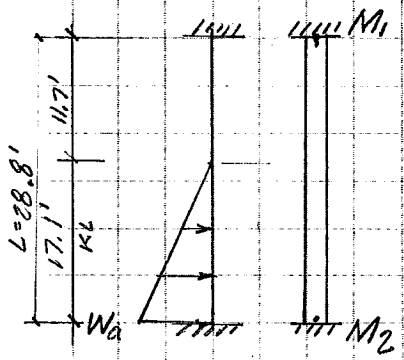
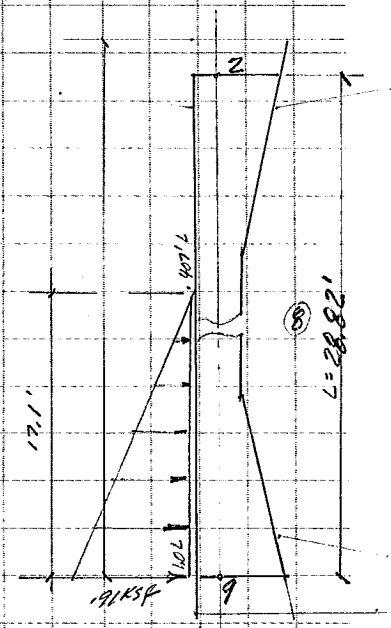
Loading 30 (Hydrostatic pressure 17.42 Ft of Head)

(A) One Ft strip of Ext. wall. (Fixed @ top & Bot.) Free on sides.





$W = .0624^{kcf}(17.1') = 1.067^{ksf}$

$K = \frac{17.1}{28.8} = .5938$

$M_1 = \frac{WL^2K^3}{60}(5-3K)$

$= \frac{1.067(28.8)^2(.5938)^3}{60}(5-3\times.5938) = 9.9387^{k'}$

$W = 17.42'(.0624^{kcf}) = 1.087^{ksf}$

$M_2 = \frac{WL^2K^2}{60}(10-10K+3K^2)$

$= \frac{1.067(28.8)^2(.5938)^2}{60}\left[10-10(.5938)+3(.5938)^2\right] = 26.6257^{k'}$

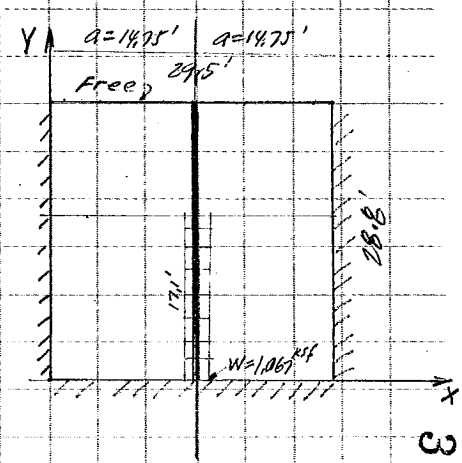
(B) Three sides Fixed, one side Free

refer: Moments and Reactions for Rectangular plates

$\frac{y}{b}=0, \quad \frac{x}{a}=1 \quad \frac{a}{b} = \frac{14.75}{28.8} = .5122 \doteq \frac{1}{2}$

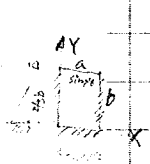
$M_y = .0235\,pb^2 =$

$= .0235(.0624^{kcf})17.1'(28.8)^2 = 20.8^{k'}$



(C) Three sides Fixed, one side simple supported

$\gamma = \frac{a}{b} = \frac{29.5}{28.8} = 1.02 \doteq 1$



$M_{y\,28} = .0234\,\gamma a^2 = .0234(.0624^{kcf})17.1'(29.5)^2 = 21.73^{k'}$

(D) Ratio: $\frac{CASE(C)}{CASE(A)} = \frac{21.73^{k'}}{26.63} = .816$

$\frac{CASE(B)}{CASE(A)} = \frac{20.8^{k'}}{26.63} = .781$

85%: $W = .0624^{kcf}(17.1').85 = .907^{ksf}$ $\quad h_{equiv.} = 17.1(.85) = 14.5'$

100%: $W = .0624(17.1) = 1.0670^{ksf}$

use this

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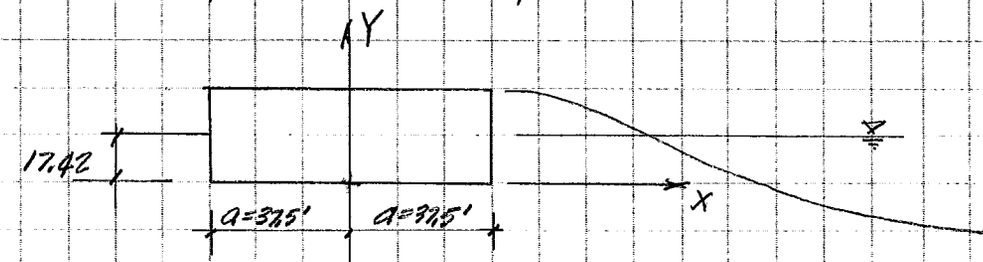
Wave-induced water pressure under pontoon



$$P(X) = \frac{2\sigma\rho\beta}{\left[1+\left(\frac{\ell}{k}\right)^2\right]\sinh 2\ell a}\left[\sin(ka+\ell z+\sigma t)\sinh \ell(x+a) + \frac{\ell}{k}\cos(ka+\ell z+\sigma t)\cosh \ell(x+a)\right]\frac{\cosh m(h-t_o)}{\cosh mh}$$

$L = 60'$ wave length

$2L' = 420'$ wave crest length.

$H_s = 4.8'$ significant wave height

$H_{max} = 8'$ Max. wave ht.

$t_o = 17.42'$ draft

$h \geq 60'$ minimum water depth [pontoon D actual $h = 216.27 + 209.27 - 3.25 \doteq 210'$]

$\rho = 1.94$ unit mass of water $= 62.4/32.16$

$\ell = \frac{\pi}{L'} = \frac{\pi}{210} = .01496$

$K = \frac{2\pi}{L} = \frac{2\pi}{60'} = .10472$

$m = \sqrt{\ell^2 + K^2} = \sqrt{(.015)^2 + (.1047)^2} = .1058$

$\sigma = \sqrt{mg} = \sqrt{.1058(32.16)} = 1.8444$

$\beta = \frac{H_s g}{2\sigma} = \frac{4.8(32.16)}{2(1.844)} = 41.8467$

When: $(ka + \ell z + \sigma T) = 90°$ $\quad \sin(ka+\ell z+\sigma T) = 1$

$\frac{\ell}{k}\cos(ka+\ell z+\sigma T)\cosh \ell(x+a) = 0$

$$P(X) = \frac{2\sigma\rho\beta}{1+\left(\frac{\ell}{k}\right)^2} \cdot \frac{\sinh \ell(x+a)}{\sinh 2\ell a} \cdot \frac{\cosh m(h-t_o)}{\cosh mh}$$

$$= \underbrace{\frac{2(1.8444)1.94(41.8467)}{1+\left(\frac{.01496}{.10472}\right)}}_{262.04} \cdot \frac{\sinh(.01496)(x+a)}{\sinh 2(.01496)37.5} \cdot \frac{\cosh(.1058)(210-17.42)}{\cosh(.1058)210}$$

$$= 264.04 \cdot \frac{\sinh(.01496)(x+37.5)}{1.3727} \cdot .1584 = 30.2348 \sinh(.01496)(x+37.5)$$

$x = 37.5$ $\quad P(x) = 21.5027$ psf

17.42' Draft. $p = .0624(17.42) = 1.087$ ksf

wave. $P(37.5')$ $= .042$

1.129 ksf.

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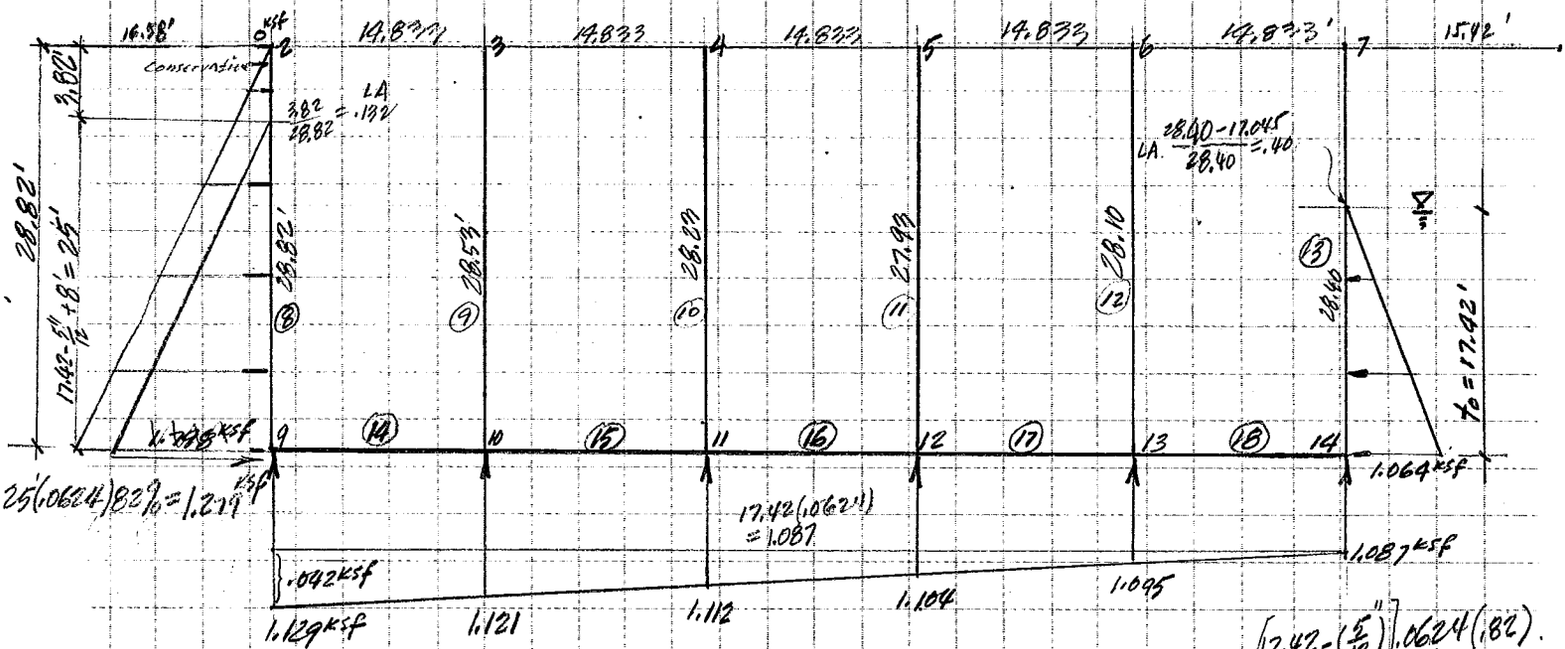
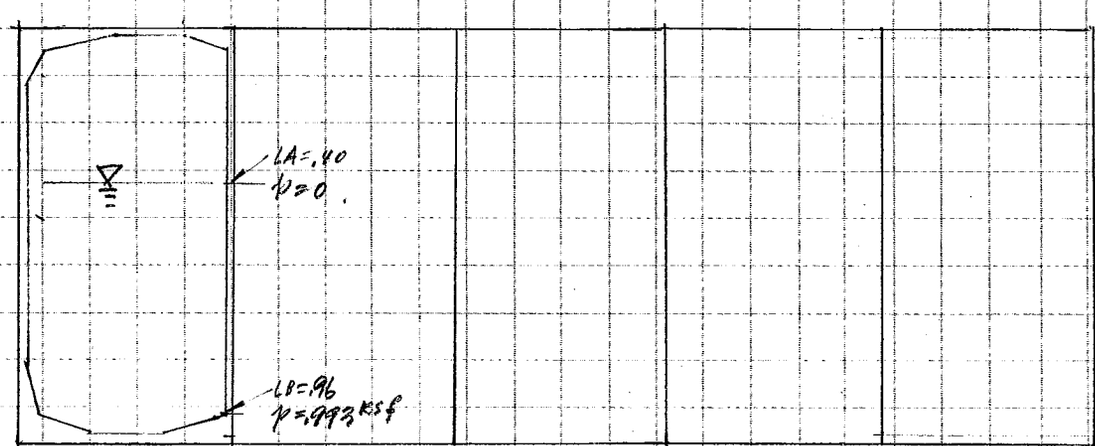
Loading 31. (Wave Force plus Hydrostatic pressure) (pontoon D)



$\left[17.42 - \left(\frac{5}{12}''\right)\right].0624(.82) = .87$ ksf

Loading 33. "Float Ext. cell" 17.42' of Draft.



$p = (17.42' - 1.5').0624 = .9934.$ $LA = \frac{28.53 - 17.42 + .75}{28.53} = .4026$ $LB = 1 - \frac{1.5(.75)}{28.53} = .9606$

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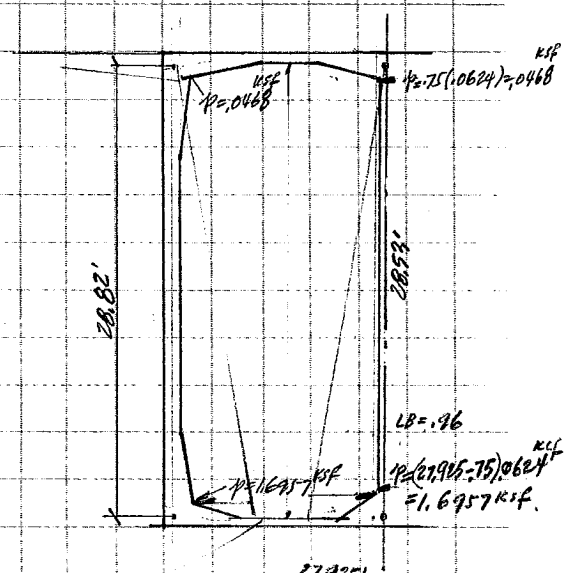
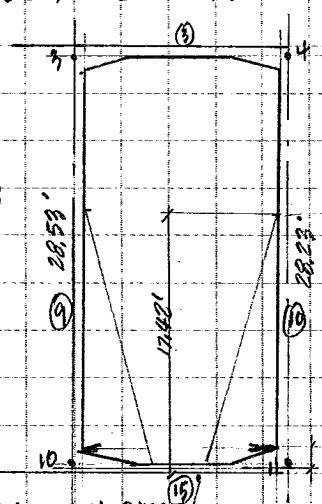
Loading 34 Flood Exterior cell Full depth



$p=\left[\frac{28.82+28.53}{2}-.75\right].0624=1.7425$ ksf (27.9251)

Loading 35 Flood 1st int. cell 17.42' Draft.



$LA=\left(28.53-17.42+\frac{.75}{2}\right)\frac{1}{28.53}$
$=.4026.$
$p=0$

$LA=\left(28.23-17.42+\frac{.75}{2}\right)\frac{1}{28.23}=.3962$
$p=0$

$LB=\left[1-\frac{1.5(.75)}{28.23}\right]=.9601$

$p=(17.42-.75).0624=1.0402$ ksf

$p=[17.42-1.5(.75)].0624=1.0168$ ksf.

Loading 36 Flood 1st int. cell Full depth

(15) $p=\left(\frac{28.53+28.23}{2}-.75\right).0624=1.724$ ksf.

(9) Bot. $\left[\frac{28.53+28.23}{2}-2(.75)\right].0624=1.6773$ ksf (27.2550')

Loading 37 Flood Middle cell 17.42' Draft. — see Loading 35

Loading 38 Flood Middle cell Full depth

(16) $p=\left(\frac{28.23+27.93}{2}-.75\right).0624=1.7054$

(10),(11) Bot. $\left[\frac{28.23+27.93}{2}-2(.75)\right].0624=1.6584$

(10),(11) Top. $.75(.0624)=.0468$ ksf

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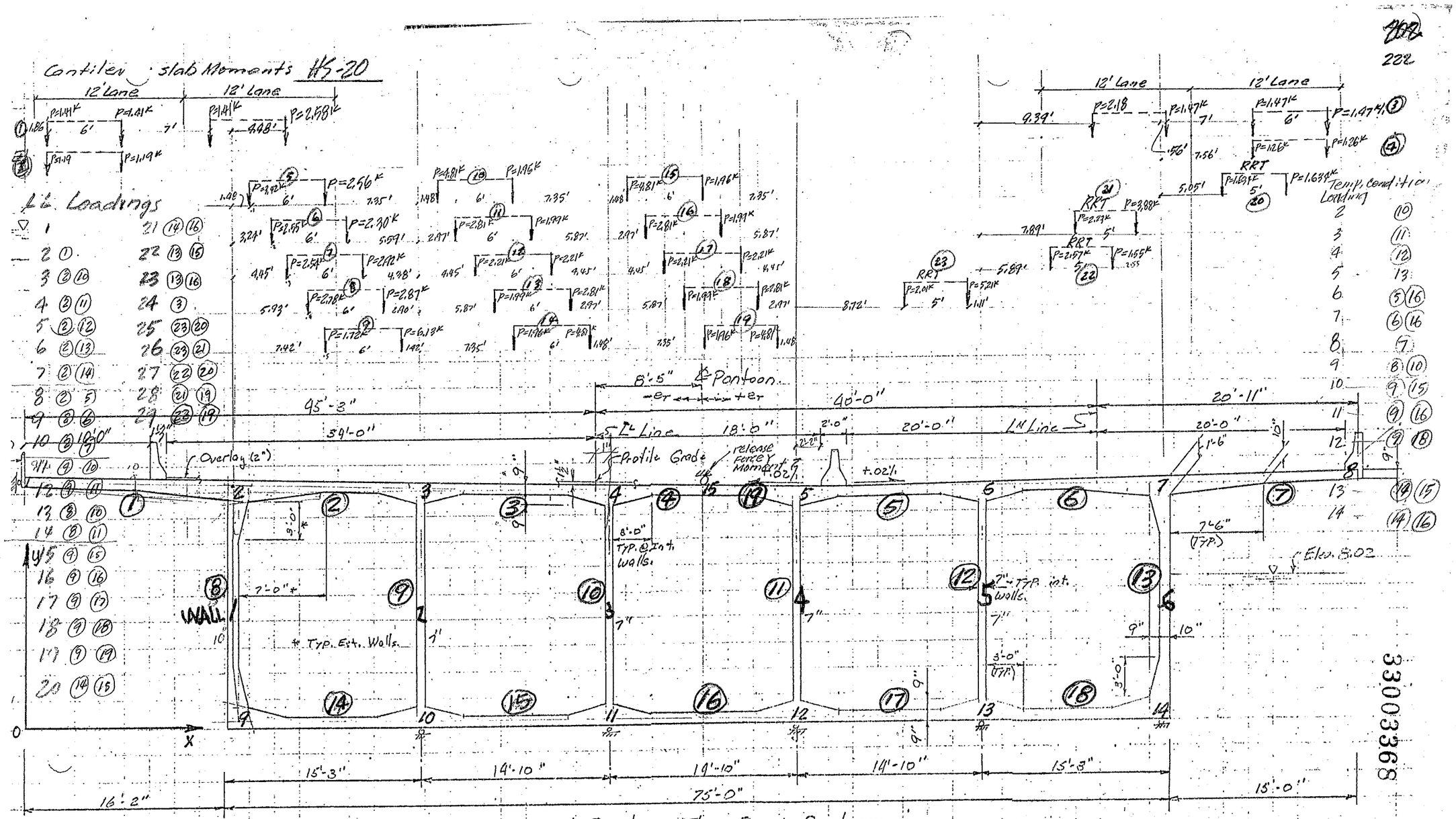

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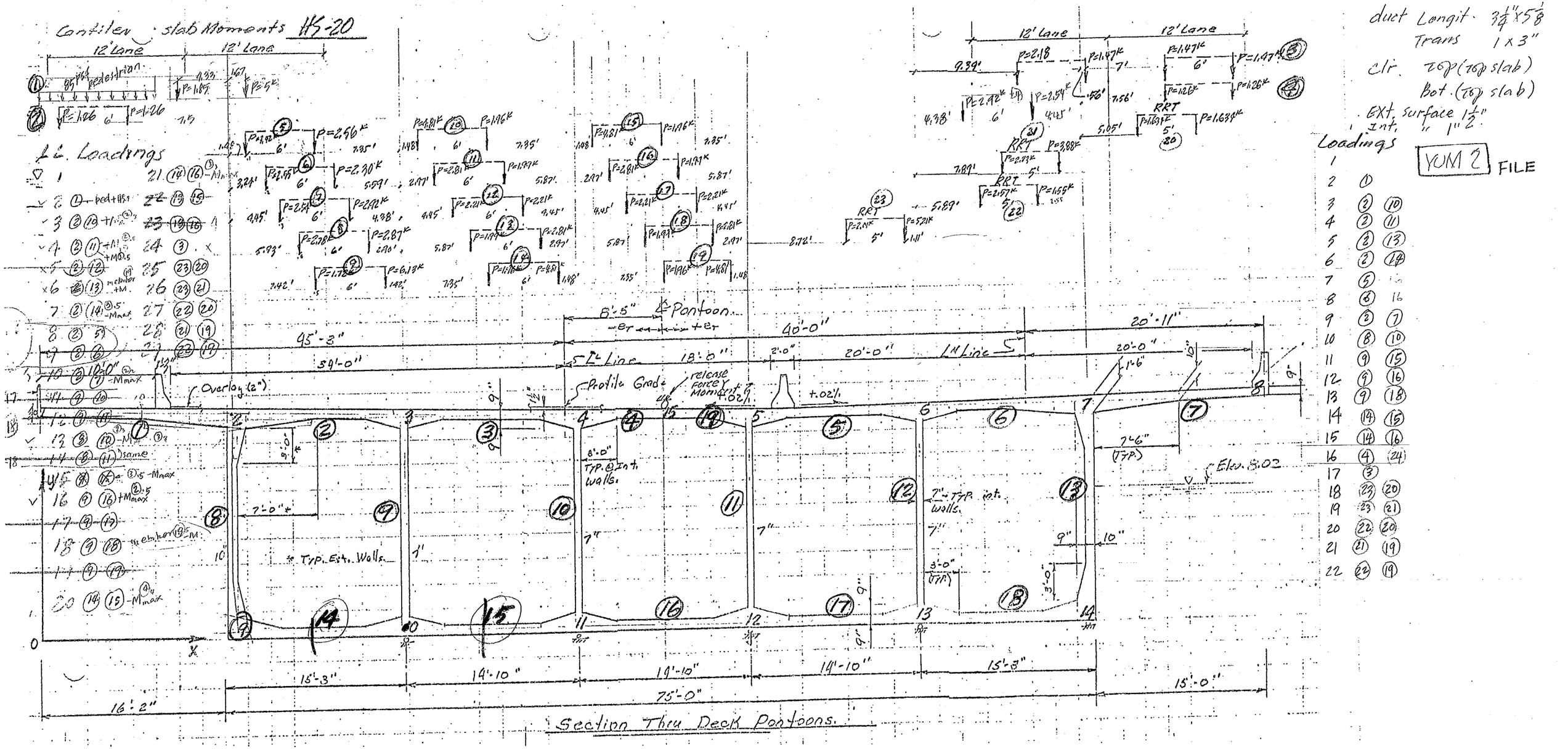
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