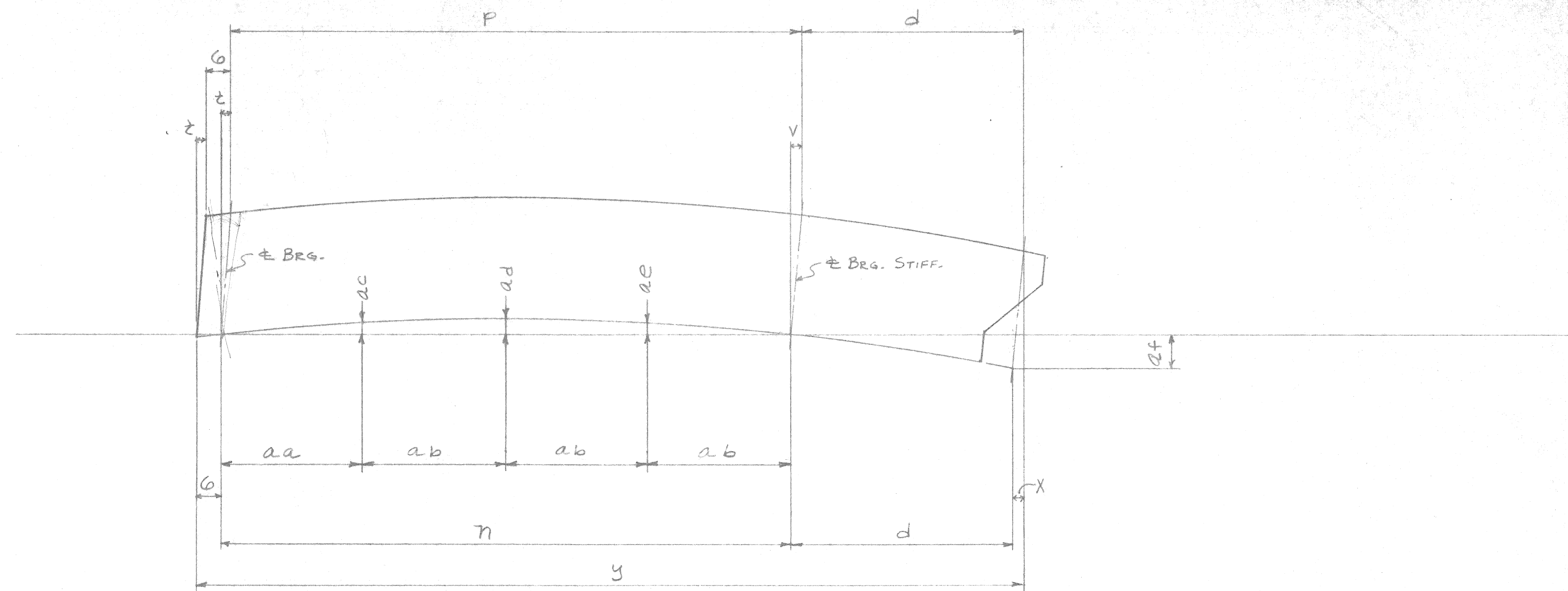


STRINGER SPAN #1 IN FINAL POSITION UNDER FULL DEAD LOAD

1. ± BEARINGS ± SUSPENSER ARE VERTICAL.
2.  $a = b = c$
3.  $a = \sqrt{(64'-11\frac{1}{2})^2 + (\text{Elev. } f' - \text{Elev. } e')^2} = \sqrt{(64'-11\frac{1}{2})^2 + (\text{Elev. } f - \text{Elev. } e)^2}$
4.  $d = (4'-8) \div \cos \phi$
5.  $\cos \phi = (64'-11\frac{1}{2}) \div a$
6.  $\tan \phi = (\text{Elev. } f - \text{Elev. } e) \div (64'-11\frac{1}{2})$
7.  $s = (2.490) \tan \phi = h$



STRINGER SPAN #1 CAMBER AND CUTTING DETAILS

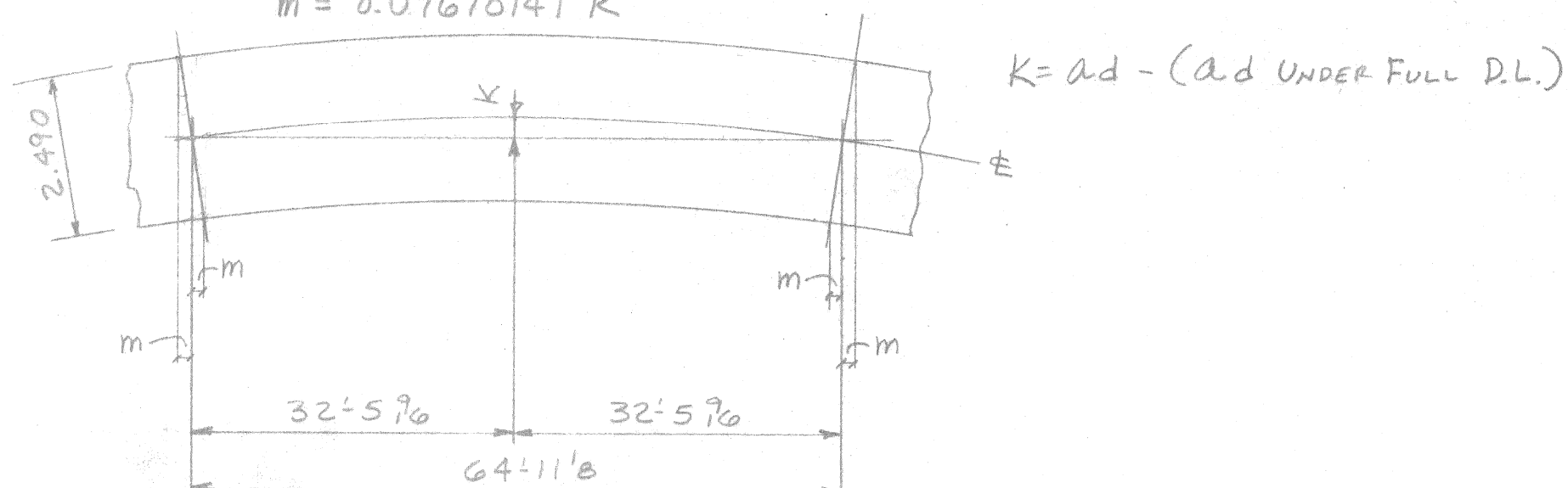
1.  $\eta = c - 2m$
2.  $P = b + 2m$
3.  $z = s - 2m$
4.  $V = h + 2m = X$
5.  $a_d = K$
6.  $P + z - V = \eta$

CITY OF DETROIT  
ENGINEERING DEPARTMENT  
**APPROVED**  
FOR COMPLIANCE WITH CONTRACT No. PW 6557  
\*\*\*\*  
THIS APPROVAL SHALL NOT RELIEVE THE CONTRACTOR OF ANY RESPONSIBILITY COVERED BY THE CONTRACT  
DATE: MAR. 2 1977 BY: \_\_\_\_\_

SEE SHEET E3

LINE	a, b, c	d	Elev. e	Elev. f	s	h	TAN φ	Cos φ	f-e	K	m	SLOPE INCR. a-(64'11 1/2)	d	η	P	z	V	X	y=6*η+d*x	y=t+6*p+d	aa	ab	ac	ad	ae	af	ad
A	64.9730	4.6699	131.933	134.374	0.0936	0.0936	0.037596	0.999294	2.441	1 1/4	0.0080	0.0459	A 4'8 1/16	64.9570	64.9890	0.0776	0.1096	0.1096	70.2365	70.2374	16'2 3/8	16'2 3/8	3'8	4'4	3'8	1'8	3
B	64.9684	4.6696	132.204	134.520	0.0888	0.0888	0.0356708	0.9993644	2.316	1 1/2	0.0096	0.0413	B 4'8 1/16	64.9492	64.9876	0.0696	0.1080	0.1080	70.2268	70.2268	16'2 3/4	16'2 3/8	3'8	4'4	3'8	1'8	2 3/4
C	64.9633	4.6692	132.558	134.725	0.0831	0.0831	0.0333759	0.9994435	2.167	2'8	0.0136	0.0362	C 4'8 (4)	64.9361	64.9905	0.0559	0.1103	0.1103	70.2156	70.2156	16'2 13/16	16'2 13/16	3'8	4'4	3'8	1'8	2'8
D	64.9566	4.6687	133.016	134.975	0.0751	0.0751	0.0301723	0.9995451	1.959	2'8	0.0136	0.0295	D 4'8 (4)	64.9294	64.9838	0.0479	0.1023	0.1023	70.2004	70.2004	16'2 3/8	16'2 3/4	3'8	4'4	3'8	1'8	2'8
E	64.9548	4.6686	133.287	135.183	0.0727	0.0727	0.02920198	0.9995739	1.896	1 1/2	0.0096	0.0277	E 4'8 (4)	64.9356	64.9740	0.0535	0.0919	0.0919	70.1961	70.1961	16'2 3/4	16'2 13/16	2 3/4	3'8	2 3/4	1	2'8
F	64.9513	4.6683	133.599	135.371	0.0680	0.0680	0.027921	0.9996278	1.772	1 1/2	0.0096	0.0242	F 4'8 (4)	64.9321	64.9705	0.0488	0.0872	0.0872	70.1876	70.1876	16'2 3/4	16'2 13/16	2 3/4	3'8	2 3/4	1	2'8
G	64.9480	4.6681	133.808	135.454	0.0631	0.0631	0.0253515	0.9996788	1.646	1'8	0.0104	0.0209	G 4'8 (4)	64.9272	64.9688	0.0423	0.0839	0.0839	70.1792	70.1792	16'2 7/8	16'2 3/4	2 3/4	3'4	2 3/4	1	2'8
H	64.9444	4.6678	133.954	135.454	0.0575	0.0575	0.0231028	0.9997332	1.500	1'8	0.0104	0.0173	H 4'8 (4)	64.9236	64.9652	0.0367	0.0783	0.0783	70.1697	70.1697	16'2 13/16	16'2 3/4	2 3/4	3'4	2 3/4	1	2'8
J	64.9417	4.6676	134.037	135.413	0.0528	0.0528	0.0211930	0.9997755	1.376	1'8	0.0104	0.0146	J 4'8 (4)	64.9209	64.9625	0.0320	0.0736	0.0736	70.1621	70.1621	16'2 13/16	16'2 3/4	2 3/4	3'4	2'8	1	2'8
K	64.9387	4.6674	134.099	135.329	0.0472	0.0472	0.0189443	0.9998266	1.230	1 1/2	0.0096	0.0116	K 4'8 (4)	64.9195	64.9579	0.0280	0.0664	0.0664	70.1533	70.1533	16'2 13/16	16'2 3/4	2 3/4	3'4	2 3/4	1	2'4
L	64.9365	4.6673	134.204	135.308	0.0423	0.0423	0.01700369	0.9998555	1.104	1 1/2	0.0096	0.0094	L 4'8 (4)	64.9173	64.9557	0.0231	0.0615	0.0615	70.1461	70.1461	16'2 3/4	16'2 3/4	3'8	4'4	2 3/4	1'8	2 3/4
M	64.9342	4.6671	134.370	135.329	0.0368	0.0368	0.01477041	0.9998909	0.959	1 1/4	0.0080	0.0071	M 4'8 (4)	64.9182	64.9502	0.0208	0.0528	0.0528	70.1381	70.1381	16'2 3/4	16'2 3/4	3'8	4'4	2'8	1'8	3

END ROTAT. =  $2m = \frac{4(K)(2.490)}{(64'-11\frac{1}{2})} = 0.153402816 (K)$   
 $m = 0.07670141 K$



END ROTATION CALCULATION

	d	η	P	z	V	X	y=6*η+d*x	y=t+6*p+d	P+Z-V
A	4'8	64'-11 1/2	64'-11 1/2	0'8	1'6	1'6	70'-2 13/16	70'-2 13/16	64'-11 1/2
B	4'8	64'-11 3/8	64'-11 3/8	0'8	1'6	1'6	70'-2 11/16	70'-2 11/16	64'-11 3/8
C	4'8	64'-11 1/4	64'-11 1/4	0'8	1'6	1'6	70'-2 7/16	70'-2 7/16	64'-11 1/4
D	4'8	64'-11 1/8	64'-11 1/8	0'8	1'4	1'4	70'-2 3/8	70'-2 3/8	64'-11 1/8
E	4'8	64'-11 3/16	64'-11 3/16	0'8	1'8	1'8	70'-2 5/16	70'-2 5/16	64'-11 3/16
F	4'8	64'-11 1/16	64'-11 1/16	0'8	1'10	1'10	70'-2 1/4	70'-2 1/4	64'-11 1/16
G	4'8	64'-11 1/8	64'-11 5/8	0'2	1	1	70'-2'8	70'-2'8	64'-11 1/8
H	4'8	64'-11 1/16	64'-11 7/8	0'8	0'5/16	0'5/16	70'-2	70'-2	64'-11 1/16
J	4'8	64'-11 1/16	64'-11 1/16	0'8	0'8	0'8	70'-1 15/16	70'-1 15/16	64'-11 1/16
K	4'8	64'-11 1/16	64'-11 1/2	5/16	0'3/8	0'3/8	70'-1'8	70'-1'8	64'-11 1/16
L	4'8	64'-11	64'-11 1/2	0'4	0'4	0'4	70'-1'4	70'-1'4	64'-11
M	4'8	64'-11	64'-11 3/8	0'4	0'8	0'8	70'-1'8	70'-1'8	64'-11

**PHILIP ZWIG & SONS**  
 2100 E. 5TH AVE. GARY, IND.  
 BUILDING BAGLEY AVE. BRIDGE CROSSING THE P.C.R.R.  
 OWNER CITY OF DETROIT, MICH.  
 LOCATION DETROIT, MICH.  
 CONTRACTOR WALTER JOEBE CONSTRUCTION COMPANY  
 ARCHITECT CITY ENGINEERING DEPT., CITY OF DETROIT, MICH.  
 TITLE SPAN #1 BEAM CALCULATIONS

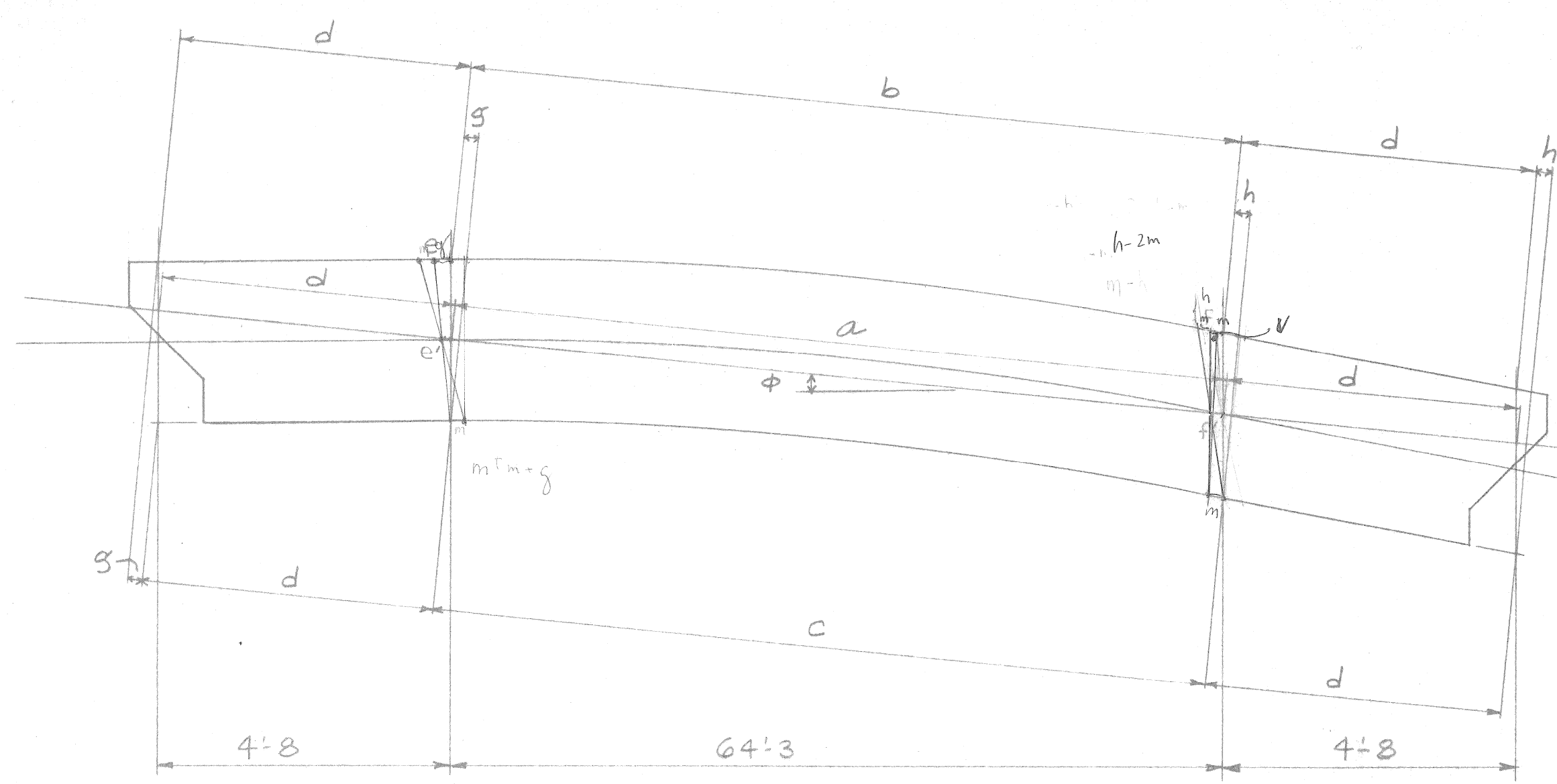
RIVETS	DRAWN RPJ	DATE 2.11.77
HOLES	CHKD. CdC	
PAINT	REV.	REV.
CONTRACT 335	SHEET WS1 OF 8	

DRAW BRIDGE INC. # 72







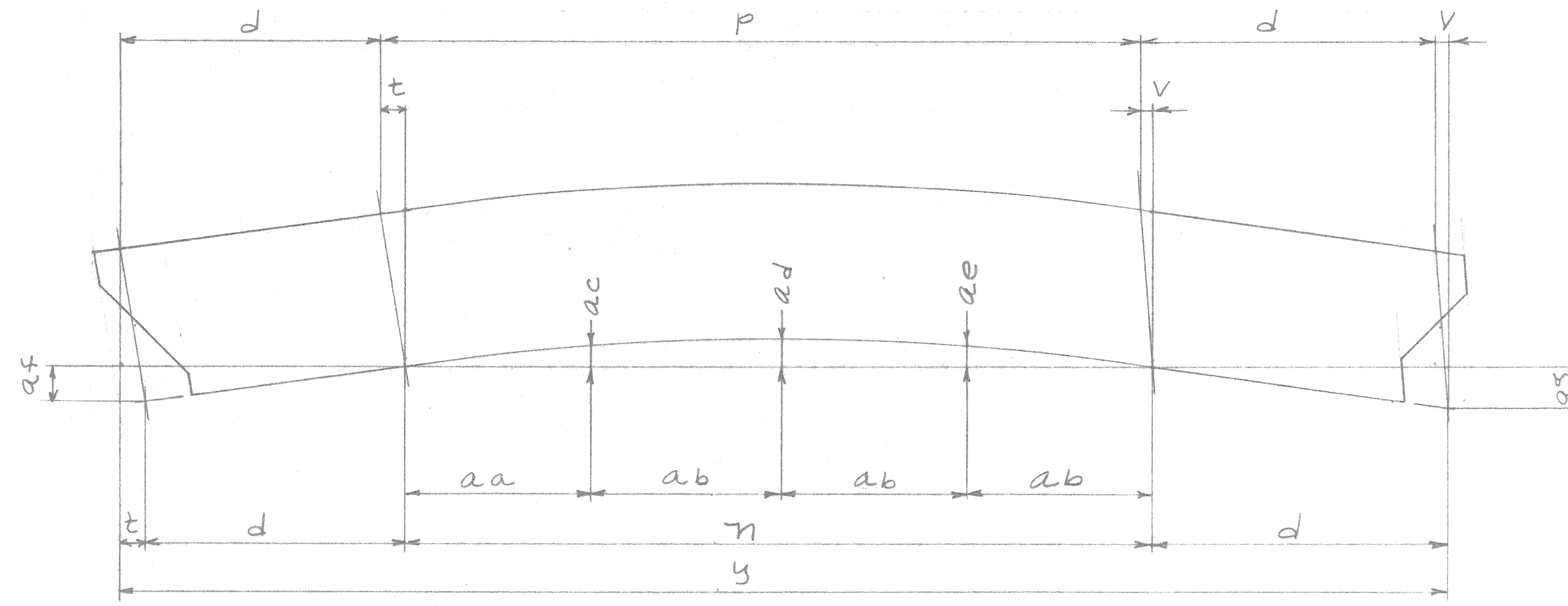


STRINGER SPAN #3 IN FINAL POSITION UNDER FULL DEAD LOAD

1. BEARINGS & SUSPENDERS ARE VERTICAL  
2. a = b = c

$$3. a = \sqrt{(64'3)^2 + (EL.E - EL.F)^2} = \sqrt{(64'3)^2 + (EL.E - EL.F)^2}$$

4.  $\cos \phi = (64'3) \div a$   
5.  $\tan \phi = (EL.E - EL.F) \div (64'3)$   
6.  $d = (4'8) \div \cos \phi$   
7.  $g = (2.490) \times \tan \phi = h$



STRINGER SPAN #3 CAMBER AND CUTTING DETAILS

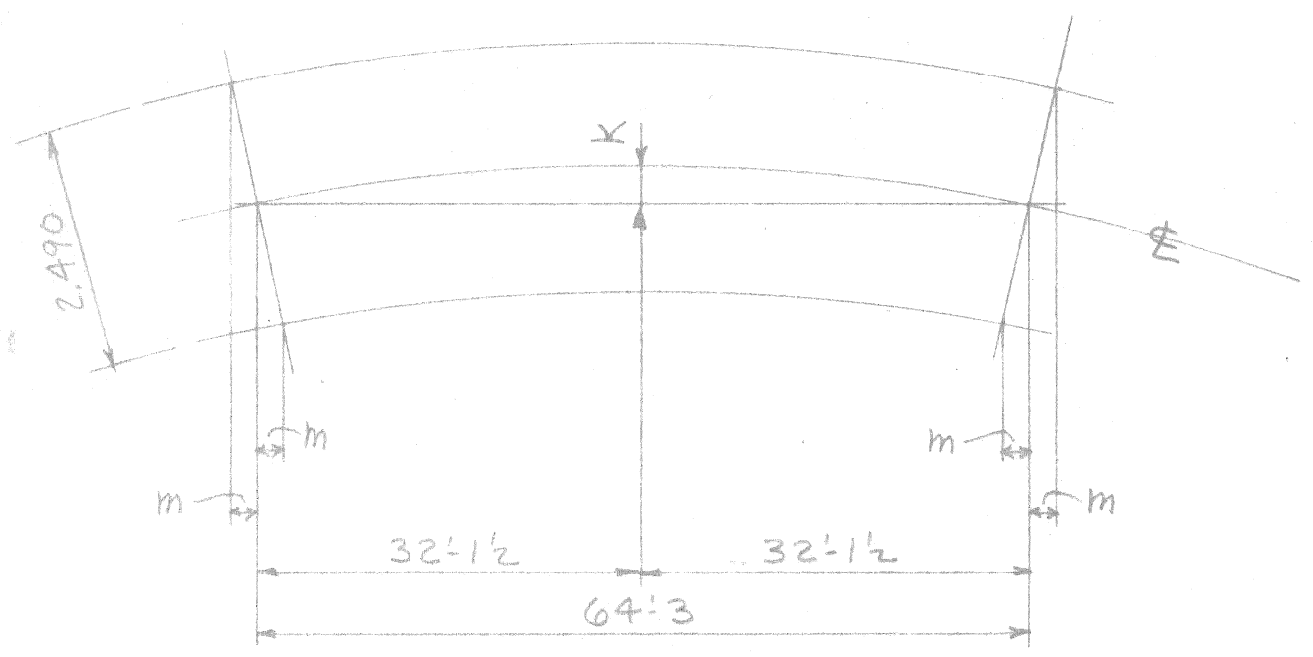
1.  $\eta = c - 2m$
2.  $P = b + 2m$
3.  $t = g + 2m$
4.  $V = h - 2m$
5.  $\eta = P + V - t$

LINE NO.	NO. OF PILES OR SHEETS	MATERIAL	LENGTH		ASSEMBLING MARK	REMARKS	ORDERED		CALCULATED FOR CHG. SHEET PRICE
			FEET	INCHES			ITEM		
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UNDER FULL DEAD LOAD ad

SEE SHEET E3											
	a, b, c	d	Elev. e	Elev. f	g & h	TAN φ	cos φ	e - f	k	m	
A	64.2568	4.6671	135.333	134.399	0.0362	0.01453696	0.99989486	0.934	7/8	0.0057	
B	64.2587	4.6672	135.313	134.253	0.0411	0.01649805	0.99986373	1.060	1/8	0.0073	
C	64.2610	4.6675	135.333	134.146	0.0460	0.01847471	0.9998294	1.187	1/2	0.0097	
D	64.2638	4.6676	135.417	134.083	0.0517	0.0207626	0.9997845	1.334	1 5/8	0.0105	
E	64.2665	4.6678	135.458	134.000	0.0565	0.0226926	0.9997426	1.458	1/8	0.0073	
F	64.2695	4.6680	135.458	133.875	0.0613	0.0246381	0.9996966	1.583	1/8	0.0073	
G	64.2733	4.6683	135.375	133.646	0.0670	0.0269105	0.9996381	1.729	1/4	0.0081	
H	64.2767	4.6685	135.208	133.354	0.0719	0.028856	0.9995839	1.854	1/4	0.0081	
J	64.2810	4.6689	135.000	133.003	0.0774	0.0310817	0.9995173	1.997	1/4	0.0081	
K	64.2851	4.6692	134.750	132.625	0.0824	0.0330739	0.9994535	2.125	1/4	0.0081	
L	64.2901	4.6695	134.545	132.274	0.0880	0.0353463	0.9993759	2.271	1/4	0.0081	
M	64.2947	4.6698	134.399	132.003	0.0929	0.0372918	0.9993054	2.396	1	0.0065	

	d	η	P	t	V	y = 2d+t+η	y = 2d+P+V	aa	ab	ac	ad	ae	af	ag	P+V-t
A	4.6671	64.2454	64.2682	0.0476	0.0248	73.6272	73.6272	16.0614	16.0614	2 3/4	3 5/8	2 3/4	1	1	64.2454
B	4.6672	64.2441	64.2733	0.0557	0.0265	73.6342	73.6342	16.0610	16.0610	2 3/4	3 5/8	2 3/4	1	1	64.2441
C	4.6675	64.2416	64.2804	0.0654	0.0266	73.6420	73.6420	16.0604	16.0604	2 3/4	3 5/8	2 3/4	1	1	64.2416
D	4.6676	64.2428	64.2848	0.0727	0.0307	73.6507	73.6507	16.0607	16.0607	2 3/4	3 5/8	2 3/4	1	1	64.2428
E	4.6678	64.2519	64.2811	0.0711	0.0419	73.6586	73.6586	16.0630	16.0630	2 3/8	3 4	2 3/8	7/8	7/8	64.2519
F	4.6680	64.2549	64.2841	0.0759	0.0467	73.6668	73.6668	16.0637	16.0637	2 3/8	3 4	2 3/8	7/8	7/8	64.2549
G	4.6683	64.2571	64.2895	0.0832	0.0508	73.6769	73.6769	16.0643	16.0643	2 1/2	3 3/8	2 1/2	7/8	7/8	64.2571
H	4.6685	64.2605	64.2929	0.0881	0.0557	73.6856	73.6856	16.0651	16.0651	2 1/2	3 3/8	2 1/2	7/8	1	64.2605
J	4.6689	64.2648	64.2972	0.0936	0.0612	73.6962	73.6962	16.0662	16.0662	2 1/2	3 3/8	2 1/2	7/8	1	64.2648
K	4.6692	64.2689	64.3013	0.0986	0.0662	73.7059	73.7059	16.0672	16.0672	2 1/2	3 3/8	2 1/2	7/8	1	64.2689
L	4.6695	64.2739	64.3063	0.1042	0.0718	73.7171	73.7171	16.0685	16.0685	2 1/2	3 3/8	2 1/2	1	1	64.2739
M	4.6698	64.2817	64.3077	0.1059	0.0799	73.7272	73.7272	16.0704	16.0704	2 1/2	3 3/8	2 1/2	1	1	64.2817



END ROTATION CALCULATION

$$K = ad - (ad \text{ UNDER FULL DEAD LOAD})$$

$$2m = \frac{4(K)(2.490)}{(64'3)} = 0.155019455 (K)$$

$$m = 0.077509727626 (K)$$

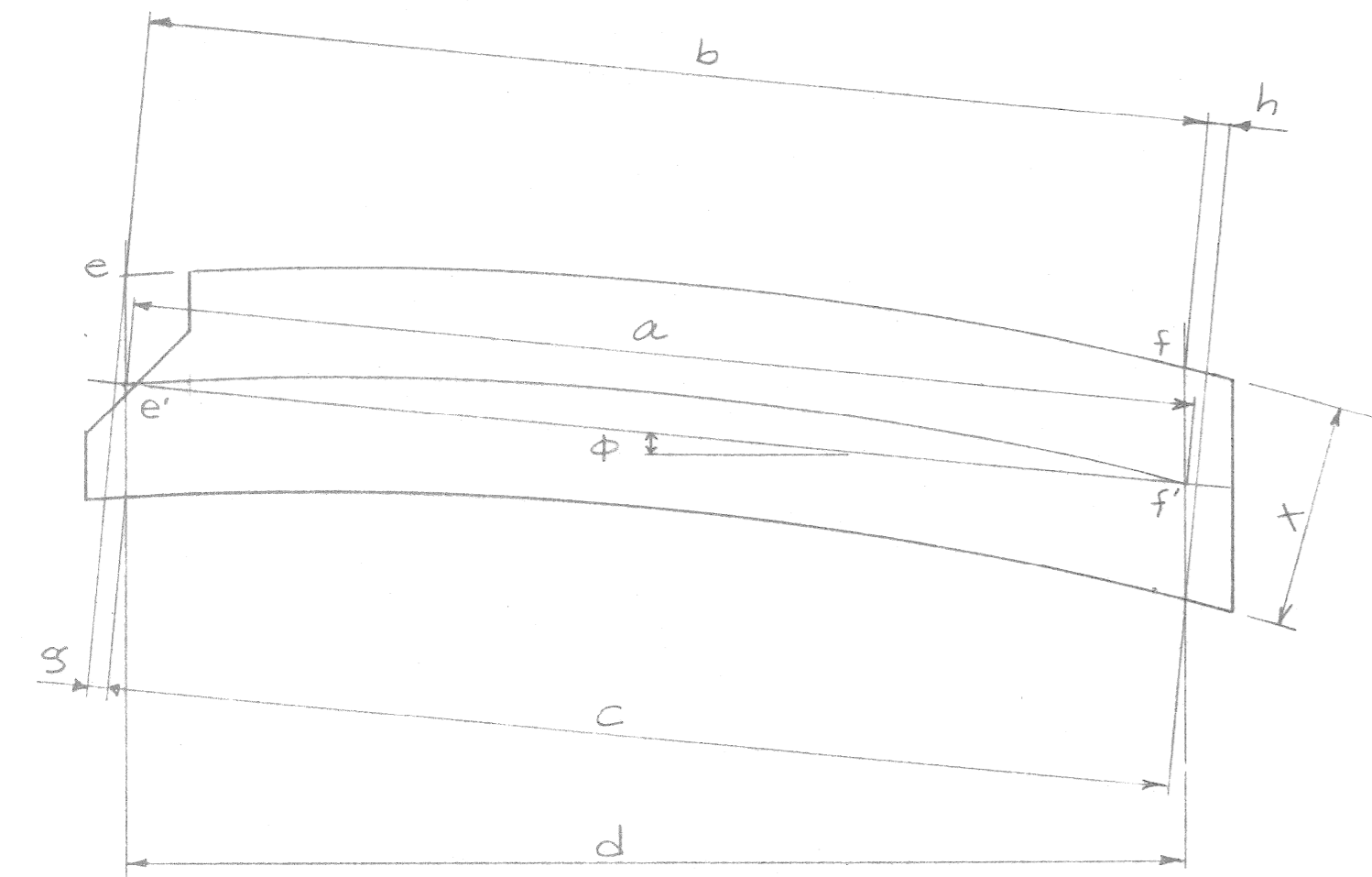
USE FOR DETAIL DIMENSIONS

CITY OF DETROIT  
CITY ENGINEERING DEPARTMENT  
**APPROVED**  
FOR COMPLIANCE WITH CONTRACT No. PW 6557  
\*\*\*  
THIS APPROVAL SHALL NOT RELIEVE THE CONTRACTOR OF ANY RESPONSIBILITY COVERED BY THE CONTRACT  
DATE MAR 2 1977 BY

**PHILIP ZWIG & SONS**  
2100 E. 5TH AVE. GARY, IND.  
BUILDING BAGLEY AVE. BRIDGE CROSSING THE P.C.R.R.  
OWNER CITY OF DETROIT, MICH.  
LOCATION DETROIT, MICH.  
CONTRACTOR WALTER TOEBE CONSTRUCTION COMPANY  
ARCHITECT CITY ENGINEERING DEPT., CITY OF DETROIT, MICH.  
TITLE SPAN 3 BEAM CALCULATION

RIVETS \_\_\_\_\_ DRAWN RPJ DATE \_\_\_\_\_  
HOLES \_\_\_\_\_ CHKD CDC  
PAINT \_\_\_\_\_ REV. \_\_\_\_\_  
CONTRACT 335 SHEET W63 OF 8

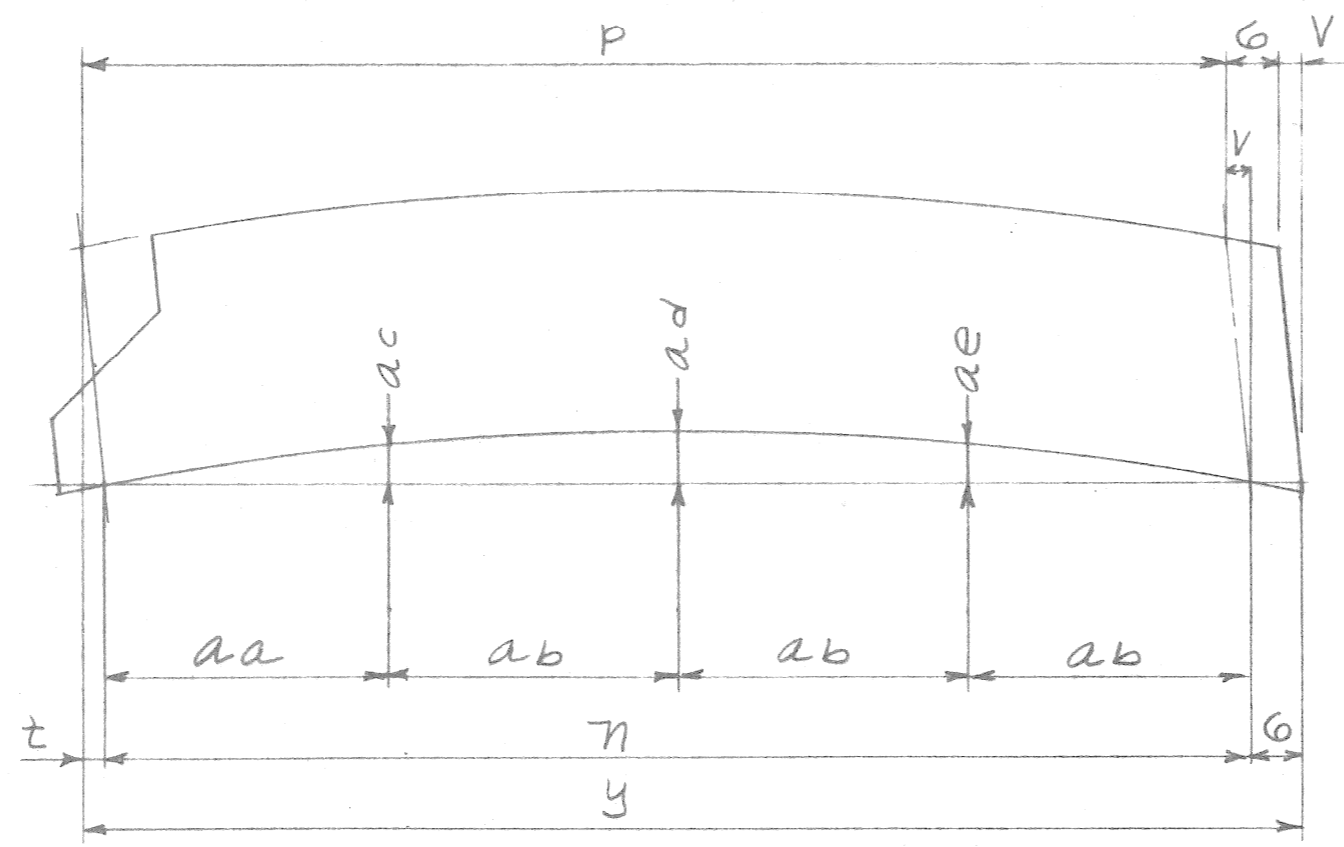




**STRINGER SPAN # 4 IN FINAL POSITION UNDER FULL DEAD LOAD**

- 1.  $\phi$  SUSPENDER AND  $\phi$  BEARING ARE VERTICAL
- 2.  $a = b = c$
- 3.  $a = \sqrt{d^2 + (EL.e - EL.f)^2} = \sqrt{d^2 + (EL.e - EL.f)^2}$

- 4.  $TAN \phi = (EL.e - EL.f) \div d$
- 5.  $S = (X) \times TAN \phi = h$

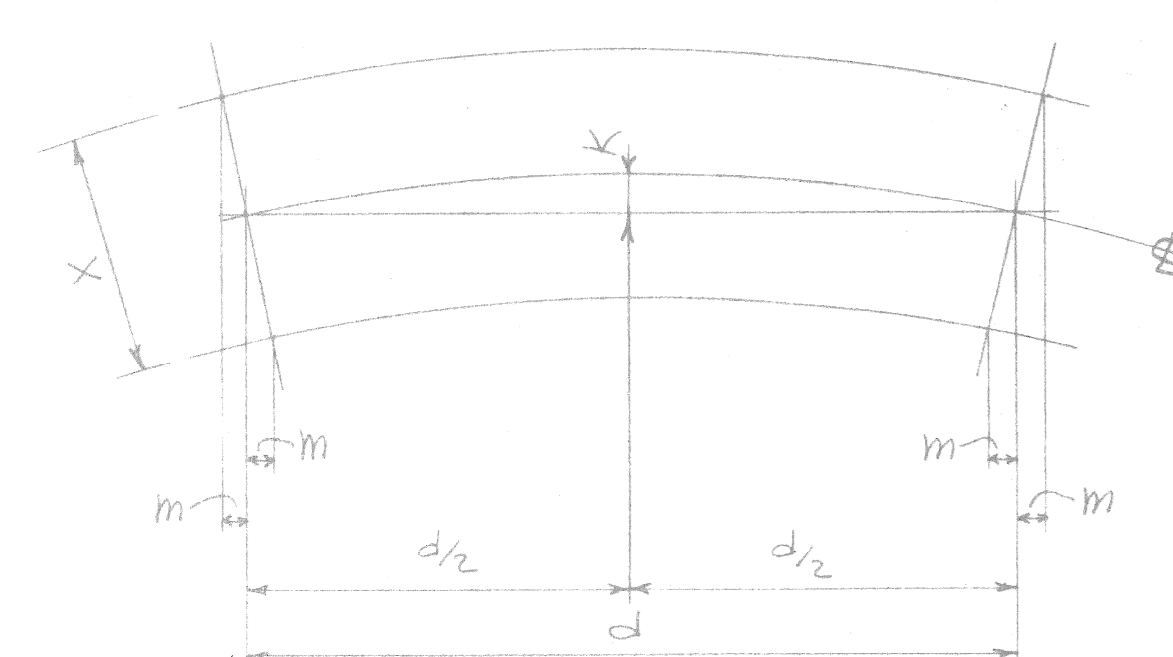


**STRINGER SPAN # 4 CAMBER & CUTTING DETAILS**

- 1.  $n = C - 2M$
- 2.  $P = b + 2M$
- 3.  $t = S + 2M$
- 4.  $Y = h - 2M$
- 5.  $y = P + G + Y = \sum n + G$

SEE SHEET E3

	a, b, c	d	ELEV. e	ELEV. f	S & h	TAN $\phi$	e-f	K	M	X	SLOPE INCREASE a-d		n	P	t	Y	aa	ab	ac	ad	ae	y = P+G+Y	y = t+n+G		
A	71.9309	71.8750	134.248	131.413	0.0990	0.03944348	2.835	2 <sup>1</sup> / <sub>8</sub>	0.0124	2.510	0.0559		A	71.9061	71.9557	0.1238	0.0742	17.9765	12.9765	4 <sup>5</sup> / <sub>8</sub>	6 <sup>4</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	72.5299	72.5299	4 <sup>1</sup> / <sub>8</sub>
B	69.4031	69.3438	134.093	131.225	0.1038	0.041359	2.868	2 <sup>1</sup> / <sub>8</sub>	0.0128	2.510	0.0593		B	69.3775	69.4287	0.1294	0.0782	17.3444	12.3444	4 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>8</sub>	70.0069	70.0069	3 <sup>3</sup> / <sub>8</sub>
C	66.8738	66.8125	133.976	131.114	0.1071	0.04283629	2.862	2 <sup>3</sup> / <sub>4</sub>	0.0172	2.500	0.0613		C	66.8394	66.9082	0.1415	0.0727	16.7099	16.7099	3 <sup>3</sup> / <sub>4</sub>	5	3 <sup>3</sup> / <sub>4</sub>	67.4809	67.4809	2 <sup>4</sup> / <sub>8</sub>
D	64.3344	64.2708	133.903	131.042	0.1108	0.04451477	2.861	2 <sup>5</sup> / <sub>8</sub>	0.0170	2.490	0.0636		D	64.3004	64.3684	0.1448	0.0768	16.0751	16.0751	3 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>	64.9452	64.9452	2 <sup>1</sup> / <sub>8</sub>
E	61.8059	61.7396	133.821	130.958	0.1145	0.04637218	2.863	1 <sup>3</sup> / <sub>4</sub>	0.0117	2.469	0.0663		E	61.7825	61.8293	0.1379	0.0911	15.4456	15.4456	2 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>	62.4204	62.4204	2
F	59.2770	59.2083	133.687	130.833	0.1190	0.0482027	2.854	1 <sup>1</sup> / <sub>2</sub>	0.0104	2.469	0.0687		F	59.2562	59.2978	0.1398	0.0982	14.8140	14.8140	2 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	59.8960	59.8960	1 <sup>1</sup> / <sub>8</sub>
G	56.7465	56.6771	133.448	130.643	0.1222	0.04949088	2.805	1 <sup>1</sup> / <sub>2</sub>	0.0109	2.469	0.0694		G	56.7247	56.7683	0.1440	0.1004	14.1812	14.1812	2 <sup>3</sup> / <sub>8</sub>	3 <sup>8</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	57.3687	57.3687	1 <sup>5</sup> / <sub>8</sub>
H	54.2059	54.1354	133.136	130.372	0.1261	0.05105716	2.764	1 <sup>3</sup> / <sub>8</sub>	0.0105	2.469	0.0705		H	54.1849	54.2269	0.1471	0.1051	13.5462	13.5462	2 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>8</sub>	54.8320	54.8320	1 <sup>3</sup> / <sub>8</sub>
J	51.6758	51.6042	132.775	130.056	0.1301	0.0526895	2.719	1	0.0080	2.469	0.0716		J	51.6598	51.6918	0.1461	0.1141	12.9150	12.9150	1 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	52.3059	52.3059	1 <sup>3</sup> / <sub>8</sub>
K	49.1441	49.0729	132.387	129.743	0.1330	0.053879	2.644	1	0.0084	2.469	0.0712		K	49.1273	49.1609	0.1498	0.1162	12.2818	12.2818	1 <sup>5</sup> / <sub>8</sub>	2 <sup>8</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	49.7771	49.7771	1 <sup>1</sup> / <sub>8</sub>
L	46.6013	46.5313	132.026	129.473	0.1355	0.0548663	2.553	3 <sup>4</sup> / <sub>8</sub>	0.0066	2.469	0.0700		L	46.5881	46.6145	0.1487	0.1223	11.6470	11.6470	1 <sup>1</sup> / <sub>2</sub>	2	1 <sup>3</sup> / <sub>8</sub>	47.2368	47.2368	1 <sup>4</sup> / <sub>8</sub>
M	44.0699	44.0000	131.746	129.264	0.1393	0.0564091	2.482	1 <sup>1</sup> / <sub>2</sub>	0.0047	2.469	0.0699		M	44.0605	44.0793	0.1487	0.1299	11.0151	11.0151	1 <sup>1</sup> / <sub>4</sub>	1 <sup>5</sup> / <sub>8</sub>	1	44.7092	44.7092	1 <sup>1</sup> / <sub>8</sub>



**END ROTATION CALCULATION**  
 $K = ad - (ad \text{ UNDER FULL DEAD LOAD})$   
 $2M = \frac{4(K)(X)}{d}$   
 $m = \frac{2(K)(X)}{d}$

USE FOR  
DETAIL  
DIMENSIONS

A	71:10 <sup>3</sup> / <sub>8</sub>	71:11 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>	3 <sup>8</sup> / <sub>8</sub>	17:11 <sup>5</sup> / <sub>8</sub>	17:11 <sup>3</sup> / <sub>4</sub>	4 <sup>5</sup> / <sub>8</sub>	6 <sup>4</sup> / <sub>8</sub>	4 <sup>5</sup> / <sub>8</sub>	72:6 <sup>3</sup> / <sub>8</sub>	72:6 <sup>3</sup> / <sub>8</sub>
B	69:4 <sup>1</sup> / <sub>2</sub>	69:5 <sup>8</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	17:4 <sup>1</sup> / <sub>8</sub>	17:4 <sup>1</sup> / <sub>8</sub>	4 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>	4 <sup>1</sup> / <sub>8</sub>	70:0 <sup>1</sup> / <sub>8</sub>	70:0 <sup>1</sup> / <sub>8</sub>
C	66:10	66:10 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	7 <sup>8</sup> / <sub>8</sub>	16:8 <sup>1</sup> / <sub>2</sub>	16:8 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>4</sub>	5	3 <sup>3</sup> / <sub>4</sub>	67:5 <sup>3</sup> / <sub>4</sub>	67:5 <sup>3</sup> / <sub>4</sub>
D	64:3 <sup>5</sup> / <sub>8</sub>	64:4 <sup>2</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	1	16:1	16:0 <sup>8</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>	4 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>	64:11 <sup>3</sup> / <sub>8</sub>	64:11 <sup>3</sup> / <sub>8</sub>
E	61:9 <sup>3</sup> / <sub>8</sub>	61:10	1 <sup>3</sup> / <sub>4</sub>	1 <sup>8</sup> / <sub>8</sub>	15:5 <sup>4</sup> / <sub>8</sub>	15:5 <sup>2</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	3 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>	62:5 <sup>8</sup> / <sub>8</sub>	62:5 <sup>8</sup> / <sub>8</sub>
F	59:3	59:3 <sup>1</sup> / <sub>2</sub>	1 <sup>11</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	14:9 <sup>3</sup> / <sub>4</sub>	14:9 <sup>3</sup> / <sub>4</sub>	2 <sup>1</sup> / <sub>2</sub>	3 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>2</sub>	59:10 <sup>1</sup> / <sub>8</sub>	59:10 <sup>1</sup> / <sub>8</sub>
G	56:8 <sup>3</sup> / <sub>4</sub>	56:9 <sup>4</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	1 <sup>4</sup> / <sub>4</sub>	14:2 <sup>7</sup> / <sub>10</sub>	14:2 <sup>7</sup> / <sub>10</sub>	2 <sup>3</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>8</sub>	57:4 <sup>1</sup> / <sub>2</sub>	57:4 <sup>1</sup> / <sub>2</sub>
H	54:2 <sup>4</sup> / <sub>4</sub>	54:2 <sup>3</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	1 <sup>4</sup> / <sub>4</sub>	13:6 <sup>9</sup> / <sub>10</sub>	13:6 <sup>9</sup> / <sub>10</sub>	2 <sup>8</sup> / <sub>8</sub>	2 <sup>3</sup> / <sub>4</sub>	2 <sup>8</sup> / <sub>8</sub>	54:10	54:10
J	51:7 <sup>8</sup> / <sub>8</sub>	51:8 <sup>4</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	12:10 <sup>8</sup> / <sub>8</sub>	12:11	1 <sup>3</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	52:3 <sup>5</sup> / <sub>8</sub>	52:3 <sup>5</sup> / <sub>8</sub>
K	49:1 <sup>1</sup> / <sub>2</sub>	49:1 <sup>7</sup> / <sub>8</sub>	1 <sup>4</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>8</sub>	12:3 <sup>3</sup> / <sub>8</sub>	12:3 <sup>3</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	2 <sup>8</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	49:9 <sup>4</sup> / <sub>4</sub>	49:9 <sup>4</sup> / <sub>4</sub>
L	46:7	46:7 <sup>3</sup> / <sub>8</sub>	1 <sup>7</sup> / <sub>8</sub>	1 <sup>2</sup> / <sub>2</sub>	11:7 <sup>3</sup> / <sub>4</sub>	11:7 <sup>3</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>2</sub>	2	1 <sup>3</sup> / <sub>8</sub>	47:2 <sup>3</sup> / <sub>8</sub>	47:2 <sup>3</sup> / <sub>8</sub>
M	44:0 <sup>3</sup> / <sub>4</sub>	44:1	1 <sup>13</sup> / <sub>10</sub>	1 <sup>9</sup> / <sub>10</sub>	11:0 <sup>7</sup> / <sub>10</sub>	11:0 <sup>7</sup> / <sub>10</sub>	1 <sup>4</sup> / <sub>4</sub>	1 <sup>5</sup> / <sub>8</sub>	1	46:8 <sup>9</sup> / <sub>10</sub>	46:8 <sup>9</sup> / <sub>10</sub>

UNDER  
FULL  
DEAD  
LOAD  
Ad

CITY OF DETROIT  
 CITY ENGINEERING DEPARTMENT  
**APPROVED**  
 FOR COMPLIANCE WITH CONTRACT No. PH 6551  
 THIS APPROVAL SHALL NOT RELIEVE THE CONTRACTOR  
 OF ANY RESPONSIBILITY COVERED BY THE CONTRACT  
 MAR 2 1977 BY

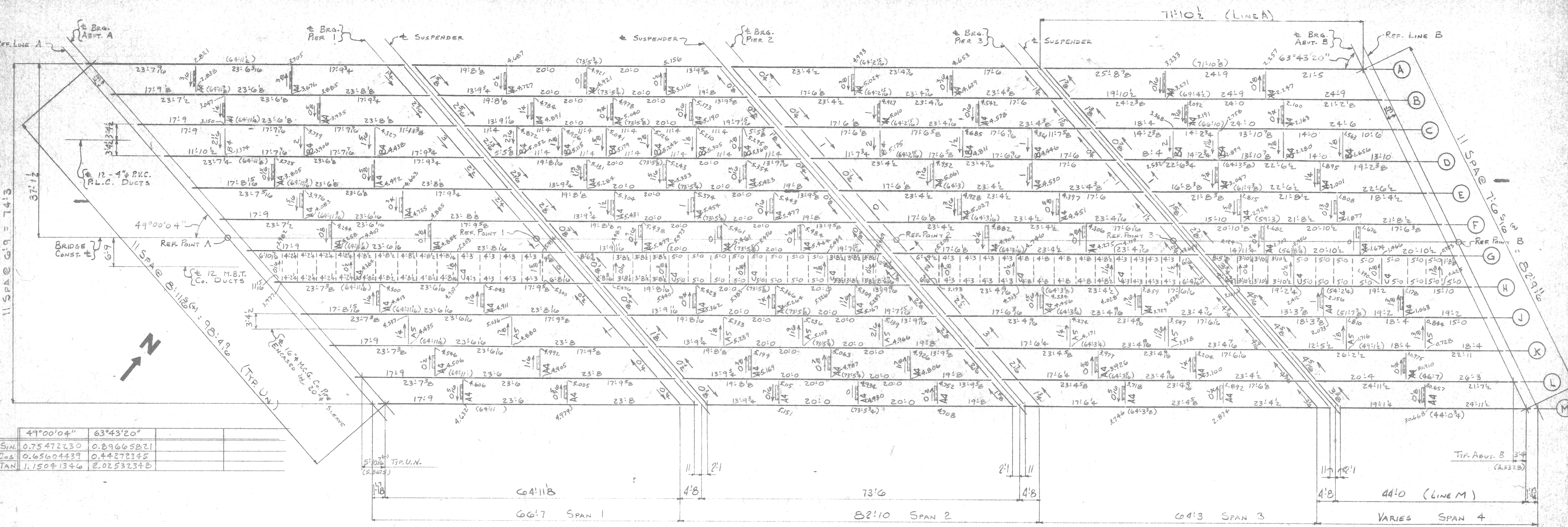
**PHILIP ZWEIG & SONS**  
 2100 E. 5TH AVE. GARY, IND.  
 BUILDING BAGLEY AVE. BRIDGE CROSSING THE P.C.R.R.  
 OWNER CITY OF DETROIT, MICH.  
 LOCATION DETROIT, MICH.  
 CONTRACTOR WALTER TOEBE CONSTRUCTION COMPANY  
 ARCHITECT CITY ENGINEERING DEPT., CITY OF DETROIT, MICH.  
 TITLE SPAN 4 BEAM CALCULATIONS

RIVETS  
 HOLES  
 PAINT

DRAWN RPJ DATE 2.1.77  
 CHKD CdC  
 REV. REV.

CONTRACT 335 SHEET W54 OF 8





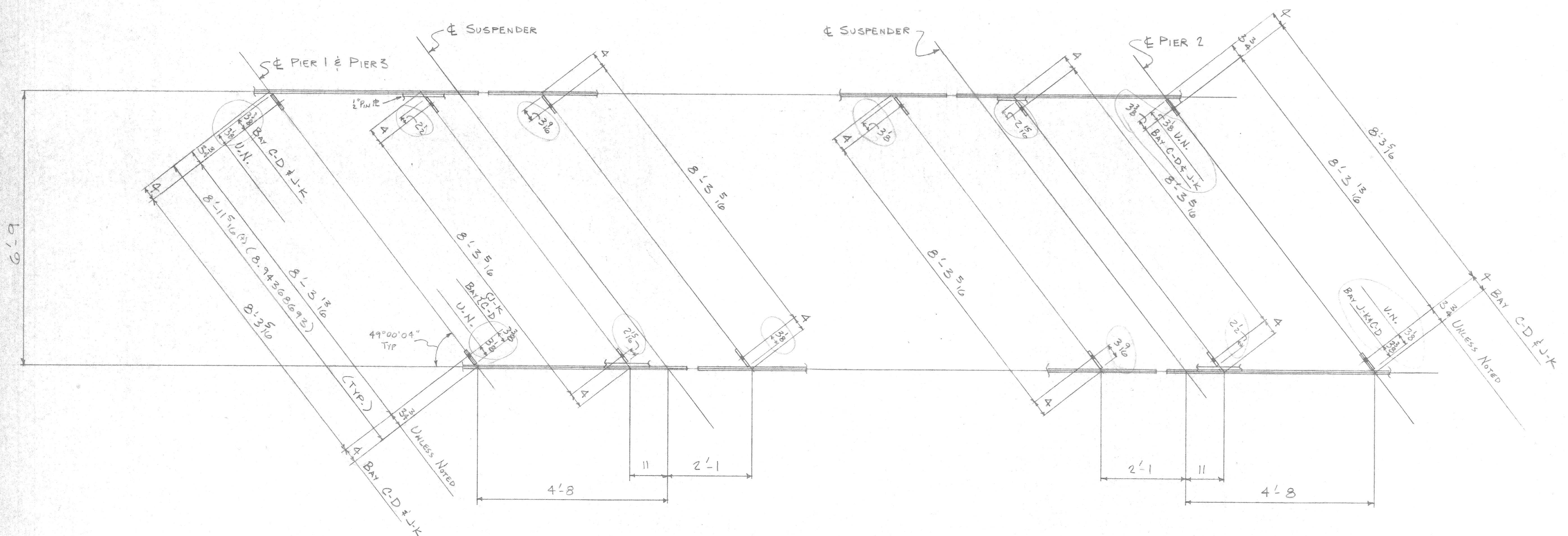
**FRAMING PLAN**

1. DETAIL DIMENSIONS ARE ALONG BOTTOM OF FLANGE.
2. DETAIL DIMENSIONS ARE CORRECTED FOR GRADE AND CAMBER.
3. ARROW POINTS TO HIGHER ELEVATION.

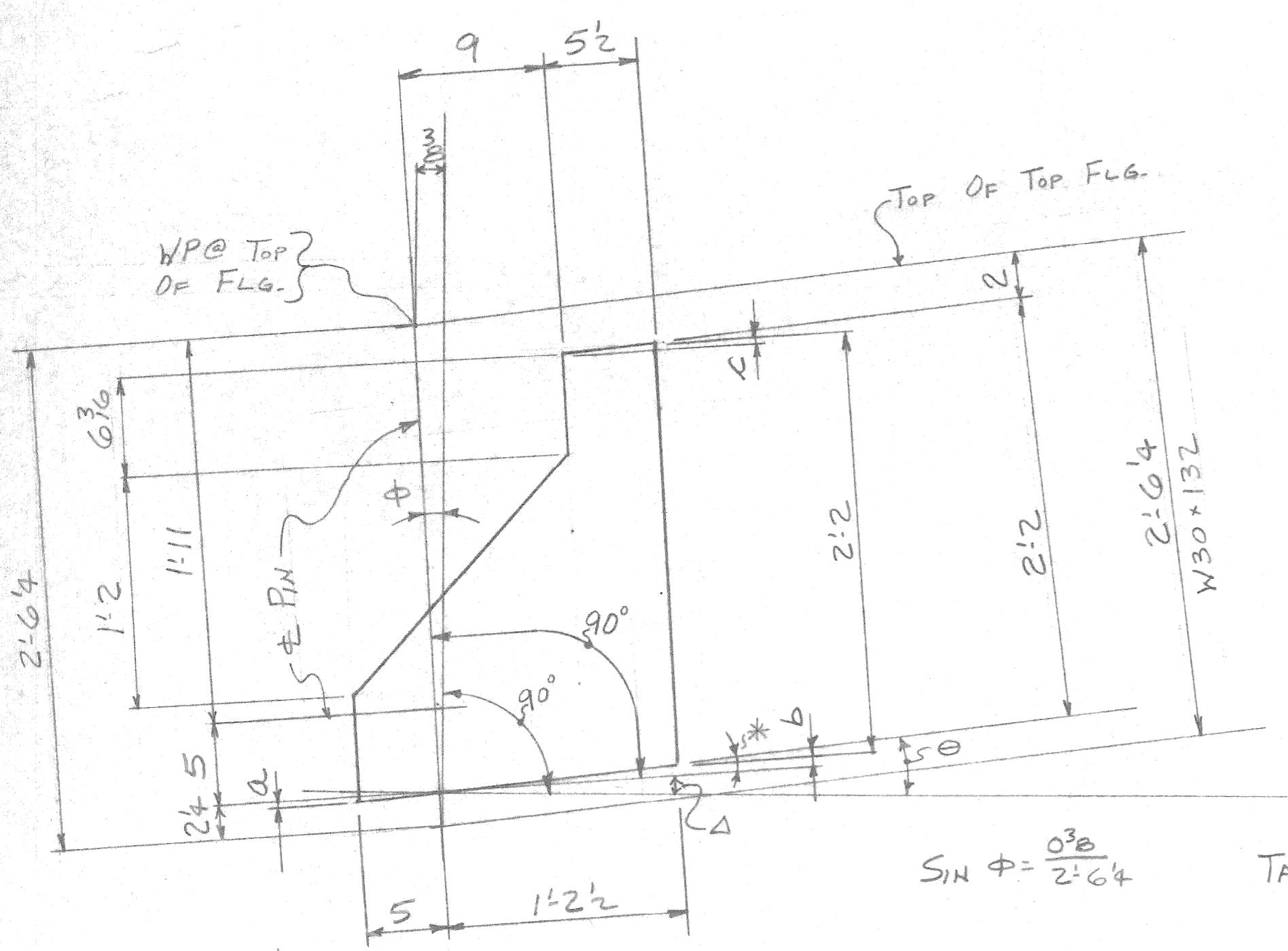
CITY OF DETROIT  
 CITY ENGINEERING DEPARTMENT  
**APPROVED**  
 FOR COMPLIANCE WITH CONTRACT No. PW 6558  
 \*\*\*  
 HIS APPROVAL SHALL NOT RELIEVE THE CONTRACTOR  
 OF HIS RESPONSIBILITY COVERED BY THE CONTRACT  
 MAR 2 1977 BY \_\_\_\_\_

<b>PHILIP ZWIG &amp; SONS</b>	
2100 E. 5TH AVE.	GARY, IND.
BUILDING BAGLEY AVE. BRIDGE CROSSING THE P.C.R.R.	
OWNER CITY OF DETROIT, MICH.	
LOCATION DETROIT, MICH.	
CONTRACTOR WALTER TEEBE CONSTRUCTION COMPANY	
ARCHITECT CITY ENGINEERING DEPT., CITY OF DETROIT, MICH.	
TITLE FRAMING PLAN CALCULATIONS	
RIVETS	DRAWN R.P.J. DATE 2.1.77
HOLES	CHKD. C.D.C.
PAINT	REV. REV.
CONTRACT 335	SHEET W55 OF 8





DIAPHRAGM CALCULATIONS



$$a = (0:5) \tan *$$

$$b = (1:2 1/2) \tan *$$

$$c = (0:5 1/2) \tan *$$

$$\sin \phi = \frac{0:38}{2:64} \quad \tan \theta \cong \frac{ac}{aa} \text{ or } \frac{ae}{ab} \text{ (SEE SH. WS2)}$$

$$90 + \Delta = 90 + \phi \quad \theta = \Delta + *$$

$$\therefore \Delta = \phi \quad \theta - \Delta = *$$

PIN PL SPAN 2

	SIN $\phi$	$\phi \neq \Delta$	TAN $\theta$	$\theta$	*	a	b	c	ac or ae SEE WS2	aa or ab SEE WS2	a	b	c	a	b	c
MAX	0.012417	0.711453	0.021552	1.234615	0.523162	0.0038	0.0110	0.0042	4 <sup>3</sup> 4	18.3702	3/2 <sup>+</sup>	1/8	3/2 <sup>+</sup>	0	0	0
MIN	0.012417	0.711453	0.017577	1.006996	0.295543	0.0021	0.0062	0.0024	3 <sup>7</sup> 8	18.3653	3/2 <sup>-</sup>	1/6	3/2	0	0	0

USE FOR DETAIL DIMENSIONS

CITY OF DETROIT  
CITY ENGINEERING DEPARTMENT  
**APPROVED**  
FOR COMPLIANCE WITH CONTRACT No. PW 6550  
DATE MAR 2 1977 BY

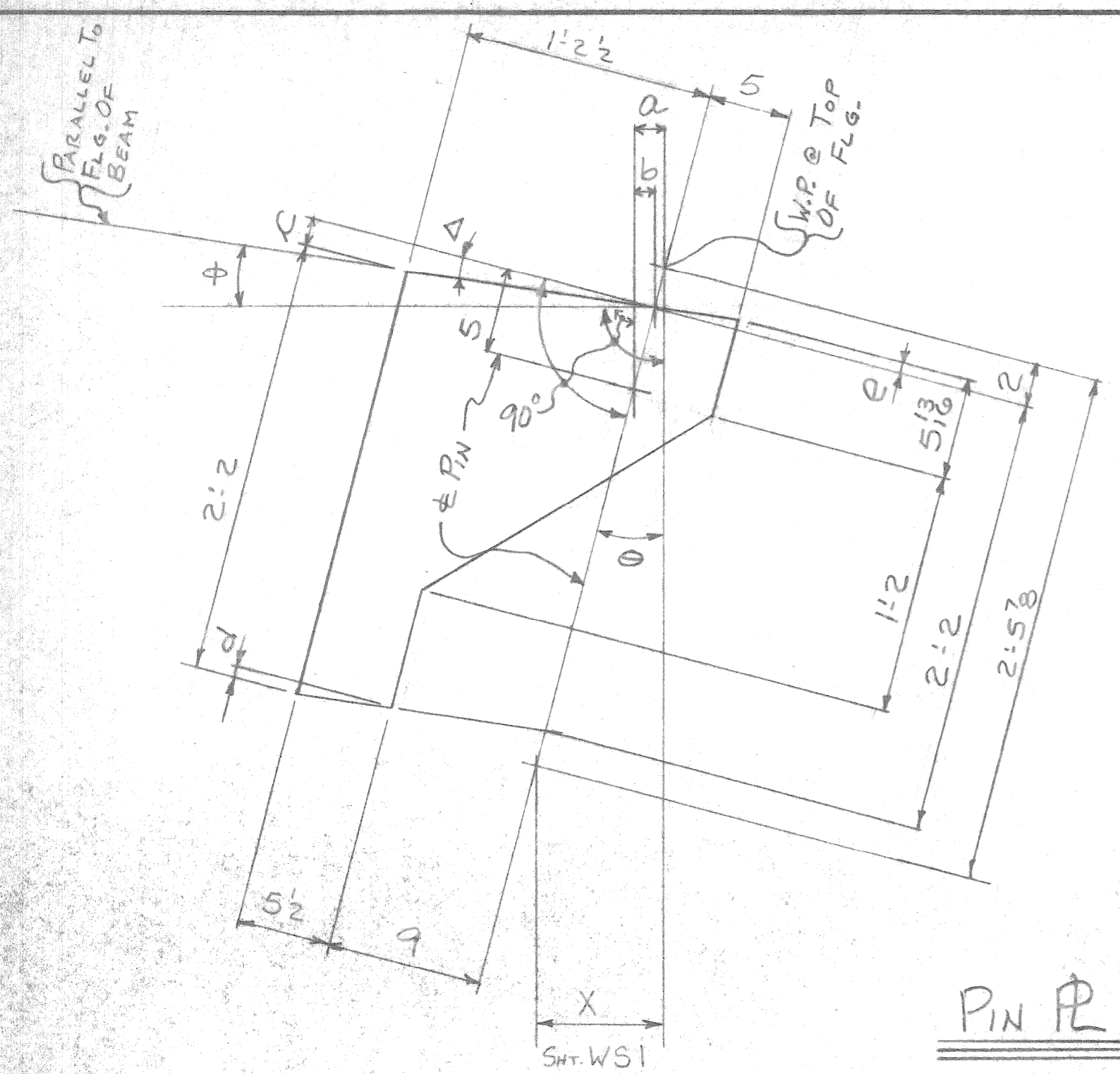
**PHILIP ZWIG & SONS**  
2100 E. 9TH AVE. GARY, IND.

BUILDING BAGLEY AVE. BRIDGE CROSSING THE P.C.R.R.  
OWNER CITY OF DETROIT, MICH.  
LOCATION DETROIT, MICH.  
CONTRACTOR WALTER TOEBE CONSTRUCTION COMPANY  
ARCHITECT CITY ENGINEERING DEPT., CITY OF DETROIT, MICH.  
TITLE SKEWED DIAPHRAGM CALCULATIONS

RIVETS	DRAWN R.F.J. & B.A.J. DATE 2.1.77
HOLES	CHKD. R.F.J. & C.C.
PAINT	REV. REV.

CONTRACT 335 SHEET W56 OF 8





$TAN \phi = \frac{a f (SHT. WSI)}{4.8}$   
 $90^\circ + \theta = 90^\circ + \phi + \Delta$   
 $\therefore \theta = \phi + \Delta$

$SIN \theta = \frac{X}{2.5' \cdot 2}$   
 $c = (1.2') (TAN \Delta)$   
 $d = (0.5') (TAN \Delta)$   
 $e = (0.5') (TAN \theta)$   
 $a = (0.7') (SIN \theta)$   
 $b = (0.5') (SIN \theta)$

PIN R SPAN #1

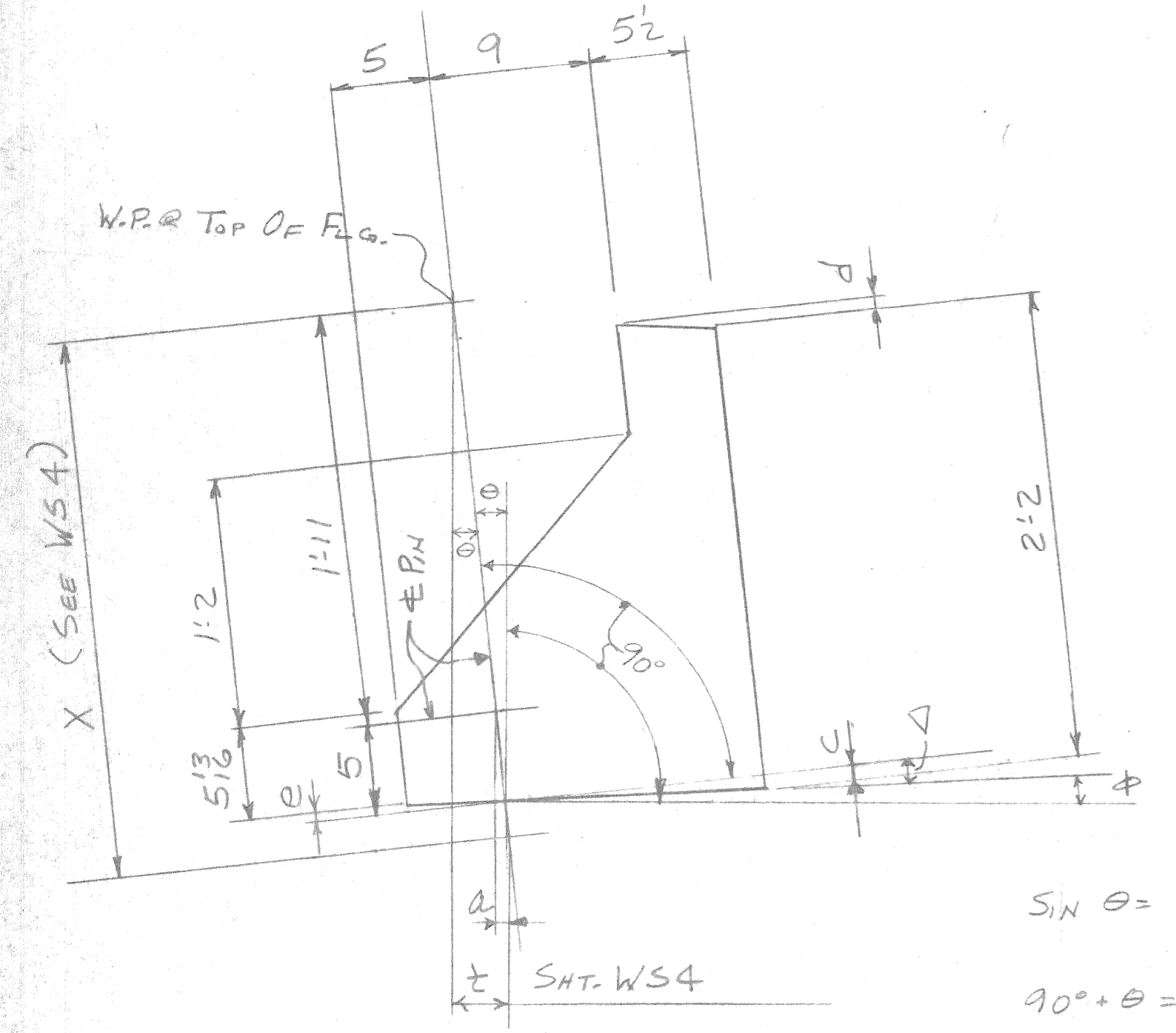
	TAN $\phi$	$\phi$	SIN $\theta$	$\theta$	$\Delta$	a	b	c	d	e	Z~SEE SHT. WSI	X~SEE SHT. WSI	a	b	c	d	e
A	0.020100	1.151485	0.0440231	2.523151	1.371666	0.0257	0.0183	0.0289	0.0110	0.0100	1'8	0.1096	5/16	1/4	3/8	1/8	1/8
B	0.020100	1.151485	0.0433805	2.486293	1.334808	0.0253	0.0181	0.0282	0.0107	0.0100	1'8	0.1080	5/16	1/4	3/8	1/8	1/8
C	0.020100	1.151485	0.0443043	2.539275	1.387790	0.0258	0.0185	0.0293	0.0111	0.0100	1'8	0.1103	5/16	1/4	3/8	1/8	1/8
D	0.020100	1.151485	0.0410909	2.354994	1.203509	0.0240	0.0171	0.0254	0.0096	0.0088	1'8	0.1023	5/16	3/16	5/16	1/8	1/8
E	0.017850	1.022621	0.03691356	2.115463	1.092842	0.0215	0.0154	0.0230	0.0087	0.0079	1	0.0919	1/4	3/16	1/4	1/8	1/8
F	0.017850	1.022621	0.0350257	2.007232	0.984611	0.0204	0.0146	0.0208	0.0079	0.0072	1	0.0872	1/4	3/16	1/4	1/8	1/8
G	0.017850	1.022621	0.0337002	1.931240	0.908619	0.0197	0.0140	0.0192	0.0073	0.0066	1	0.0839	1/4	3/16	1/4	1/8	1/8
H	0.017850	1.022621	0.0314508	1.80229	0.779669	0.0183	0.0131	0.0164	0.0062	0.0057	1	0.0783	1/4	3/16	3/16	1/8	1/8
J	0.017850	1.022621	0.0295630	1.694076	0.671455	0.0172	0.0123	0.0142	0.0054	0.0049	1	0.0736	3/16	1/8	3/16	1/8	1/8
K	0.017850	1.022621	0.026671	1.528308	0.505687	0.0156	0.0111	0.0107	0.0040	0.0037	1	0.0664	3/16	1/8	1/8	1/8	1/8
L	0.020100	1.151485	0.0247028	1.415504	0.264019	0.0144	0.0103	0.0056	0.0021	0.0019	1'8	0.0615	3/16	1/8	1/8	3/8	3/8
M	0.020100	1.151485	0.021208	1.215215	0.06373	0.0124	0.0088	0.0013	0.0005	0.0005	1'8	0.0528	1/8	1/8	0	0*	0*

↑ USE FOR DETAIL DIMENSIONS ↑

	Z~SEE SHT. WSI	X~SEE SHT. WSI	aC~SEE SHT. WSI	aA~SEE SHT. WSI	SIN $\theta$	$\theta$	TAN $\phi$	$\phi$	$\Delta$
A	0.1238	2.510	4'8	17.9765	0.0493227	2.827129	0.0219391	1.228181	1.598948
B	0.1294	2.510	4'8	17.3444	0.0515537	2.955116	0.0198219	1.135562	1.819554
C	0.1415	2.500	3'4	16.7099	0.0566000	3.244666	0.0187014	1.071385	2.173281
D	0.1448	2.490	3'2	16.0751	0.0581526	3.333722	0.018146	1.039575	2.294147
E	0.1379	2.469	2'4	15.4456	0.0558525	3.201774	0.0148391	0.850155	2.351619
F	0.1398	2.469	2'2	14.8140	0.0566221	3.245938	0.014061	0.805579	2.440359
G	0.1440	2.469	2'8	14.1812	0.0583232	3.343564	0.013955	0.799505	2.544059
H	0.1471	2.469	2'8	13.5462	0.0595787	3.415625	0.0130737	0.749022	2.666603
J	0.1461	2.469	1'4	12.9150	0.0591737	3.392380	0.0112891	0.646789	2.745591
K	0.1498	2.469	1'8	12.2818	0.0606723	3.478398	0.0110244	0.631623	2.846775
L	0.1487	2.469	1'2	11.6470	0.0602268	3.452827	0.0107323	0.614887	2.837940
M	0.1487	2.469	1'4	11.0151	0.0602268	3.452827	0.0094597	0.541984	2.910843

	a	c	d	e	a	c	d	e
A	0.0293	0.0337	0.0128	0.0116	3/8	3/8	1/8	1/8
B	0.0306	0.0384	0.0146	0.0132	3/8	7/8	3/16	3/16
C	0.0330	0.0458	0.0174	0.0158	3/8	9/8	3/16	3/16
D	0.0333	0.0484	0.0184	0.0167	3/8	9/8	3/16	3/16
E	0.0308	0.0496	0.0188	0.0171	3/8	5/8	1/4	3/16
F	0.0313	0.0515	0.0195	0.0178	3/8	5/8	1/4	3/16
G	0.0322	0.0537	0.0204	0.0185	3/8	5/8	1/4	1/4
H	0.0329	0.0563	0.0213	0.0194	3/8	11/8	1/4	1/4
J	0.0327	0.0579	0.0220	0.0200	3/8	11/8	1/4	1/4
K	0.0335	0.0601	0.0228	0.0207	3/8	3/4	1/4	1/4
L	0.0333	0.0599	0.0227	0.0207	3/8	3/4	1/4	1/4
M	0.0333	0.0614	0.0233	0.0212	3/8	3/4	1/4	1/4

↑ USE FOR DETAIL DIMENSIONS ↑



$SIN \theta = \frac{X}{11}$   
 $90^\circ + \theta = 90^\circ + \phi + \Delta$   
 $\therefore \theta = \phi + \Delta$   
 $\phi - \theta = \Delta$

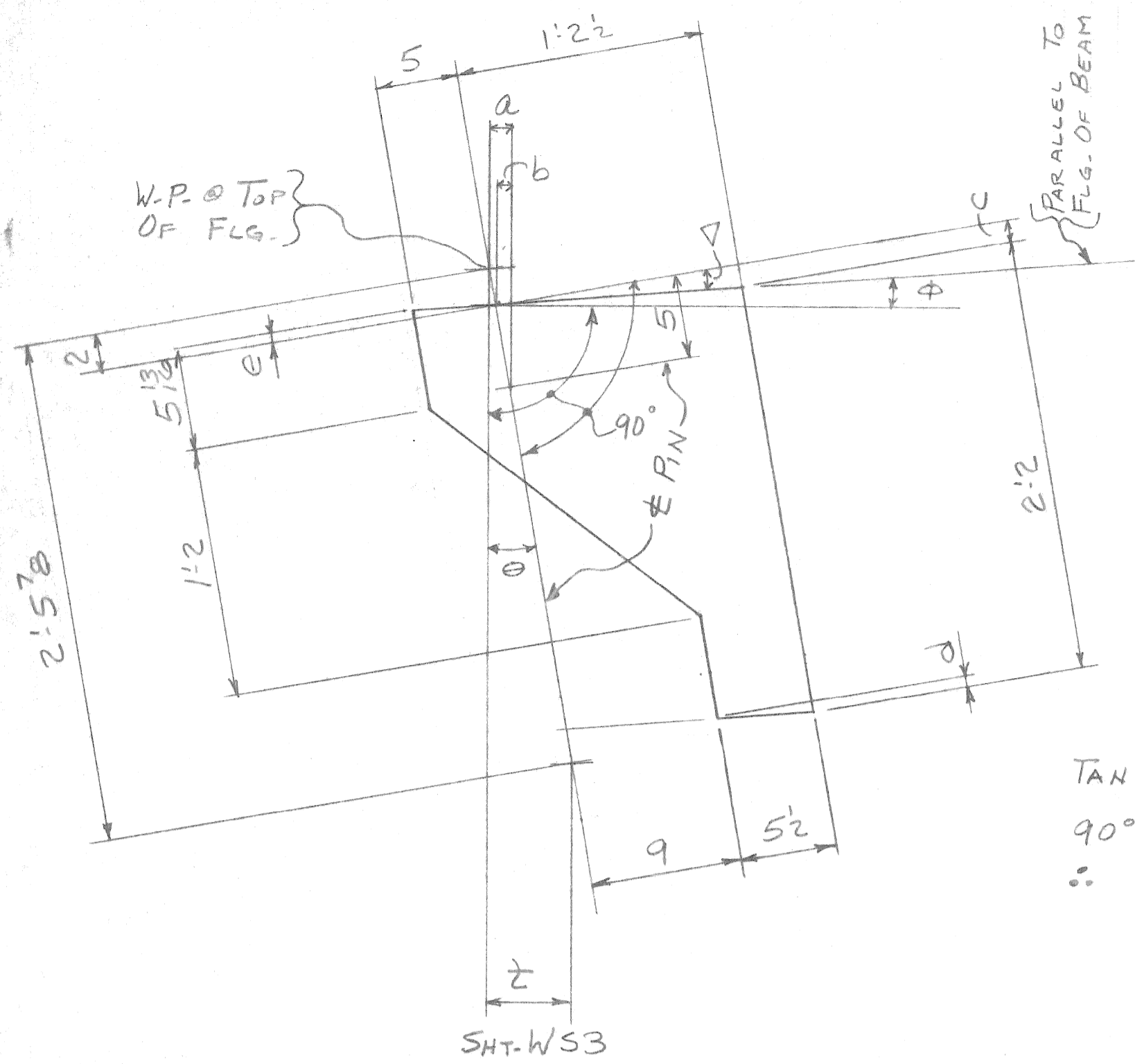
$TAN \phi \cong \frac{aC (SHT. W.S.4)}{aA (SHT. W.S.4)}$   
 $a = [X - (11)] SIN \theta$   
 $c = (1.2') [TAN (\Delta)]$   
 $d = (0.5') [TAN (\Delta)]$   
 $e = (0.5') [TAN (\Delta)]$

PIN R - SPAN #4

CITY OF DETROIT  
 CITY ENGINEERING DEPARTMENT  
**APPROVED**  
 FOR COMPLIANCE WITH CONTRACT NO. PN.6557  
 THIS APPROVAL SHALL NOT RELIEVE THE CONTRACTOR OF ANY RESPONSIBILITY COVERED BY THE CONTRACT  
 DATE: MAR 7 1977 BY:

**PHILIP ZWIG & SONS**  
 2100 E. 5TH AVE. GARY, IND.  
 BUILDING BAGLEY AVE BRIDGE CROSSING THE R.C. R.R.  
 OWNER: CITY OF DETROIT MICH.  
 LOCATION: DETROIT, MICH.  
 CONTRACTOR: WALTER TOEBE CONSTRUCTION CO.  
 ARCHITECT: CITY ENGINEERING DEPT. CITY OF DETROIT MICH.  
 TITLE: PIN R CALCULATIONS  
 RIVETS: \_\_\_\_\_ DRAWN: RPJ DATE: 2-1-78  
 HOLES: \_\_\_\_\_ CHKD: CDC  
 PAINT: \_\_\_\_\_ REV: \_\_\_\_\_  
 CONTRACT: 335 SHEET: W57 of 8





$$\tan \phi = \frac{a \text{ (SHT. WS3)}}{4'-8''}$$

$$90^\circ + \theta = 90^\circ + \phi + \Delta$$

$$\therefore \theta = \phi + \Delta$$

$$\sin \theta = \frac{c}{2'-5''}$$

$$c = (1'-2 \frac{1}{2}'') (\tan \Delta)$$

$$d = (0'-5'') (\tan \Delta)$$

$$e = (0'-5'') (\tan \Delta)$$

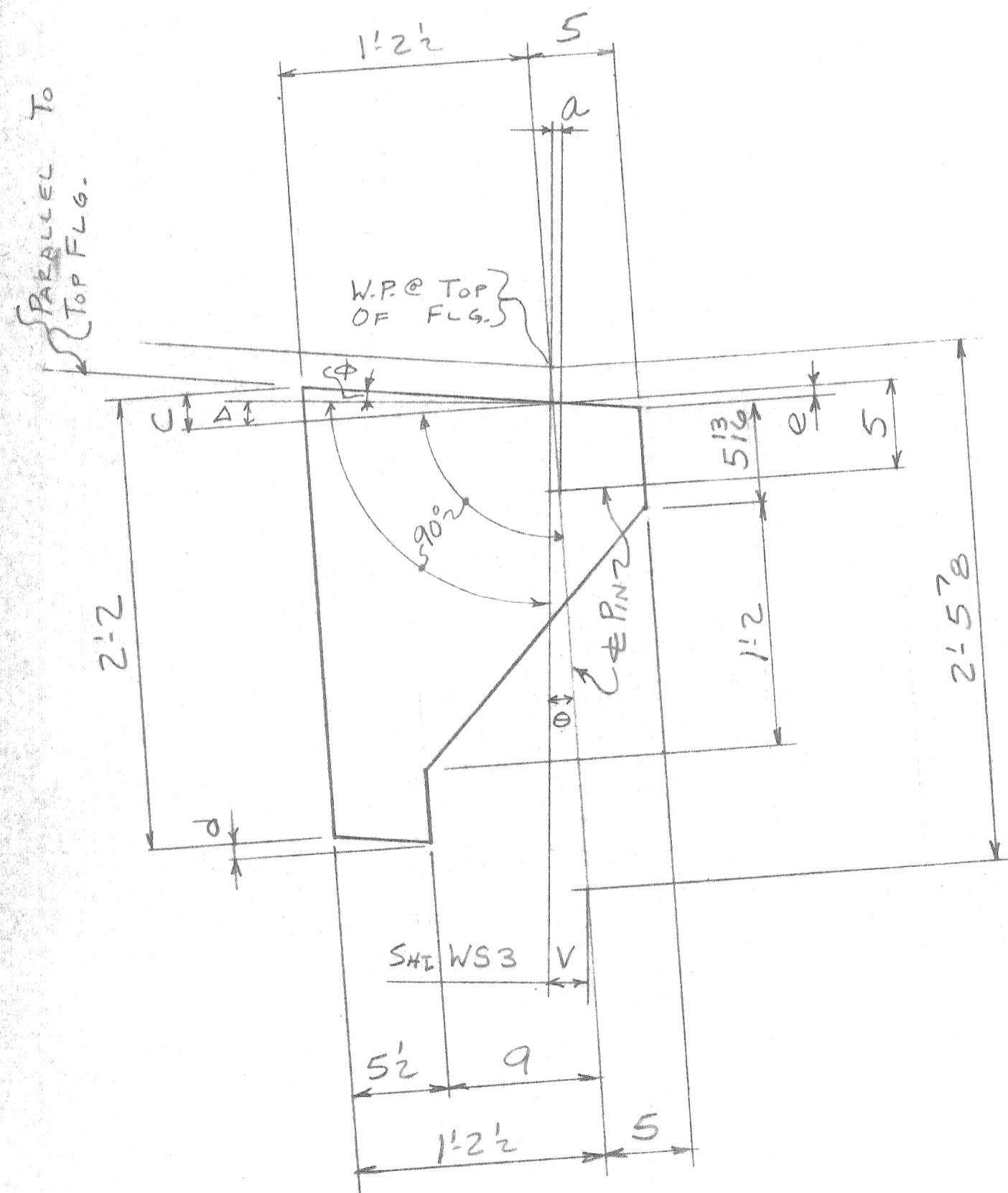
$$a = (0'-7'') (\sin \theta)$$

$$b = (0'-5'') (\sin \theta)$$

PIN A - LEFT END - SPAN 3

Use For Detail Dimensions

	TAN $\phi$	$\phi$	SIN $\theta$	$\theta$	$\Delta$	a	b	c	d	e	a-See SHT. WS3	e-See SHT. WS3	a	b	c	d	e
A	0.0178502	1.022632	0.0191195	1.095524	0.072892	0.0112	0.0080	0.0015	0.0006	0.0005	1	0.0476	1/8	1/8	0	0	0
B		1.022632	0.022373	1.281982	0.259350	0.0131	0.0093	0.0055	0.0021	0.0019	1	0.0557	1/8	1/8	1/16	0	0
C		1.022632	0.026269	1.505280	0.482648	0.0153	0.0109	0.0102	0.0039	0.0035	1	0.0654	3/16	1/8	1/8	1/16	1/16
D		1.022632	0.0292014	1.673346	0.650714	0.0170	0.0122	0.0137	0.0052	0.0047	1	0.0727	3/16	1/8	3/16	1/16	1/16
E	0.0156216	0.894977	0.0285588	1.636516	0.741539	0.0167	0.0119	0.0156	0.0059	0.0054	7/8	0.0711	3/16	1/8	3/16	1/16	1/16
F		0.894977	0.0304868	1.747029	0.852052	0.0178	0.0127	0.0180	0.0068	0.0062	7/8	0.0759	3/16	1/8	3/16	1/16	1/16
G		0.894977	0.033419	1.915117	1.020140	0.0195	0.0139	0.0215	0.0082	0.0074	7/8	0.0832	1/4	3/16	1/4	1/8	1/16
H		0.894977	0.0353672	2.027956	1.132979	0.0206	0.0147	0.0239	0.0091	0.0082	7/8	0.0881	1/4	3/16	1/4	1/8	1/8
J		0.894977	0.0375964	2.154614	1.259637	0.0219	0.0157	0.0266	0.0101	0.0092	7/8	0.0936	1/4	3/16	5/16	1/8	1/8
K		0.894977	0.0396047	2.269767	1.374790	0.0231	0.0165	0.0290	0.0110	0.0100	7/8	0.0986	1/4	3/16	3/8	1/8	1/8
L	0.0178502	1.022632	0.0418541	2.398762	1.376130	0.0244	0.0174	0.0290	0.0110	0.0100	1	0.1042	5/16	3/16	3/8	1/8	1/8
M		1.022632	0.0425369	2.437918	1.415286	0.0248	0.0177	0.0299	0.0113	0.0103	1	0.1059	5/16	3/16	3/8	1/8	1/8



$$\tan \phi = \frac{a \text{ (SHT. WS3)}}{4'-8''}$$

$$90^\circ + \phi + \theta = 90^\circ + \Delta + \phi$$

$$\therefore \theta = \Delta$$

$$c = (1'-2 \frac{1}{2}'') \tan(\phi + \Delta)$$

$$d = (0'-5'') \tan(\phi + \Delta)$$

$$e = (0'-5'') \tan(\phi + \Delta)$$

$$a = (0'-7'') \sin \theta$$

$$\sin \theta = \frac{c}{2'-5''}$$

PIN A - RIGHT END - SPAN 3

Use For Detail Dimensions

	TAN $\phi$	$\phi$	SIN $\theta$	$\theta \neq \Delta$	$\phi + \Delta$	a	c	d	e	a-See SHT. WS3	e-See SHT. WS3	a	c	d	e
A	0.0178502	1.022632	0.0099614	0.570746	1.593378	0.0058	0.0336	0.0127	0.0116	1	0.0248	1/16	3/8	1/8	1/8
B		1.022632	0.0106442	0.609873	1.632505	0.0062	0.0344	0.0131	0.0119	1	0.0265	1/16	7/16	1/8	1/8
C		1.022632	0.0106442	0.609873	1.632505	0.0062	0.0344	0.0131	0.0119	1	0.0266	1/16	7/16	1/8	1/8
D		1.022632	0.0123312	0.706537	1.729169	0.0072	0.0365	0.0138	0.0126	1	0.0307	1/16	7/16	3/16	1/8
E	0.0156216	0.894977	0.016830	0.964328	1.859305	0.0098	0.0392	0.0149	0.0135	7/8	0.0419	1/8	1/2	3/16	3/16
F		0.894977	0.018758	1.074812	1.969789	0.0109	0.0416	0.0158	0.0143	7/8	0.0467	1/8	1/2	3/16	3/16
G		0.894977	0.0204048	1.169183	2.064160	0.0119	0.0435	0.0165	0.0150	7/8	0.0508	1/8	1/2	3/16	3/16
H	0.0178502	1.022632	0.022373	1.281982	2.304614	0.0131	0.0486	0.0184	0.0168	1	0.0557	3/16	9/16	1/4	3/16
J		1.022632	0.0245822	1.408594	2.431226	0.0143	0.0513	0.0195	0.0177	1	0.0612	3/16	5/8	1/4	3/16
K		1.022632	0.0265906	1.523707	2.546339	0.0155	0.0537	0.0204	0.0185	1	0.0662	3/16	5/8	1/4	1/4
L		1.022632	0.0288399	1.652628	2.675260	0.0168	0.0565	0.0214	0.0195	1	0.0718	3/16	11/16	1/4	1/4
M		1.022632	0.0320935	1.839132	2.861764	0.0187	0.0604	0.0229	0.0208	1	0.0799	3/16	3/4	1/4	1/4

CITY OF DETROIT  
ENGINEERING DEPARTMENT  
**APPROVED**  
FOR COMPLIANCE WITH CONTRACT No. PW 6552  
DATE MAR. 2, 1977 BY

**PHILIP ZWIG & SONS**  
2100 E. 8TH AVE. GARY, IND.  
BUILDING BAGLEY AVE. BRIDGE CROSSING THE P.C.R.R.  
OWNER CITY OF DETROIT, MICH.  
LOCATION DETROIT, MICH.  
CONTRACTOR WALTER TOEBE CONSTRUCTION COMPANY  
ARCHITECT CITY ENGINEERING DEPT. CITY OF DETROIT, MICH.  
TITLE PIN R CALCULATIONS SPAN 3  
RIVETS NONE DRAWN RPJ DATE 2.1.77  
HOLES 1/8 & U.N. CHKD CDC  
PAINT NONE REV. REV.  
CONTRACT 335 SHEET WS8 OF 8