ 2 Pls 20x½	35.0	28.0	
U11L11	0	9	369	383	539	591	83	91	181	199	+18	0	0	+157	±0	A 665	A 705	34	21.6	24.0	30.8	29.4	4 Ls 4x4x9/16 2 Pls 20x½	36.8	29.3	
U12L12	7	0	0	0	0	0	0	0	0	0	+0	0	0	+12	±0	—	—	—	—	—	—	—	4 Ls 6x3½x3/8	—	—	
U0L1	0	67	428	473	529	805	83	122	178	270	+249	0	0	−277	+37	A 9 5	A 834	73	22.8	23.8	40.0	35.1	4 Ls 4x4x9/16 2 Pls 22x5/8	44.3	36.5	Supported @ 3 Pts on Rt Ls to Elevation Truss
U1L2	0	123	377	415	480	798	73	119	161	268	±282	0	0	−301	+23	Aw 773	B 1471	78	22.2	39.8	34.8	37.0	4 Ls 4x4x5/8 2 Pls 20x11/16	46.0	37.0	Supported @ 2 Pts on Rt Ls to Elevation Truss
U2L3	0	137	329	391	427	761	66	105	144	256	±27	0	0	−297	±15	A 387	A 762	67	18.0	23.7	21.5	32.2	4 Ls 4x4x5/8 2 Pls 20x5/8	41.0	32.6	Supported @ 1 Pt on Rt Ls to Elevation Truss
U3L4	0	146	276	350	367	700	49	118	123	235	±49	0	0	−292	±41	A 269	A 704	60	18.2	23.7	14.8	30.4	4 Ls 4x4x9/16 2 Pls 20x9/16	39.3	31.4	Supported @ 1 Pt on Rt Ls to Elevation Truss
~~U4L5~~	~~0~~	~~137~~	~~235~~	~~314~~	~~291~~	~~612~~	~~41~~	~~105~~	~~98~~	~~206~~	~~±35~~	~~0~~	~~0~~	~~−313~~	~~±51~~	~~A 209~~	~~A 676~~	73	16.6	22.9	12.6	27.4	4 Ls 4x4x½ 2 Pls 18x9/16	35.2	27.6	
U5L6	0	95	206	252	197	512	35	93	66	188	+40	0	0	328	+49	A 719	A 51[illegible]	68	17.1	22.9	17.8	[illegible]24	4 Ls 3½x3½x7/16 2 Pls 18x½	29.5	23.0	
U6L7	0	40	193	220	237	440	33	81	78	162	±47	0	0	−327	+56	A 279	A 434	64	17.6	23.0	15.8	18.9	4 Ls 3½x3½x7/16 2 Pls 18x7/16	27.2	21.1	
U7L8	33	0	204	193	315	484	33	78	106	195	±96	0	0	−297	±45	A 389	Bw 747	61	17.9	39.0	21.8	19.1	4 Ls 3½x3½x7/16 2 Pls 18x7/16	27.2	21.1	
U8L9	128	0	231	168	423	327	67	32	142	110	±93	0	0	−270	±44	Bw 786	Ew 314	58	29.7	30.2	26.5	10.4	4 Ls 3½x3½x7/16 2 Pls 18x7/16	27.2	21.1	
U9L10	185	0	345	261	597	395	93	53	201	133	±84	0	0	−273	±0	A 688	B 427	56	18.5	39.1	37.2	11.0	4 Ls 4x4x½ 2 Pls 18x5/8	37.5	29.7	
U10L11	118	0	473	418	772	589	120	89	259	198	±60	0	0	−261	±0	A 906	A 524	50	19.3	23.3	47.0	25.1	4 Ls 4x4x11/16 2 Pls 20x11/16	47.6	38.0	
U11L12	43	0	564	544	870	794	134	122	292	268	±22	0	0	−47	+3	A 1053	A 935	45	19.8	23.3	53.2	40.2	4 Ls 6x4x11/16 2 Pls 22x5/8	53.1	43.8	



Live Load for Trusses

Loading A consists of a uniform load of 10,000# per lineal ft of bridge or 5000# per lineal foot of truss. This load must be continuous and covers all that part of the bridge which produces the same kind of stress in any member.

Loading B consists of a uniform congested load of 20000# per lineal ft of bridge or 10000# per lineal foot of truss. This load must be continuous and is assumed to have a length of 6 Panels (approx 150) or less.

Percent of Max Live Load Stress added to itself for Impact = 100 (50+L). L = loaded length of span in feet producing the maximum stress in any member.

When stresses in Truss Members reverse due to Live Load only, each stress shall be increased by 50% of the smaller stress.

Dead Load for Trusses

Actual weight of the Structure

Wind Load for Trusses

The wind load shall be as follows: 50# per sq ft of exposed surface for Floors and Windward Truss. 25# per sq ft of exposed surface for Leeward Truss.

Material for Trusses

Nickel Steel for all Truss Members (except Mem U Un U1L1 & lacing rivets & stay plates for all members which are to be Carbon Steel)

Carbon Steel for all other parts except castings which are to be Cast Steel.

Rivets

One inch diameter for Lower Chord of Trusses and 7/8 dia (generally) for all other parts.

Field Rivets shall be increased 20% over Shop Rivets.

The letters A Aw Bw E & Ew in the columns for Stress Proportion for designate the following combinations:

A designates a combination of DL + LL Loads + Impact Loads + Reversal Loads.

Aw designates the combination designated by A increased by the Wind Stress.

Bw designates a combination of DL + LL Loads + Impact Loads + Wind Stress. Bw is a very remote but possible combination and for this reason we add nothing for reversal and use a unit stress slightly under the elastic limit of the material.

E designates a combination of the DL Stress of the Truss acting as a Cantilever during Erection with the stress produced by the Traveler and its load in such cases as load (wind neglected) controls. Ew designates the combination designated by E increased by the Erection Wind Stress.

The following unit stresses are to be used with the above combinations:

Unit Stresses Truss Members Nickel Steel

Combination A	Tension	24000	Tension	31200
	Compression 25000 − 100 l/r		Compression (25000 − 100 l/r) 1.3	
	Shear (Gus & Pins)	18000	Shear (Gus & Pins)	23400
	Bending Pins	40000	Bending Pins	52000
	Bearing Pins	36000	Bearing Pins	46800
		Combination Aw E & Ew		
Combin Bw	Tension			40000
	Compression (25000 − 100 l/r) 1.6			

Note

The Unit Stresses in Tension and Compression Members which act as beams should be reduced the following amounts for extreme Fiber Stress.

Unit Stresses in Tension & Comp for Combinations A Aw Bw E & Ew for all diagonals to be reduced for a Fiber Stress obtained by taking 3/4 center moment (for a simple span) produced by the weight of the Member.

Unit Stresses in Tension & Comp for Combinations Aw & Bw for verticals U0L0 to U5L5 inc to be reduced for a Fiber Stress obtained from the wind bending moment given in Table.

D SSES F R CH MEMBERS

MP FD PC RE

Mem	Case I	Case II	Ca		S
L L		96		92	980
L L					5
L L3					2
L3L4		6	4	4	64
L4			6		9
L L			4		
L6L7			3	9	0
L7L8	25			F	3
L8L9	43	7	15	13	71
L9L		44	72	4	44
Lo		0	2		206
L					7
L U				0	0
U	E			0	C2
U2L3	2			5	72
U3U4	54	35	62	24	62
U4U5	80	4	04	220	220
L		5	96	204	290
			7	28P	P
L	5				
U8U9	4		58		
U9Uo			7	6	E
L			2		
U U	2		2		
			259	2 5	6
U			9		F
		6	265	284	
	22	C	4	4	4
UCL	2	8	7	30	
L	2	3		8	8
U	56	6	8	2	6
	6	36			
L	9			6	
L9 9	60				
U Lo	43	6	5	4	
L		4		8	8
		C	0	0	0
	9		2 E		49
			24		2
			6		2
		2	8	40	49
			2		35
			24		40
			2		
U					
U8L9	69			93	9
U8Lo	8	6	6	84	85
U		46	46		60
U		6			2

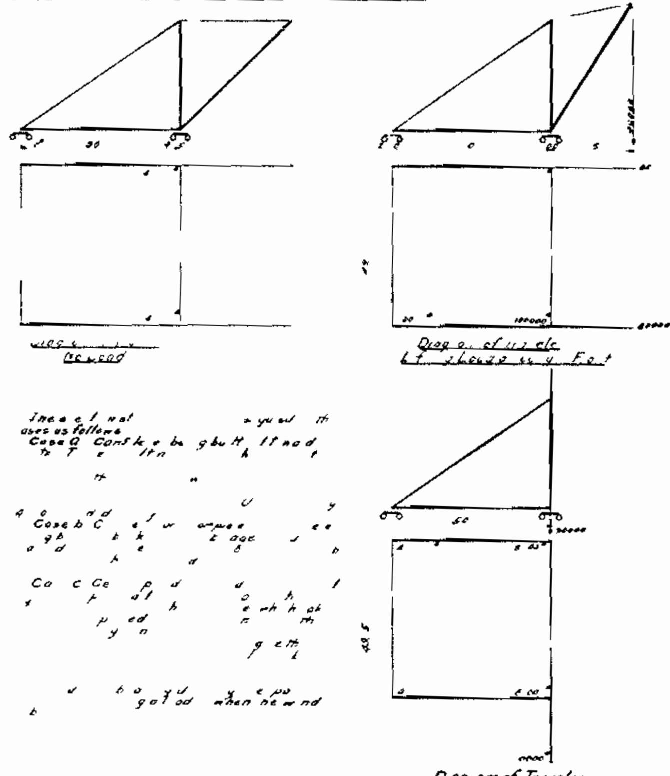


Diagram of Traveler

Diagram of Traveler
Lifting at ato e Side of Truss

TRAVELER
AND
TRAVELER LOADS
FOR
COMPUTING ERECTION STRESSES
DETROIT SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO

Unit Stresses and Loading for Floor System

Detroit Superior Bridge

Unit Stresses

Nickel Steel

Tension	Truss Members	24 000	
	Hanger Bars	27 000	
Compression	Truss Members	25 000	100ℓ
Shear	Gusset Plates	18 000	
	Pins	18 000	
Bending	Pins	40 000	
Bearing	Pins	36 000	

Carbon Steel

Tension	Hanger shapes	16 000	Net Section
	Bracing	18 000	
	Flanges of Beams	18 000	
	Flanges of Brackets	14 000	
Compression	Bracing	18 000	70ℓ/r not to exceed 11000
	Flgs of Bms (Built up bms only)	18 000	70ℓ/r
	Flgs of Bms (Rolled bms only)	17 000	
Shear	Webs of Plate Girders	13 500	Net section
	Webs of Brackets	10 000	
	Shop Rivets Hangers	12 000	
	Bracing	13 500	
	Floor Beams	13,500	
	Stringers	13,500	
	Brackets	10 000	

Bearing — Unit intensities to be double the value for shear

Field Rivets to be increased 20% over Shop Rivet

Floor System to be Carbon Steel

Loading

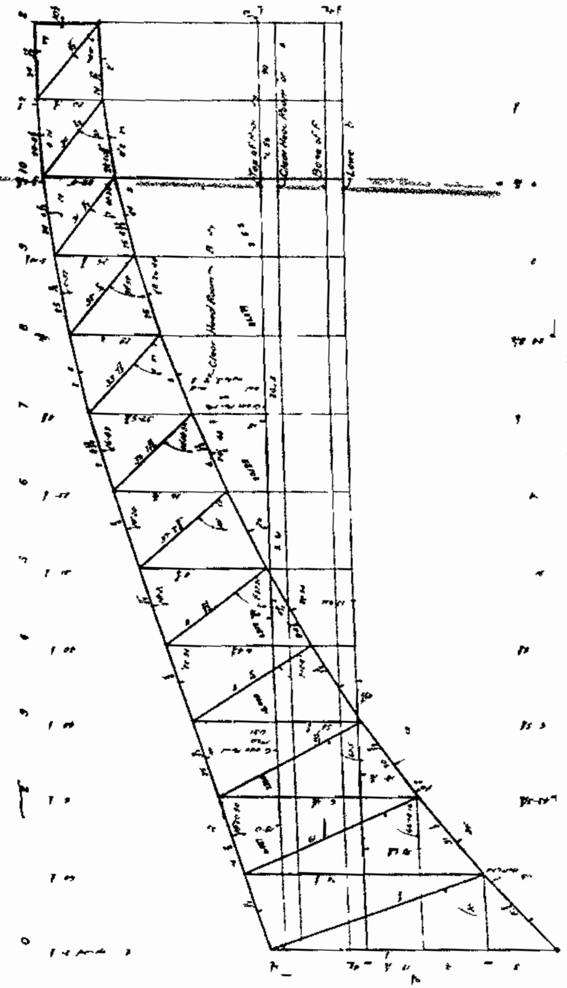
Dead Load — Weight of Structure

Live Load

Upper Deck — Roadway stringers 24 Ton Truck with 20 wheel base or 100 lb per sq ft
Sidewalk stringers & Brackets 80 lb per sq ft
Floor Beams & Hangers 24 Ton Truck assumed to occupy a space 12-0 wide x 30-0 long and 80 lb per sq ft on remaining roadway
Per cent of LL added for impact 100 (50 L) L sum of loaded lengths of lines of Traffic in feet producing max stress in member assuming 4 lines for roadway and 1 line for each sidewalk

Lower Deck — Stringers Floor Beams Hangers and Brackets 2-60 Ton cars per track (30 000 lbs per axle) 6 26 6 14 6 26 6
Percent of LL added for impact 200 (270+L) L sum of loaded lengths of tracks producing max stress in member

Note — When Stress in Floor beams rise se due to live load add 30% of lesser ... to greater for combined dead live and wind load stresses stress 30% higher than for dead and



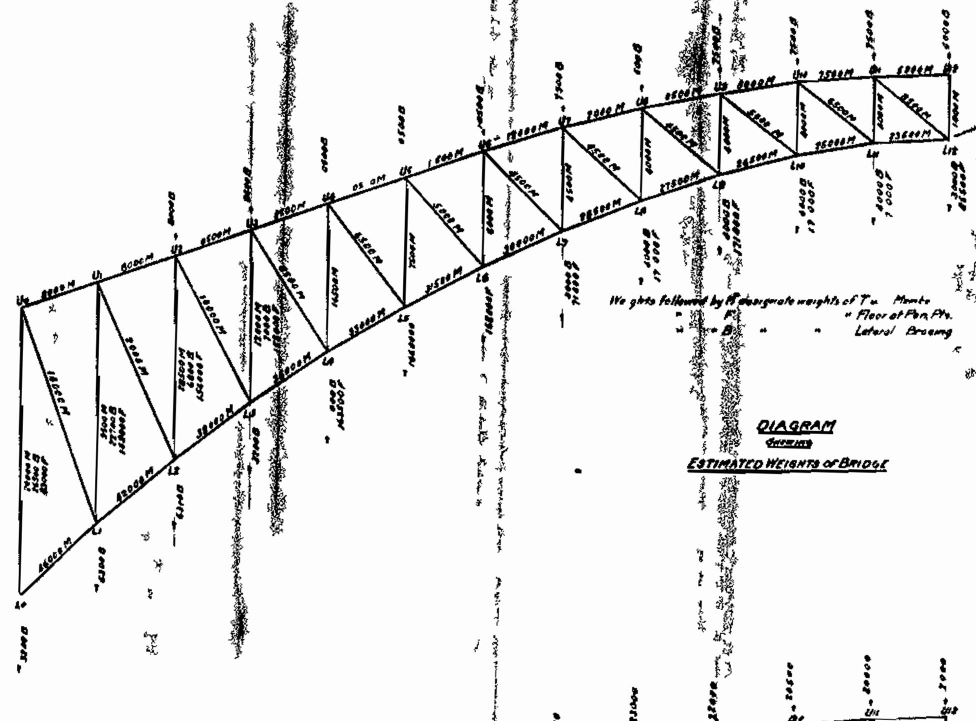


DIAGRAM
Showing
ESTIMATED WEIGHTS OF BRIDGE

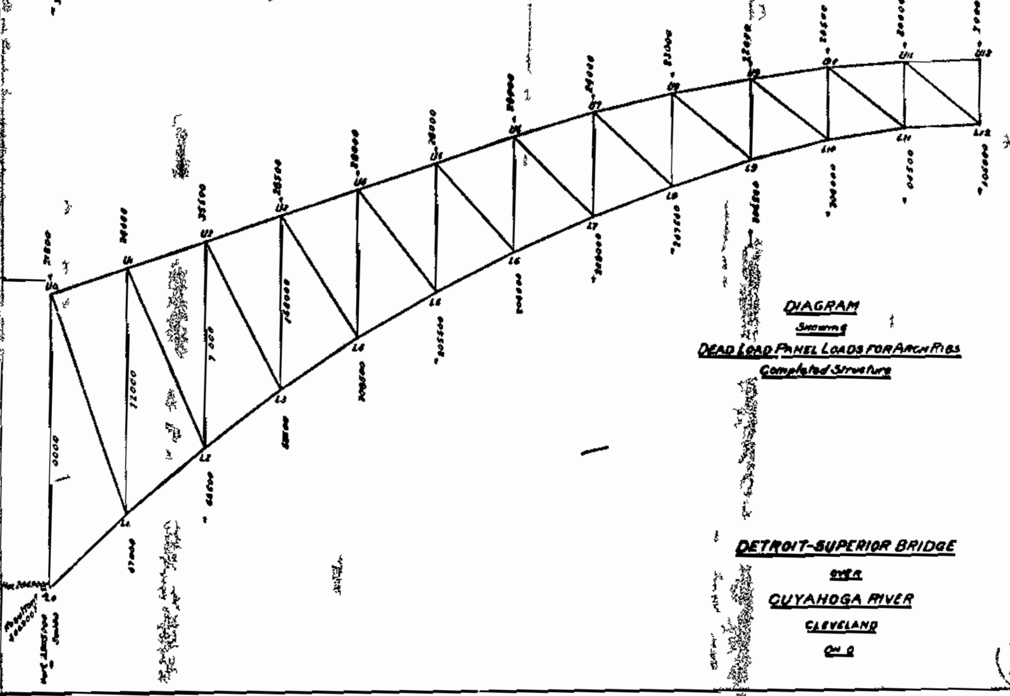


DIAGRAM
Showing
DEAD LOAD PANEL LOADS FOR ARCH RIBS
Completed Structure

DETROIT-SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO

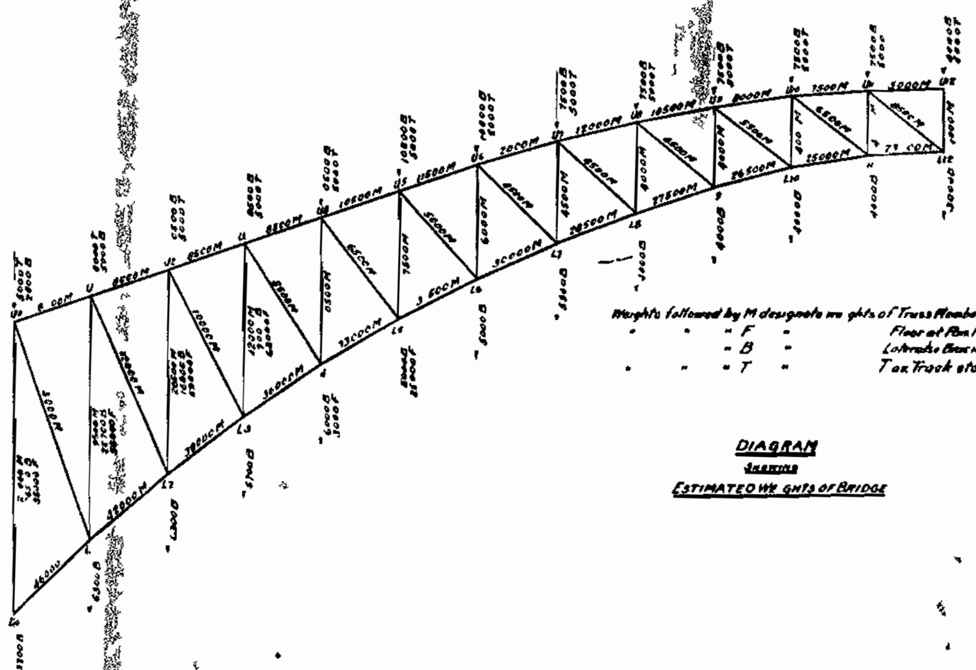


DIAGRAM
Showing
ESTIMATED WEIGHTS OF BRIDGE

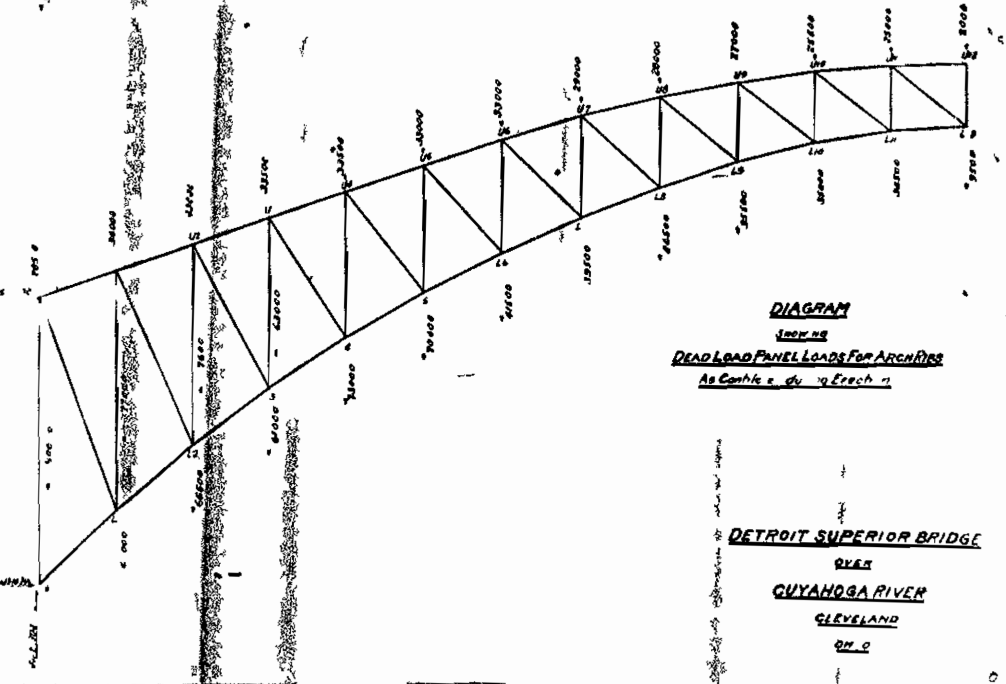
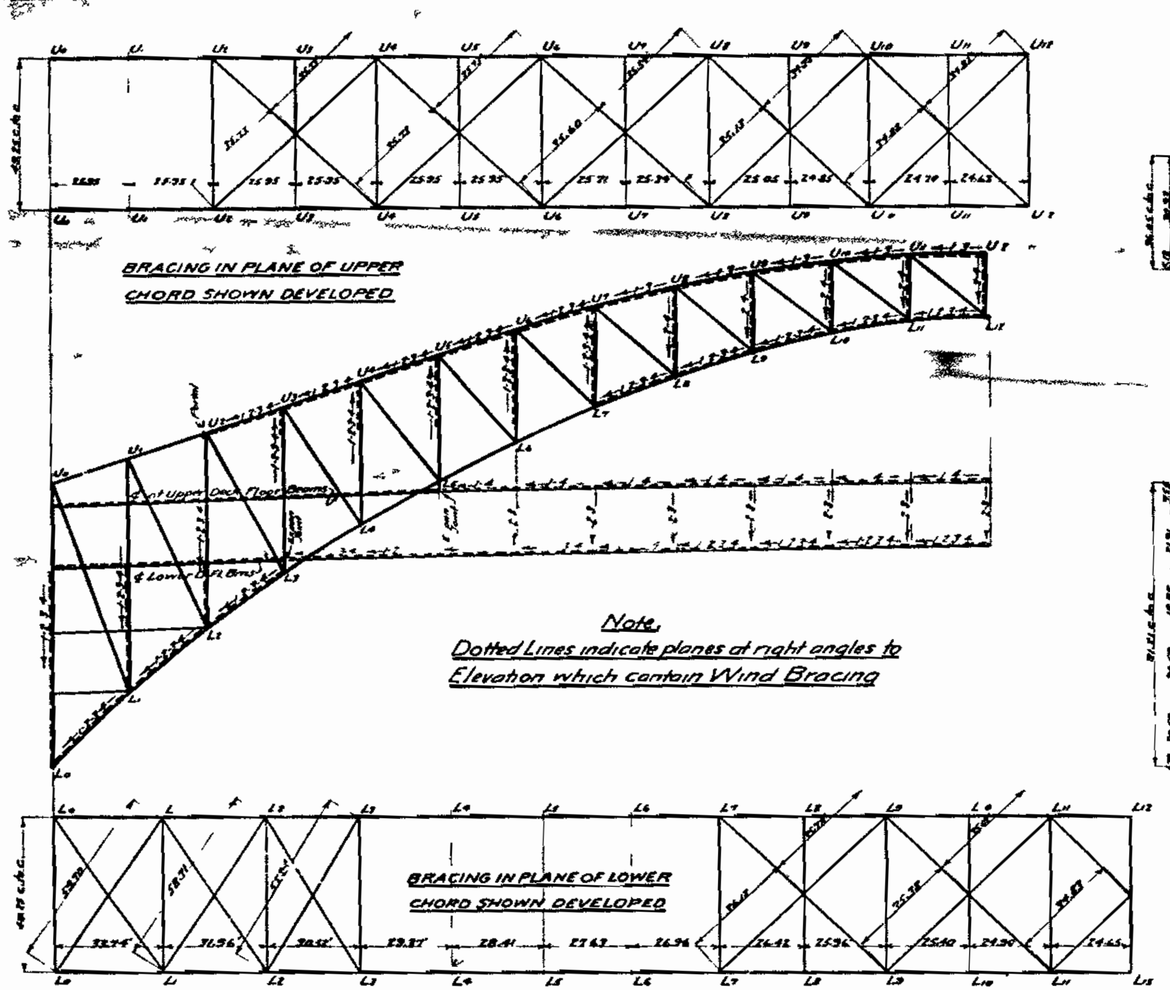
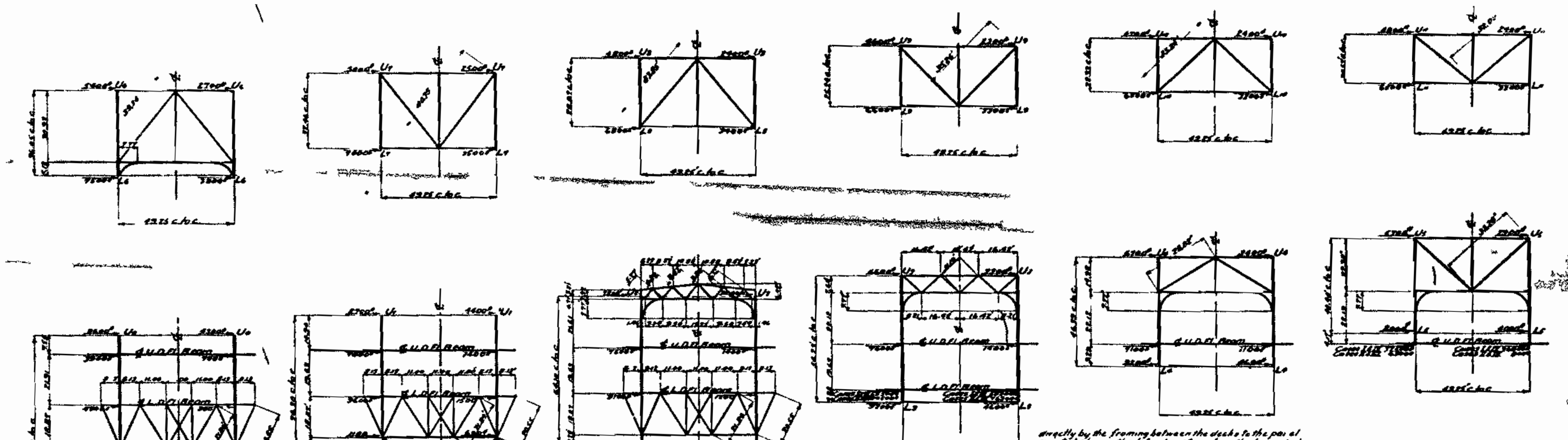
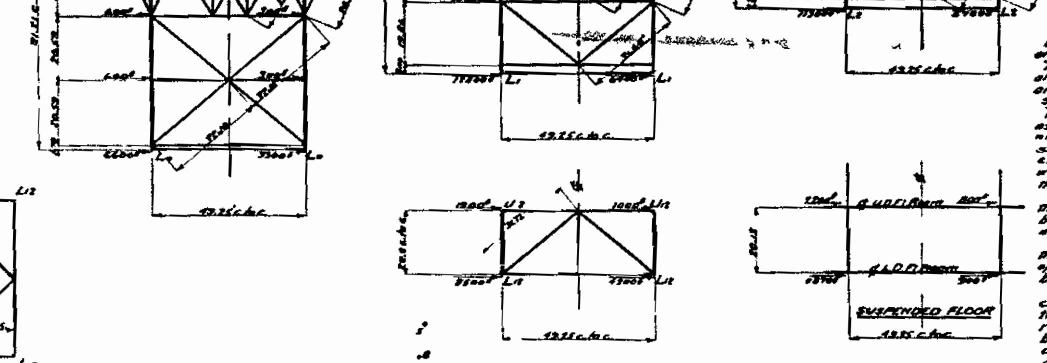


DIAGRAM
Showing
DEAD LOAD PANEL LOADS FOR ARCH RIBS
As Cantilevered during Erection

DETROIT SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO







Note:-

Loads shown appl ed at the vertical sections thro arch ribs are the local concentrated wind loads.

The bracing indicated in the elevat on of bridge along the Upper Deck from L5 to End of Bridge and along Lower Deck from L3 to End of Br dge s assumed to be r bratory brac ng

The Lateral system of the arch is continuous as for us transmitting shear but s not continuous when the bending moments are considered The shears can follow several d ffe ent paths as explained in detail below, and for this reason we will f nd the wind stresses in the arch r bs for the Cases I, II, III + IV

The Top Lateral System from U7 to U12 can carry the local shears appl ed along the top chord between these po nts to U7 We will call th s con d t on a

The Lateral System along the upper deck of the suspended span can car y the local shears appl ed along t to L5 We w ll call th s cond tion b

The local wind shears appl ed at the upper chord panel points from U8 to U12 incl. can be transfe red thro the sway bracing at their respective panel po nts to the panel points below n the bottom ateral system. We will call th s cond t on c. Lower lateral system s cont nuous at center so loads will come from the top chord thro sway bracing to lower system

The local wind shears appl ed along the upper deck of the suspended span can be transferred directly by the framing between the decks to the pa el points below in the lateral system along the lower deck We will call this cond t n d.

The remaining paths the wind shears can take are the same under all conditions. We will call this condition e

Now any two of conditions a, b, c + d combined with e can occur simultaneously as we have

Case I Cond tions a, b + e combined and ind cated by the numeral 1 on the elevation of the arch r b

Case II Cond tions c, d + e combined and nd cated by the nume al 2 on the elevation of the arch r b

Case III Conditions a, d + e combined and ind cated by the numeral 3 on the elevat on of the a ch b

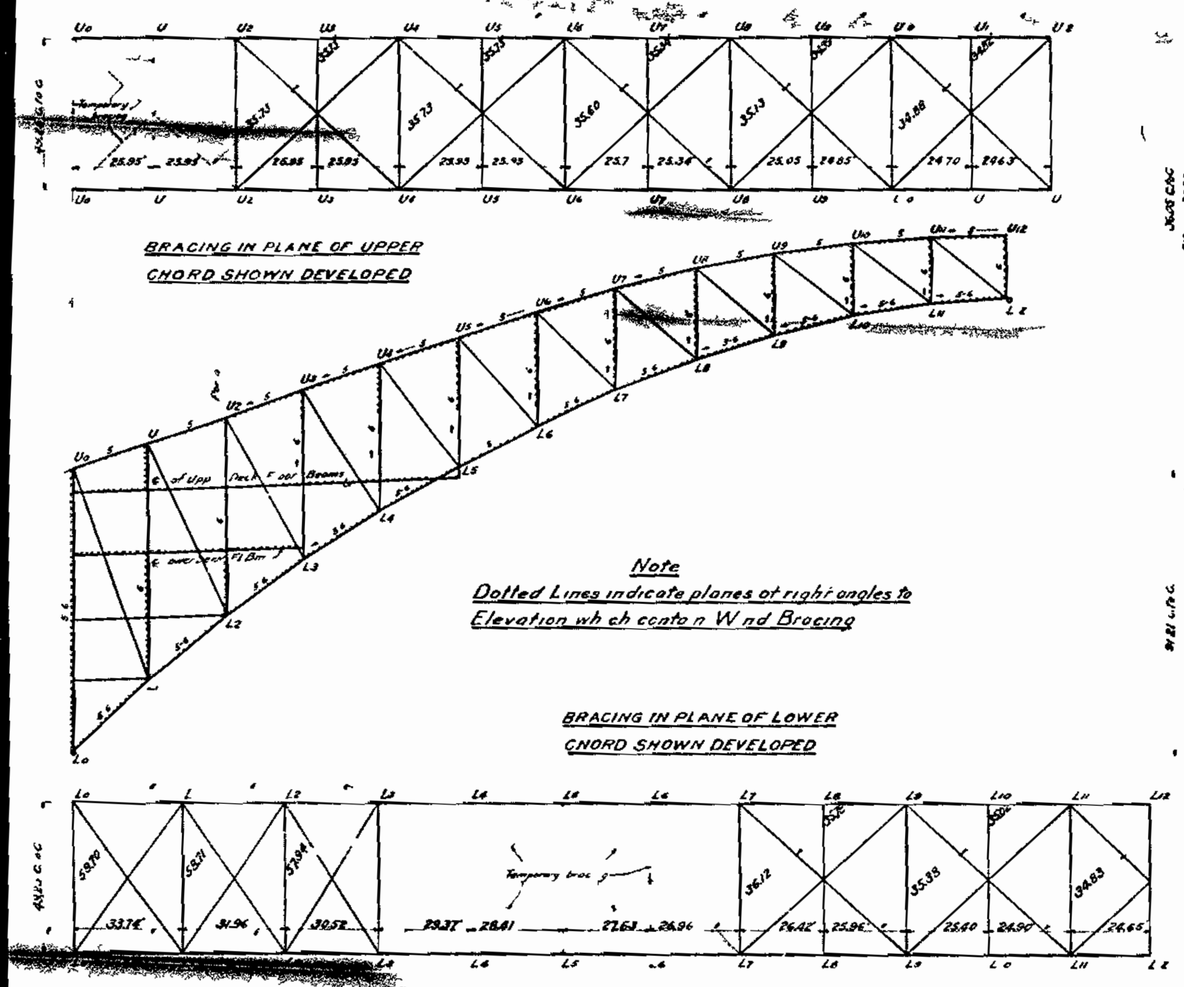
Case IV Cond t ons b, c + e combined and ind cated by the numeral 4 on the elevation of the arch r b.

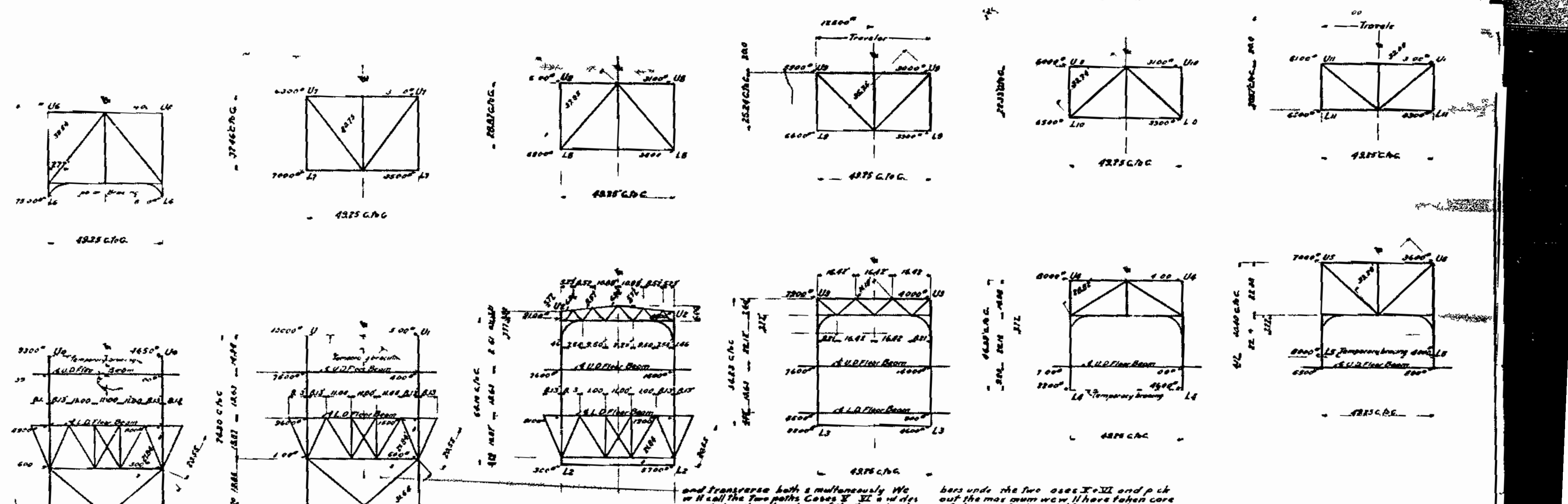
Then the w nd shear s free to t averse any one of the four paths 1, 2 3 + 4 as nd cated on the elevation of arch r bs or can also traverse paths 1+2 and 3+4 simultaneously as d v ded shears. In the latter cases the stress in any arch member will not be as g eat as the maximum found in one of the first four cases, and will be greater than the minimum found n one of the four cases. Then f we compute the stresses n all the arch rib membe s unde the four cases I II III + IV and pick out the max mum we w ll have taken care of the greatest possible wind stress any member can be subjected to

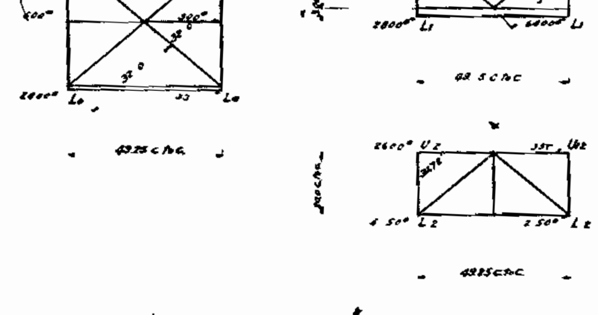
All lateral bracing for the a ch r bs w ll be con side ed as a double system.

WIND LOADING
FOR
COMPLETED STRUCTURE

7







Note

For Erection Wind Stresses one half of Arch will be considered as a Cantilever Arm and held by back stays.

Loads shown applied at the vertical Sections through bridge are the local concentrated wind load. Additional wind load is added along the Top Chord to take care of Traveler Truck etc. The Traveler is assumed to be 50 ft (2 Panels) long between supports and has a concentrated wind load of 17600# at right angles to elevation of bridge at each support and applied 80 ft above center line of Top Chord of Bridge. See Elevations and Sections U9L9 + U11L11. The Traveler is assumed to be over panel points when wind acts and can occupy any panel points on the bridge except U12.

The bracing indicated in the elevation of bridge along the Upper Deck from L5 to end of bridge and along Lower Deck from L3 to end of bridge is assumed to be sub-lateral bracing.

The Top + Bott. Lateral Systems are supplied with temporary bracing where bracing is omitted in completed structure so both Top and Bott. Systems are continuous. Then the Wind can take one of two paths or divide and traverse both simultaneously. We will call the two paths Cases V + VI and designated on the elevation of the Truss by the numbers 5 + 6 respectively.

Case V

All the wind loads along Top Chord are carried by the Top Lateral System to Panel Points U0 and thence thro sway bracing in Section U0L0 to the shoes. The wind loads along Lower Chord are carried by the Bott. Lateral System directly to the Shoes. These paths are indicated on elevation of bridge by the numeral 5.

Case VI

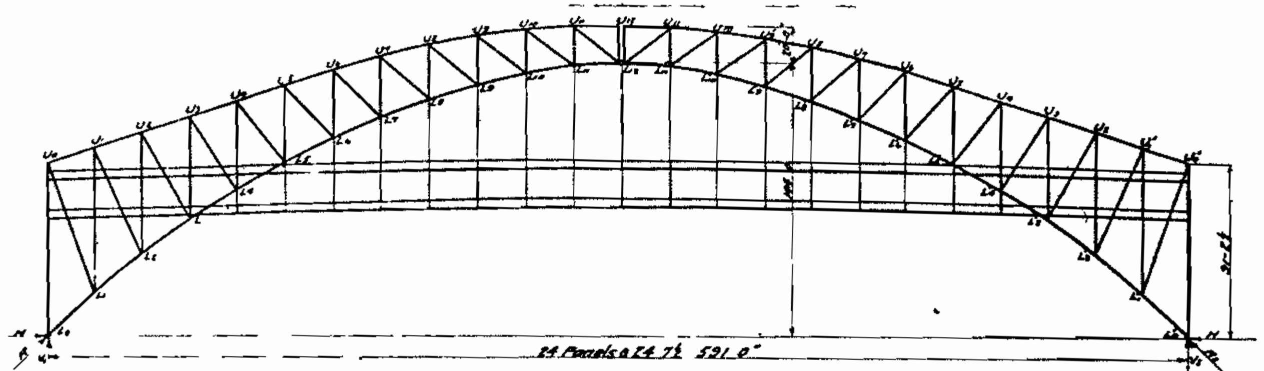
The local wind loads at the Top Chord Panel Points are transmitted by the sway bracing to the Panel Points directly below and in the Bott. Lateral System which carries this load and the Lower Panel Loads directly to the shoes. These paths are indicated on elevation of bridge by the numeral 6.

Then the wind shear is free to traverse either of the two paths 5 + 6, or can traverse both paths simultaneously as divided shears. In the latter case the stress in any truss member will not be as great as the maximum found in one of the first two cases and will be greater than the minimum found in one of the first two cases. Then if we compute the stresses in the truss members under the two cases V + VI and pick out the maximum we will have taken care of the greatest possible wind stress any member can be subjected to.

Owing to the high Unit Stresses allowed for Erection we allow the same unit stresses for Wind as for D.L. + Trav. hence we use the combination of D.L. + Trav. + Wind which gives the greatest total rather than the Max. Wind Stress with the D.L. + Trav. stress which occurs simultaneously with it. When the Traveler is over the Panel Points U9 U11 and lifting a 40,000# load the wind is assumed to be absent and where the stresses for this loading govern there will be no wind stress in the combination as seen on the stress sheet. All Lateral Bracing for the Trusses will be considered as a double system.

WIND LOADING
FOR
ONE HALF ARCH ACTING AS CANTILEVER
DURING
ERECTION

8



STRESSES IN ARCH MEMBERS

DUE TO

UNIT LOAD MOVING ACROSS THE BRIDGE

DETROIT-SUPERIOR BRIDGE

OVER

CUYAHOGA RIVER

CLEVELAND

OHIO

Load of 10000# Panel Point	V	V2	H	R	R2	L0L1	L1L2	L2L3	L3L4	L4L5	L5L6	L6L7	L7L8	L8L9	L9L10	L10L11	L11L12	U0U1	U1U2	U2U3	U3U4	U4U5	U5U6	U6U7	U7U8	U8U9	U9U10	U10U11	U11U12	U0L0	U1L1	U2L2	U3L3	U4L4	U5L5	U6L6	U7L7	U8L8	U9L9	U10L10	U11L11	U12L12	U0L1	U1L2	U2L3	U3L4	U4L5	U5L6	U6L7	U7L8	U8L9	U9L10	U10L11	U11L12
L0	[illegible]	0	0	[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L to L nc (By Algebraic Add)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
L to L nc (By Moments)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Max Comp (10000# Panel Loads)	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Loaded Length produce Max Comp	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Panel LL added to M Comp for Imp	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Max Tens (10000# Panel Loads)	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Loaded Length produce Max Tens on	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Panel ... added to M Ten for Imp	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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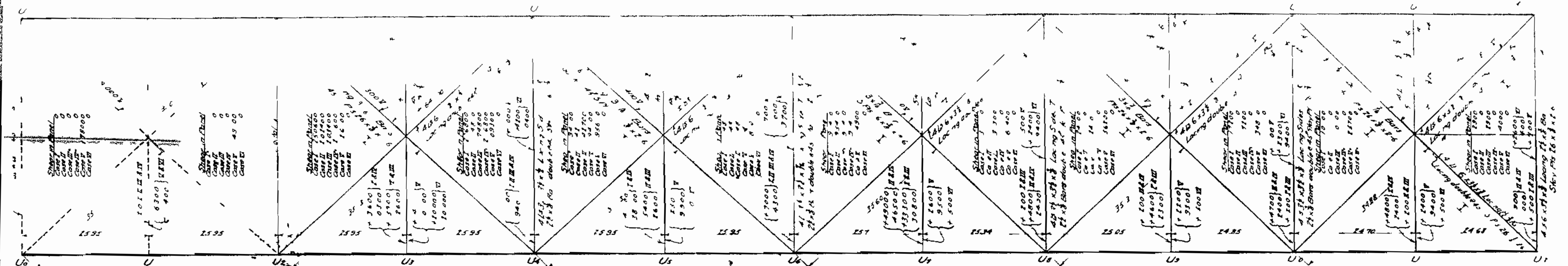
672	6.2	759	647	1714	60	663	17.8		6				
87	4 9	9	6 5	1505	254	6.5	1556	256	654	1758	1556	654	LaLs
357	114	9	84	67	154	40	1323	159	431	1514	1323	431	LsL6
306	953	140	347	1011	47	370	1073	154	391	1252	1013	397	L6L7
54	688	69	171	258	79	197	818	88	227	981	818	227	L7L8
123	415	50	143	511	63	159	583	75	194	27	583	194	L8L9
45	276	18	45	316	23	57	357	29	75	477	411	0	L9L10
33	137	15	33	137	15	33	182	2	52	249	249	0	L10L
2	37	0	2	37	0	2	37	0	2	37	3	2	L Lu
147	1702	390	148	1722	403	144	1756	48	139	906	56	418	UaU1
164	1601	377	168	1633	389	167	1666	402	165	1827	1666	402	U1U2
77	1477	221	85	1515	231	187	1553	243	187	1725	1557	243	U2U3
163	1331	221	176	1374	23	181	1420	242	185	1598	1420	242	U3U4
135	1141	170	2	1 91	128	160	1244	136	169	1423	1423	0	U4U5
99	918	127	120	974	132	133	1033	[illegible]	147	1205	1205	0	U5U6
69	671	53	80	733	57	98	797	59	15	956	356	0	U6U7
39	463	57	51	498	66	60	568	68	83	709	709	0	U7U8
24	272	16	24	312	17	36	352	18	47	471	471	0	U8U9
13	136	19	3	136	25	13	181	26	26	248	248	0	U9U10
3	37	2	3	37	2	3	37	2	3	37	37	3	U10U11
0	0	2	0	0	2	0	0	2	0	0	0	2	UaUi
1	605	205	8	597	200	15	587	198	22	577	670	233	UaLa
3	363	29	4	35	3	10	337	34	18	307	441	57	U1L1
4	378	19	3	366	2	9	353	24	17	332	440	39	U2L2
44	360	4	36	349	2	31	336		24	325	407	65	U3L3
57	328	13	51	318	10	45	307	7	37	307	360	68	U4L4
56	343	12	50	334	9	44	325	6	39	335	360	58	U5L5
45	36	16	53	355	13	47	348	10	43	369	361	53	U6L6
41	332	15	57	327	14	5	321	11	45	348	332	52	U7L7
23	240	1	3	277	17	34	27	15	40	298	271	40	U8L8
16	200		28	198	10	28	235	15	38	267	235	38	U9L9
9	14	3	9	154	9	14	154	9	20	213	213	0	U10L10
6	57	1	6	57	1	6	97	7	16	157	157	0	U11L11
0	12	0	0	12	0	0	12	0	0	12	12	0	U12L12
58	201	49	67	189	5	72	177	53	78	140	277	37	UaL1
40	239	33	48	228	36	53	215	37	60	187	30	23	U1L2
25	249	23	32	237	5	38	225	28	45	204	297	15	U2L3
26	257	3	17	247	0	17	234	3	5	223	292	4	U3L4
45	298	9	38	288	7	32	277	4	24	275	319	52	U4L5
49	320	10	43	310	7	37	30	4	30	31	328	49	U5L6
42	327	5	56	319	12	50	311	9	43	328	327	56	U6L7
36	262	11	33	297	17	45	287	14	39	308	297	45	U7L8
19	239	13	35	237	10	32	270	16	44	296	270	44	U8L9
14	166	4	14	2 6	1	29	209	10	26	213	273	0	U9L10
12	122	3	12	122	3	12	178	10	29	26	261	0	U10L11
7	47	0	3	47	0	3	47	0	3	47	[illegible]	3	U11L12

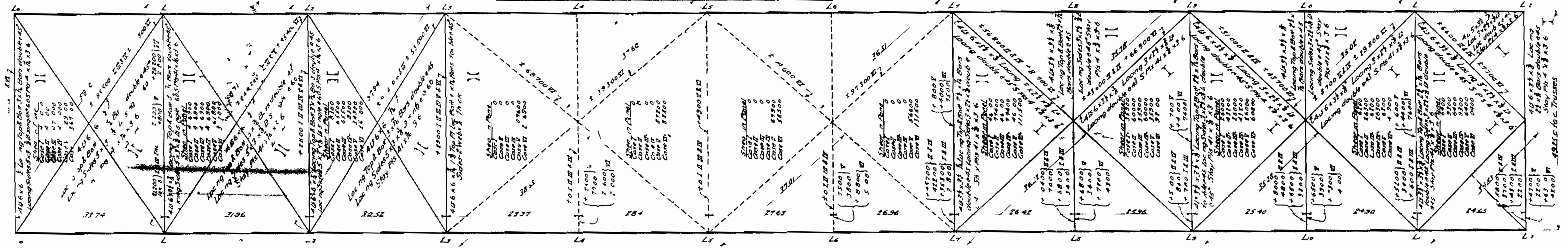
12

16



BRACING IN PLANE OF UPPER CHORD SHOWN DEVELOPED

BRACING IN PLANE OF LOWER CHORD SHOWN DEVELOPED



Brac g figured as a doub e system

A bracing indicated by dotted lines is temporary bracing to be used during erection

All bracing to be Carbon Steel

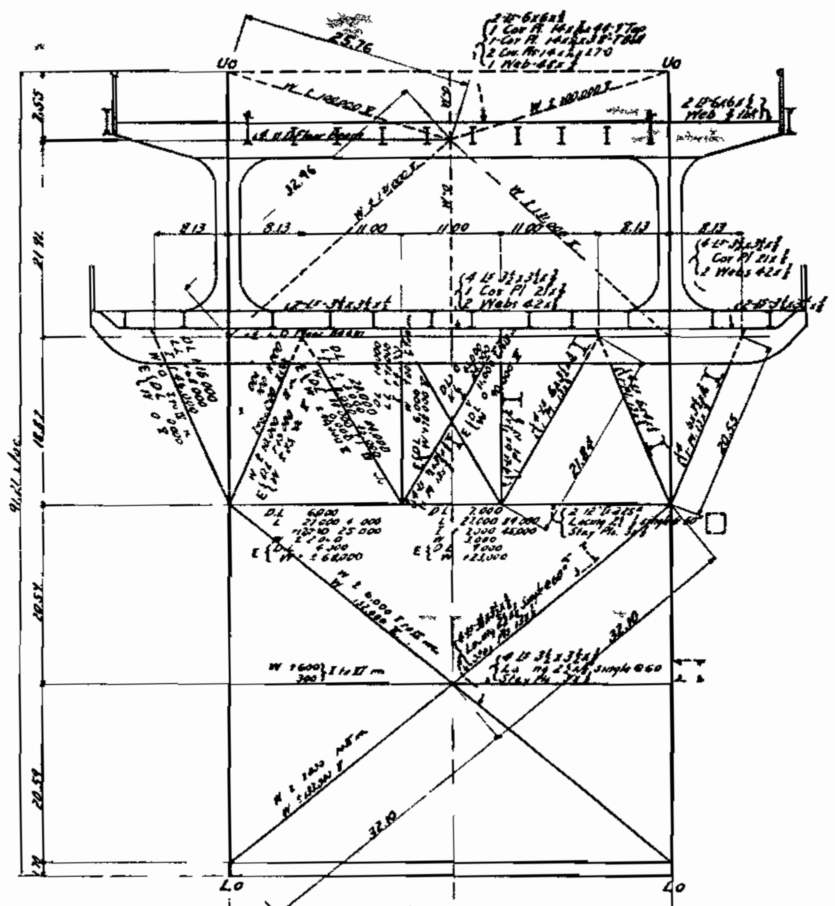
Unit Stresses

Comp Structure	Tension	18000
	Compression	18000 70 l/r
Erection	Tension	20000
	Compression	(8000 70 l/r)

Cases I II III & IV are for completed structure

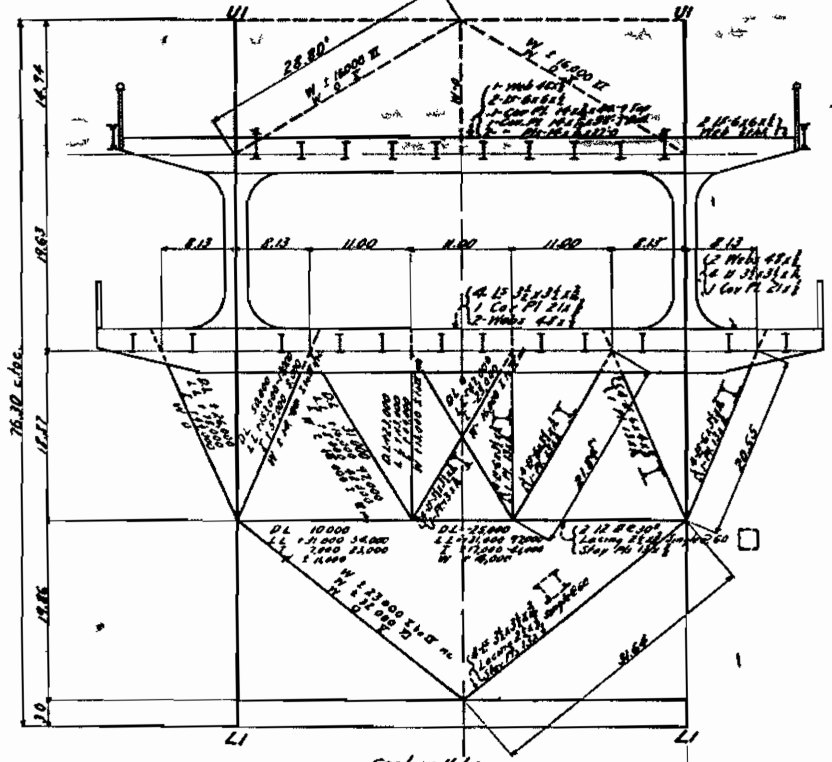
Cases V & VI are for structure during erection

13



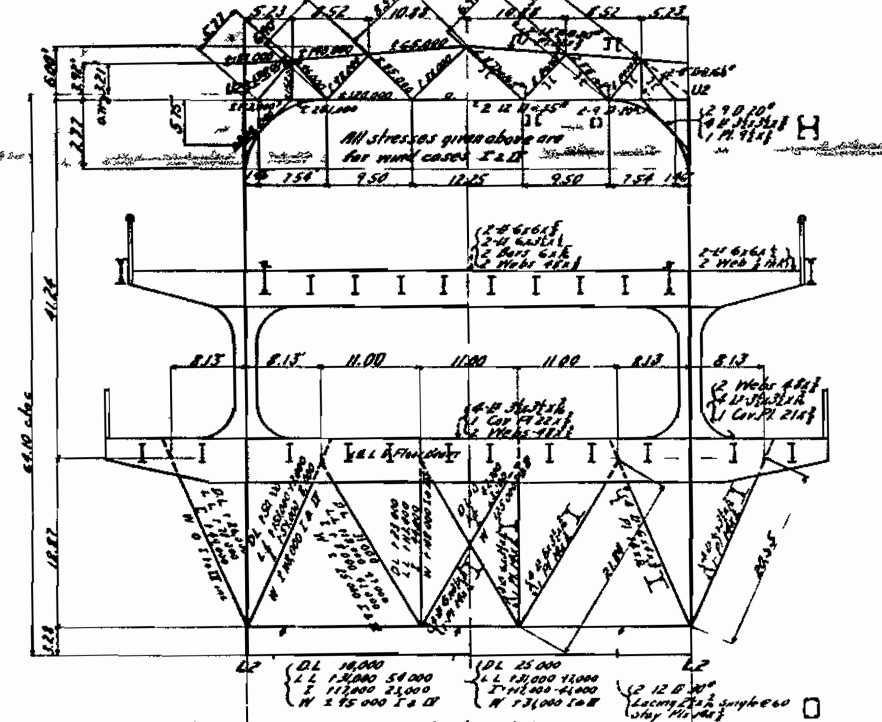
Section U0L0

49.25 c to c.



Section U1L1

49.25 c to c.



Section U2L2

49.25 c to c.

Bracing figured as a double system

All bracing indicated by dotted lines is temporary bracing to be used during erection

All brac ng to be carbon steel

Un l Stresses for Trusses

DL+LL+I	Tension	18 000
	Compression	18 000 70 $\frac{l}{r}$
DL+LL+I+T+W	Tension	23 400
	Compression	(18 000 70 $\frac{l}{r}$)1.3

Unit Stresses for Wind Bracing

Camp Structure	Tension	18 000
	Compression	18 000 70 $\frac{l}{r}$
Erection	Tension	20,000
	Compression	(18 000 70 $\frac{l}{r}$)$\frac{10}{3}$

Cases I II III & IV are for completed structure

Cases V & VI are for structure during erection

STRESS SHEET

WIND BRACING

DETROIT SUPERIOR BRIDGE

OVER

CUYAHOGA RIVER

CLEVELAND

OHIO

Revised 4/10/15

Revised 4-10-13

14

16

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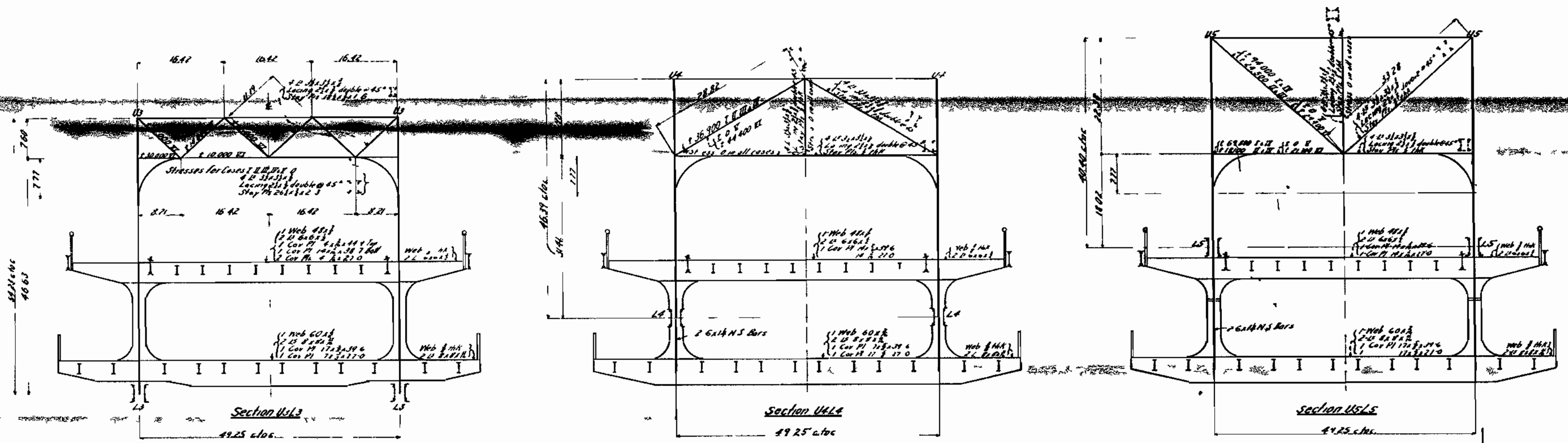


Bracing figured as a double system
All bracing to be carbon steel

Unit Stresses for Wind Bracing

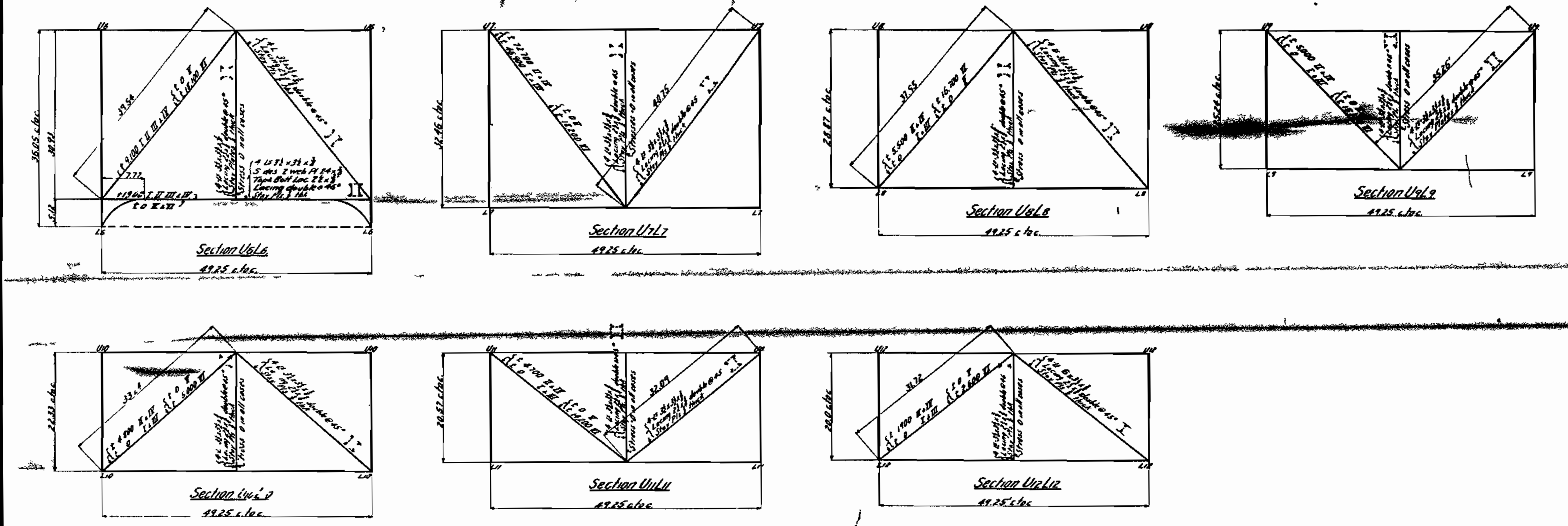
Comp. Structure	Tension	18 000
	Compression	18 000 70 l/r
Erection	Tension	20 000
	Compression	(18 000 70 l/r) 1.5

Cases I II III & IV are for completed structure
Cases V & VI are for structure during erection

STRESS SHEET
WIND BRACING
DETROIT SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND,
OHIO

Revised 4-10-41

15



Bracing figured as a double system
All bracing indicated by dotted lines
is temporary bracing to be used
during erection
All bracing to be Carbon Steel

Unit Stresses for Wind Bracing

Comp. Structure	Tension	18 000
	Compression	18 000 70l/r
Erection	Tension	20,000
	Compression	(18 000 10l/r)

Cases I II III & IV are for completed structure
Cases V & VI are for structure during erection

STRESS SHEET
WIND BRACING FOR ARCH RIBS
DETROIT SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO

16

Revision 4

Revised 4 29 13 Rev 5

Lower Deck Floor Beam Suspended Floors at Panel Point #3

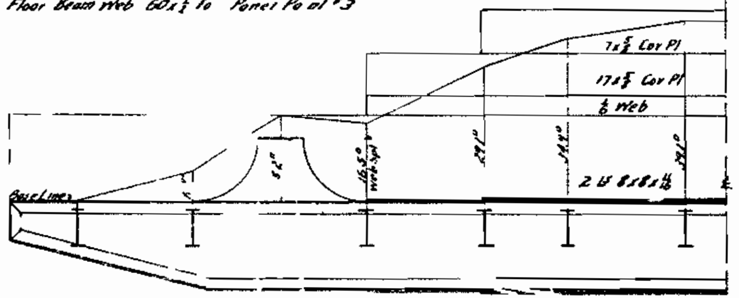
				Max		Min
D.L.S.	50 000		D.L.M.	+ 444 000		+ 444 000
L.L.S.	154 600		L.L.M.	+ 1 950 000		− 582 000
I	59 500		I	+ 830 000		315 000
	264 100			+ 3 224 000		453 000
			50% of lesser	226 500		
			Prop for	3 450 500		

Flange section required 3 450 500 (4.9 x 18 000) 39.1□"

Use for each Flange

2 Ls 8x8x11/16	21.06	2.75	
1 Cov Pl 17x5/8x39-6	10.62	1.25	
1 17x5/8x27-0	10.62	1.25	
1/6 Web (60x7/16)	4.38		
	46.58	5.25	41.43□"

Floor Beam Web 60x7/16 for Suspended Floor
Floor Beam Web 60x1/2 fo Panel Point #3



Upper Deck Floor Beam Suspended Floors at Panel Points #1, 3, 4 & 5

D.L.S.	57 800	D.L.M.	370 000
L.L.S.	80 800	L.L.M.	785 000
I	20 200	I	225 000
	158 800		1 380 000

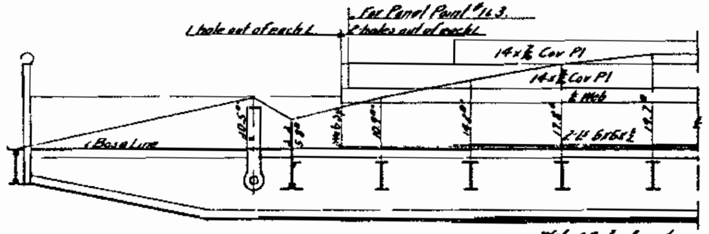
Flange section required 1 380 000 ÷ (3.9 x 18 000) 19.7□"

Use for each Flange (For Suspended Floor & Panel Points #4 & 5)

2 Ls 6x6x1/2	11.50	2.00	
1 Cov Pl 14x7/16x39-6	6.13	.88	
1 " 14x7/16x27-0	6.13	.88	
1/6 Web (48x3/8)	3.00		
	26.76 − 3.76		23.00□"

Use for each Flange — (For Panel Points #1 & 3)

2 Ls 6x6x1/2	11.50	2.00	
1 Cov Pl 14x7/16x39-6	6.13	.88	
1 14x7/16x27-0	6.13	.88	
1/6 Web (48x3/8)	3.00		
	26.76	3.76	11.00□"



Web 48x3/8 at center

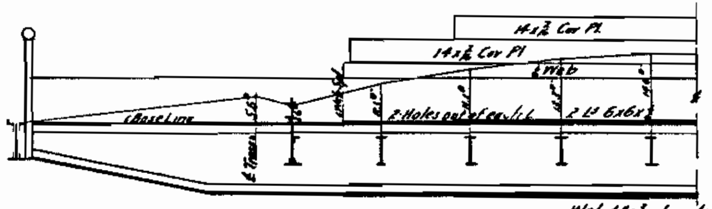
Upper Deck Floor Beam at Panel Point #0

D.L.S.	32 900	D.L.M.	222 500
L.L.S.	55 700	L.L.M.	570 400
I	20 300	I	228 100
	108 900		1 021 000

Flange section required 1 021 000 (3.9 x 18 000) 14.6□"

Use for each Flange

2 Ls 6x6x1/2	11.50	2.00	
1 Cov Pl 14x7/16x39-6	5.13	.88	
1 14x7/16x27-0	6.13	.88	
1/6 Web (48x3/8)	3.00		
	26.76	3.76	23.00□"



Web 48x3/8 at center

Upper Deck Floor Beam at Panel Point #2

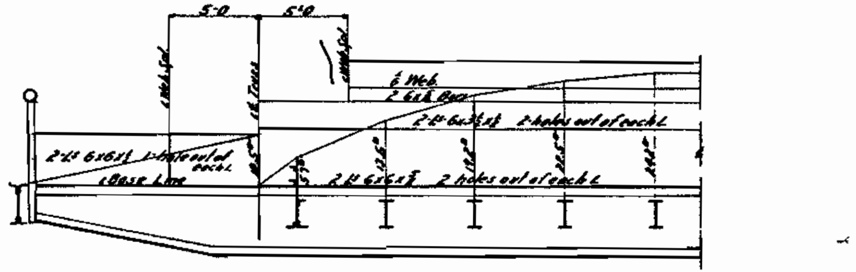
D.L.S.	57 800	D.L.M.	589 000
L.L.S.	80 800	L.L.M.	785 000
I	20 200	I	225 000
	158 800		1 599 000

Flange section required 1 599 000 ÷ (3.65 x 18 000) 24.2□"

Use for each flange

2 Ls 6x6x5/8	14.22	2.50	
2 Ls 6x4x1/2	9.00	2.00	
2 Bars 6x5/8	3.75	.63	
1/6 2 Webs (48x3/8)	6.00		
	32.97 −	5.13	= 27.84□"

Floor Beam Webs 2 Pls 48x3/8 at center



Lower Bracket Suspended Floor & at Panel Point #3

D.L.S.	27 300	D.L.M.	238 500
L.L.S.	71 400	L.L.M.	582 000
I	44 600	I	364 000
	143 300		1 184 500

Flange section required 1 184 500 (4.65 x 14 000) 18.2□"

Use for each Flange

2 Ls 8x8x11/16	21.06	2.75	
1/6 Web (60x1/2)	5.00		
	26.06	2.75	23.31□"

Bracket Web 1/2 thick

Upper Bracket Suspended Floors at Panel Points 1, 3, 4 & 5

D.L.S.	16 500	D.L.M.	219 500
L.L.S.	14 000	L.L.M.	186 200
I	7 000	I	93 100
	37 500		498 800

Flange section required 498 800 (3.42 x 14 000) 10.5□"

Use for each Flange

2 Ls 6x6x1/2	11.50	1.00	
1/6 Web (44x1/2)	3.67		
	15.17	1.00	14.17□"

At point of maximum moment on bracket horizontal flange of each L is cut away 2 to clear hanger bars which reduces net flange section for bracket to 12.17□"

Upper Bracket at Panel Point #0

D.L.S.	3 900	D.L.M.	118 400
L.L.S.	7 000	L.L.M.	93 100
I	4 000	I	53 100
	14 900		264 600

Flange section required 264 600 ÷ (3.42 x 14 000) 5.6□"

Use for each Flange

2 Ls 6x6x1/2	11.50	1.00	
1/6 Web (44x3/8)	2.75		
	14.25	1.00	13.25□"

Upper Bracket at Panel Point #2

D.L.S.	16 500	D.L.M.	219 500
L.L.S.	14 000	L.L.M.	186 200
I	7 000	I	93 100
	37 500		498 800

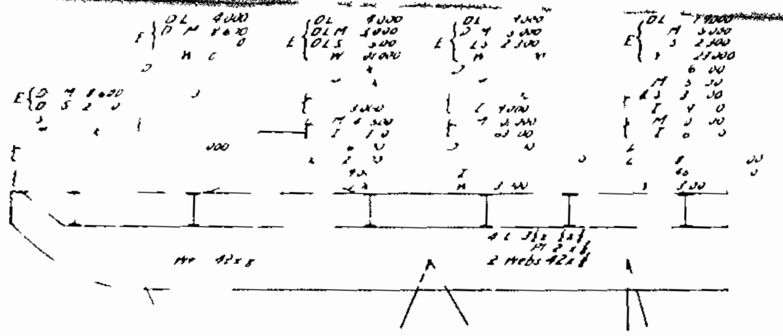
Flange section required 498 800 ÷ (3.4 x 14 000) = 10.5□"

Use for each flange

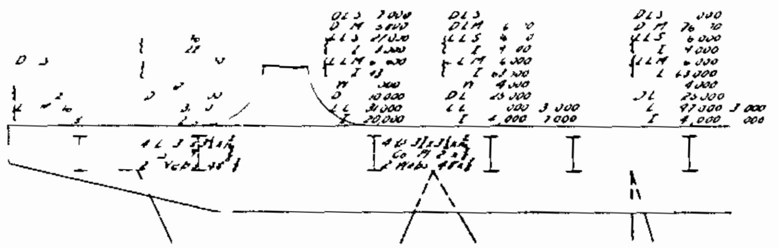
2 Ls 6x6x1/2	11.50	1.00	
1/6 2 Webs (48x3/8)	11.00		
	22.50	1.00	= 21.50□"

STRESS SHEET
FLOOR BEAMS
DETROIT SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO

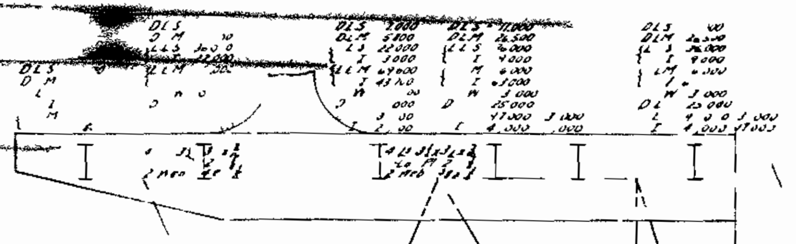
Revised 6-18-13



Lower Deck Floor Beam at Panel Point #0



Lower Deck Floor Beam at Panel Point #1



Lower Deck Floor Beam at Panel Point #2

Lower Deck Stringers

DLS 5000 DLM 30500
LLS 29200 LLM 41200
I 9800 I 91000
54000 210700

U t Stress for compress on flo y 7000# n
S M Requred 270 00x 2 / 17000 = 913 Use 24 " [84# 198.5

Upper Deck Stringers

Roadway
DLS 3900 DLM 24000
LLS 18200 LLM 85 00
I 0400 I 33 0
32500

S M Requred 257600x12 / 17000 = 12 Use 20 B th I 59# 117.2

I rder to use 17000# un t stress t s necessary to support compression nge of 20 I 59# y 0 wood lies o e pxel 36 to ll res o e s o ged th note s d e se ured t st ngers t may be pe missable oca sde the c oss ties n co juncl o with the wood floor as affo d y the necess y support

Sidewalk Joists at ¼ points of panel

DLS (tw o St nge) 2700 DLM 0600
LLS 3600 LLM 13700
I 2200 I 8300
8500 32600

S M Required 32600x12 / 12000 = 23 Use 0 Beth I 28.5# 26.9

Sidewalk Joist at center of panel

DLS (two a Str) 3300 DLM 11000
LLS 3200 LLM 13700
I 2000 I 8300
8700 33000

S.M Required 33000x 2 / 17000 = 23.3 Use 2 10 B 0# 31.4

Sidewalk Joist at end of panel

DLS 1800 D M 7100
LLS 2400 L M 9300
I 1500 I 5100
5300 22 00

S M Requred 22100x 2 / 17000 = 15.6 Use 10 [20# 15.7

In order to use 17000 lbs unit stres on all sidewalk joists t s necessary to assume that concrete will support compression flange

Facia Stringers

DLS 7200 DLM 47400
LLS 7000 LLM 43500
I 4000 I 24800
18200 115100

Flange section equ red 115700 (25 x 8000) 25°
Use 2 Ls 3x3x⅜ Bott Flange
1 L 3x3x⅜ & 3x⅜ 2 Top Flange
Web 31½ x ⅜

Curb Stringers

0 to 5
DLS 4300 DLM 58000
LLS 23200 LLM 12600
I 13300 I 64600
45800 235200

Flange sect on equired 235200 (31 8000) 4.56°
Bott flange 2 Ls 4x3½x⅜ 4.48 7.5 4.23+2.14(web) 6.47° reql
Top Flange 1 L 5x4x⅜ & ... for 3 bo k L 10½" w A101
See detail of section
Web 42 x ⅜

5 to 12
Bott flange 2 L 6x3½x⅜ (5 to 0) 2 Ls 6x3½x⅜ (0 to 12)
Top Flange same as for top flange 0 to 5
Web 4 x ⅜

Lower Deck Hangers

DL 40500
LL 22 000
I 37000
403500

Sect on requ red 403500 6000 25.2°
Use 2 15x ½ 15 00 2 00
4 Ls 3½x3½x ½ 13 00 2 00
28 00 4 00 24 00° rel

Be t L f qu ed as supply ny def c e cy
See detail

Lower Deck Hangers at Panel Points 4 & 5

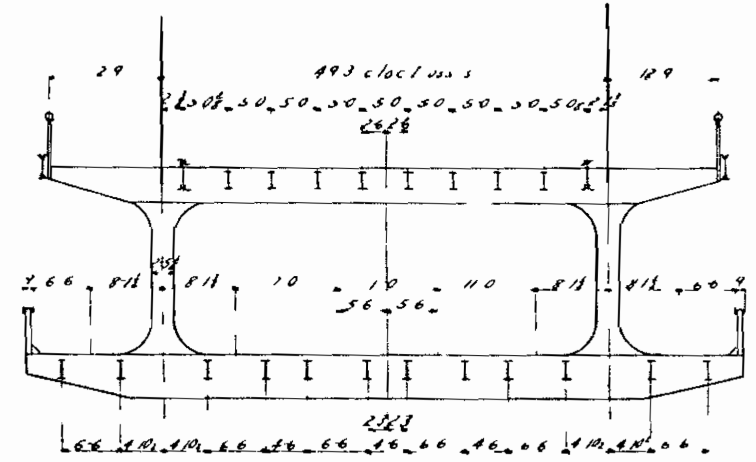
DL 90500
LL 21 000
I 31000
463500

Sect o equ d 423500 21 00 49.5°
Use 2 6x ⅞ N.S Bars 50°

Upper and Lower Deck Hangers

DL 171300
LL 320500
I 110700
602500

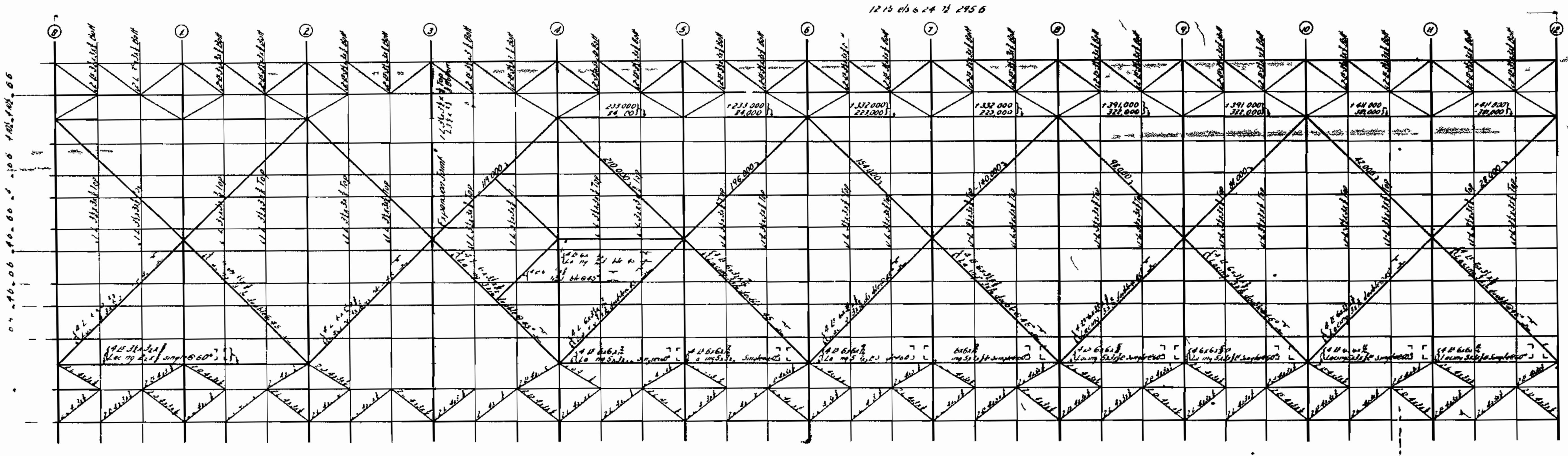
Sect on requ red 602500 2 000 22.3°
Use 2 8x1⅛ N S Bars 22.0°



Section showing Suspended Floor

STRESS SHEET
FLOOR SYSTEM
DETROIT SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO

Revised 4 29 13 Rev 5 2 13



Bracing figured as a single system
All bracing to be carbon steel

Unit Stresses for Wind Bracing

Comp Structure	Tension	18000
	Compression	18 000 70 l/r
Erection	Tension	20,000
	Compression	(18 000 70 l/r) 10/9

Cases I, II, III & IV are for completed structure
Cases V & VI are for structure during erection

STRESS SHEET
WIND BRACING FOR LOWER DECK
DETROIT SUPERIOR BRIDGE
OVER
CUYAHOGA RIVER
CLEVELAND
OHIO