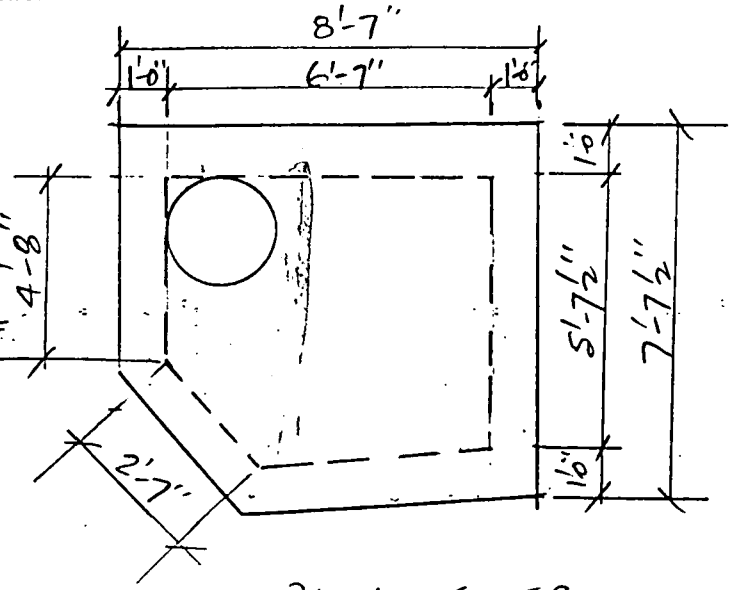
CLIENT Amtrak	STV/SEELYE STEVENSON VALUE & KNECHT.			
PROJECT NORTH ACCESS CONNECTION	MADE	CHK.	REV.	JOB. NO. 6018/01
SUBJECT SEWER CHAMBER	C.LEUNG			SHT. NO. 1
	5/5/84			

DESIGN OF PRECAST M.H COVER – 10" Thick.

Conc. : 3500 psi
Steel f_y = 60 ksi

Loading: 10" slab = 125 #/f²
Earth on Top (17") = 142 x 120 = 170 #/f²
Total D.L = 295 psf



PLAN : COVER.

Design as one way slab.

max span = 6'-7" + h
= (6'-7") + 10" = 7'-5"

L.L. (Case I) 1500 psf

Total Load = 1500 + 295 = 1795 psf

$V_{clear\ span}$ = ½ x 1795 x 6.58 = 5890 #/'

V_d from face of supp = 5890 - $\frac{8"}{12}$ x 1795
= 4696 #/' 4693

$V_c = \frac{4693}{12 \times 8} = 49$ psi < 1.1√3500 = 65 psi ok.

Max. B.M. = ½ x 1.795 x 7.42² = 12.35 ft-k/FT.

$A_s = \frac{12.35}{1.75 \times 8.12} = 0.87$ "/'

$\frac{M}{f_s j d}$ 20 x 8 x .87

1.45 8 in 1.0"

USE = #6@6" btm. Bothways
(A_s = 0.88)

provide 3-#6 Btm ADD'L @ OPNG

$A_s = \frac{M \times 12000}{f_s j d}$

$a = \frac{120 \times .87}{21 \cdot 12}$

Check Bond (Development length).
Development length for #6 Bar ≈ 20" < ½ span ok

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PROJECT NORTH ACCESS TUNNEL	MADE	CHK.	REV.	JOB. NO. 6018/01
SUBJECT SEWER CHAMBER	C. LEUNG			SHT. NO. 2
	5/5/81			

PRECAST COVER (CONT'D)

CASE(II) H-20 Loading + Impact

$$\text{IMPACT} = \frac{50}{L+125} = \frac{50}{7.42+125} = 0.38 \quad \text{USE } 30\% \text{ max}$$

Max. L.L.M. (Reinf ⊥ To Traffic)

$$\frac{S+2}{32} \times 16{,}000^{\#} \times 1.3 \text{ Impact} = \left(\frac{7.42+2}{32}\right) \times 16^{K} \times 1.3$$

$$= 6.12^{K'}/_{'}$$

$$D.L.M. = \frac{1}{8} \times .129 \times 7.42^2 = 2.00$$

$$8.12^{K'}/_{'}$$

Reinf parallel to Traff

$$L.L.M. = 900S \times 1.3 \text{ Impact}$$

$$= \frac{900}{1000} \times 7.42 \times 1.3 = 8.68^{K'}/_{'}$$

D.L.M. (as above) = 2.00

$10.68^{K}/_{'}$ ← GOVERN

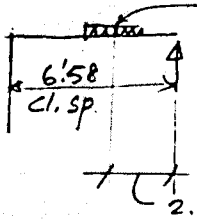
< Case I ($12.32^{K'}/_{'}$)

∴ #6 @ 6" Bottom Both ways OK

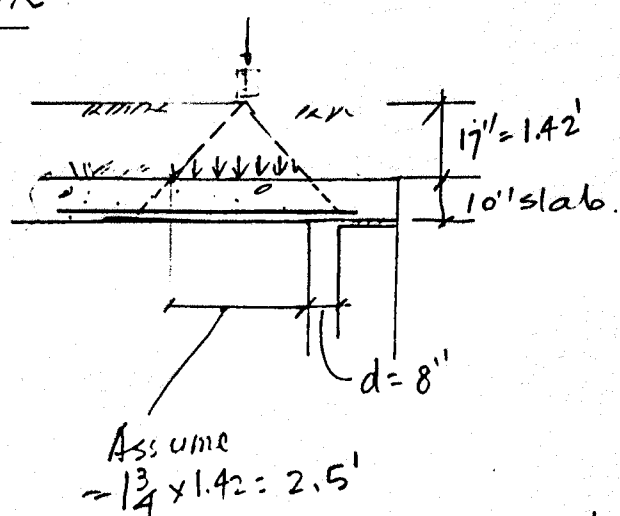
CHECK SHEAR (CASE II)

Max. Shear due to Wheel Load

$W = 16 \times 1.3 = 20.8^{K}$



$$R_R = \frac{6.58-3.17}{6.58} \times 20.8 = 10.8^{K}$$



CLIENT AMTRAK	STV/SEELYE STEVENSON VALUE & KNECHT.			
PROJECT NORTH ACCESS TUNNEL	MADE	CHK.	REV.	JOB. NO. 6012/01
SUBJECT SEWER CHAMBER	C.LEUNG			SHT. NO.
	[illegible]			3

Check Shear Case II (cont'd) Roof Slab.

max. Reaction for shear due to L.L. = 10.8^K

Assume spread over $1\frac{3}{4} \times 1.42 + 2d$ (Fill)

$= 2.5 \times 2 \times .67 = 3.84'$

∴ L.L. Shear = $10.8/3.84 = 2.81^K/FT.$

D.L. Shear = $\frac{1}{2} \times .29 \times 6.58 = 0.95^K/FT.$ (clear span)

∴ Total Shear = $2.81 + 0.95 = 3.76^K$

$v_c = \frac{3,760}{12 \times 8} = 39.2 \text{ psi} < 65 \text{ psi}$ OK

DESIGN WALLS (12" THICK)

Data: Max. depth of wall 16'±
L.L. Surcharge 150 psf.
Ka (pressure at Rest) = 0.5
Water table at 10'± below grade

Design wall span Horizontally

USE Lateral pressure at 14' below grade for design

∴ 1) Earth pressure: $10 \times 125 \times 0.5$ (above W.T.) $+ (14-10) \times (125-62.5) \times 0.5 = 750$ psf

2) Water pressure $(14-10) \times 62.5$ (125) $= 250$

3) Surcharge pressure = $150 \times 0.5 = 75$

1,750 psf

B.M. $= \pm \frac{1}{12} \times 1.588 \times \overline{7.58}^2 = 7.6^{K'}/FT$

$A_s = \frac{7.6}{1.75(12-2.5)} = 0.46^{sq.in.}$

USE: #5 @ 8" E.F (Main)
#5 @ 12" E.F (Vert.) WALL

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PROJECT NORTH ACCESS TUNNEL	MADE	CHK.	REV.	JOB. NO. 6018/01
SUBJECT SEWER CHAMBER	C. Lewis			SHT. NO. 4
	7/1/02			

INVERT DESIGN min. Thickness = 12" at end

Load From Roof = L.L. 1500#/□'

Earth + Cover 290#/□'

Walls = $\frac{150^{\#} \times 16'_H (7.58+6.62)/2}{(8.58 \times 7.62)}$ = 1040

12" wall × Area Invert

2,830 PSF.

DESIGN INVERT Two ways Slab Fixed Four side

$\frac{\text{Short span}}{\text{Long span}} = \frac{5'-7\frac{1}{2}"}{6'7} = \frac{5.625}{6.583} = .85$

From ACI Method 3.

Max. Neg. M. = $\frac{0.06}{C_A} \times 2.83^{KSF} \times \overline{5.625}^2$

= $5.37^{K'}/FT$

$A_S = \frac{5.37}{1.75 \times (12-3.5)} = 0.36^{\square"}/FT.$

USE: #5@9 (0.39) T & B. E.W INVERT.

.36 + .39 / 5.37

= .6

1/10

8.37 × 1/.06 = 8.95

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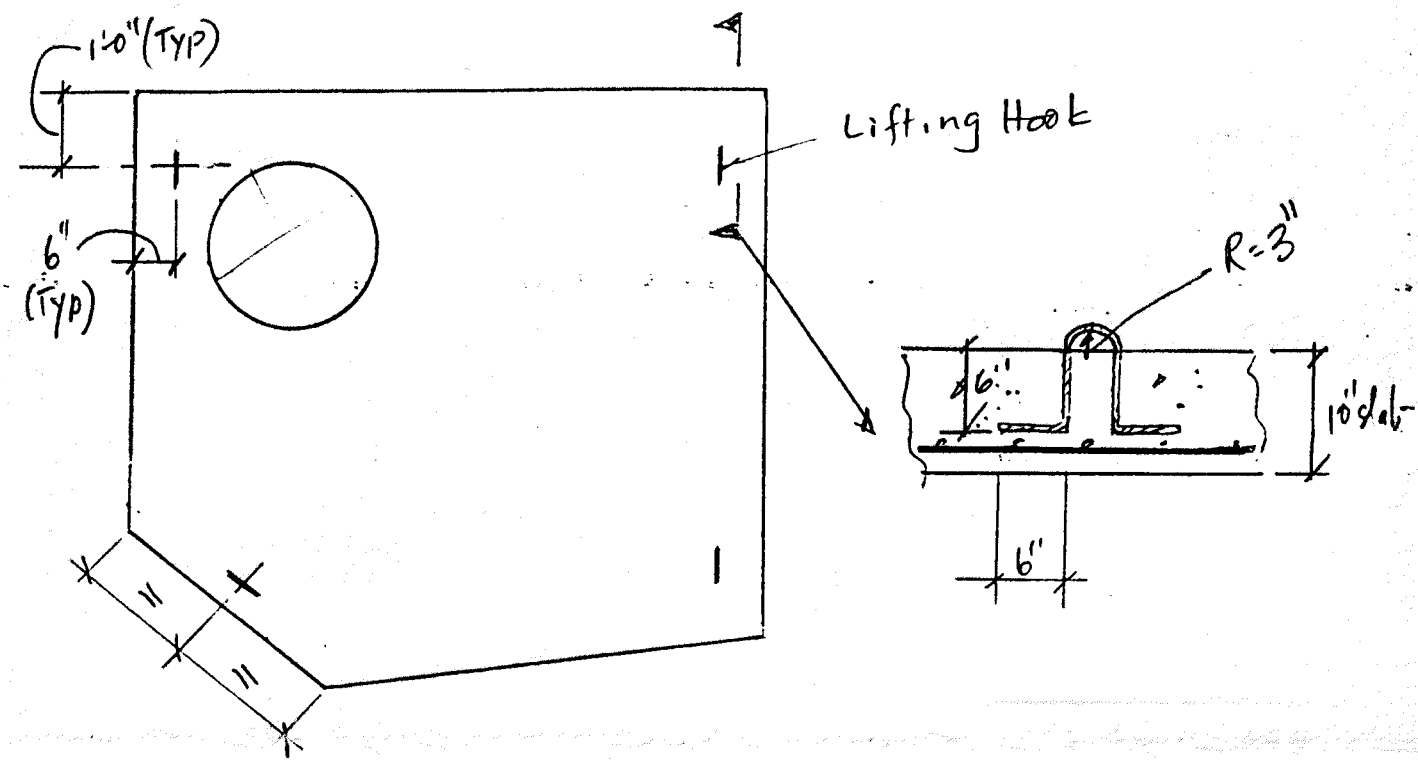
PROJECT NORTH ACCESS TUNNEL	MADE	CHK.	REV.	JOB. NO. 6018/01
SUBJECT SEWER CHAMBER	E. LEUNG			SHT. NO. 5
	5/5/84			

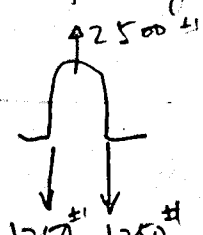
DESIGN OF LIFTING HOOKS



WT. OF COVER ≐ (8.58 × 7.62) × 120#/ft² = 7,850#

× 1.25 impact for lifting = 10,000#

Lift by Four Hook .. Ea. hook = $\frac{10,000}{4}$ = 2500#



USE #4 Bar (MIN).

$f_s = \frac{1250^{\#}}{0.2^{in^2}} = 6250 psi << 24,000 psi$.

Development tension Length for #4 Bars. = 12"

check slab BM = $\frac{1}{8} \times (1.25 \times 0.12) \times 7.6^2 = 1.08^{k'}/_{'}$

$<< 12.32^{k'}/_{'}$ (Sh. 1) ok