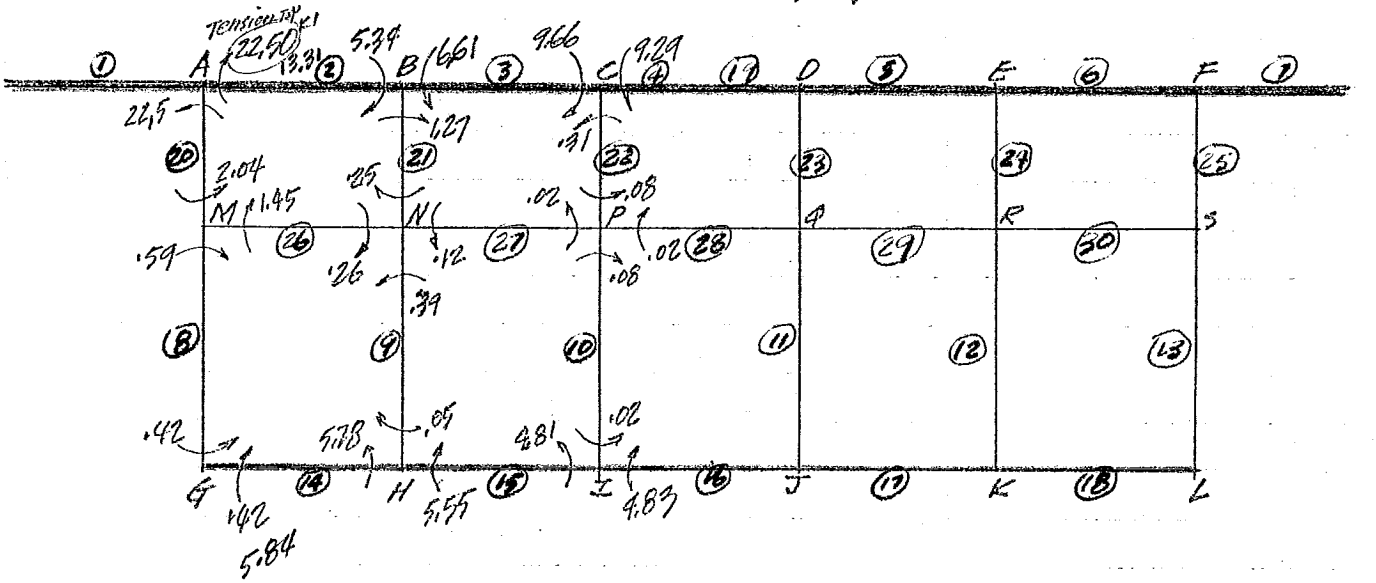
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Project..... Sheet No. 227 of..... sheets

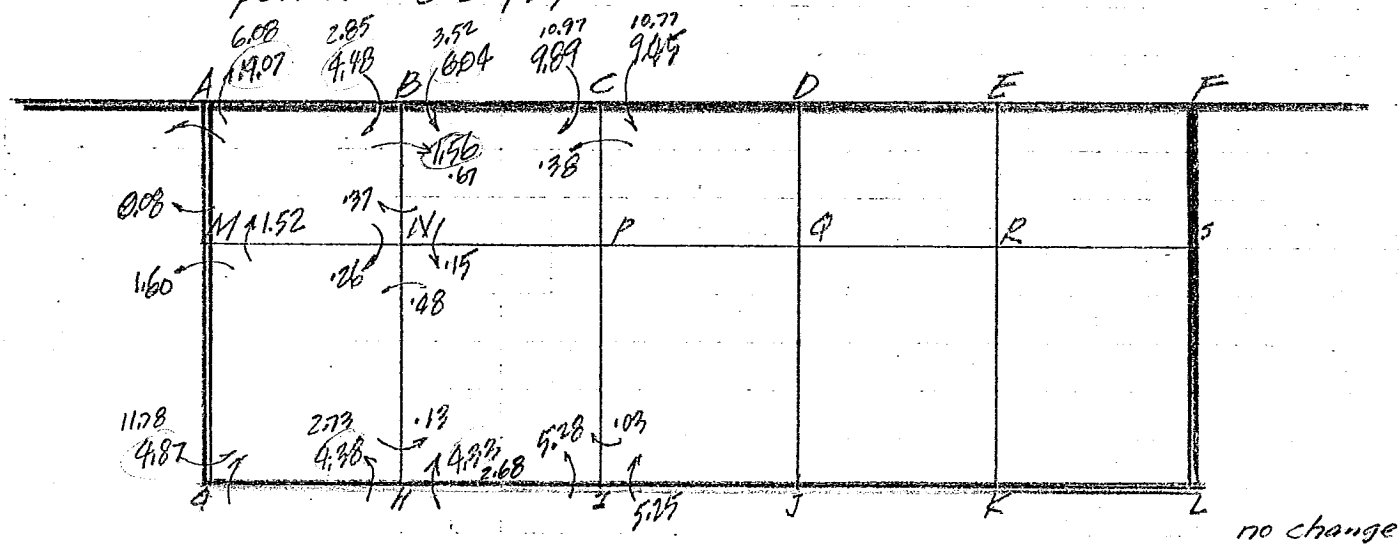
S.R..... Made by..... Check by..... Date..... Supv.....

Transition slab —— Secondary Moment.

Case A. side Wall segment precast & prestressed prior to Fixing into pontoon structure and applying Transv. P/s.



Case B. Entire pontoon structure cast-in-place, then transv. and vert. P/s apply. (Here assuming cantilever slab would be possible c-i-p.)



no change much
= Increasing.
decreasing

Comparing to std. section

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DOT FORM 232-007A
REVISED 9/81 -615-

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Project ..... Sheet No. 228 of ..... sheets

S.R. ..... Made by ..... Check by ..... Date 6/83 Supv. YFC/RTS

(M) $K_{MA} = \frac{4EI_7}{6.8} = .588 EI_7$ .787

$K_{MG} = \frac{4EI_3}{24} = .061 EI_7$ .081

$K_{MN} = \frac{4EI_6}{14.83} = .098 EI_7$ .132

(N) $K_{NB} = \frac{4EI_5}{6.2} = .645 EI_5$ .271

$K_{NH} = \frac{4EI_5}{24.3} = .165 EI_5$ .069

$K_{NM} = \frac{4EI_6}{14.83} = .786 EI_5$ .330

$K_{NP} = \frac{4EI_6}{14.83} = .786 EI_5$ .330

(P) = (N)

(G) $K_{GM} = \frac{11.808 EI_3}{24} = .492 EI_3$ .348

$K_{GH} = \frac{13.660 EI_4}{14.83} = .921 EI_3$ .652

(H) $K_{HG} = \frac{8.221 EI_4}{14.83} = .554 EI_4$ .522

$K_{HI} = \frac{6.682 EI_4}{14.83} = .450 EI_4$ .425

$K_{HN} = \frac{4 EI_5}{24.3} = .056 EI_4$ .053

(I) $K_{IH} = \frac{6.682 EI_4}{14.83} = .451 EI_4$ .471

$K_{IJ} =$ " $= .451 EI_4$ .471

$K_{IP} = .056 EI_4$ .058

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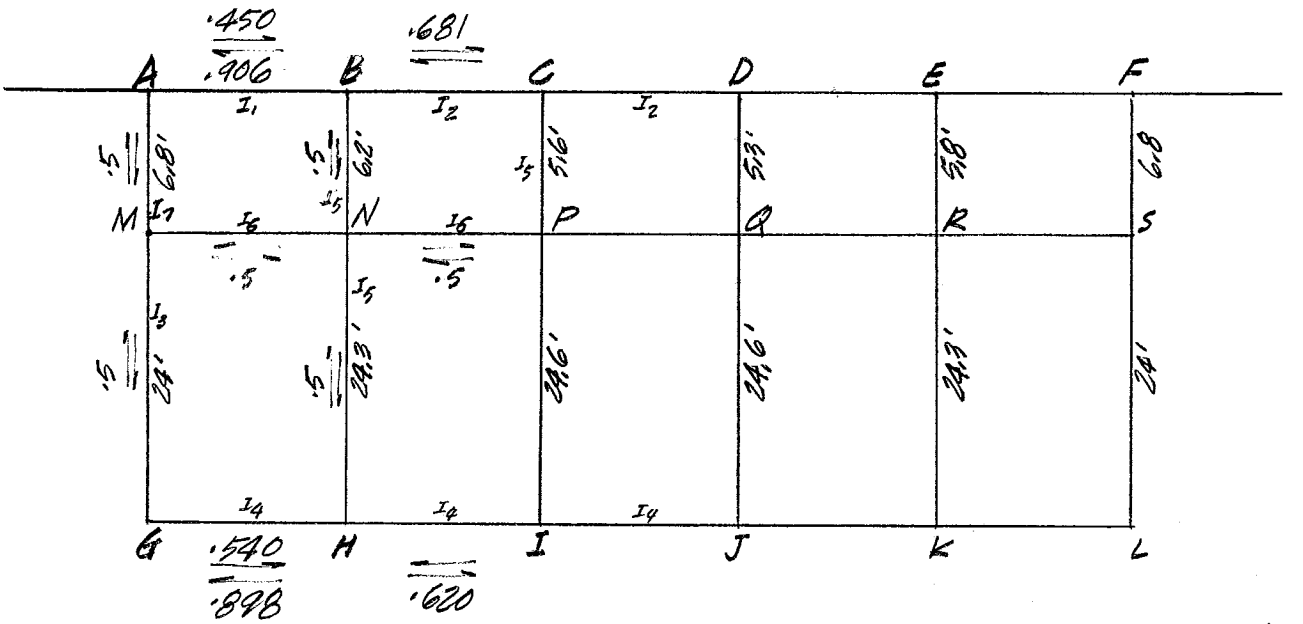
Project..... Sheet No. 229 of..... sheets

S.R..... Made by..... Check by..... Date 6/83 Supv. YFC/RTS

Secondary Moment. — Moment distribution



Stiffness Factor

		Distr. Factor.
(A)	$K_{AB} = \frac{14.464\,EI_1}{14.83} = .975\,EI_1$	.511
	$K_{AM} = \frac{4\,EI_7}{6.8} = .934\,EI_1$	.489
(B)	$K_{BA} = \frac{7.1922\,EI_1}{14.83} = .485\,EI_1$	.560
	$K_{BC} = \frac{8.8754\,EI_2}{14.83} = .253\,EI_1$	.292
	$K_{BN} = \frac{4\,EI_5}{6.2} = .128\,EI_1$	.148
(C)	$K_{BC} = \frac{8.8754\,EI_2}{14.83} = .599\,EI_2$	.391
	$K_{CD} = .599\,EI_2$	.391
	$K_{CP} = \frac{4EI_5}{5.6} = .336\,EI_2$	.218

$I_1 = (12)^3 = 1728$ in.4
$I_2 = (9)^3 = 729$
$I_3 = (10)^3 = 1000$
$I_4 = I_6 = 1000$
$I_5 = (7)^3 = 343$
$I_7 = (14)^3 = 2744$

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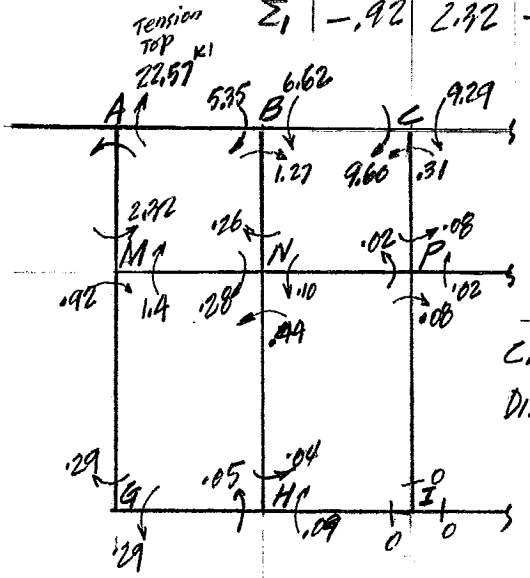
Project ..... Sheet No. 230 of ..... sheets

S.R. ..... Made by ..... Check by ..... Date 6/83 Supv. .....

P.T. Rdwy slab - secondary Moments

	(A) AM .489	AB .511	.45 / .906	(B) BN .148	BA .560	BC .292	.681	(C) CP .218	CB .391	CD .391
FEM.		-42.62			-11.18	-2.03			8.75	-8.75	8.75
Distr.	20.84	21.78			1.36	.36	.71		—	—
C.O.		1.23			9.80				.48	
	-.60	-.63			-5.49	-1.45	-2.86		-.19	-.10	-.19
		-4.97			-.28		-.13		-1.95		
	2.43	2.54			.23	.06	.12		.76	.43	.76
		.21			1.14	1.66	.52		.08		
	-.10	-.11			-.93	-.24	-.49		-.03	-.02	-.03
Σ_1	22.57	-22.57			-5.35	-1.27	6.62		-9.60	.31	9.29

	(M) MG .081	MA .787	MN .132	.5	NM .33	(N) NB .271	NH .069	NP .33	.5	PN .33	(P) PC .271	PI .069	PQ .33
C.O.		22.57(.5)= 11.29				-1.27(.5)= -.64					.31(.5)= .15		
Distr.	-.91	-8.89	-1.49		.21	.17	.05	.21		-.05	-.04	-.01	-.05
			.10		-.75	-.78		-.03		.10			
	-.01	-.08	-.01		.26	.21	.05	.26		-.03	-.03	-.01	-.03
Σ_1	-.92	2.32	-1.40		-.28	-.26	.10	.44		.06	.08	-.02	-.08



	(G) GM .348	GH .652	.540 / .898	(H) HN .053	HG .522	HI .425	.620	(I) IP .058	IH .471	IJ .471
C.O	-.92(.5)= -.46			.10(.5)= .05						
Distr.	.16	.30			-.03	0	-.02			
		-.02			.16					
	.01	.01			-.08	-.01	-.07			
	-.29	.29			.05	.04	-.09			

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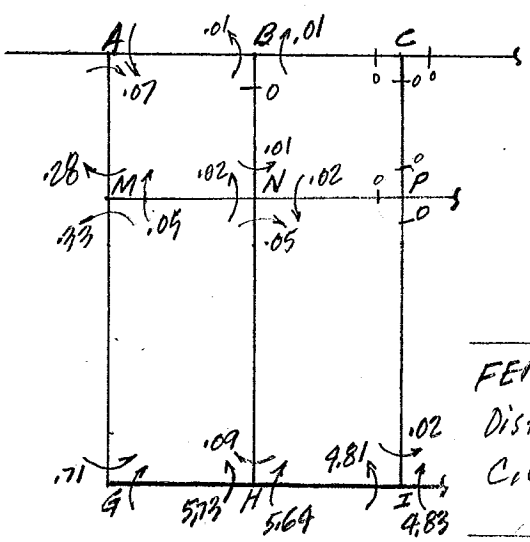
Project ..... Sheet No. 231 of ..... sheets

S.R. ..... Made by ..... Check by ..... Date 6/8/ ..... Supv. .....

P.T. Bot. Slab – Secondary Moment

	(A) AM .489	AB .511	.45 / .906	(B) BA .560	BN .148	BC .292	.681	CB .391	(C) CP .218	CD .391
C.O.	-.28(.5)= -.14			.03	.01(.5)=0					
Distr.	.07	.07		-.02	0	-.01				
Σ_1	-.07	.07		.01	0	-.01				

	(M) MB .081	MA .787	MN .132	.5	NM .33	(N) NB .271	NH .069	NP .33	.5	PN .33	P PC .271	PI .069	PQ .33
C.O.	.71(.5)= .36						-.09(.5)= -.05					.02(.5)= .01	
Distr.	-.03	-.28	-.05		.02	.01	0	.02					
Σ_1	.33	-.28	-.05		.02	.01	-.05	.02					



	(G) GM .348	GH .652	.540 / .898	(H) HG .522	HN .053	HI .425	.620	IH .471	(I) IP .052	IJ .471
FEM		-1.56		6.03	.07	-4.96		4.96	0	-4.96
Distr.	.54	1.02		-.56	-.06	-.45				
C.O.		-.50		.55				-.28		
	.17	.33		-.29	-.03	-.23		.13	.02	.13
Σ_1	.71	-.71		5.73	-.09	-5.64		4.81	.02	-4.83

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DOT FORM 232-007A
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WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

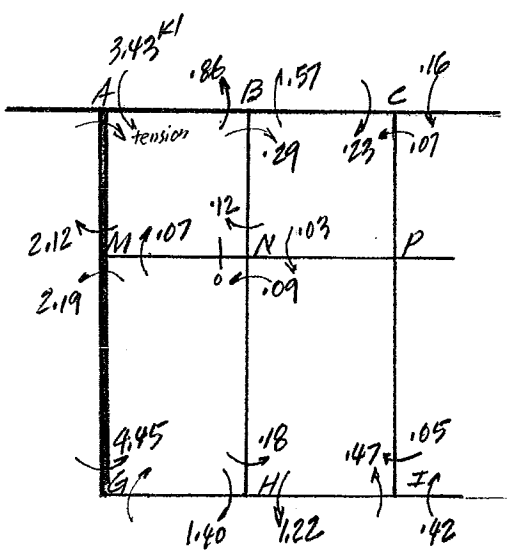
Project..... Sheet No. ~~214~~ 232 of..... sheets

S.R..... Made by..... Check by..... Date..... Supv.....

~~P.T. Vertical ext. wall~~ — Secondary Moments.

	(A) AM .487	AB .511	BA .560	(B) BN .148	BC .292	CB .391	(C) CP .218	CD .391
		.45 ⇌ .906			.681 ⇌			
FEM	-7.67							
Distr.	3.75	3.92						
C.O.		-.90	1.76			-.35		
	.44	.46	-.99	-.26	-.51	.14	.07	.14
		-.11	.21			-.04		
	.05	.06	-.12	-.03	-.06	.02	0	.02
Σ	-3.43	3.43	.86	-.29	-.57	-.23	.07	.16

	(M) MG .081	MA .787	MN .132	NM .33	(N) NB .271	NH .069	NP .33	DN .33	(P) PC .271	PI .069	PQ .33
			.5 ⇌			.5 ⇌					
C.O.	4.45(.5)= 2.23	-3.43(.5)= -1.72			-.29(.5)= -.15	.18(.5)= .09			.07(.5)= .04	-.05(.5)= -.03	
Distr.	-.04	-.40	-.07	.02	.02	0	.02				
				-.03							
				.01	.01		.01				
Σ	2.19	-2.12	-.07	0	-.12	.09	.03				



	(G) GM .348	GH .652	HG .522	(H) HN .053	HI .425	IH .471	(I) IP .058	IJ .471
		.540 ⇌ .898			.620 ⇌			
FEM	7.67							
Distr.	-2.67	-5.00						
C.O.		1.27	-2.7			.71		
	-.44	-.83	1.41	.14	1.15	-.34	-.03	-.34
		.31	-.45	.66	-.21	.18		
	-.11	-.20	.34	.04	.28	-.08	-.02	-.08
Σ	4.45	-4.45	-1.40	.18	1.22	.47	-.05	-.42

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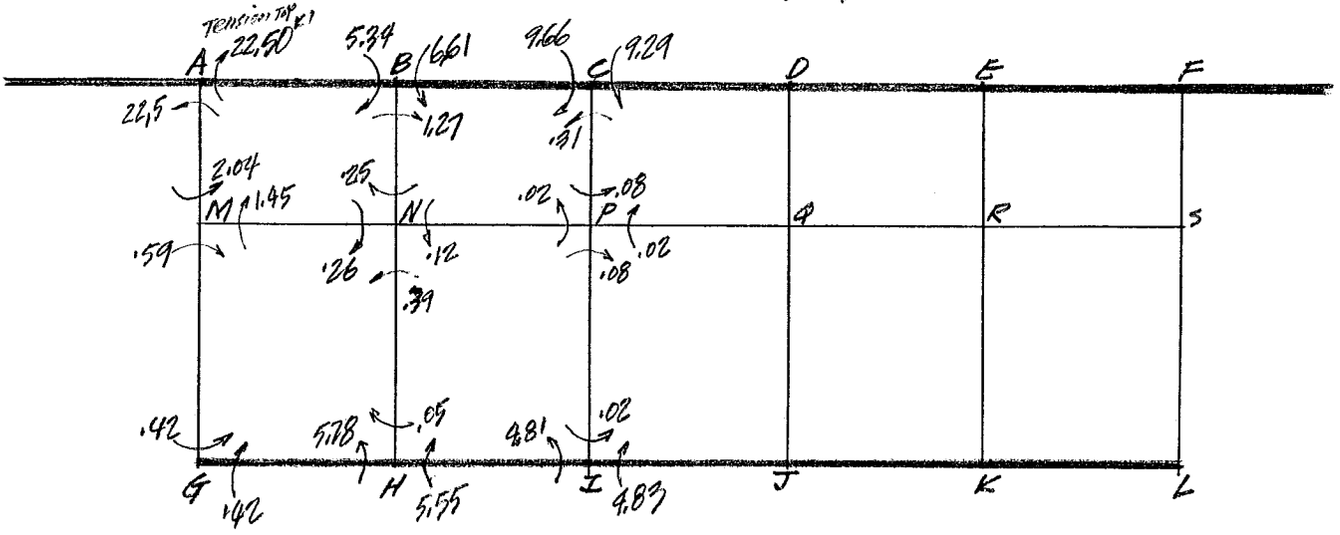
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Project..... Sheet No. 233 of..... sheets

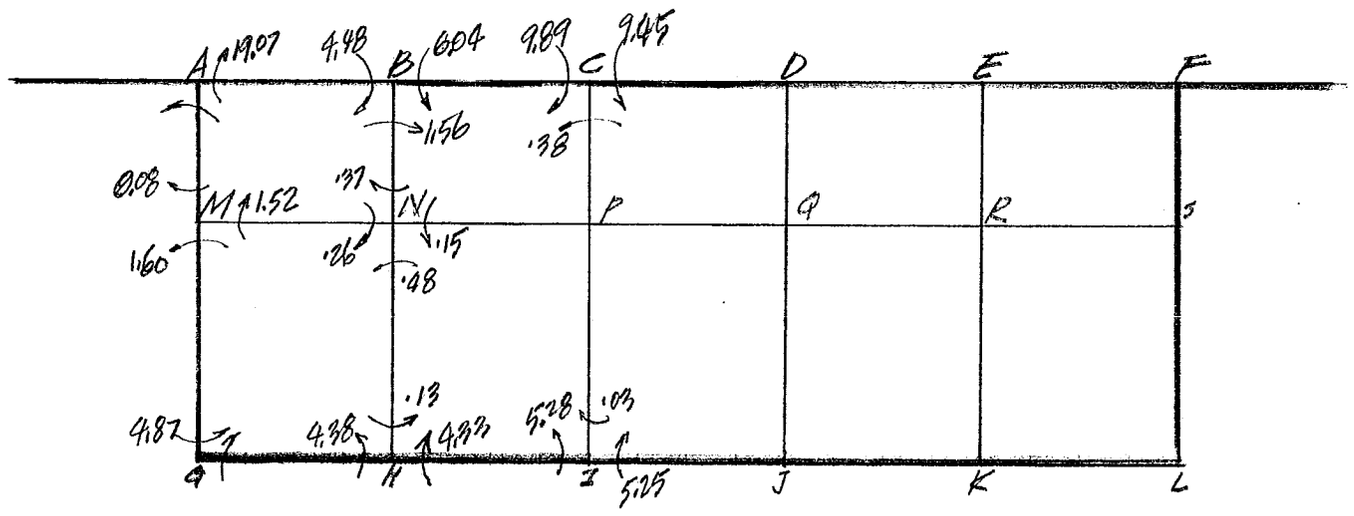
S.R..... Made by..... Check by..... Date..... Supv.....

Transition slab —— Secondary Moment.

Case A. side Wall segment precast & prestressed prior to Fixing into pontoon structure and applying Transv. P/s.



Case B. Entire pontoon structure cast-in-place, then transv. and vert. P/s apply. (Here assuming cantilever slab would be possible c-i-p.)



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DOT FORM 232-007A
REVISED 9/81 -615-

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Project..... Sheet No. 234 of..... sheets

S.R..... Made by..... Check by..... Date..... Supv.....

Rdwy slab (Ext cell) member 2

Moments @ Face of support — btwn. $OL_2 \rightarrow .1L_2$ 21" Fillet 21'-5" = 1.33' from OL_2

-M tension top.

$-M_{DL} = 10.19 - (10.19 - 7.52)\frac{1.33}{14.83} = 7.80^{k'/'}$ of transv. slab.

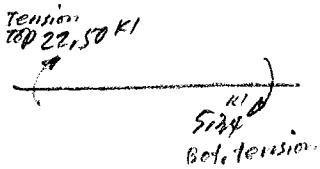
$-M_{LL2} = 19.83 - (19.83 - 14.26)$ " $= 14.84^{k'/'}$

$+M_H = .59 - (.59 - .52)$ " $= .53^{k'/'}$

$-M_{NW} = 30\%[1.92 - (1.92 - 1.58)$ "$] = (1.62^{k'/'})\,.3 = .49$

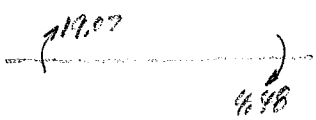
$\pm M_T = 58.96 - (58.96 - 50.42)$ " $= 51.30$ @ $\frac{1}{2}$ $n=16$ $= 25.60^{k'}$

M_S: case A



$-M_S = 22.50 - (22.50 + 5.34)\frac{1.33}{14.83} = 20.0^{k'}$

case B



$-M_S = 19.07 - (19.07 + 4.48)$ " $= 16.95$

$t = 21"$ $e = 7.4"$ $M_{pe} = 47.06^{k'}$

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DOT FORM 232-007A REVISED 9/81 -615-

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
BRIDGE & STRUCTURES BRANCH

Project 3rd Lake Wash. Floating Bridge - Stage II Sheet No. 235 of ___ sheets
S. R. 90 Made by YMT. Check by ___ Date ___ Supv. YFC/RTS

Transverse Design — pontoon D near Wall 5
Section at Rdwy Slab — Ext. cell Face of support
$t = 21''$ $e = 7.4''$ $M_{pe} = 47^{kl}$
$A = 21(12) = 252$ $S = 882$

Group S①: $D + H + (L + I) + M_{P/S}$ 100%

	Case A	Case B	Case C
M_D	-7.8		
M_H	.53		
M_L	-14.84		
M_{pe}	47.06		
M_{2nd}	-20.		
	4.95		

Group S③: S① + .3 Wave 125%

	Case A	Case B	Case C
S①	4.95		
.3W	.49		
	5.44		

Group S④: S① + T 125%

	Case A	Case B	Case C
S①	4.95		
T	25.6		
	30.55 kl		

Group S⑥: S③ + T 140%

	Case A	Case B	Case C
S③	5.44		
T	25.6		
	31.04		

$f = -\frac{76.27}{252} \pm \frac{31.04(12)}{882} = -.303 \pm .422 = -.725$ ksi Max < 2.0 ksi
$= .119$ ksi Min. 0 ksi $\sqrt{f'c} = .232$ ksi
temp. Fall
tension I.F.

Flood Damage

Group S⑦: S① + DM

	Case A	Case B	Case C
S①			
DM			

Group S⑨: S③ + DM

	Case A	Case B	Case C
S③			
DM			

$f = \quad \pm \quad = \quad \pm \quad =$ ksi Max < 2.0 ksi
$=$ ksi Min. +.212 ksi

33003381

Form 232-007

2

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Project..... Sheet No. 236 of..... sheets

S.R..... Made by..... Check by..... Date..... Supv.....

Vert. Ext. Wall Member 20.

Moments @ face of support. 21" thick. 16.5" to face of support.

$\frac{16.5/12}{6.8} \doteq .2$ of member 20

$-M_{DL} = 10.80^{k'}$ tension I.F.

$-M_{L+I} = 15.80$ "

$+M_{L+I} = 7.74$

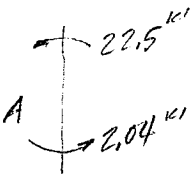
$M_H = .11 \pm 0$ small

$M_{NW} = 30\%(3.16) = .95^{k'}$

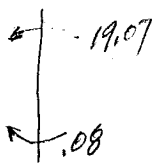
$\pm M_T = 40.64^{k'}$ @ $\frac{1}{2} = 20.32^{k'}$] BDM Vol. 2 P. 5-240

M_S

case A



$M_S = 22.5 - (20.5 + 2.04).2 = 18.41^{k'}$



$M_S = 19.07 - (19.07 - .08).2 = 15.27^{k'}$

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DOT FORM 232-007A REVISED 9/81 -615-

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Project..... Sheet No. 237 of..... sheets

S.R..... Made by..... Check by..... Date..... Supv.....

Transition slab

Moments @ approx. Face of support $\cdot 1 L_{20}$ "STRUDL" output

① Allow. Tension $3\sqrt{f'c} = 3\sqrt{6000} = 232.4^{psi} = .232^{ksi}$

② BDM Vol. 2. P. 5-240, Ec For T&S Moments $n = 16$. STRUDL input Ec @ $n = 8$, Adjust the T&S Moments by times $\frac{1}{2}$. for design.

$M_{DL} = .17^{k'}$ tension Bot.

$-M_{LT1} = .56$

$M_{LT2} = .60$

$-M_H = 1.24$

$-M_{NW} = 30\%(5.38) = 1.61$

$\pm M_T = -17.52(\frac{1}{2}) = -8.76^{k'}$

slab thickness $t = 9''$ $e = 0$ $A = 12(9) = 108^{in^2}$ $S = \frac{12}{6}(9)^2 = 162^{in^3}$

Group. S① $M_b + M_H + M_L + M_{pe} + M_{2nd}$

$.17^{k'} - 1.24 - .56 + 0 - 1.52 = -3.15^{k'}$ tension top.

S③ $-3.15 - 1.61 = -4.76^{k'}$

S④ $-3.15 - 8.76 = -11.91^{k'}$

S⑥ $-4.76 - 8.76 = -13.52$

$\frac{P}{A} \pm \frac{M}{S} = 3\sqrt{f'c}$ $\frac{P}{108^{in^2}} \pm \frac{13.52^{k'}(12)}{162} = .232^{ksi}$ $P = 83.^{k/'}$

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DOT FORM 232-007A REVISED 9/81 -615-

/

.3 L26

$M_{DL} = 1.56$ Tension Bot.

$-M_{L+I} = .34$

$M_{L+I} = .66$

$-M_H = .85$

$-M_{NW} = .30\%(3.60) = 1.08$

$\pm M_T = -10.78(\frac{1}{2}) = 5.39$

S ① $1.56 - .85 - .34 + 0 - \overset{M_S}{1.52} = -1.15^{k'}$

S ③ $-1.15 - 1.08 = -2.23^{k'}$

S ④ $-1.15 - 5.39 = -6.54$

S ⑥ $-2.23 - 5.39 = -7.62$

$\frac{P}{A} \pm \frac{M}{S} = 3\sqrt{f_c'}$ $\quad \frac{P}{108} \pm \frac{7.62(12)}{162} = .232^{ksi}$ $\quad P = 35.9^{k}$

.5 L26

$M_{DL} = 1.78$ Tension Bot.

$-M_{L+I} = .43$

$M_{L+I} = .73$.

$-M_H = .47$

$-M_{NW} = 30\%(1.83) = .55$

$\pm M_T = 4.04(\frac{1}{2}) = 2.02$

$-M_S = 1.52 - (1.52 + .26) \cdot .5 = .63^{k'}$

S ① $1.78 - .47 + .73 + 0 - .63 = 1.41^{k'}$

S ④ $1.41 \pm 2.02 = 3.43^{k'}$

$\frac{P}{A} \pm \frac{M}{S} = 3\sqrt{f_c'}$ $\quad \frac{P}{108} \pm \frac{3.43^{k'}(12)}{162} = .232$ $\quad P \doteq 2.3^{k}$

33003381

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
BRIDGE & STRUCTURES BRANCH

Project 3rd Lake Wash. Floating Bridge - Stage II Sheet No. 219 of sheets
S. R. 90 Made by YMT. Check by Date Supv. YKC/RTS

Transverse Design — pontoon D near Wall 5
Section at Face of support — member 20

$t = 21''$ $e = 1.8''$ $M_{pe} = 11.43$ Tension T.F.
$A = 21(12) = 252 in^2$ $S = 882 in^3$

Group 5①: $D + H + (L + I) + M_{P/S}$ 100%

	Case A	Case B	Case C
M_D	-19.80		
M_H	0		
M_L	-15.8, +7.74		
M_{pe}	-11.43		
M_{and}	18.41		
	-19.62 3.92		

Group 5③: 5① + .3 Wave 125%

	Case A	Case B	Case C
5①	-19.62, 3.92		
.3W	.95	.95	
	-18.67	4.87	

Group 5④: 5① + T 125%

	Case A	Case B	Case C
5①	-19.62		
T	-20.32		
	39.94		

Group 5⑥: 5③ + T 140%

	Case A	Case B	Case C
5③	-18.67		
T	± 20.32		
	39.0		

$f = -\frac{76.23}{252} \pm \frac{39.94(12)}{882} = -.303 \pm .543 = -.846$ ksi Max < 2.0 ksi allow tension
$= +.241$ ksi Min = close 0 ksi $3\sqrt{f'c} = .232$ ksi

Flood Damage

Group 5⑦: 5① + DM

	Case A	Case B	Case C
5①			
DM			

Group 5⑨: 5③ + DM

	Case A	Case B	Case C
5③			
DM			

$f = \_\_\_ \pm \_\_\_ = \_\_\_ \pm \_\_\_ =$ ksi Max < 2.0 ksi
$=$ ksi Min. +.212 ksi

33003385

Form 232-007