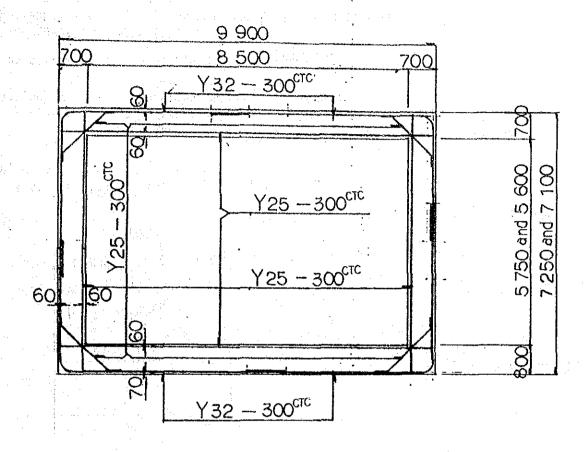
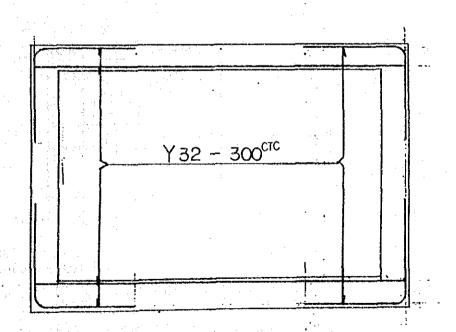
NO@66 BOX CULVERT FOR ROAD





NO@ BOX FOR ROAD

(similar Box - NO⑤, NO⑥)

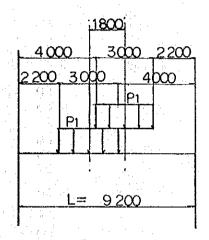
- B. Type-2 D = 2.000 m
- (1)Dead load
 - a) vertical load --- (case-1)

For upper slab
$$w1 = 22.6 \times 0.50 + 19.6 \times 1.50 + 23.6 \times 0.70$$
 = 57.220 kN/m
For side wall $w2 = 23.6 \times 0.70$ = 16.520 "

For bottom slab $w3 = 57.220 + \frac{2 \times 16.520 \times 6.40}{2 \times 10.520 \times 6.40}$ = 80.204 "

For side wall P1 =
$$(22.6 \times 0.50 + 19.60 \times 1.85) \times 0.500$$
 = 23.780 kN/m
P2 = $(22.6 \times 0.50 + 19.60 \times 8.25) \times 0.500$ = 86.500 "

- (2) Live load
 - a) Vertical load of center ---- (case-3)



$$B = 0.300+2.000+0.700 = 3.000 m$$

P1 =
$$\frac{10 \times 30}{3.50 \times B}$$

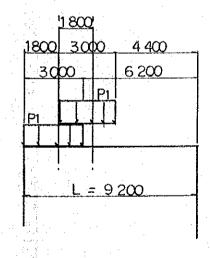
= $\frac{10 \times 30}{3.50 \times 30}$ = 28.572 KN/m

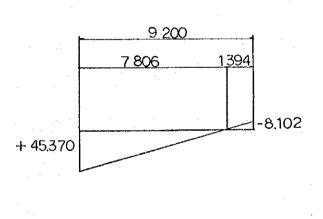
= 80.204

For bottom slab

$$P2 = \frac{2 \times 28.572 \times 3.00}{9.20} = 18.634 \text{ KN/m}$$

b) Vertical load of partial --- (case-4)





For bottom slab

$$P2 = \frac{2 \times 28.572 \times 3.00}{9.20} \pm \frac{6 \times 28.572 \times 3.00(3.10 + 1.30)}{9.20^2}$$

= 18.634
$$\pm$$
 26.736 = $\begin{cases} P2-1 = +45.370 \text{ KN/m} \\ P2-2 = -8.102 \text{ KN/m} \end{cases}$

c) Horizontal loal (earth pressure of live load surcharge) ---- (case-5)

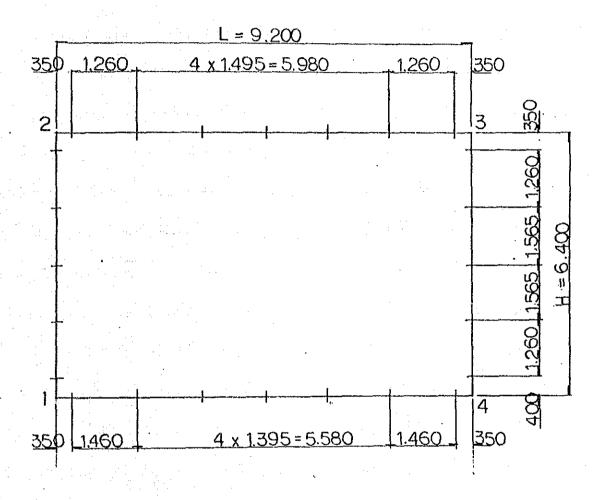
kN/rihicle

$$g_0 = \frac{40 \times 30}{3.50 \times 10.0} = 34.300 \text{ KN/m}$$

$$Pe = goko = 34.300 \times 0.500 = 17.150 \text{ KN/m}$$

	o o												
	NOTE: THE DIMENSIONCE) BE EXCHANG TO DIMENSION(KN) INTO THIS CALCULATION						ori Na						
•	N(KN)	:		'e ja		·.		:	•			·	
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	O N		က	0 0 0 0			i e				L-No 10 20		
			EPS	1.00E-05 1.00E-05 1.00E-05				:			L-No 9 19		
			(t/m2)	50E+07 50E+07 50E+07							L-No	•	
			E	01 51 51 61				:		•	L-No	8 50	8.850
			L (E)	9 6 9 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6				:			L. No.	7.590 8	7.390 8
			J	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		M(tm/Rad)	Free Free				1 N N N N N N N N N N N N N N N N N N N	6.050	000.0
	e e		<u>.</u>	0000 0000 xxxx xxxx		УK					N-J 441	14.4	009
É	0000		I (m4)	0.028580 0.028580 0.028580 0.042670		Y (t/m)	F F X X				L+No 13	10101	205
Y	0.000		(m2)	0.70000 0.70000 0.70000 0.80000							L-No	1.660	2 89
ž X	0.0000 0.0000 9.2000		J.	0000		X (t/m)	Fix Free				L-No	000	
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CALCULATION POINTS OF EACH FORCE



: Dead load

Pj (t/m)	116.520	ĵ.			Pj (t/m)	23.780				Pj (t/m)	128.572 18.634
Pi (t/m)	116.520 116.520 157.520 80.204				Pi (t/m)	86.500 -23.780				Pi (t/m)	128.572
Lo (m)	6. 9.200 9.200 0.200	-	: :		Lo (m)	6.400		·		Lo (m)	3.000 3.000 9.200
Li (m)	0000	0.003 (t) 0.000 (t)	pressure		Lí (m)	0.000	0.000 (t) 0.000 (t)		load-VL-	Li (m)	0.000 0.000 0.000
:	****	1	Earth pr 2			××			HB live 3		***
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BOX FOR ROAD NO 4

. o.v.	Case. RX (t)	1 RY (t)	RM (tm)	Case. RX (t)	2 RY (t)	RM (tm)	Case. EX (t)	3 RY (t)	RM (tm)
 লেখ	000.0	0.002	0.000	0.000	0000.0	0000.0	0.000	0.000	000.0
, No	Case. RX (t)	RY (t)	RM (tm)	Case. RX (t)	5 RY (t)	RM (tm)	Case. RX (t)	6 RY (t)	. R.W. (tm)
লেখা	0.000	0.001	0000.0	0.000	0.000	000.0	0.00.0	0.002	0.000
No.	Case. RX (t)	7 RY (t)	RM (tm)	Case. EX (t)	8 RY (t)	RM (tm)			
 	000.0	0.001	0.000.0	0000.0	0.003	0.0000			

ROTA.(mmRad)	3.3386 -4.2808 -3.3386 -3.3386 NOTA.(mmRad)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
3 Y-DIS.(mm)	0.00000 -0.31348 -0.31348 0.00000 Y-DIS. (mm)	0000	
Case. X-DIS.(mm)	0.00000 0.04783 -0.00319 0.04464 X-DIS.(mm)	0 4 4 0	
ROTA.(mmRad)	-4.54327 4.48011 -4.48011 4.54327 ROTA.(mmRad)		5.5.8 6.5.8 6.5.8 6.5.8 6.036 7.86
Y-DIS.(mm)	0.00000 0.00000 0.00000 0.00000	0.00000 0.00000 0.00000 0.00000 8	0.0000 -1.59519 0.00000
Case. X-DIS.(mm)	0.00000 -0.13444 -0.85681 -0.99124 -0.99124 Case.	0.00000 0.01154 -0.27005 -0.25851 Case. X-DIS.(mm)	0.00000 -0.26307 -1.85529 -2.11836
HOTA.(mmRad)	12.01597 -11.15536 -12.01597 ROTA.(mmRad)	3.41742 -4.22449 2.62255 -2.70462 ROTA.(mmRad)	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Y-DIS.(mm) R	0.00000 -1.15594 -1.15594 0.00000 Y-DIS.(mm) R(0.00000 -0.47367 -0.15328 0.00000	0.0000 -2.27254 -1.81438 0.0000 0.0000
4 Case. X-DIS.(mm)	0.00000 -0.04369 0.00291 -0.04078 Case.	0.00000 1.44103 1.42140 0.01718 Case. X-DIS.(mm)	0.0000 1.77857 0.62289 -1.66726
BOX FOR ROAD NO			મું બું હું તું
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	% (t)	0,0000	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.000000000000000000000000000000000000	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
	10ad-v7 S (t)	13 10 10 10 10 10 10 10 10 10 10 10 10 10	88 85.716 59.716 69.57716 69.8518 69.518 716 85.716 716	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8
	RB live tm)	2008 1110 120 120 120 120 120 120 120 120 12	000000000000000000000000000000000000000	0010F008	0 0 4 4 0 0 0 0 4 4 0 0 0 0 0 0 0 0 0 0
	Case 3 F	#600000 000000	41 444 14 000000000000000000000000000000	111 1111 1110 110 110 110 110 110 110 1	1
	(1) X	0000000	-1137.408 -1137.408 -1137.408 -1137.408 -1137.408	000000000000000000000000000000000000000	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	pressure S (t)	215. 85.672 85.400 -128.421 -128.485	000000000	128.4868 128.4808 12.511 12.511 181.672 181.672	000000000000000000000000000000000000000
	ase 2 Earth M (tm)	11055. 1140.642 1140.642 114.003 114.003		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	N (t) O	1 1 1 1 1 1 2 3 6 8 3 9 1 1 1 1 2 3 8 6 8 3 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
	oad S(t)	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	2463 1712 1713 1713 1713 1713 1713 1713 171	1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0	368 340 340 323 340 323 370 363 363 363 363 363 363 363 363 363 36
	se 1 Dead 1 M (tm)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-1230 11910.290 3711.124 375.11291 1111.124 1111.124 1111.124 1111.124 1111.124	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
*************************************	Ca L(m)	0.000 0.400 1.660 3.225 6.050 6.050	00.00.00.00.00.00.00.00.00.00.00.00.00.	0.000 1.510 6.7175 6.000 6.000	00118 4 10 1 8 9 0 0 0 10 10 10 10 10 10 10 10 10 10 10
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N CD	631.71	622.59	593.86	∞	522.53	493.78	485.80	228.36	228.36	228.36	228.36	-228-368	228.36	228.36	228.36	228.30	Ο α 1. α) t	490.18	522.51	558,18	-593,867	622.59	631.7	353.91	353.91	353.91	353.91	353.91	353.93	-353.910	353.91	353.91
S (t)	53.91	98.11	39.26	C)	144.24	13.64	228.36	08	φ. 	.67	03.64	0.000	03.64	358 67	58.16	485.80	υ υ		70.01	4.24	22.28	139.26	98.11	-358,910	31.70	83.64		91.57	0.00	191.57	-383.146	583.64	631.70
Case 6 M (tm)	647.20	516.88	244.03	-157.666	293.14	521.30	598.71	71	300	50.58	2 33	(0) (10)	12.33	81,09	433.51	7.1	0 0		521.30	293.14	157.66	44.03	516.88	647	647.20	34.52	271,23	72.10	05.72	72.10	271.236	34.52	647.20
N (£)	00.	00.	00.	0000	00.	00.	00.	(r		0.00	53	3.56	53.56	53.56	53.56	(0)	ć) i	ိ	<u>ဗ</u>	00.	00.	00.	0.000	56.19	56.19	56.19	56.19	56.19	56.19	-56.197	56.19	56.19
load-HL- S (t)	6.19	9.33	72	0.88	5 95	47.56	10	C	5	S	0	0	.00	00	0	0	ن د د	0 1	7.56	5.95	0.88	7.72	.9.33	-56.197	۰.	0	9	0	0	0	000.0	0	0
Case 5 HB live M (tm)	31.27	0.16	38.38	60.77	1.16	5.15	-22.847	200	20 00	22.00	22.84	8	22,84	22.84	22.84	22.84	0			1.16	0.77	8.38	10.16	-31.276	31.27	31.27	31.27	31.27	31.27	31.27	-31.276	31.27	31.27
N CE	29.52	129.52	129.52		129.52	129.52	129.52	() ()	7.7		3.73	(1)	3.73	3.73	3.73			7.07	11.91	41.91	41.91	41.91	41.91	-41.912	73	73	73	3.73	7.3	7	3.734	. 73	.73
load-VL- S (t)	3.73	3.73	3.73	-3.734	3.73	3.73	3.73	20.50	, v	000	50	6.19	41.912	41.91	41.91	-41.912	7	7		73	٠. دي	7.3	7.3	3.734	9	39	7.05	8.02	7.58	13.96	-56.921	113.99	9.52
se 4 HB live M (tm)	73.36	74.85	79.56	-85.408	91.25	95.93	97.26	36 76	000	74.23	42.99	0.80	58.71	-3.94	56.75	-71.421	,	77.7	70.11	65.41	59.56	3.72	19.01	-47.525	47.52	2.40	35.86	96.52	36.70	0.61	92.49	30.77	-73.366
Ca L(m)	00	07.	.66	3.225	4	0	.40	00	. (*	9	0.5	ွှ	60	59	8	9.200	6	3		.61	17	7	00	6.400	00	LC.) c			0	0	8	9.200
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	N (t)	-509.137	0	-471.293	6	. 93	칁	23	. 86	.86	-302.869	.86	.86	.86	.86	.86	.86	63.23	71.21	-399.937	35,61	471.29	00.01	09.13		0.51	-460.513	60.51	0.51	60.51	60.51	60.51	io H
	S (£)	60.51	93,39	198.895	46.	73.18	78.24	86	63.23	35.59	236.101	18.05	0.00	18.05	236.10	8	363.23	02.86	8.24	173.181	6.94	198.89	339	460.51	. 6	70.3	308.801	4.40	0.0	54.4	∞.	70.3	09.1
Case 8	M (tm)	2	50.8	-80.436	అ	10	68.6	က	70.35	8.06	12,105	76.83	5.07	76.83	12.10	48.06	0.35	70.35	368.60	-81.514	4.60	0.43	50.88	ε Σ	21.58	50.16	118.652	41.73	49.43	41.73	18.65	50.16	21.58
	N (£)	94,38	685.23	-656.506	620.82	85.15	556.42	48.4	219.83	219.83	-219.830	219.83	219.83	19.83	219.83	19.83	19.83	23.16	31.14	9.87	95.55	31.22	59.95	-569.072	62.44	62.44	-362.449	62.44	62.44	62.44	62.44	62.44	62.44
	S (t)	62.4	9.90	147.804	13.7	35.7	05.1	8		06.50	355.533	27.37	51.76	177.98	96.03	95.53	423.16	.00	05.1	5.7	13.7	47.8	06.6		69.06	33.87	376.092	08.78	25.29	74.36	0.19	33.41	94.34
Case 7	M (tm)	74.89	541.15	-257.543	157.81	279.92	497.32	571.74	571.74	87.13	155.955	19.00	75.52	98.49	4.16	91.52	4.79	34.79	60.37	42.96	20.85	20.55	04.20	-637.936	37.93	44.89	221.541	31.37	96.51	94.42	02.51	42.56	74.89
U	L(m)	0	-7,	1.660	c.)		٠,	4.	00	ιο ιο	1.610	1.0	69.	.09	9	83	.30	0	(7)	8	-		0	6.400	00	. 23	1.810	20	.60	66	39	φ τυ	200
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PICK-UP No.

(3) N	6 6 6 4 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	1620.838 1522.511 1493.786 1485.806	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	228.86	1.558.7866 1.558.7866 1.558.786 1.558.188 1.622.5867 1.632.5867 1.632.758	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
S (t)	62.44.06.69.44.000.00000000000000000000000	-1144.240 -213.645 -228.368	485.806 458.169 256.101 118.001	0 8	2228 2138 2136 2244 2244 2245 225 236 256 256 256 256 256 256 256 256 256 25	631.709 470.306 308.801 154.801 1154.401 1154.700 1154.701 1154.701 1154.701 1154.701 1154.701 1154.701 1154.701
M (tm)	74.89 41.15	-157.811 -293.140 -521.303 -598.713		76.83 33.51	1598 1293 1293 1293 127 157 157 157 157 157 157 157 157 157 15	-627.208 -450.162 118.652 441.735 549.430 441.735 -450.162 -674.890
Case	1 1 1	, 0000 1111	00000 	1111	0000000 1111111 99999999	0,000000000c
(£)	00 . 13 71 . 29	10 11 C	1302. 1302. 1210.869 1219.830 1218.830	2228.36 202.36 302.86	1.363.233 1.399.937 1.399.937 1.500.018 1.500.018	4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
S (£)	0.000	-173.181 -278.242 -302.869	363.23 355.595 355.533 127.333	000000	302.869 278.242 173.181 6.945 -198.895 -395.398 -460.513	509.135 583.645 383.146 191.573 0.000 1.380.199 1.583.645 1.380.199
M (tm)	-100	4 0 0 7 4 0 0 0 0	1.4470 1.55.053 1.55.055 1.19.009	12.33 81.09 48.06	- 1 2 4 7 7 0 5 2 5 8 8 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	. 621. 271.236 672.102 8672.102 805.102 805.724 1.302.422 621.621
Case	1 1 1	ထတ္တ ပါပီပီပီ	00000 00000	1111	000000000 00000000	0000000000 11111111111
L (m)	00.	6.050	0.000	00000	0.000 0.350 1.610 3.175 4.740 6.000	0 0 1 0 4 0 7 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
No.		*	1 * * * * ധ – ഗ ധ ച		1 * * * * * * 1 4 * 0 00 4 10 00	1 % % % % % % % 1 W 0/ 00 4 10 00 C 4

Σ. .>	N (t)	631.71	622.59		558.18	399.93	371.21	363.23	02.86	-302.869	302.86	302.86	219.83	28.36	228.36	228.36	228.36	123.16	131.14	459.87	-435.615	471.25	500.01	509.13	460.51	460.51	460.51	460.51	353.91	353.51	-362.449	362.44	
W 1 X 1 W	(t)	53.91	98.11	.26	22.28	173.18	78.24	302.8	63.23	335.595	36.10	18.05	51.76	203.64	58.67	458.16	85.80	19.83	05.10	.70	6.94	198.89	39	460.5	09.13	70.39	08.80	40	0.00	91.57	390	33.41	
n	M (tm)	647.20	516.88	-244.036	157.66	81.51	368.60	70.35	70.35	-348.063	12.10	76.83	75.52	2.33	81.09	433.51	8.71	534.79	60.37	242.96	64.600	80.43	450.88	21.58	621.58	50.16	18.65	41.73	05.72	72.10	302.519	42.56	
	Case	1	1	و د د	ï		1	& ၂		∞ -5	1	1.	į.	Ÿ.		ì	1	í	. 1	. 1	-C	É	,	1.	1	ı	ı	ï		1	C- 7		
×.	N (t)	509.13	500.01	71.29	435.61	585.15	556.42	5.	219.83	-219.830	228.36	228.36	228.36	302.86	302.86	302.86	302.86	363.23	371.21	399.93	-558.189	593.86	622.59	631.	353.91	353.91	353.91	362.44	362.44	460.51	-460.513	460.51	
) W I V V W	S (t)	60.5	93.39	O	46.9	35.70	5.10	19.83	48.4	506.508	58.6	03.6	0	18.0	7	35.5	363.	02.86	78.24	3.18	22.289	39.26	8.11	353.91	31.7	83.6	83.1	8.7	25.2	154.4	-308.801	470.3	
'n	M (tm)	621.58	50.88	80.43	64.60	279.92	497.32	7	7	387.13	81:09	12.33	75.53	76.83	12.10	348.06	70.35	470.35	68.60	81.51	-157.666	44.03	516.88	647.20	47.20	434.52	71.23	31.37	16.96	41.73	118.652	50.16	
	Case	r	j.	12	į.	Ė	ŧ	C- 7		۲ ۲		ī.	1		ť	1	1.	1	1	ī		ı	ŧ	1	i	ı	ı	i	ı.	1	C- 8	ı	
· .	L (m)	0.000	0	7.6	3.2		9	4	00	0	1.61	3.10	4.60	60.	.59	S	<u>.</u>	00.	ω ις	61	3.175	7.4	00.	.40	.00	S.	.81	.20	.60	99	7.390	ω Ω	
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1.0002 362.449 306.652 147.804 -113.750 -205.106 209.133 270.396 308.801 24.00.4.001 155.401 108.801 108.801 -470.396 S - 1598. 713 - 1291. 303 - 1293. 140 - 1257. 666 -470.358 -348.063 12.105 276.834 276.834 276.834 12.105 470.358 (tm) ... တ်ထံတတတ္တတ္တ 9999999999 9999999999 4444444 1.0571.212 1.0571.212 1.0571.212 1.0500.937 1.0500.018 -500.137 -500.018 -471.293 -485.615 -371.212 -371.212 -173.181 -278.242 -302.869 4006.4 1017.5 631.709 583.645 383.146 191.573 0.000 -1983.146 -1383.6456 460.513 393.398 198.895 -6.945 (1) -198. 647.208 271.236 672.1236 672.724 672.724 647.208 .470.358 .368.606 -81.514 64.600 (tm) 0 00 00 00 00 00 Case **∞ ∞ ∞ ∞ ∞ ∞** ∞ 9999999999 99999999 00.000 00.000 00.000 00.000 00.000 00.000 00.000 00.000 00.000 00.000 0.000 0.350 1.610 3.175 4.740 6.000 4.600 6.093 7.590 8.850

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NO@ BOX FOR ROAD

(similar Box - NO⑤, NO⑥)

$$D=0.500 \text{ m}$$

(1) Dead load

a) vertical load --- (case-1)

For upper slab
$$w1 = 22.6 \times 0.50 + 23.60 \times 0.70$$
 = 27.820 kN/m
For side wall $w2 = 23.6 \times 0.70$ = 16.520 "

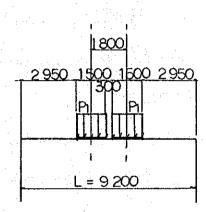
For bottom slab $w3 = 27.820 + \frac{2 \times 16.520 \times 6.40}{0.20}$ = 50.804 "

b) Horizontal load -- earth pressure --- (case-2)

For side wall P1 =
$$(22.6 \times 0.50 + 19.60 \times 0.35) \times 0.500$$
 = 9.080 kN/m
P2 = $(22.6 \times 0.50 + 19.60 \times 6.75) \times 0.500$ = 71.800 "

(2) Live load

a) Vertical load of center (case-3)



B = wide of despersal of HB-load
= 0.30+0.50+0.70 = 1.500 m
P1 =
$$\frac{10 \times 30}{3.50 \times B}$$

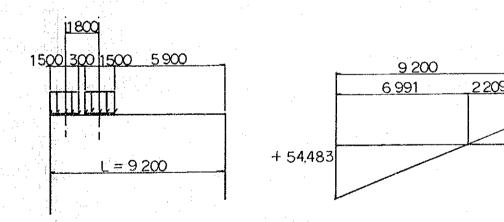
= $\frac{10 \times 30}{3.50 \times 1.50}$ = 57.143 KN/m

For bottom slab

$$P2 = \frac{2 \times 57.143 \times 1.50}{9.20} = 18.634 \text{ KN/m}$$

-17,215

b) Vertical load of partial --- (case-4)



For bottom slab

P2 =
$$\frac{2 \times 57.143 \times 1.50}{9.20}$$
 ± $\frac{6 \times 57.143 \times 1.50(3.85 + 2.050)}{9.20^2}$
= 18.634 ± 35.849 = $\begin{bmatrix} P2-1 = +54.483 & KN/m \\ P2-2 = -17.215 & KN/m \end{bmatrix}$

c) Horizontal loal (earth pressure of live load surcharge) ----- (case-5)

$$g_0 = \frac{40 \times 30}{3.50 \times 10.0} = 34.300 \text{ KN/m}$$

$$Pe = goko = 34.300 \times 0.500 = 17.150 \text{ KN/m}$$

NOTE: THE DIMENSIONCE BE EXCHANG TO	DIMENSION(KN) INTO THIS CALCULATION							
		*0	a et ai et				L-No 20	
		ក ខ	1.00E-05 1.00E-05 1.00E-05				L_No 9 19	
		(t/m2)	3000 3000 3000 3000 3000 407				1 NO	
		[1]	લાલાલા				 L-No	8 50
		(a)	6.200 9.200 9.200					ω ω
		니					L-No 6 16	7.390
		ا ا			M(tm/Rad)	77 77 79 90 90 90 90 90 90 90 90 90 90 90 90 90	L-No	6.050 6.095 6.000 5.995
			H.H.H.H.		×		L-No	4.790 4.500 4.500
	*:	(m4)	0.028580 0.028580 0.028580		Ê	××		10.10.10.10
ć e	0000	Proof.	0000		Y (t/m)	FF	L-No	33.1.2
N (iii	0.0000 6.4000 0.0000	(83)	0.70000 0.70000 0.70000 0.80000			٠	L-No 122	1.660 1.610 1.610 1.810
(E)	0.0000	∢			X (t/m)	Trie x	1-No	0.350
×	0000	ъ	(111) (10) 4.44	S.				10 1~ 10 1~
No.	୍ ପ୍ରଥ	-	~ 이 이 寸			T	0 N	ଜ୍ୟପସ
		0 %	(1) (2)					

No. : Dead load

				•						
Pj (t/m)	-16.520 -27.820 -27.820			Pj (t/m)	9.080		•	Pj (t/m)	-57.143 -57.143 18.634	
Pi (t/m)	-16.520 -16.520 -27.820 50.804			Pi (t/m)	71.800	·		Pi (t/π)	-57.143 -57.143 18.634	
Lo (m)	6.400 6.400 9.200 9.200			Lo (m)	6.400		·	Lo (m)	1.500	
Li (m)	000000000000000000000000000000000000000	0.003 (t) 0.000 (t)	pressure	Li (m)	0.000	0.000 (t) 0.000 (t)	load-VL-	Li (m)	2.000 000 000 000	0.004 (t)
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RM (tm)

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RM (tm)

	ROTA.(mmRad)	3.3709 4.3804 4.3804 13.3709	ROTA.(mmRad)	9,2301 9,1443 9,1443		
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	Case. X-DIS.(mm)	0.00000 0.05125 -0.00342 0.04783	Case. X-DIS.(mm)	0.00000 -0.25686 -1.03058		
	ROTA. (mmRad)	-3.38728 -3.21935 -3.21935 -3.38728	ROTA.(mmRad)	1.34866 1.47088 1.34866	ROTA.(mmRad)	- 2.18 - 0.11 - 0.45 - 0.45 - 0.18 -
	2 Y-DIS.(mm)	000000000000000000000000000000000000000	S Y-DIS.(mm) F	0.0000000000000000000000000000000000000	8 Y-DIS.(mm) F	0.00000 -0.91265 -0.91265 0.00000
	Case. X-DIS.(mm)	0.00000 -0.14433 -0.62534 -0.76967	Case. X-DIS.(mm)	0.00000 0.01154 -0.27005 -0.25851	Case. X-DIS.(mm)	0.00000 -0.31081 -1.47128 -1.78208
	ROTA. (mmRad)	7.24551 -5.93643 5.93643 -7.24551	ROTA.(mmRad)	3.38152 -3.68212 1.99578 -2.36193	(OTA, (mmRad)	9.24536 -8.14578 5.73431 -7.78736
	1 Y-DIS.(mm) R	0.00000 -0.66134 -0.66134 0.00000	4 Y-DIS.(mm) R	0.00000	7 Y-DIS.(mm) ROTA.(mmRad)	0.00000 -1.56555 -1.05627 0.00000
4.	Case. X-DIS.(mm)	0.00000 -0.06646 0.00443 -0.06203	Case. X-DIS.(mm)	0.00000 1.06514 1.06691 -0.00155	Case. X-DIS.(mm)	0.00000 1.19330 0.49999
BOX FOR ROAD NO 4	No.	~d04	No.	H0004	No	N W 4
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	Case 3 HB liv	53.26	37. 42 70. 52 86. 79	-103.069 -116.171 -119.811	9.81	145. 197.935 145.933	8.6. 19.81	-119.811 -116.171 -103.069 -86.796 -70.522	53.26 24.40	12421 12421
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	pressure S (t)	7.31	59.58 61.63 13.27	-64.177 -87.719 -91.497	000	00000		91.497 87.719 64.177 13.273 13.273 13.273	67.31 0.00 0.00	0000000
	Case 2 Earth	100	27 - 29 - 24 - 25 - 24 - 25 - 24 - 25 - 25 - 25	78.721 -18.607 -50.005	50.00		50.00	1 50.005 1 18.607 1 42.721 1 1 42.721 1 1 0 7 7 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	78.55	74444444444444444444444444444444444444
	3 2	233.70	227.09 206.27 180.42	-154.569 -133.754 -127.972	0000 444 0000			127.972 133.754 154.569 180.423 1227.092	233.70 -13.48 -13.48	111111 C C C C C C C C C C C C C C C C C C C
	oad S (†)	60 80 80	ა ი. ი. 4 4 4 8 8 8	13.484 13.484 13.484	23		. 23	111111 600000 444444 8000000 4444444	13.48 33.69 15.91	141.743 70.872 0.000 -70.872 -141.743 -215.917
	sse 1 Dead 1 M (tm)	190.31	167.92 146.82	-125.725 -108.735 -104.016	0.92	10001 10001 10001 10001 10001	4.01	-104.016 -108.735 -125.725 -146.827 -167.929	190.31 190.31 111.63	149.462 297.761 347.194 297.761 149.462 -111.630
NO 4.	Ca L(m)	66.	. 66 22	6.050 6.400	93.00	3.105 4.600 6.095 7.590	28.6	0.000 0.350 0.350 4.175 6.740	35.00	1 8 4 6 7 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
OR ROAD NO	N O			* * 1		* * * * w 4 rv c				* * * * * * * ! vi w 4 rv ro p 4

	(3) N	445.07	435,95	407.23	71.55	335.87	307.15	299	147.23	-147.232	147.23	147.23	147.23	147.23	147.23	147.23	147.23	299.17	307.15	-335.877	371.55	407.23	435.95	445.07	279.81	279.81	279.81	279.81	279.81	279.83	-279,815	279.81	279.81
	S (t)	79.81	33.72	05.43	18.16	102.15	140.99	-147.232	99.17	285.736	37.36	67.30	0.00	167.30	37.36	285.73	299.17	47.23	40.99	2.	18.16	05.43	233.72	279.81	45.07	11.21	69.95	97	0.00	134.97	-269.950	411.21	415.07
Case 6	>:	68.40	365.78	54.81	-91.68	191.00	46.88	-397.379	397.37	-295.020	34.53	45.50	2.32	45.50	34.53	295.02	97.37	397.37	46.88	-181.000	91.68	154.81	65.78	468.40	468.40	18.33	78.69	61.13	55.27	61.13	178.696	18.55	68.40
	(£)	00.	00.	90.	0	80,	00.	00000	53.56	-53.563	53.56	53.50	53.56	53.56	53.56	53.56	53.50	00:	00.	0.000	00.	00.	00.	00.	56.19	56.19	56.19	56.19	56.19	56.19	-56.197	56.19	56.19
e 10	S	1.9	9.33	7.72	0.88	25.95	7.56	53	, °	00000	00.	00.	00.	8	00.	80.	8	3:56	7.56	25.951	0.88	27:72	9:33	56.19	00	00	00	00	00.	0	000.0	00	8
1O	M (tm)	31.2	0.16	38.38	0.77	1.16	5.15	84	22.84	-22.847	22.84	22.84	22.84	22.84	22.84	22.84	22.84	2.84	5.13	41.162	0.77	8.38	10.16	1.27	31.27	31.27	31.27	31.27	31.27	31.27	-31.276	31.27	31.27
	N (t)	43.96	143.96	143.96	-143.967	143.96	143.96	143.9	.33	0.338	8	.33	33	.33	Ω	ლ	. 33	27.46	27.46	7.46	27.46	27.46	27.46	27.4	33	0.33	0.33	0.338	0.33	0.33	-0.338	0.33	0.33
e 10		0.338	9	33	φ,	က က	89	33	Ω	23,96	58.25	16.31	7.46	27.46	27.46	27.46	27:46	0.33	0.338	-0.338	0.338	0.33	0.33	0.33	7.46	3:01	5.85	2.61	4.20	9.37	-58:119	5.37	143:96
ase 4 HB liv	M (tm)	-79.939	79.80	79.37	8.85	78.32	77.89	77.77	.77	-30.890	80.29	8.72	8.75	7.69	3.35	37.95	7.37	47.57	47.68	٠	48.64	49.17	49,59	49.73	49.73	9.11	0.47	83.94	2.31	44.43	660.66	2.83	79.93
Ca	L(m)	000.0	40	.66	(시 (시	7.9	0.5	9	0	9	6	0.1	9.	.09	დ დ	.85	CI.	٥.	33	1.610	.17	7.4	00.	.40	.00	.35	8	.20	.60	9	7.390	5	. 20
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	N CE	60	000	22.000	248.08	01 01 0	100	-176.601		220.7	220.74	220.74	220.74	220.74	20.74	220.74	220.74	220	76.60	184 58	213.30	248.9	284.66	313.38	322.50	87.40	87.40	87.40	87.40	87.40	87.40	-387.409	87.40	87.40
	S (t)	87.40	000	500	- 1 82	30.10	204.60	-220.741		6.60	63.16	14.79	7.39	000	57.39	14.79	63.16	-176.601	20.74	04 60	2	1.82	66.05	29.99	-387.409	22.50	97.96	5.60	97.80	0.00	7.80	-195,606	97,96	22.50
Case 8	M (tm)	443.84	ц.	98.0	2.70	24.30	189.25	-263.746		263.74	04.28	29.17	99.53	42.43	99.534	29.17	204.28	3.74	63.74	189.25	24.30	132.708	9.36	00.45	8	43.84	5.26	25.04	29.69	97.91	9.69	25.042	5.26	43.84
	N (t)	28.37	519.26	490.53	-454.857	419.17	390.45	82.47		31.87	31.87	31.87	31.87	31.87	-131.879	31.87	31.87	31.87	15.87	23.85	252.57	288.2	323.93	52.65	361.77	95.16	95.16	95,16	295.16	295.16	95.16	-295.167	92.16	95.16
	S (t)	95.16	49.07	0.78	ា	86.80	5.64	31.87			40.43	98.09	4.05	9.27	-96.666	54.06	02.43	15.87	31.87	5.64	86.80	2.810	120.78	0.7	295.16	61 77	45.17	61.18	8 73	34.60	11.21	-278.716	77.25	28.37
ase 7	M (tm)	506.55	397.79	67.47	-80.326	155.61	92.14	337.27	• 1	37.27	210.76	23.34	02.00	92.75	191.141	3.72	. 87	94.07	94.07	48.94	12.41	-37.127	24.27	54.59	63.35	63.35	39.60	05.92	01.34	38.72	87.81	218,359	30.60	06.55
c C	L(m)	000	40	.66	3.225	7.5	.05	40		<u>٠</u>	က	Ġ	٦.	တ	6.095	ഹ	∞.	C)	00.	ю С	61	3.175	74	00	40	0	က	ω	S	ω.	<u>.</u>	7.390	∞.	Ċì
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PICK-UP No. 1 *

				M	MAXIMU	×		>	MINIME	×	
	No.	(m)	Case	M (tm)	S (t)	N (t)	Case	% (tm)	s (t)	N (£)	
, i	01	0.000	စ ပ်	00	7.40	22.50		506.55	95	528.37	
የ		40		300.45	29.99	313.38		397.79	49.07	519.26	
*		. 66	ı	9.36	66.05	84.66	3	57.47	20.78	190,53	
જ		. 22		32.70	-1.82	248.98	٠,	-91.68	8	371 25	
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	1	0.0	ī	89.25	04.60	184.58	ı	346.22	140.00		
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		3 (60.74	16.60	220.74	ı	397.37	99.17	147.23	
ж		io m		204.28	63.16	220.74	ı	95.02	85.73	47.23	
'n'		.61	ŧ	23.34	98:09	131.87	ī	-29.17	4.79	220.74	
W.		2	į	45.50	7:30	147.23	ı	6.53	57.39	220.74	
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•		60 .	,	45.50	167.30	147.23	1	6.0	57.39	220.74	
×		59	ı	34.53	237.36	147.23	ı	29.17	14.79	2000	
*		8.850	- - - - - -		63.16	20.74	t	295.02	285. 73	47.23	
(C)	ત	20	i.	3.74	-176.601	-220.741	0 -5	-397.379	-299.173	-147.232	
ന	7	00000	∞ -	4	20.74	176.60	i	397.37	47.23	299,17	
•			i	189.25	04.60	184.58	ı	346.88	40.99	307.15	
•		.61	ı	24.30	.10	213.30	ı	51.00	5	335.87	
**		1.7	ŀ	2.70	1.82	248.98	ı	-91.68	18.16	371.55	
~	*	. 7	í	7		-284.662	9 - O	-154.813	105.4	07.23	
~		00	i	4.5	9.89	313.38	1	365.78	33.72	135.95	
4.		.40	i	443.84	387.40	322.50	1	68.40	279.81	445.0	
্ব ব		00.	i	443.84	22.50	387.40	i	468.40	45.07	279.81	
W		ω ιο	ŧ	18.55	11.21	279.81	ŀ	39.60	4.51	002.16	
		.83	ı	178.69	9	279.81	1	25.04	. 60	387.40	
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-74		.60	ŧ	55.27	0.00	279.81		97.9	0.00	387.40	
ж.		.99	ı	87.81	111.21	295.16	ı	25,65	97.80	387.40	
*	Ś	7.390	C-7	218.359	-278.716	-295.167	8 - - -	25.042	-195,606	87.4	
*		8.	1	18.55	411.21	279.81	1	35.26	95.78	387.40	
res T		. 20	i	443.84	322.50	387.40	1	96.35	528,37	5.16	

#	
No.	
PICK-UP	

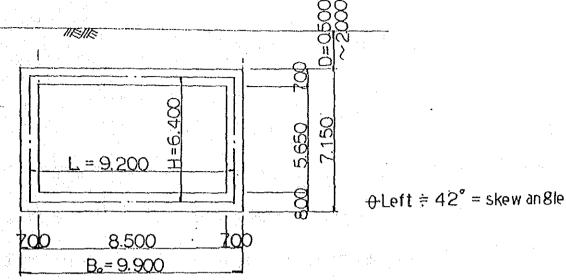
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N (\$)	.1 .1	000	407 23		213.30	104	-176.601	220.74	74 066	220.74	131.87	131.87	147.23	147.23	47.23	-147.232	215.87	99.00	252.57	24.0	284.66	313.38	-322.506	387.40	387.40	387.40	387.40	279.81	279.81	-295.167	295.16	295.16
(1) S	79.81	33.72	05.43	8.16	130, 10	204.60	-220.741	76.60	63.16	4.79	34.05	39.27	167.30	237.36	285.73	-299.173	31,87	25.64	6.80	1.82	166.05	29.99	387	22.50	97.96	5.60	97.80	0.00	134.97	-278.716	477.25	528.37
. (tm)	468.40	65.78	154.81	-91.68	24.30	189.25	-263.746	263.74	04.28	29.17	07.00	92.75	45.50	34.53	295.02	-397.379	294.07	2.8.94	12.41	132.70	9:36	00.45	4.43	443.84	35.26	5.04	29.69	55.27	61.13	218.359	30.60	506.55
Case	9 - V			•		·	8 - - -	ı	ı	ì	ı	ŧ	ŧ	ı	ı	9 -0	1		1	ı	ı	,	C- 8	1	,	ı	i	,	1	C- 7	ı	ì
N (£)	322.50	Ġ	284.66	248.98	419.17	390.45	382.47	131.87	131.87	147.23	147.23	147.23	220.74	20.74	220.74	220	176.60	184.58	213.30	-371.555	407.23	435.95	445.07	279.8	279.81	279.81	295.16	295.16	387.40	4	387.40	387.40
s (t)	87.40	329.996	66.05	-1.82	86.80	125.64	1.87	82.47	40.43	37.36	7.30	00.0	57.39	-114.791	63.16	176.60	20.74	04.60	0.10	18.162	105.43	33.72	275.81	45.07	11.21	9.95	58.73	34.60	97.80	-195,606	97.96	322.50
M (tm)	3.84	300.	.36	32,70	155.61	ا	337.27	7.27	210.76	34.53	45.50	62.32	99.53	-29.176	204.28	63.74	263.74	9.25	24.30	-91.688	154.81	65.78	468.40	68.40	318.55	8.69	01.34	38.72	29.69	25.0	5.26	43.84
Case	∞ - - - -	% 	ı	ı	ŧ	į	1	C- 7	1	ı	ı	i	ı	,	;	ı	ı	ı	ı	C- 6	,	ı		1	1	ŧ	ı	ı	ı	& - -	,	ı
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	s (t)	5.16	-2.81	-125.645	.60	14.79	0.00	-114.791 -163.164 -176.601	47.23	18.162 -105.433 -233.720 -279.815	00.00 00.00 00.00	0.000 -97.803 -195.606 -297.965
	W (tm)	97.79	180.03	-155.012 -292.148 -337.273	4.2.4	29.17 99.53	242 00 64.0 60	-29.176 -204.287 -263.746	97.37	-154.688 -154.888 -365.784 -468.404	2255 255 255 255 255 255 255 255 255 25	2007 2007 2007 2006 2006 2006 2006 2006
	Case	1.1	l # i	566	1 1	l i	i i	000 000	111	00000 1111	1 1 1 1	ဂ္ဂဂ္ဂ ထထထထထ
	N (t)	322.50	248.98		131.87	131.87	131.87	-131.879 -131.879 -131.879	176.60 184.58 213.30	1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	279.81 279.81 279.81 279.81	1 1 1 1 1 2 2 7 3 9 3 8 1 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
MAXIMOM	S (t)	9.09	1.82	204.6	82.47	34.05	39.27 96.66	-154.061 -202.435 -215.872	7.00 4.00		20.00	
%. 1 * N. N.	W (tm)	-443.847 -300.452	200	3 62 7	.27	23.34	92.75 91.14	3.722 -220.870 -294.074	4 8 8 8	30 0 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	68.40 18.55 78.69	178.276 178.276 178.696 1818.553
PICK-UP	Case	0 0 0 0 0 0	1 1	1 1		, ,		777			1 1 1	0 0 0 0 0 0 0 0 0 0
	(m)	0.000	2 62 6	0.00	950	300	09	7.590 8.850 9.200	35	3.175 4.740 6.000 6.400	00000	4.0.78.00 0.0.00 0.000 0.000 0.000
OX FOR ROAD NO	No.	0 m c) (O 5	r 10		* * VI 00 '		0 ~ 0 1 * *	ω 1 % % 4 ⊷ σ	4. * * * * I በወኋኮህ		* * * * 1
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NO @ BOX CULVERT FOR RORD

1) Shape and Size



Where

 D^{m} depth of asphalt and similar surface soil.

2) Factor of section

No. O BOX CULVERT FOR ROAD

- 1. calculation for bending moment (U.L.S)
 - 1) For upper slab

$$h = 70$$

$$d = 64, 0$$

$$\mathbf{i} = 6.0$$

a) middle point $2\sim3$ Mu. max = 631.9 KNm

$$A_s = \left(\begin{array}{c} Y_{32} - 300^{\text{ctc}} = 8.042/0.300 \\ Y_{25} - 300^{\text{ctc}} = 4.909/0.300 \end{array} \right) = 43.17 \text{ cm}^2$$

$$X = \frac{0.87 \times 41000 \times 43.17}{0.40 \times 2500 \times 100} = 15.4^{\text{cm}}$$

$$Z = 64.0 - \frac{15.4}{2} = 56.3^{cm} < 0.95 \times 64.0 = 60.8^{cm}$$

 $M_{Rs} = 0.87 \times 41000 \times 43.17 \times 56.3 \times 10^{-5} = 867.0^{KNm} > Mu = 631.9^{KNm}$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 15.4 \times 56.3 \times 10^{-5} = 867.0^{KNm} > Mu = 631.9^{KNm}$$

OK

b) intersection point 2=3 Mu.min = -580.7^{KNm}

$$A_s = Y_{25} - 150^{c+c} = 4.909 / 0.150 = 32.73 \text{ cm}^2$$

$$X = \frac{0.87 \times 41000 \times 32.73}{0.40 \times 2500 \times 100} = 11.8^{cm}$$

$$Z = 64.0 - \frac{11.8}{2} = 58.1^{cm} < 0.95 \times 64.0 = 60.8^{cm}$$
 OK

 $M_{RS} = 0.87 \times 41000 \times 32.73 \times 58.1 \times 10^{-5} = 678.3^{KNm} > Mu = 580.7^{KNm}$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 11.8 \times 58.1 \times 10^{-5} = 685.5^{KNm} > Mu = 580.7^{KNm}$$

0K

2) For bottom slab

section
$$b = 100^{cm}$$
 $h = 80$ $d = 73.0 (74.0)$ $d' = 7.0 (6.0)$

a) middle point $\textcircled{a} \sim \textcircled{1}$ Mu. max = 802.1 KNm

$$A_s = \left(\begin{array}{c} Y_{32} - 300^{\text{ctc}} = 8.042/0.300 \\ Y_{25} - 300^{\text{ctc}} = 4.909/0.300 \end{array} \right) = 43.17 \text{ cm}^2$$

$$X = \frac{0.87 \times 41000 \times 43.17}{0.40 \times 2500 \times 100} = 15.4^{cm}$$

$$Z = 73.0 - \frac{15.4}{2} = 65.3^{\text{cm}} < 0.95 \times 73.0 = 69.3^{\text{cm}}$$
 OK

 $M_{RS} = 0.87 \times 41000 \times 43.17 \times 65.3 \times 10^{-5} = 1005.5^{KNm} > Mu = 802.1^{KNm}$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 15.4 \times 65.3 \times 10^{-5} = 1005.6^{KNm} > Mu = 802.1^{KNm}$$

0K

$$Z = 73.0 - \frac{11.6}{2} = 67.2^{cm} < 0.95 \times 73.0 = 69.3^{cm}$$

 $M_{RS} = 0.87 \times 41000 \times 32.73 \times 67.2 \times 10^{-5} = 784.5^{\text{KNm}} > \text{Mu} = 660.4^{\text{Nm}}$ $M_{RC} = 0.40 \times 2500 \times 100 \times 11.6 \times 67.2 \times 10^{-5} = 793.0^{\text{KNm}} > \text{Mu} = 660.4^{\text{Nm}}$

Notice: this bar is decide for shearing force without bending moments.

- 2. calculation for shearing force (U.L.S)
- a) For upper slab

section
$$b = 100^{cm}$$
 $h = 70$ $d = 64.0$ $d' = 6.0$ intersection point $@= ③$ Su.max = 343.4^{KN}

$$A_s = \left(\begin{array}{c} Y_{32} - 300^{\text{ctc}} = 8.042/0.30 \\ Y_{25} - 300^{\text{ctc}} = 4.909/0.30 \end{array} \right) = 43.17 \text{ cm}^2$$

$$P = \frac{43.17}{100 \times 64.0} \times 100 = 0.675 \%$$

$$Vc = \frac{343.4 \times 10^3}{100 \times 64.0} = 53.7 \text{ N/cm}^2$$

$$< \text{Vca} = 50.0 + 15.0 \frac{(0.675 - 0.50)}{0.50} = 55.2 \text{ N/cm}^2 \text{ OK}$$

b) For bottom slab

section b = 100 h = 80 d = 73.0 d' = 7.0 intersection point 4 = 1 Su.min = -386.2^{KN}

$$A_s = \begin{pmatrix} Y_{32} - 300^{\text{ctc}} = 8.042/0.30 \\ Y_{25} - 300^{\text{ctc}} = 4.909/0.30 \end{pmatrix} = 43.17 \text{ cm}^2$$

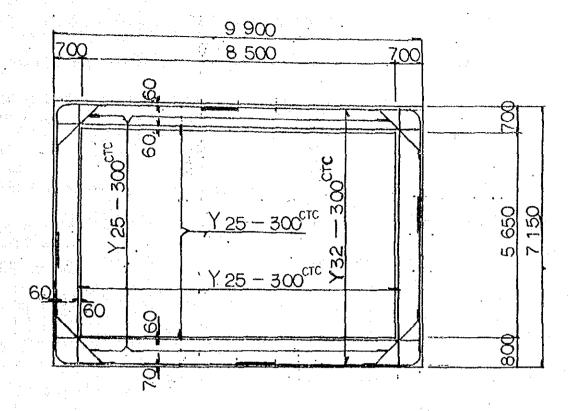
$$P = \frac{43.17}{100 \times 73.0} \times 100 = 0.592 \%$$

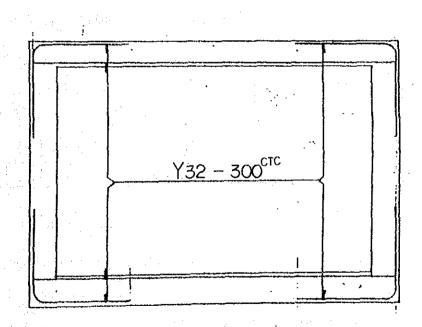
$$V_{\rm C} = \frac{386.2 \times 10^3}{100 \times 73.0} = 52.8 \text{ N/cm}^2$$

$$< \text{Vca} = 50.0 + 15.0 \frac{(0.592 - 0.50)}{0.50} = 52.8 \text{ N/cm}^2$$
 OK

Notice: this bar is decide for shearing force about point ②, ③ and ④, ①

NO DBOX CULVERT FOR ROAD





NOT BOX CULVERT FOR ROAD D= 2.000 m

(1) Dead load

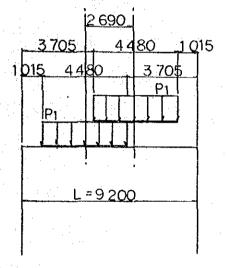
a) vertical load --- (case-1)

9.20

b) Horizontal load — earth pressure ——— (case-2)
For side wall P1 =
$$(22.6 \times 0.50 + 19.60 \times 1.85) \times 0.500$$
 = 23.780 kN/m
P2 = $(22.6 \times 0.50 + 19.60 \times 8.25) \times 0.500$ = 86.500 "

(2)Live load

a) Vertical load of center ---- (case-3)



$$B = (0.30 + 2.0 + 0.70) \csc 42^{\circ} = 4.480 \text{ m}$$

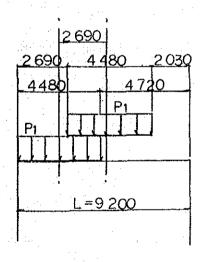
P1 =
$$\frac{10 \times 30}{3.50 \times B}$$

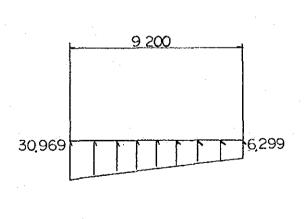
= $\frac{10 \times 30}{3.50 \times 4.48}$ = 19.133 KN/m

For bottom slab

$$P2 = \frac{2 \times 19.133 \times 4.480}{9.20} = 18.634 \text{ KN/m}$$

b) Vertical load of partial ---- (case-4)





$$P2 = \frac{2 \times 19.133 \times 4.480}{9.20} \pm \frac{6 \times 19.133 \times 4.480(2.360 - 0.330)}{9.20^{2}}$$

$$= 18.634 \pm 12.335 = \begin{cases} P2-1 = 30.969 \text{ KN/m} \\ P2-2 = 6.299 \text{ KN/m} \end{cases}$$

C) Horizontal load of live load surcharge ---- (case-5)

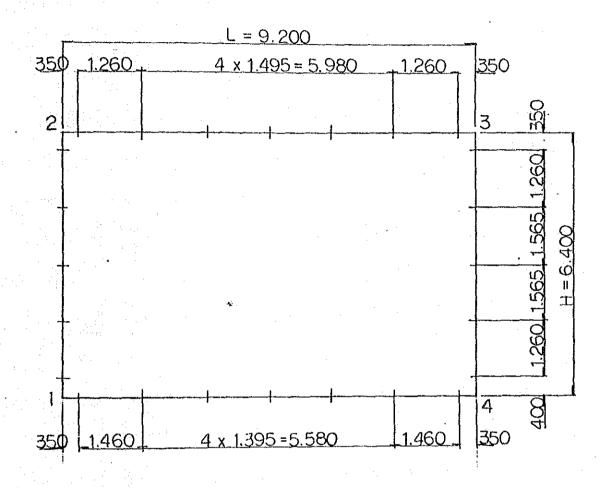
Pe = goko = 34.300
$$\times$$
 0.500 = 17.150 KN/m
1 - 129

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NOTE: THE DIMENSIONCE EXCHANG TO

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CALCULATION POINTS OF EACH FORCE



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့် မွှေ	80.		·	Pj (t/m)	186.8				P. (t/m)	, H
טו מו	80.204			Pi (t/m)	86.500 -23.780				Pi (t/m)	
Lo (m) 6.400 6.400	* *	~~		Lo (m)	6.400				Lo (m)	
Li (m) 0.000 0.000	0000.0	-0.003 (t)	 pressure	Li (m)	0.000	0.000 (t)	1 2 1	10801	Li (m)	
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No. : 4 live load-VL-

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Pj (t/m)	119.133							Pj (t/m)	17.150	
Pi (t/m)	-19.133 6.239		÷					Pi (t/m)	17.150	
Lo (m)	4.480 4.480 9.200		٠.	,			A	Lo (m)	6.400	
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	RM (tm) 0.000 0.000 0.000 0.000 0.000 0.000
	8 RY (t) 0.000 0.000 0.000 0.000 0.000 0.002
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0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	EM (tm) 0.000 0.000 0.000 0.000 EM (tm) EM (tm) 0.000
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 A-DIS. (mm) 0.00000 0.00291 0.04369 Case. X-DIS. (mm)	X-DIS.(mm) Y-DIS.(mm) 0.00000 0.00000 -0.04359 -1.15594 -0.04078 0.00000 X-DIS.(mm) Y-DIS.(mm)	X-DIS.(mm) Y-DIS.(mm) ROTA.(mmRad) 0.00000 0.00000 12.01597 -0.04369 -1.15594 -11.15536 -0.00291 -1.15594 11.15536 -0.04078 0.00000 -12.01597 X-DIS.(mm) Y-DIS.(mm) ROTA.(mmRad)	X-DIS.(mm) -0.00000 -0.13444 -0.85681 -0.95124 -X-DIS.(mm)	Y-DIS.(mm) 0.00000 0.00000 0.00000 0.00000	ROTA.(mmRad) -4.54327 -4.48011 -4.54327 A.54327 ROTA.(mmRad)	X-DIS.(mm) 0.00000 0.03615 -0.00241 0.03374 X-DIS.(mm)	
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 Case. X-DIS.(mm)	7. Y-DIS.(mm)	-2.59503 ROTA.(mmRad)	Case. X-DIS.(mm)	8 Y-DIS.(mm)	L.ofebb ROTA.(mmRad)	X 1	* * *
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load-VL-	S	7 33	7.33	7 33	7.33	7.33	.co	-7.334	į	7	7.1	.33	() ()	00	7.3	G	5 71	85.71		9	3	7.334	(,	8	33	333		7	9.19	1.98	83	0.00	25.99	51.98	-79.195	85.71
3	M (tm)	56.56	59.49	68.73	80.21	91.69	00.93	103		03.50	3.00	31.11	20.85	60.17	20.85	H	73.50	10		03.50	00.93	191.695	80.21	68.73	59.49	56.56	1	56.56	7.70	8.05	22.45	46.58	2.45	68.05	-27.705	56.36
	S C	•	•	•		•	•	0.000		757.40	137.40	137.40	37.40	137,40	137.40	137.40	37.40	5		00.	.00	000.0	00.	00.	8	00.		215.48	215.48	215.48	215.48	215.48	215.48	215.48	-215.488	215.48
pressure	<u> </u>	15 48	81 67	85.40	12 51	86.42	128.48	-137.408	,	3	00.	00.	00.	00	00	0.000	00	0		37.40	8.48	.∞	2.51	85.40	181.67	4 ∞	. (0	00	00.	00	00	00.	00.	000.0	00.
~ `	ν Υ	05.35	25.98	40.64	94.54	4.00	23.02			00.60	69.58	9.58	65.58	9.58	69.58	69	9.58	69.58		69.58	23.02	114.003	94.54	40.64	25.98	10 		09.30	105.35	105.35	105.35	105.35	105.35	105.35	-105.359	105.35
	(†) N	68.94	362.33	341.53	315.66	289.80	268.99	-263.212		2	88	86	.86	86	.86	8.864	.86	.85		263.21	268.99	-289.809	315.66	341.51	362.33	368.94	.0	90.0	8.86	8.86	8.86	8.86	8.86	8.86	-8.864	8.86
•	()	(0)	86	86	86	88	86		ç	77.00	43.18	1.08	85.54	0.00	85.54	171.08	43.18	263.2		8.86	8.86	-8.864	8.86	8.86	.86	8.86	-:-0	00.00	40.86	. 76	11.88	80.	111.88	223.76	-340,867	368.93
se 1 Dead	E4 > 7	-287.053	283.50	272.33	258.46	244.59	233.42	230.32	000	70.00	141.70	19,29	11.12	75.06	11.12	ÇĮ.	141.70	30.3		0	233.42	244.59	258.46	272.33	283.50	287.05	i C	00.10	162.83	49.34	83.46	61.50	83.46	49.34	-162.837	287.05
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X (E)	631.71	-622,592	593.86	558.18	522.51	493.78	485.80	224.97	224.97	224.97	224.97	-224.978	224.97	224.97	224.97	224.97	0 8 2 8 9	20.00		0.00	593.86	622.59	631.71	57.30	337.30	-357.300	357.30	357.30	357.30	357.30	357,30	357.30
s (t) ·	57.30	301.504	42.63	18.89	140.84	10.25	224.97	85.80	8.16	42.39	83.44	Q	183.44	342.39	.16	485.80	70 76	9	200	10.044	142.65	. 50	357.30	31.70	83.64	385.146	91.57	0.00	191.57	83.14	583.64	31.70
ase 6 M (tm)	650.86	×	242.06	150.38	280.55	504 LA	580.6	80.67	415.47	94.29	87.35	631.825	87.35	94.29	15.47	580.67	0 0 0 0		1111	1180.080	242.06	519.18	650.86	50.86	438.17	267.581	68.44	02.06	68.44	67.58	38.17	50.86
Ca N (t)	0.000	00	8	00.	8	.00	8	53.56	53.56	53.56	53.56	-53.563	53.56	53.56	53.56	53.56	C	2	2 5		00	00	00	56.19	56.19	-56.197	56.19	56.19	56.19	56.19	56.19	56.19
e load-HL- S (t)	6.19	3	7.72	0.88	10 (0	7.36		.00	00.	8	00.	0	8	00.	00.	00.	r U	7 0	9 0	100 CI	27.72	9.33	56.19	00.	00.	0.00.0	80.	00.	80.	00.	8	٥
Case 5 HB live M (tm)	1.27	-10.169	8.38	0 77	1.16	5.15	2.84	2.84	22.84	22.84	22.84	-22.847	22.84	22.84	22.84	22.84	2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		50 12 E	8 38	0.16	31.27	31.27	31.27	-31.276	31.27	31.27	31.27	31.27	31.27	1.27
(‡) N	105.77	-105.776	105.77	105.77	105 77	105.77	105.77	6.06	0.00	6.06	6.06	-6.063	8.06	-6.06	90.9	90.9	10 10 10	יי טע טע	ט ני ני		65.65	65.65	65.63	90	90.	6.063	.06	.06	90.	90.	90.	90.
e load-VL- S (t)	-6.06		90	5.06	8	6.00	6.06	5.77	9.07	4.97	38.42	-16.484	45.08	65.65	65.65	5.65	20	2 6		90.0	90	.06	90.	. 65 . 55	3.28	49.862	1.69	8.31	20.29	54.11	. 10	05.77
se 4 HB live M (tm)	63.20	-65.634	73 27	82.763	92 28	99.89	02.01	2.01	66.16	43.48	32.54	147.366	01.34	14.24	68.48	1.46	01.16	76.00	2	172 214	62.72	55.08	52.66	2.66	30.08	53.209	10.70	9.21	31.46	80.16	8.06	63.20
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	S (t)	60.3	93.39	98.89	-6.94	173.18	78.24	302.86	· ·	63,23	35.08	0	18.05	0.00	18:03	236.10	-335.595	363.23	302.809	78.24	73.18	6.94	198.89	3.39	460.51	9.13	0.39	8.80	4.40	00.0	154.40	-308.801	470.35	509.13
«) 	821.58	50.88	00	64.60	-81.51	68.60	470.35	1 1 1 1 1 1	470.35	8.06	12.10	6.83	65.07	76.83	12.10	48.06	470.	70.	368.60	81.51	64.600	80.43	450:88	21.58	621.58	50.16	118.65	41.73	49.43	41.73	118.652	50.16	21.58
	×	660.39	651.27	622.55	586.87	551:19	522.47	-514.492		223.16	223.16	223.16	223.16	223.16	223.16	223.16	23	223:16	457.12	465.10	493.82	-529.503	565.18	593.90	603,02	359.11	359.11	359.11	359.11	359.11	359.11	-359.118	359.11	359.11
	s (t)	59.14	03.32	44.47	-17.08	39.03	208.43	-223 161		14.49	77.27	43.31	73.00	23.57	182.52	329.98	-429.483	457.12	23.16	08:43	39.03	17.08	144.47	03.32	359	03.02	60.89	80.10	9.72	11.88	183.42	-386.186	606.39	660.39
Q) : .	660.36	527.96	48.54	154.02	281:35	502.95	578		78.54	04.98	1.99	04.06	13.50	59.44	70.16	-408.300	3.45	63.45	487.86	266.26	-138.944	233,46	512.87	645.28	6 4 F. O.	7 10	246.34	51.64	00.11	81,33	284.897	438.69	60.36
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	m	-	i.	64.60	6.94	435.61	5	150.38	18.89	558.18
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S. MAXIMUM

S. MINIMUM

3	3.7	-622.592	593,86	58.18	399.93	371.21	63.23		302.86	302.86	302.86	02.86	223.16	224.97	224.97	224.97	-224.978	457.12	65.1	493.82	435.61	471.29	500.01	508.13	60.51	460,51	460.51	460.51	357.30	357.30	-359.118	359.11	359.11
S (‡)	57.30	301.504	42.65	18.89	173.18	78.24	302.86		63.2	35.55	36.1	18.0	23.5	183.4	342.3	58.1	-485.806	23.16	.43	39.03	6.94	198.89	93.39	460.	09.3	70.3	φ,	4.40	0.0	93.5	-386.186	606.3	60.3
M (tm)	50.86	-519.188	42.06	50.38	81.51	68.60	70.35		70.35	8.06	12.10	6.83	13.50	87.35	94.29	415.47	-580.671	63.4	487.86	266.26	64.60	80.43	450.88	. 58	621.58	50.16	18.65	41.73	02.06	68.44	284 897	38.69	98.099
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» (t)	509.13	-500.018	471.29	35.61	551.19	522.47	514.49		223.16	223.16	223.16	5	224.97	302.86	302.86	302.86	302.8	3.23	371.21	399.93	58.18	593.86	622.59		357.30	357.30	357.30	359.11	359.11	460.51	-460.513	160.51	460.51
(†) S	60.51	393,398	98.89	-6.94	9.03	08.43	223.16		4.49	7.27	9.9	3.4	00.0	118.05	6.10	000	363.2	02.	78.24	73.18	18.89	42.65	301.50	357.30	31.70	83.64	83.14	99.72	11.88	154.40	-308.801	470.39	509.13
M (tm)	621.58	450.8	80.43	64.60	281.35	02.95	578.54	, i	-578.541	404.98	11.99	87.35	31.82	76.83	12.10	8.06	70.35	-470.358	8.60	81.51	150.38	42.06	519.18	550.86	50.86	38.17	67.58	51.64	00.11	41.73	œ ·	50.16	621.58
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NO BOX CULVERT FOR ROAD D= 0.500 m

(1) Dead load

a) vertical load --- (case-1)

For upper slab
$$w1 = 22.6 \times 0.50 + 23.6 \times 0.70$$
 = 27.820 kN/m
For side wall $w2 = 23.6 \times 0.70$ = 16.520 "

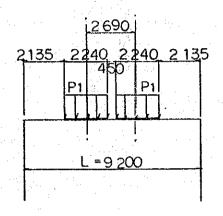
For bottom slab $w3 = 27.820 + \frac{2 \times 16.52 \times 6.40}{0.20}$ = 50.804 "

b) Horizontal load -- earth pressure --- (case-2)

For side wall P1 =
$$(22.6 \times 0.50 + 19.60 \times 0.35) \times 0.500$$
 = 9.080 kN/m
P2 = $(22.6 \times 0.50 + 19.60 \times 6.75) \times 0.500$ = 71.800 "

(2) Live load

a) Vertical load of center ---- (case-3)



$$B = (0.30+0.50+0.70) \csc 42^{\circ} = 2.240 \text{ m}$$

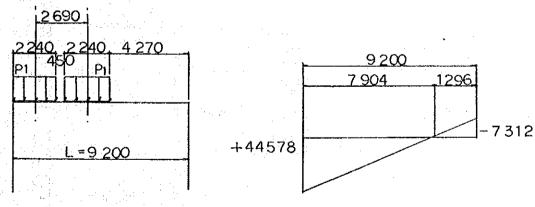
P1 =
$$\frac{10 \times 30}{3.50 \times B}$$

= $\frac{10 \times 30}{3.50 \times 2.24}$ = 38.265 KN/m

For bottom slab

$$P2 = \frac{2 \times 38.265 \times 2.240}{9.20} = 18.633 \text{ KN/m}$$

b) Vertical load of partial ---- (case-4)



For bottom slab

$$P2 = \frac{2 \times 38.265 \times 2.240}{9.20} \pm \frac{6 \times 38.265 \times 2.240(3.480 + 0.790)}{9.20^{2}}$$

$$= 18.633 \pm 25.945 = \begin{bmatrix} P2-1 & = +44.578 & KN/m \\ P2-2 & = -7.312 & KN/m \end{bmatrix}$$

C) Horizontal load of live load surcharge ---- (case-5)

Pe = goko = 34.300
$$\times$$
 0.500 = 17.150 KN/m

BOX FOR ROAD NO 7' Depth = 0500 For Check

NOTE: THE DIMENSIONCEUBE EXCHANG TO DIMENSION(KN)INTO THIS CALCULATION				
	EPS 1.00E-05 1.00E-05 1.00E-05		L-No L-No 9 10 19 20	
	E (1/m2) 2.50E+07 2.50E+07 2.50E+07 2.50E+07		L-No L-No 7 8 17 18	8 8 2 0
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	HERE	M(tm/Rad) Free Free	0 4 4 4 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1	010000
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Y (m) 0.0000 6.4000 0.0000	A (m2) 0.70000 0.70000 0.70000	>	L-No 1 2 3	1.660 1.610 1.810 3
X (m) 0.0000 0.0000 9.2000	५ ००४न	X (t/m) Fix Free	1 N	00.000
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No. : Dead load

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Pj (t/m)	-16.520 -16.520 -27.820 50.804		(E)	·-			Pj (t/m)	-38.265 -38.265 18.655
Pi (t/m)	-16.520 -16.520 -27.820 50.804		Ð; (+/m)	7 1			Pi (t/m)	1.38 1.38.265 1.8.265 6.35
Lo (m)	6.400 9.200		Lo (m)				Lo (m)	2.240 2.240 9.200
Li (m)	0.000.0	-0.003 (t) 0.000 (t) ressure	Ê		0.000 (t)	load-vl-	Li (m)	2.135
	X	Σ V = -0.003 Σ H = 0.000 : Earth pressure : 2	4	××	N N > ∓	: HB live		>> >> >> >> > > >
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No	H0014		800	rd M			% %	01014

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	Pj (t/m)	-38.265 -38.265 0.000 44.578				Pj (t/m) 17.130	001
	Pi (t/m)	-38.265 -38.265 -7.312 0.000		· .		Pi (t/m) 17.150	
	Lo (m)	2.240 2.240 1.296 7.904	·		·	Lo (m) 6.400)) * •
HB live load-VL-	Li (m)	Y 0.000 Y 2.690 Y 1.296	0.007 (t)		live load-HL-	Li (m)	00
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C-No 1 C-No 2 No 6 No 7

RM (tm)	00000	RW (tm)	0.000	
3 RY (t)	0.002	6 RY (t)	0.005	
Case. RX (t)	0.000	Case. RX (t)	000000	
RM (tm)	0.0000	RM (tm)	0.000.0	RM (tm)
2 RY (t)	0.000	5 RY (t)	0.000	8 RY (t)
Case. RX (t)	0.000	Case. RX (t)	0000.0	Case.
RM (tm)	0.000	RM (tm)	000000	RM (tm)
RY (t)	0.002	RY (t)	-0.002	RY (t)
Case. 1 RX (t)	0.000	Case. 4 RX (t)	00000000	Case. 7 RX (t)
No.	, , , , ,	No.	, , , , च	No.

(mm) ROTA.(mmRad)	0.00000 3.3002 0.31347 -4.1625 0.31347 4.1625 0.00000 -3.3002	(mm) ROTA.(mmRad)	0000 9.1291 0031 -8.8328 0091 8.8328 0000 -9.1291		
se. 3 b) Y-DIS.	1 1	se. 6 n> Y-DIS.(mm)	0.00000 -1.36091 -1.36091		
Case. X-DIS.(mm)	0.00000 0.04378 -0.00292 0.04086	Case. X-DIS.(mm)	0.00000 -0.26725 -1.02987 -1.29712		
ROTA.(mmRad) X-DIS.(mm) Y-DIS.(mm)	-3.38728 -3.21935 -3.38728	ROTA.(mmRad)	11.34866 11.47088 11.347088	ROTA.(mmRad)	-0.1 -0.45339 -4.5339
2 Y-DIS.(mm)	0.00000	5 Y-DIS.(mm)	000000000000000000000000000000000000000	8 Y-DIS.(mm)	0.00000
Case. X-DIS.(mm)	0.00000 -0.14433 -0.62534 -0.76967	Case. X-DIS.(mm)	0.00000 0.01154 -0.27005 -0.25851	Case. X-DIS.(mm)	0.00000
ROTA. (mmRad)	7.24551 -5.93643 5.93643 -7.24551	ROTA. (mmRad)	3.40303 -4.00040 2.71001 -2.67484	ROTA. (mmRad)	9.27613 -8.60091 6.75565
Y-DIS.(mm)	0.00000 -0.66134 -0.66134	4 Y-DIS.(mm)	0.00000	7 Y-DIS.(mm)	0.00000
Case. 1 X-DIS.(mm) Y-DIS.(mm) ROTA.(mmRad	0.00000 -0.06645 -0.06443 -0.06203	Case. 4 X-DIS.(mm) Y-DIS.(mm) ROTA.(mmRad	0.00000 0.91557 0.89844 0.01499	Case. 7 X-DIS.(mm) Y-DIS.(mm)	0.00000
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1000	S . W	α α	2 6	000	000	8	000	. 8 . 8 . 8 . 8 . 8 . 8 . 8 . 8 . 8 . 8	Ü			77.0	50.0	9	8.59	85.71	5.73	85		ထ	8	88.	88	0	88	8.882	, 7 , 7	0) () () ()	0000	, () (00.01	86.16	3	85.71
20	M (tm)	28.9	000	69.63	83.03	97.43	08.82	-111,737		0.6		07.00	0 i	97:79	36.40	26.26	81.7	7.3		11.73	108:62	57,43	83.53	69:63	8.44	-54.892	54.89	6.03	100	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	10	;	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	69.72	6.03	04.39
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. į.)	67.31		61.63	13.273	64.17	87.719	91.49			•	? <	•	?	9	9	000.0	0		1.49	7.7	4.17	3.27	61.63	39.3	-167.319	00.	00	200	000	000) C) (3	8	00
Case 2 Earth	X (tm)	78.55	-17.264	07.74	42.45	78.72	8.60	50.00	00	50.00		\$ C		00.00	00.0	0.00	-50.005	00.0	,	00.0	8.60	8.72	42.45	7.74	-17.264	8.53	8 .0 .0	78,55	70.07	1 200 00 00 00 00 00 00 00 00 00 00 00 00	10	100) t	00.00	20.00	8.00
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load	s (t)	3.48	13.484	က ကို	3.48	3.48	3.48	3.48	27.972	235	83.182	100	1000		41.591	83, 182	-118.235	127.972		13.484	3 48	13.484	13.48	13.48	-13.484	13.48	33.69	15.91	1.743	70.872	0.000	70 07		5 / · · · · · · · · · · · · · · · · · ·	3,4	233.69
se. 1 Dead	M (tm)	190.31	O.	167.92	146.82	125:72	108:73	104:01	04.0	-60.92	5.96	0.00	0000	9 6	33.73	5.96	-60.92	04:01		TO 1 0 0 1	27.807	135.72	146.82	167.92	-184.919	190.31	90.3	1111.63	49.46	Ó	47.19	97 76		0 4 5 7 7 7 7	20.11	180.81
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	N (t)	445.07	407.23	-335.876	299.17	145.06	145.06	-145.063	145.06	145.06	145.06	258.17	307.15	371.00	407.23	450.907	20.7	200	281.98	281.98	200	281 - 48 281 - 48	281.983
	(3) \$	81.983	07.602	1000 000 000 000 000 000 000	45.063	172	37.361	26.889	126.889	.361	299.172	5.003	38,829	0 00 00 00 00 00 00 00 00 00 00 00 00 0	107.602	1281.983	45 079	11.208	9:6	34.973	0.000	269.946	+411.208 -
	ase 6 N (tm)	70.7	153.54	2.94	385.83	-385.833	46.07	2.28	32.286	46.076		385.83	36.09	-87.02	153.546	737	470 73	20.88	76.35	58.78	02.007	76.353	889 737
	N (t)	0.000	000	000	00	(O) (O)	53.56	9.00 0.00 0.00	53.56	00 to 10 to	50.00 50.00 50.00	00.	88	30	00.	000.0	9.5	56.19	56.19	56.19	90	56.19	-56.197
	e 10ad-HL- S (t)	56.197	7.72	9 0	53.56	0.000	8	000	8	800	80.	3.56	7.56	9.0	27.72	-48.337 -56.197	00	00	00.	00.	000	38	0.000
	se o nb ilv M (tm)	-31.276	8.38	1.16	2.84	-22.847	22.84	22.02.02.02.02.02.02.02.02.02.02.02.02.0	22.84	22.84	22.84	2.84	 	0.77	38.38	-31.276	31.27	31.27	31.27	31.27	31 27	31.27	-31.276 -31.276
	N (t)	-127.945	127.94	127.94	127.94	1 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	S 2 2	3 G	2.2	0 6 0 0	3.25	43.48	24. W	43.48	00 0	# * #	25	23	.25) () ()	6	3.258 3.258
τς ο	SC	ကြက္လ	-3.25 -3.25	3.2	-3.25	127.945	66.33	30.85	43.48	43°,48	43.48	(C) (0 10	10	(C)	10 6	3.48	5.70	47.48	37.94	14.04	56.50	-112.691 -127.948
4 HR 3 1 V	M (tm)	172.228	82.73	87.83 91.93	93.07	-93.077	63.32	27.39	64.47	10 55 52 52 52	0.54	70.54	66.29	60.19	000.000	69.64	49.69	4.06	35.42	0 7	83.0	91.91	-30.136
, , , o, v	L(m)	0.000	200	. 79 . 05	40	0.000	.0.	9	60.		.20	00.	. 6	.17	4.740	4.	00	.35	 	, v	9 6	33	8:850 9:200
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No L(m) (450 c) (450 c) (470 c	`	1	87.40	29.99	66.05	-1.82	130.10	204.60	20.74		76.60	63.16	14.79	57.39	00.00	57.39	14.79	163.16	76.60	,	* * * * * * * * * * * * * * * * * * * *	04.60	30.10	. 82	166.05	329.99	87.40	2.5	5 26	95.6	67.8	0	57.8	195.6	297.9	322.5
No L(m) (45.5) 2 0.000	 ∞ > •	,	43.8	00.4	6.3	32.7	24.3	189.2	63.7		263.7	204.2	29.1	99.3	42.4	99.5	29.1	204.2	63.7	74 090	# 10 CO O	22.581	24.30	32.70	9:36	300.45	443.84	443.84	335.26	25.04	29.69	97.91	29.69	25.04	335,26	43.84
No. L(m) (asc. M) (tm) (cm) (cm) (cm) (cm) (cm) (cm) (cm) (c	•	•	505.46	496.34	467.62	431.94	396.26	367.54	359.56		37.02	37.02	37,02	37.02	37.02	37.02	37.02	37.02	37.02	7.00		0/*0*/	275.48	311.16	346.84	375.56	84.68	290.02	290.02	290.02	290.02	290.02	290.02	290.02	90.02	90.03
No N	S (‡)		90.02	43.93	15.64	7.95	91.94	130.78	137.02	(((59.56	26.97	69.69	95.07	44.12	119.57	176.97	225.34	238.78	37 02	\$ 0 0 0 0 0	0.00	40.1	7.95	115.64	243.93	90.02	84.68	63.31	63.50	52.06	60 4	117.88	276.40	159.11	05.46
о очимати мчиматори ачимати ччиматора очичать оснивать	<u>,</u> .~		95.52	388.82	164.98	85.87	169.21	12.22	59.14	, (7	39:00	99.07	24.21	62.30	29.42	70	245.70	26.92	26.92	270 00	00 C C C C C C C C C C C C C C C C C C	20.001	53.05	132.75	356.59	463.30	63.30	32.37	27.29	18.98	44.27	81.26	08.07	26.75	95.52
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3 3.205 C-6 458.784 134.973 -281.983 C-8 229.695 97.803 -387.40 4 600 C-6 458.784 -134.973 -281.983 C-8 229.695 -97.803 -387.40 5 5.995 C-6 458.784 -134.973 -281.983 C-8 229.695 -97.803 -387.40 6 7.390 C-6 176.353 -269.946 -281.983 C-8 25.042 -195.606 -387.40 7 8.850 C-6 -470.737 -445.072 -281.983 C-8 -443.847 -322.504 -387.40		o.		76.33	69.94	281.98		25.04	95.60	387.40
4 4.600 C- 6 552.927 0.000 -281.983 C- 8 229.695 -97.803 -387.40 5 5.995 C- 6 458.784 -134.973 -281.983 C- 8 229.695 -97.803 -387.40 6 7.390 C- 6 176.353 -269.946 -281.983 C- 8 25.042 -195.606 -387.40 7 8.850 C- 6 -320.889 -411.208 -281.983 C- 8 -335.264 -297.965 -387.40 4 9.200 C- 6 -470.737 -445.072 -281.983 C- 8 -443.847 -322.504 -387.40		200		58.78	34.97	281.98	ı	29.69	97.80	387.40
5 5.995 C- 6 458.784 -134.973 -281.983 C- 8 25.042 -97.803 -387.40 6 7.590 C- 6 176.353 -269.946 -281.983 C- 8 25.042 -195.606 -387.40 7 8.850 C- 6 -320.889 -411.208 -281.983 C- 8 -335.264 -297.965 -387.40 4 9.200 C- 6 -470.737 -445.072 -281.983 C- 8 -443.847 -322.504 -387.40		9	٠,	52.92	0.00	281.98	1	97.91	0.00	387.40
6 7.590 C-6 176.353 -269.946 -281.983 C-8 25.042 -195.606 -387.40 7 8.850 C-6 -320.889 -411.208 -281.983 C-8 -335.264 -297.965 -387.40 4 9.200 C-6 -470.737 -445.072 -281.983 C-8 -443.847 -322.504 -387.40		66	ı	58.78	134.97	281.98	ı	29.69	97.80	387.40
7 8.850 C-6 -320.889 -411.208 -281.983 C-8 -335.264 -297.965 -387.40 4 9.200 C-6 -470.737 -445.072 -281.983 C-8 -443.847 -322.504 -387.40		0.0	1	76.35	269.94	281.98	i	25.04	195.60	387.40
4 9.200 C- 6 -470.737 -445.072 -281.983 C- 8 -443.847 -322.504 -387.40		8	,	320.88	411.20	281.98	ı	335.26	257.96	387.40
		000	,	470.73	445.07	281.98	,	443.84	322.50	387.40

CALCULATION OF WINGWALL

Caluculation formula for wingwalls

bending moment

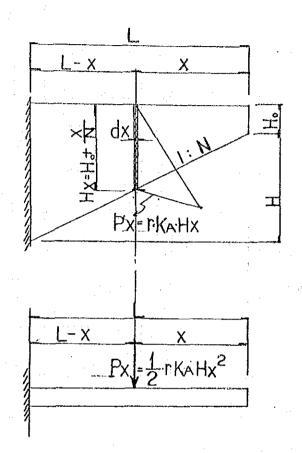
$$Mx = \int_{0}^{L} Px (L-x) dx$$

$$= \int_{0}^{L} \frac{1}{2} rK_{A} (H_{0} + \frac{x}{N})^{2} (L-x) dx$$

shearing force

$$Sx = \int_{0}^{L} Px \cdot dx$$

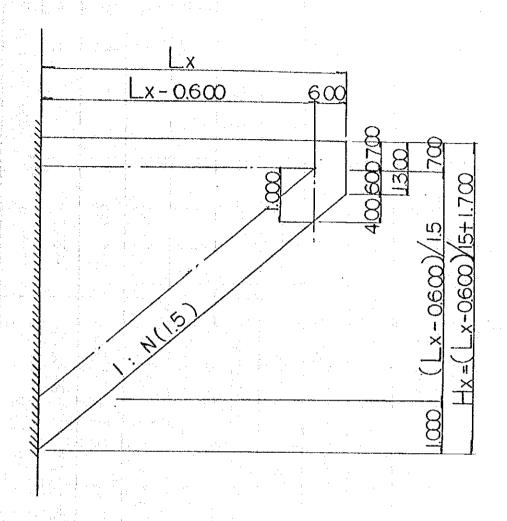
$$= \int_{0}^{L} \frac{1}{2} rK_{A} (H_{0} + \frac{x}{N})^{2} dx$$



... Analysis of upper formula for earth pressure

$$Mx = \frac{1}{2} rK_A \left(\frac{H_0 \cdot x^2}{2} + \frac{H_0 \cdot x^3}{3 \cdot N} + \frac{x^4}{12 \cdot N^2} \right)$$

$$S_{X} = \frac{1}{2} r K_{A} \left(H_{o}^{2} \cdot x + \frac{H_{o} \cdot x^{2}}{N} + \frac{x^{3}}{3 \cdot N^{2}} \right)$$



from general formula

where

$$r = 19.6 \text{ KN/m}^2$$

$$K_A = \tan^2 (45^\circ - \frac{\phi}{2}) = \tan^2 (45^\circ - \frac{30^\circ}{2}) = 0.5774^2$$

= 0.3334 \(\Rightarrow 0.400\)

$$Mx = \frac{1}{2} \times 19.6 \times 0.400 \left(\frac{1.30^{2}}{2} x^{2} + \frac{1.30}{3 \times 1.5} x^{3} + \frac{1}{12 \times 1.5^{2}} x^{4} \right) / Hx$$

$$= (3.312 \cdot x^{2} + 1.132 \cdot x^{3} + 0.145 \cdot x^{4}) / Hx (KNm/m)$$

$$Sx = \frac{1}{2} \times 19.6 \times 0.400 \left(1.30^{2} \cdot x^{2} + \frac{1.30}{1.5} x^{2} + \frac{1}{3 \times 1.5^{2}} x^{3} \right) / Hx$$

$$= (6.628 \cdot x + 3.397 \cdot x^{2} + 0.581 \cdot x^{3}) / Hx (KN/m)$$

$$1 - 155$$

Calculation of bending moment and shearing force

of menber	ڻ ت	34.0	34.0	44.0	54.0	53.5	53.5	53.5	63.5	63.0	63.0	63.0
thickness o	D cm	40	40	20	09	9	09	60	70	70	70	10
Area of	reinforced	Y16-150°tc	Y16-150°tc	Y16-150ctc	Y20-1500tc	Y25-150ctc	Y25-1500tc	Y25-150ctc	Y25-150ctc	Y 20-300 to Y 32-300 to	Y ₂₅ -300°t° Y ₃₂ -300°t°	Y 32-150°tc
S	Sx(KN/m)	71.000	81.919	93.592	147.691	163.061	179.202	196.090	213.700	232.083	251.219	271.072
n	Mx (KNm/m)	117.257	146.283	179.552	360.312	418.782	483.200	553.792	630.760	714.538	805.330	903.322
	Sx(KN/m)	41.159	47.489	54.256	85.618	94.528	103.885	113.675	123.884	134.541	145.634	157.143
S. L.	MIX (KNm/m)	67.975	84.802	104.088	208.876	242.772	280.116	321.039	365.658	414.225	466.858	523.665
	<u>Г</u>	4.633	4.967	5.300	6.633	6.967	7.300	7.633	7.967	8.300	8.633	8.967
	EX (B)	5.0		6.0	8.0	& rc	9.6	9.52	10.0	10.5	11.0	11.5

Each calculation of

Resisting moment and shearing intension for U.L.S and S.L.S

1)
$$Lx = 5.0^{m}$$
 and 5.5^{m}

$$b = 100^{cm} h = 40 d = 34.0 d^2 = 6.0$$

As
$$=Y_{1s}-150^{\text{etc}}=2.011/0.15=13.41 \text{ cm}^2$$

$$p = As \times 100/bd = 13.41 \times 100 / 100 \times 34.0 = 0.394 \%$$

$$x = \frac{0.8 \text{fy.As}}{0.25 \text{fcu·b}} = \frac{0.8 \times 41000 \times 13.41}{0.25 \times 2500 \times 100} = 7.00$$

d - x/3 = 34.0 - 7.0/3 = 31.7 cm

= 2

$$x = \frac{0.87 \text{fy.As}}{0.40 \text{fcu.b}} = \frac{0.87 \times 41000 \times 13.41}{0.40 \times 2500 \times 100} = 4$$

$$Z = d - x/2 = 34.0 - 4.8/3 = 31.6$$
 cm $< 0.95 \times 34.0 = 32.3$ cm

$$M_{RS} = 0.8 \text{fy As Z}$$

 $=0.8 \times 41000 \times 13.41 \times 31.7 \times 10^{-5}$

$$M_{RS} = 0.87 fy As Z$$

$$=0.87 \times 41000 \times 13.41 \times 31.6 \times 10^{-5}$$

 $> Mu = 117.257 ^{KNm} \text{ or } 146.283^{KNm}$

$$= M_S = 67.975 \text{ KNM}_{O\Gamma} 84.802^{\text{KNM}} = 151.1 \text{ KNM}$$

$$M_{Rc} = 0.40 \text{ fcub} \cdot \text{xZ}$$

 $M_{Rc} = 0.25 fcub \cdot xZ$

= 139.4 KNm

$$=0.40 \times 2500 \times 100 \times 4.8 \times 31.6 \times 10^{-5}$$

$$= 138.7^{\text{ KNm}} > M$$

 $-0.25 \times 2500 \times 100 \times 7.0 \times 31.7 \times 10^{-5}$

$$= 151.7^{\text{KMm}} > \text{Mu}$$

Notice: the U.L.S is critical from result of both calculation of resisting moment and the other case is exclude calculation of resisting moment for S.L.S

Shearing intension (U.L.S)

Rose Deriving April 1988 April 1989

$$\tau = \frac{\text{Su}}{\text{bd}} = \frac{81.919 \times 10^3}{100 \times 34.0} = 24.1 \text{ N/cm}^2$$

$$< \tau a = 35.0 + \frac{15.00}{0.25} (0.394 - 0.25) = 43.6 \text{ N/cm}^2$$

2)
$$Lx = 6.0^{m}$$
 (for U.L.S)
 $b = 100^{cm}$ $h = 50$ $d = 44.0$ $d' = 6.0$
 $As = Y_{16} - 150^{cc} = 2.011/0.15 = 13.41^{cm}$
 $P = 13.41 \times 100/100 \times 44.0 = 0.305$
 $X = \frac{0.87 \times 41000 \times 13.41}{0.40 \times 2500 \times 100} = 4.8^{cm}$
 $Z = 44.0 - 4.8/2 = 41.6^{cm} < 0.95 \times 44.0 = 41.8^{cm}$
 $M_{RS} = 0.87 \times 41000 \times 13.41 \times 41.6 \times 10^{5} = 199.0^{KNm} > Mu = 179.552^{KNm}$
 $M_{RC} = 0.40 \times 2500 \times 100 \times 4.8 \times 41.6 \times 10^{5} = 199.7^{KNm} > Mu = 179.552^{KNm}$
 $CK = \frac{93.592 \times 10^{3}}{100 \times 44.0} = 21.3 \text{ N/cm}^{2}$
 $CK = 35.0 + \frac{15.0}{0.25} (0.305 - 0.25) = 38.3 \text{ N/cm}^{2}$

0K

3)
$$L_{X} = 8.0^{m}$$
 (for U.L.S)
 $b = 100^{cm}$ h=60 d=54.0 d'=6.0
 $A_{S} = Y_{20} - 150^{c+c} = 3.141/0.15 = 20.94$ cm²
 $P = 20.94 \times 100 / 100 \times 54.0 = 0.388$
 $X = \frac{0.87 \times 41000 \times 20.94}{0.40 \times 2500 \times 100} = 7.4$ cm
 $Z = 54.0 - 7.4 / 2 = 50.3$ cm $< 0.95 \times 54.0 = 51.3$ cm OK
 $M_{RS} = 0.87 \times 41000 \times 20.94 \times 50.3 \times 10^{-5} = 375.7$ knm $> Mu = 360.312$ knm
 $M_{RC} = 0.40 \times 2500 \times 100 \times 7.4 \times 50.3 \times 10^{-5} = 372.2$ knm $> Mu = 360.312$ knm
 $C = \frac{147.691 \times 10^{3}}{100 \times 54.0} = 27.4$ N/cm²
 $< \tau = \frac{15.0}{0.25}$ ($0.388 - 0.25$) $= 43.3$ N/cm²

4)
$$Lx = 8.5^{m} 9.0^{m}$$
 and 9.5^{m} (for U.L.S)

 $b = 100^{cm}$ $h = 60$ $d = 53.5$ $d' = 6.5$
 $As = Y_{25} - 150^{c+c} = 4.909/0.15 = 32.73 \text{ cm}^{2}$
 $P = 32.73 \times 100/100 \times 53.5 = 0.612$
 $X = \frac{0.87 \times 41000 \times 32.73}{0.40 \times 2500 \times 100} = 11.8 \text{ cm}$
 $Z = 53.5 - 11.8/2 = 47.6^{cm} < 0.95 \times 53.5 = 50.8 \text{ cm}$ OK

 $M_{RS} = 0.87 \times 41000 \times 32.73 \times 47.6 \times 10^{-5} = 555.7^{KNm} > Mu = 418.782^{KNm} \times 10.87 \times 10.$

5)
$$Lx = 10.0^{m}$$
 (for U.L.S)
 $b = 100^{cm}$ $h = 70$ $d = 63.5$ $d' = 6.5$
 $As = Y_{26} - 150^{c+c} = 4.909/0.15 = 32.73 \text{ cm}^{2}$
 $P = 32.73 \times 100/100 \times 63.5 = 0.515$
 $X = \frac{0.87 \times 41000 \times 32.73}{0.40 \times 2500 \times 100} = 11.8 \text{ cm}$
 $Z = 63.5 - 11.8/2 = 57.6 \text{ cm} < 0.95 \times 63.5 = 60.3 \text{ cm}$ OK
 $M_{RS} = 0.87 \times 41000 \times 32.73 \times 57.6 \times 10^{-5} = 672.5 \text{ knm} > Mu = 630.760 \text{ knm}$
 $M_{RC} = 0.40 \times 2500 \times 100 \times 11.8 \times 57.6 \times 10^{-5} = 679.7 \text{ knm} > Mu = 630.760 \text{ knm}$
 $C = \frac{263.700 \times 10^{3}}{100 \times 63.5} = 33.7 \text{ N/cm}^{2}$
 $C = \frac{263.700 \times 10^{3}}{100 \times 63.5} = 33.7 \text{ N/cm}^{2}$

6)
$$Lx = 10.5^{m}$$
 (for U.L.S)
 $b = 100^{cm}$ $h = 70$ $d = 63.0$ $d' = 7.0$
 $As = \begin{array}{c} Y_{20} - 300^{ctc} \\ Y_{32} - 300^{ctc} \end{array} = \begin{bmatrix} 3.142/0.300 \\ 8.042/0.300 \end{bmatrix} = 37.28 \text{ cm}^2 \\ P = 37.28 \times 100/100 \times 63.0 = 0.592 \\ X = \begin{array}{c} \frac{0.87 \times 41000}{0.40 \times 2500 \times 100} \times 37.28 \\ = 13.4 \text{ cm} \\ Z = 63.0 - 13.4/2 = 56.3^{cm} < 0.95 \times 63.0 = 59.8 \text{ cm} \\ M_{RS} = 0.87 \times 41000 \times 37.28 \times 56.3 \times 10^{-5} = 748.6^{KNm} > Mu = 714.538^{KNm} \\ M_{RC} = 0.40 \times 2500 \times 100 \times 13.4 \times 56.3 \times 10^{-5} = 754.4^{KNm} > Mu = 714.538^{KNm} \\ 0K \\ \tau = \frac{232.083 \times 10^{3}}{100 \times 63.0} = 36.8 \text{ N/cm}^{2} \\ < \tau a = 50 + \frac{15.0}{0.50} (0.592 - 0.50) = 52.7 \text{ N/cm}^{2}$ OK

7)
$$Lx = 11.0^{m}$$
 (for U.L.S)
 $b = 100^{cm}$ h=70 d=63.0 d'= 7.0
 $As = \frac{Y_{25} - 300^{c+c}}{Y_{32} - 300^{c+c}} = \begin{bmatrix} 4.909/0.300 \\ 8.042/0.300 \end{bmatrix} = 43.17 \text{ cm}^{2}$
 $P = 43.17 \times 100/100 \times 63.5 = 0.685$
 $X = \frac{0.87 \times 41000 \times 43.17}{0.40 \times 2500 \times 100} = 15.4 \text{ cm}$
 $Z = 63.0 - 15.4/2 = 55.3 \text{ cm} < 0.95 \times 63.0 = 59.8 \text{ cm}$ OK
 $M_{RS} = 0.87 \times 41000 \times 43.17 \times 55.3 \times 10^{-5} = 851.5^{KNm} > Mu = 805.330^{KNm}$
 $M_{RC} = 0.40 \times 2500 \times 100 \times 15.4 \times 55.3 \times 10^{-5} = 851.6^{KNm} > Mu = 805.330^{KNm}$
 $C = \frac{251.219 \times 10^{3}}{100 \times 63.0} = 39.9 \text{ N/cm}^{2}$
 $C = 39.0 + \frac{15.0}{0.50} (0.685 - 0.50) = 55.4 \text{ N/cm}^{2}$

check of S.L.S

$$X = \frac{0.80 \times 41000 \times 43.17}{0.25 \times 2500 \times 100} = 22.8 \text{ cm}$$

$$Z = 63.0 - 22.8/3 = 55.4 \text{ cm}$$

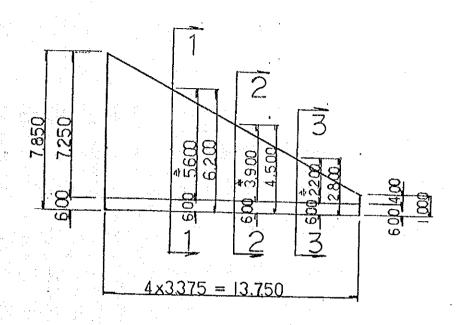
$$M_{RS} = 0.80 \times 41000 \times 43.17 \times 55.4 \times 10^{-5} = 784.4 \text{ KNm} > Mu = 466.858 \text{ KNm}$$

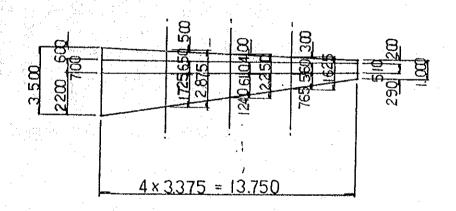
$$M_{RC} = 0.25 \times 2500 \times 100 \times 22.8 \times 55.4 \times 10^{-5} = 789.4 \text{ KNm} > Mu = 466.858 \text{ KNm}$$

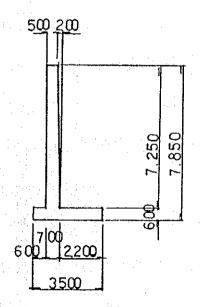
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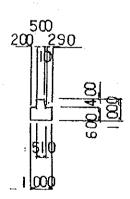
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8)
$$Lx = 11.5^{m}$$
 (for U.L.S)
 $b = 100^{cm}$ $h = 70$ $d = 63.0$ $d' = 7.0$
 $As = Y_{32} - 150^{cec} = 8.042/0.15 = 53.61$ cm^{2}
 $P = 53.61 \times 100 / 100 \times 63.0 = 0.851$
 $X = \frac{0.87 \times 41000 \times 53.61}{0.40 \times 2500 \times 100} = 19.2$ cm
 $Z = 63.0 - 19.2/2 = 53.4$ cm $< 0.95 \times 63.0 = 59.8$ cm $= 0.87 \times 41000 \times 53.61 \times 53.4 \times 10^{-5} = 1021.1$ knm $> Mu = 903.322$ knm
 $M_{RC} = 0.40 \times 2500 \times 100 \times 19.2 \times 53.4 \times 10^{-5} = 1025.8$ knm $> Mu = 903.322$ knm $= 0.40 \times 2500 \times 100 \times 19.2 \times 53.4 \times 10^{-5} = 1025.8$ knm $> 0K$
 $C = \frac{271.072 \times 10^{3}}{100 \times 63.0} = 43.1$ N/cm²
 $< case = 50.0 + \frac{15.0}{0.50}$ ($0.851 - 0.50$) $= 60.5$ N/cm²









BOTH EDGE

(3) Each Factor

CALCULATION OF RETAINING WALLS FOR ROAD STRUCTURE

(1) SHAPE AND SIZE

19.500 (t/m³) 23.600 (t/m³) CANC GAM1 Unit volume weights for concrete. for back fill

10.780 (t/m3) " (underwater) GAMIS =

9.800 (t/m³) 18.600 (t/m3) 9.780 (t/m³) 30.000 (*) "(underwater) GAM28 = for above toe slab GAM2 Internal friction angle FAI

For Foundation Ground Cohesive power for water

tanøB = Friction factor 350,000. (t/m²)

Allowable Pressure

(2) Earthhight and

1.000 HS2 = Water leve

0.000 (m)

HW1 =

NOTE: THE DIMENSION (T) BE EXCHANG TO DIMENSION (KN) INTO

THIS CALCULATION

001 F22 H

EARTH PRESSURE (COULOMB FORMULA)

EARTH PRESSURE COEFFICIENT . Ka

30.000 (*)		0.000 (*)	0.000.0	0.000.0
30	-	0 =	0	0
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EA:				-1 -
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	0.000
	0.000 (*)
Application and the second	0.000 (*)
H - Structure High	5.200 (m)
GAM, =	19.600 (t/m³)
	0.000 (t/m²)
	0.000 (E/m²)
p = Ka*ro*H - 2*C* \/Ka + Ka*Q	
$p_1 = 0.000 (t/m^2)$	
$p2 = 40.507 (t/m^2)$	
EARTH PRESSURE	
P = (p1+p2) * H / 2 = 125.571 (t/m)	I (t/m)
Ph = 125.571 (t/m)	^
Pv = 0.000 (t/m)	



y = 2.067 (m)

0.000 (m)

CALCULATION OF WEIGHT OR FORCE

CONCRETE

V(£)	H(t)	X(m)	v(n) v	Mx(t·m)	My(t·m)
100	0.000	1.438	0.300	58.521	0.000
1.080.1	0.000	0.750	3.400	49.560	0.000
9.912	00000	1.050	2.467	10.408	0.000
16.702	0.000			118.488 [0.000

V = Xi*Yi*GAMC MX = V*X

II a V*KH1

(2) BACK FILLING

No.	V(t)	H(t)	x(m)	y(m)	Mx(t·m) {	My(t.m)
2	8.232	0.000	1.100	4.333	9.055	000.0
n	189.336	0.000	2.013	3.400	381,039	0.000
N	197.568	0.000			390.094	0.000

V = Xi*Yi*GAMIAX = V*X

(3) SURCHAGE OF TOE SLAB

	V(t)	H(t)	х(ш)х	у(m)	Mx(t·m)	My(t·m)
2	3.720	0.000	0.250	0.000	0.930	0.000
8	3.720	0.00.0			0.630	0000

V = Xi*Yi*GAM2 Mx = V*X

H = V*Kil2 My = 11*y

D EARTH PRESSURE

Mx(t-m) My(t-m)	0.000 259.513
L	
y(m)	2.067
(m)x	2.875
VCt) HCt)	0.000 125.571
	24

TOTAL OF ACTION FORCE FOR FOUNDATION EDGE

My(t·m)	259.513	259.513
Mx(t·m)	118.488 390.094 0.000	509.512
H(t)	125.571	125.571
V(t)	116.702 197.568 3.720 0.000	317.990
LOADS	MHNM	Total

= \(\Sigma \text{MX} = 249.999 (t-m)

TOTAL FORCE FOR UNDER FOUNDATION CENTER

Mc(t-m)	207.111	
e(m)	0.651	
H(t)	125.571	
V(t)	317.990	

e = B0/2 - Mo/V : Mc = V *

BO : STRUCTURE WINTH

CALCULATION OF

SECURITY OF DIRECTION FOUNDATION (SLS)

FOR INVERSION

	0.479
e(m)	0.651 >
Mc(t-m)	207.111
ν(t)	317,990

V/0/ = 4

OR SLIDE

L. D(m)	V(t)	H(t)	Hu(t)	នុក
2.359	317.990	125.571	190.794	1.519 > 1.5

 $C = 0.00 (t/m^2)$ ts

Hu = C*D+V*tan(S)

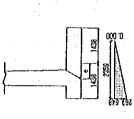
Fs = Hu/II

FOR CONTACT PRESSURE UNDER FOUNDATION.

٠.	150		· -,	. :
	2.875	317.990 125.571 207.111	0.651	269.648 0.000 29 4000
	B (m) L (m)	V (t) H (t) Mc (t·m)	e (m) X (m)	Qmax(t/m²) Qmin(t/m²) Qd
لہ ۔۔۔	L , —, —, d	L	ال سد عند ما	ا. ـــ ـــ ــا

Q = V/(B*L) + 6*Mc/(L*B*B)

2*V/(L*X) : X = 3*(B/2-Mc/V)



A. for section 1)

- l calculation of stability
- 1) for S, L, S

load	N (KN)	H (KN)	MX (KNm)	Mg(KNm)
concrete of				
structure, surcharge of heel slab	317.990	- -	509. 512	<u>-</u>
and toe slab		:		
earth pressure	-	125. 571	–	259. 513
total	317.990	125. 571	509. 512	259. 513

a) for inversion — U.L.S

$$Fin = \frac{509.512}{259.513 \times 1.50 \times 1.15} = 1.14 > 1.0$$

b) for sliding - S, L, S

Fs1 =
$$\frac{317.990 \times 0.60}{125.571}$$
 = 1.519 > 1.5

c) for pressure of bottom - S.L.S

$$X = \frac{509.512 - 259.513}{317.990} = 0.786 > \frac{B}{3} = \frac{2.875}{3} = 0.958 \text{ m}$$

$$< \frac{B}{6} = \frac{2.875}{6} = 0.480 \text{ m}$$

$$= \frac{2 \times 317.990}{3 \times 0.786 \times 1.00} = 269.8 \text{ KN/m}^2 < qa = 350 \text{ KN/m}^2$$

1 calculation of stability

2) for U.L.S

load	N(KN)	H(KN)	MX(KNm)	Mg(KNm)
concrete of structure,		:		
surcharge of heel slab and toe slab	317.990×1.2 ×1.15	<u></u>	509. 512×1. 2 ×1. 15	
earth pressure		125. 571×1. 5 ×1. 1 =216. 610	•••	259. 513×1. 5 ×1. 1 =447. 660
total	438.827	216.610	703. 126	447.660

a) for inersion

$$X = \frac{703.126 - 447.660}{438.827} = 0.582 \text{ m} > \frac{B}{3} = \frac{2.875}{3} = 0.958 \text{ m}$$

$$< \frac{B}{6} = \frac{2.875}{6} = 0.480 \text{ m}$$
Fin = $\frac{509.512}{447.660} = 1.138 > 1.00$ OK

b) for sliding

$$Fs1 = \frac{438.827 \times 0.60}{216.610} = 1.215 > 1.1$$

C) for pressure of bottom

$$qmax = \frac{2 \times 438.827}{3 \times 0.582 \times 1.00} = 502.7 \text{ KN/m}^2 < qa = 525 \text{ KN/m}^2$$

- 2. calculation of each section
- 1) Vertical wall for U, L, S
- a) bending moment and shearing force

$$M = \frac{1}{6} \times 19.6 \times 0.333 \times 5.60^{3} \times 1.5 \times 1.15 = 329.6 \text{ KNm}$$

$$S = \frac{1}{2} \times 19.6 \times 0.333 \times 5.60^{2} \times 1.5 \times 1.15 = 176.6 \text{ KN}$$

b) calculation of stress

$$AS = Y20 - 150^{CTC} = 3.1416 / 0.15 = 20.944 \text{ cm}^2$$

$$P = \frac{20.944}{100 \times 59.0} \times 100 = 0.35$$

$$X = \frac{0.87 \times 41000 \times 20.944}{0.40 \times 2500 \times 100} = 7.4 \text{ cm}$$

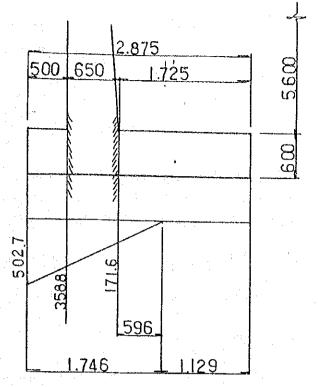
$$Z = 59.0 - \frac{1}{2} \times 7.4 = 55.3 \text{ cm} < 0.95 \times 5.90 = 56.0 \text{ cm}$$

MRS =
$$0.87 \times 41000 \times 20.944 \times 55.3 \times 10^{-5}$$
 = 413.1 KNm > 329.6 KNm MRC = $0.40 \times 2500 \times 100 \times 7.4 \times 55.3 \times 10^{-5}$ = 409.2 KNm > 329.6 KNm

$$\tau = \frac{176.6 \times 10^3}{100 \times 59.0} = 30.0 \text{ N/cm}^2 < \tau = 50 + 15 \frac{0.355 - 0.25}{0.25} = 56.3 \text{ cm}^2$$

2) Footing slab for U.L.S

a) load of surcharge



W1 =
$$(23.6 \times 0.60 + 18.6 \times 0.40) \times 1.2 \times 1.15 = 19.8 \text{ KN/m}$$

W2 = $(23.6 \times 0.60 + 19.6 \times 5.60) \times 1.2 \times 1.15 = 171.1 \text{ KN/m}$

b) for toe footing slab

$$M = \frac{0.50^2}{6} \quad \{2 \times 502.7 + 358.8\} - \frac{0.50^2}{2} \times 29.8 = 53.2 \text{ KNm}$$

$$S = \frac{0.50}{2} \quad \{502.7 + 358.8\} 29.8 \times 0.500 = 200.15 \text{ KN}$$

C) for heel footing slab

$$M = \frac{1.725^2}{2} \times 171.1 - \frac{0.596^2}{6} \times 171.6 = 244.4 \text{ KNm}$$

$$S = 171.1 \times 1.725 - \frac{1}{2} \times 171.6 \times 0.596 = 44.1 \text{ KN}$$

d) calculation of stress

(1) for toe footing slab

b=100cm h=60 d=54.0 d'=60
AS =
$$Y20-150^{ctc}$$
 = 20.944 cm²
P = $\frac{20.944}{100 \times 54.0}$ × 100 = 0.388%
X = $\frac{0.87 \times 41000 \times 20.944}{0.40 \times 2500 \times 100}$ = 7.4 cm
2 = 54.0 - $\frac{1}{2}$ × 7.4 = 50.3 cm < 54.0×0.95 = 51.3 cm

MRS =
$$0.87 \times 41000 \times 20.944 \times 50.3 \times 10^{-5}$$
 = 375.8 KNm > 53.2 KNm
MRc = $0.40 \times 2500 \times 100 \times 7.4 \times 50.3 \times 10^{-5}$ = 372.2 KNm > 53.2 KNm

$$\tau = \frac{200.5 \times 10^3}{100 \times 54.0} = 37.2 \quad \text{N/cm}^2 < \tau \text{ a = } 50 + 15 \times \frac{(0.388 - 0.25)}{0.25} = 58.3 \quad \text{cm}^2$$

$$AS = Y20 - 150^{\text{ctc}} = 20.944 \text{ cm}^2$$

$$P = \frac{20.944}{100 \times 54.0} \times 100 = 0.388\%$$

$$X = \frac{0.87 \times 41000 \times 20.944}{0.40 \times 2500 \times 100} = 7.4 \text{ cm}$$

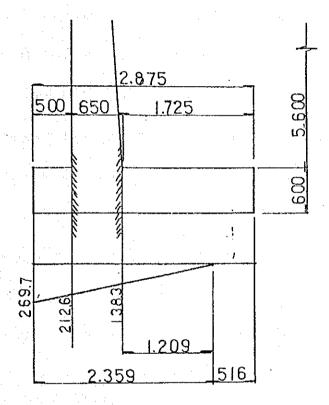
$$2 = 54.0 - \frac{1}{2} \times 7.4 = 50.3 \text{ cm} < 0.95 \times 54.0 = 51.3 \text{ cm}$$
 OK

MRS =
$$0.87 \times 41000 \times 20.944 \times 50.3 \times 10^{-6}$$
 = 375.8 KNm > 244.1 KNm

$$MRc = 0.40 \times 2500 \times 100 \times 7.4 \times 50.3 \times 10^{-5} = 372.2 \text{ KNm} > 244.1 \text{ KNm}$$
 OK

$$\tau = \frac{244.1 \times 10^3}{100 \times 54.0} = 45.2 \quad \text{N/cm}^2 < \tau \text{ a = } 50 + 15 \times \frac{(0.388 - 0.25)}{0.25} = 58.3 \quad \text{cm}^2 \qquad \text{OK}$$

3) footing slab for S, L, S



a) load of surcharge

$$W1 = 23.6 \times 0.6 + 18.6 \times 0.40 = 21.600 \text{ KN/m}$$

$$W2 = 23.6 \times 0.6 + 19.6 \times 5.60 = 123.920 \text{ KN/m}$$

b) for toe footing slab

$$M = \frac{0.50^2}{6} \cdot (2 \times 269.7 + 212.6) - \frac{0.50^2}{2} \times 21.60 = 28.7 \text{ KN}$$

$$S = \frac{0.50^2}{289.7 + 212.6} - 21.60 \times 0.50 = 109.8 \text{ KN}$$
c) for heel footing slab

$$M = \frac{1.725^2}{2} \times 123.920 - \frac{1.209^2}{6} \times 138.3 = 150.7 \text{KNm}$$

$$S = 123.920 \times 1.725 - \frac{1}{2} \times 138.3 \times 1.209 = 130.2 \text{ KN}$$
note: this case is abridge

$$GAMC = 23.600 (t/m^3)$$

$$GAM1 = 19.600 (t/m^3)$$

$$GAM1S = 10.780 (t/m^3)$$

$$FAI = 30.000 (°)$$

$$GAM2 = 18.600 (t/m^3)$$

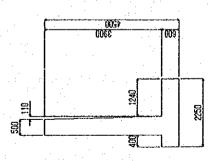
$$GAM2S = 9.780 (t/m^3)$$

$$\Psi ATS = 9.800 (t/m^3)$$

$$C = 0.000 (t/m^2)$$

$$tan \phi B = 0.600$$

$$Qa = 29.400 (t/m^2)$$



β = 0.000 (°) HS2 = 1.000 (m) HW1 = 0.000 (m)

0.000 (t/m²) 19.600 (t/m³) 0.000 (t/m²) 4.500 (m) 0.000 (°) = Ka*7 O*H - 2*C* √Ka + Ka*Q $pl = 0.000 (t/m^2)$ $p2 = 29.400 (t/m^2)$

> $\frac{(\sin(\phi + \delta) * \sin(\phi - \beta))}{(\cos(\theta + \delta) * \cos(\theta - \beta))}$ $\cos^2(\phi-\theta)$ cos² θ*cos(θ+δ)* 1+, = 0.333 Ka =

0.000.0

0.000.0

0.000.0

= (p1+p2) * H / 2 = 66.150 (t/m)

66.150 (t/m) 0.000 (t/m)

Ph == H Ad

1.500 (m)

0.000 (m)

MX(t-m) | My(t-m) 99.225 0.000 1.500 y (m) 2.250 X(B) 66.150 H(t) 0.000 V(t)

(4)

		II = V*KIII My = II*V	II = V*K	эамс	V = Xi * Yi * GAMC $Mx = V * x$	

0.000	70.497			0.000	82.942]
0.000	4.742	1.900	0.937	0.000	5.062	7
0.000	35.843 29.913	0.300	1.125	0.000	31.860	
My(t·m)	Mx(t·m)	y(m)	x(m)	H(t)	V(t)	N

V(t)	H(t)	x(m)	y(m)	Mx(t·m)	My(t·m)
4.204	0.000	0.973	3.200 1	4.092	000.0
94.786	0.000	1.630 }	2.550	154.501	000.0
98.990 1	0.000		-	158.593	00000

99.225 99.225

229.685

66.150 66.150

184.908 |

130.460 (t·m)

□ NAy □

ΣMX

11 Ö

My(t·m)

Mx(t·m)

V(t)

70.497 | 158.593 | 0.595 | 0.000 |

82.942 98.990 2.976

NO.	V(t)	H(t)	x(m)	y(m)	Mx(t·m) }	My(t·m)
2	4.204	0.000	0.973	3.200 [4.092	000.0
3	94.786	0.000	1.630 }	2.550	154.501	000.0
	98,990	0.000		-	158.593	0000

		v(t)	H(t)	e(m)	Mc(t·m)
<u>.</u>	2	184.908	66.150	0.419	77.562

e = B0/2 - Mo/V

B0:

0.000 0.000

0.595 0.595

My(t·m)

Mx(t·m)

0.000 (E) X

0.200

0.000 0000.0

2.976 2.976 V(t)

x(B)

H(t)

9 2

3

= Xi*Yi*GAMI = V*X

> ×

II = V*KII2 My = H*y V = Xi*Yi*GAM2 Mx = V*x

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77.562	

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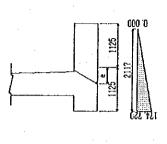
99

	į
ž,	1.677 > 1.5
Hu(t)	66.150 110.945
H(t)	66.150
V(t)	2.117 184.908
D(m)	2.117

- UVO OTT - OUT DY - OVO VOL

Q = 2*V/(L*X) : X = 3*(B/2-Kc/V)

Q = V/(B*L) + 6*Mc/(L*B*B)



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$$Fs = Hu/H$$

B, for section 2)

1 calculation of stability

2) for U. L. S

load	N (KN)	H(KN)	MX (KNm)	Mg(KNm)
concrete of stucture,	184.908×1.2		229. 685×1. 2	
surcherge of heel slab and toe slab	×1.15 =255.2		×1.15	⊢
earth pressure		66. 150×1. 5 ×1. 10 = 114. 1		99. 225×1. 5 ×1. 10 =171. 2
total	255. 2	114. 1	317.0	171. 2

a) for inversion

$$Fin = \frac{229.685}{171.2} = 1.34 > 1.00$$

b) for sliding

$$Fs = \frac{255.2 \times 0.6}{114.1} = 1.3 > 1.1$$

c) for pressure of bottom

$$X = \frac{317.0 - 171.2}{255.2} = 0.571 \text{ m} < \frac{2.250}{3} = 0.750 \text{ m}$$

$$< \frac{4.250}{6} = 0.375 \text{ m}$$

$$Q = \frac{2 \times 255.2}{3 \times 0.571 \times 1.00} = 298.0 \text{ kN/m}^2$$

- 2. calculation of each section (U.L.S)
- 1) vertical wall
 - a) bending moment and shearing force

$$M = \frac{1}{6} \times 19.6 \times 0.333 \times 3.90^{3} \times 1.5 \times 1.15 = 111.3 \text{ KNm}$$

$$S = \frac{1}{2} \times 19.6 \times 0.333 \times 3.90^{2} \times 1.5 \times 1.15 = 85.7 \text{ KN}$$

b) calculation of stress

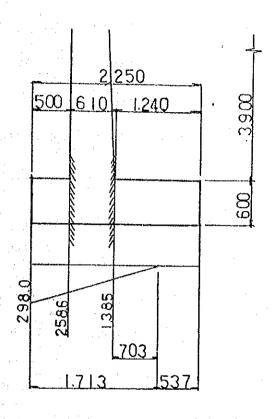
b=100cm h=61 d=55.0 d'=6.0
AS = Y20-300^{ctc} = 3.1416/0.30 = 10.472cm²
P =
$$\frac{10.472}{100 \times 55.0} \times 100$$
 = 0.190% > 0.15 %
X = $\frac{0.87 \times 41000 \times 10.472}{0.40 \times 2500 \times 100}$ = 5.6 cm
Z = 55.0 - $\frac{1}{2}$ × 5.6 = 52.2 cm = 0.95×5.40 = 52.2 cm

MRS =
$$0.87 \times 41000 \times 10.472 \times 52.2 \times 10^{-5}$$
 = 195.0 KNm > 111.3 KNm
MRc = $0.40 \times 2500 \times 100 \times 5.6 \times 52.2 \times 10^{-5}$ = 292.3 KNm > 111.3 KNm

$$\tau = \frac{85.7 \times 10^3}{100 \times 55.0} = 15.6 \text{ N/cm}^2 = \tau \text{ a} = 35.0 \times \frac{0.19}{0.25} = 26.6 \text{ N/cm}^2$$

2) footing slab

a) load of surcharge



W1 =
$$(23.6 \times 0.60 + 18.6 \times 0.40) \times 1.20 \times 1.15$$
 = 29.8 KN/m
W2 = $(23.6 \times 0.60 + 19.6 \times 3.90) \times 1.20 \times 1.15$ = 125.1 KN/m

b) for toe footing slab

$$M = \frac{0.40^{2}}{6} (2 \times 298.0 + 258.6) - \frac{0.40^{2}}{2} \times 29.8 = 20.4 \text{ KN/m}$$

$$S = \frac{0.40}{2} (298.0 + 258.6) - 29.8 \times 0.40 = 99.4 \text{ KN}$$

C) for heel footing slab

$$M = \frac{1.24^{2}}{2} \times 125.1 - \frac{0.703^{2}}{6} \times 138.5 = 84.8 \text{ KN/m}$$

$$S = 125.1 \times 1.24 - \frac{1}{2} \times 138.5 \times 0.703 = 106.5 \text{ KN}$$

- d) calculation of stress
 - (1) for toe footing slab

$$b=100$$
 $h=60$ $d=54.0$ $d'=6.0$

$$\tau = \frac{99.4 \times 10^3}{100 \times 54.0} = 18.4 \text{ N/cm}^2 < \tau \text{ a} = 27.2 \text{ N/cm}^2$$

$$As = Y20-300^{\text{ctc}} = 10.472 \text{ cm}^2$$

$$P = \frac{10.472}{100 \times 54.0} \times 100 = 0.194\% > 0.15\%$$

$$\tau a = 35.0 \times \frac{0.194}{0.25} = 27.2 \text{ N/cm}^2$$

(2) for heel footing slab

As =
$$Y20 - 300$$
 etc = 10.472

$$P = \frac{10.472}{100 \times 54.0} \times 100 = 0.194\% > 0.15\%$$

$$X = \frac{0.87 \times 41000 \times 10.472}{0.40 \times 2500 \times 100} = 5.4 \text{ cm}$$

$$Z = 54.0 - \frac{1}{2} \times 5.4 = 51.3 \text{ cm} = 0.95 \times 54.0 = 51.3 \text{ cm}^2$$

MRS =
$$0.87 \times 41000 \times 10.472 \times 51.3 \times 10^5$$
 = 191.6 KNm > 84.8 KNm

$$MRC = 0.40 \times 2500 \times 100 \times 5.4 \times 51.3 \times 10^5 = 277.0 \text{ KNm} > 84.8 \text{ KNm}$$

$$\tau = \frac{106.5 \times 10^3}{100 \times 54.4} = 19.8 \text{ N/cm}^2 < \tau a = 35.0 \times \frac{0.194}{0.25} = 27.2 \text{ N/cm}^2$$

$$GAMC = 23.600 (t/m^3)$$

$$GAM1S = 19.600 (t/m^3)$$

$$FAi = 30.000 (°)$$

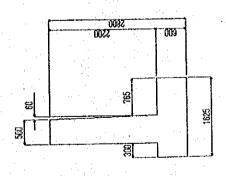
$$GAM2 = 18.600 (t/m^3)$$

$$GAM2S = 9.780 (t/m^3)$$

$$WATS = 9.800 (t/m^3)$$

$$tan \phi B = 0.000$$

$$Qa = 29.400 (t/m^2)$$



HS2 = 1.000 (m) HW1 = 0.000 (m)

$$30.000 (°)$$

$$0.000 (°)$$

$$0.000 (°)$$

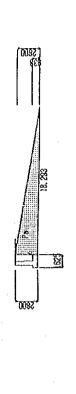
$$0.000 (°)$$

$$0.000 (°)$$

$$0.000 (°)$$

$$19.600 (t/m^2)$$

$$0.000 (t/m^2)$$

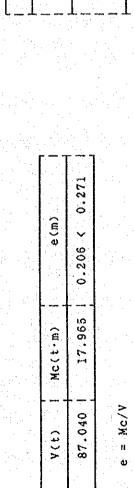


.0.000 (t/m)

y = 0.933 (m)

0.000 (m)

<u>.</u> 1	VCE)	H(t)	x(m)	y(m)	Mx(t·m)	My(t.m)	• •••		(t)	H(t)	(m)x	y(m) Mx(t-m)	n) My(t·m)	
	23.010	00000	0.813	0.300	18 696	000.0			0.000	25.611	1.625	0.933 0.000	00 23.903	
:	1.558	0.000	0.820	1.333	1.277	0.000								:
	50.528	0.000			34.251	0.000								
> >	= Xi*Yi*GAMC	AMC	# 3E 2	V*KH1										
	.			\ \ \ \					V(t)	H(t)	Mx(t-m)	My(t-m)		
									50.528		34.251	6	:	
	V(t)	H(t)	(m)x	y(m)	Mx(t·m)	My(t·m)	<u> </u>		2.232	25.611	00.0	23.903		
	1.294 32.987	0.000	0.840	2.067	1.087	0.000			87.040	25.611	76.658	3 23.903		
1-1	34.280	0.000			42.073	0.000	. X	. 11	ΣMX - ΣMy	11	52.755 (t·m)			
> ×	= Xi*Yi*GAM1 = V*X	АМІ	H My. =	V*KIII II*y										
ļ. —	V(t)	H(t)	x(m)	J (m)	Mx(t·m)	My(t-m)			V(t)	3	e(m)	Mc(t·m)		
1	2.232	0.000	0.150	000.0	0.335	000.0		-	87.040	25.611	0.206	17.965		
ļ	2.232	0.000			0.335	0.000	·	e = B0/2	/2 - Mo/V		Mc = V * e			
> X	= Xi*Yi*GAM2 = V*X	AM2	H My =	V*K112 11*y										



1.625

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87 040 1 25 611 52 224	1 x7 040 95 611
V(t) 87 040	20
	D(m)

Q = 2*V/(L*X) : X = 3*(B/2-Mc/V)

Q = V/(B*L) + 6*Mc/(L*B*B)

0.206

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87.040 25.611 17.965

94.383 12.743 29.400

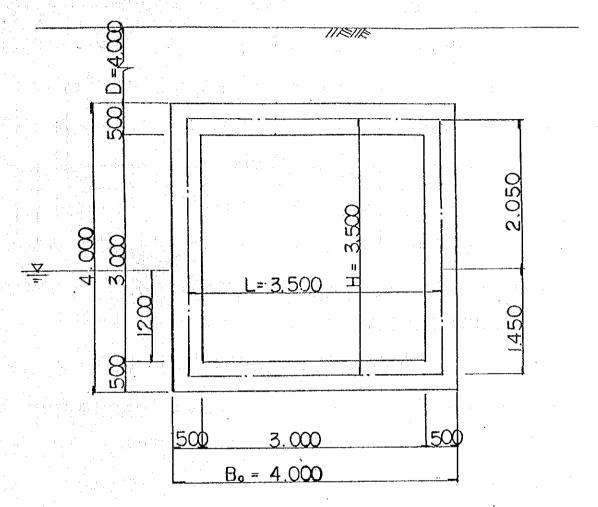
 $Qmax(t/m^2)$ $Qmin(t/m^2)$

		Ē	(1) H(1)	מונו	וחששוו	
<u>L</u>		1.625	87.040	25.611	52.224	
1						
	O II	$C = 0.00 (t/m^2)$		tan(8) = 0.60	09.	. :
	Hu	Hu = C*D+ V*tan(8)	an(8)			:
:	\$	11/				

WATER BOX CULVERTS

NO O BOX: CULVERT FOR DRAINAGE

1) Shape and Size

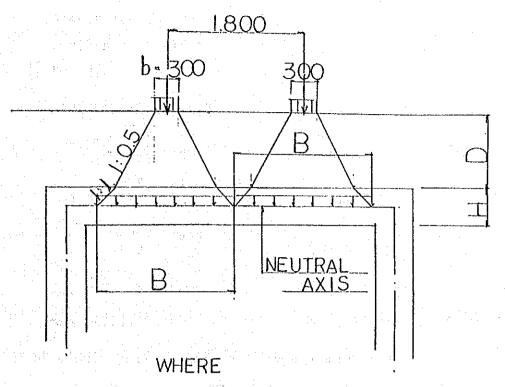


Where ... D = depth of asphalt and similar surface soil.

2) Factor of section

A =
$$1.00 \times 0.50$$
 = 0.5000 m²
I = $\frac{1.00 \times 0.50^3}{12}$ = 0.01041 m⁴
EC= 25 kN/mm² = 2.5 × 10⁷ kN/m²

LIVE LOAD --- HB loading



D = DEPTH OF ASPHALT AND SIMILAR SURFACE SOIL

H = DEPTH OF CONCRTE SLAB

DISPERSAL OF WHEEL

LOADED STRENGTH

$$P = \frac{10.0 \times \text{Uno}}{\text{B} \times \text{L}}$$
 (KN/m²)

WHERE

Uno = NUMBER OF UNITS = 30 L = WIDTH OF HB-VEHICLE = 3,500 m.

No. ① BOX CULVERT FOR DRAINAGE

section
$$b=100^{cm}$$
 $h=50$ $d=44.0$ $d'=6.1$

- 1) For upper slab
- a) intersection point 2 = 3 Mu. min = -133.9 KNm

$$A_s = \left(\begin{array}{c} Y_{12} - 300^{\text{ctc}} = 1.131/0.300 \\ Y_{16} - 300^{\text{ctc}} = 2.011/0.300 \end{array} \right) = 10.47 \text{ cm}^2$$

$$X = \frac{0.87 \times 41000 \times 10.47}{0.40 \times 2500 \times 100} = 4.0^{\text{cm}}$$

$$Z = 44.0 - \frac{4.0}{2} = 42.0^{\text{cm}} = 41.8^{\text{cm}} = 0.95 \times 44.0 = 41.8^{\text{cm}}$$
 OK

$$M_{RS} = 0.87 \times 41000 \times 10.47 \times 41.8 \times 10^{-5} = 156.1^{KNm} > Mu = 133.9^{KNm}$$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 4.0 \times 41.8 \times 10^{-5} = 167.2^{KNm} > Mu = 133.9^{KNm}$$
 OK

b) middle point ②~③ Mu.max=135.1KNm

$$M_R = 156.1^{\kappa_{Nm}} > Mu = 135.1^{\kappa_{Nm}}$$

(Where: MR: From calculation of point(2))

- 2) For bottom slab
- a) intersection point $\triangle = \bigcirc$ Mu.min = -160.9^{KNm}

$$A_s = Y_{16} - 150^{ctc} = 2.011/0.150 = 13.41 \text{ cm}^2$$

$$X = \frac{0.87 \times 41000 \times 13.41}{0.40 \times 2500 \times 100} = 4.8 \text{ m}$$

$$Z = 44.0 - \frac{4.8}{2} = 41.6^{cm} < 0.95 \times 44.0 = 41.8^{cm}$$
 OK

 $M_{RS} = 0.87 \times 41000 \times 13.41 \times 41.6 \times 10^{-5} = 199.0^{\text{KNm}} > \text{Mu} = 160.9^{\text{KNm}}$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 4.8 \times 41.6 \times 10^{-5} = 199.0^{KNm} > Mu = 160.9^{KNm}$$

b) middle point -1 Mu. max = -157.9^{KNm}

$$M_R = 199.0^{KNm} > Mu = 157.9^{KNm}$$

(Where: M_R : From calculation of point 4)

2. calculation for shearing force (U.L.S)

section
$$b = 100^{cm} h = 50 d = 44.0 d' = 6.0$$

a) For upper slab

$$A_{s} = \begin{pmatrix} Y_{12} - 300^{c+c} = 1.131/0.300 \\ Y_{16} - 300^{c+c} = 2.011/0.300 \end{pmatrix} = 10.47 \text{ cm}^{2}$$

$$P = \frac{10.47}{100 \times 44.0} \times 100 = 0.238 \%$$

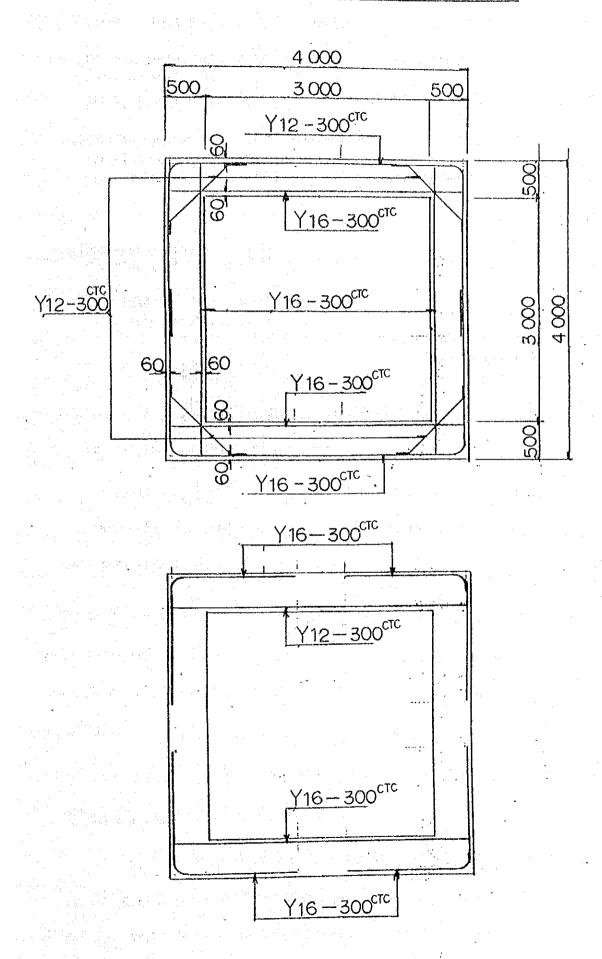
$$V_{c} = \frac{123.0 \times 10^{3}}{100 \times 44.0} = 28.0 \text{ N/cm}^{2}$$

$$< V_{ca} = 35.0 \times \frac{0.238}{0.250} = 33.3 \text{ N/cm}^{2} \text{ OK}$$

b) For bottom slab

intersection point
$$\textcircled{4}=\textcircled{1}$$
 Su.max = 145.8^{kN}
 $A_s = Y_{16} - 150^{\text{ctc}} = 13.41 \text{ cm}^2$
 $P = \frac{13.41}{100 \times 44.0} \times 100 = 0.305 \%$
 $Vc = \frac{145.8 \times 10^3}{100 \times 44.0} = 33.2 \text{ N/cm}^2$
 $< Vca = 35.0 + \frac{15}{0.25} (0.305 - 0.25) = 38.3 \text{ N/cm}^2$

0K



Load

(1) Dead load

a) Vertical load Where
$$\alpha = 1.0$$
 {earth pressure factor of vertical} : $\frac{D}{B_0} = 1.00$

For upper slab w1 = 22.6×0.50+19.6×3.50+23.60×0.50 = 91.700 kN/m
For side wall w2 = 23.6×0.50 = 11.800 "

For bottom slab W3 = 91.700 +
$$\frac{2 \times 11.800 \times 3.50}{3.50}$$
 = 115.300 "

b) Horizontal load --- earth pressure

For side wall P1 =
$$(22.6 \times 0.50 + 19.6 \times 3.75) \times 0.500$$
 = 42.400 kN/m
P2 = $(22.6 \times 0.50 + 19.6 \times 5.80) \times 0.500$ = 62.490 "

P3 = $(22.6 \times 0.50 + 19.6 \times 5.80 + 10.8 \times 14.5) \times 0.500$ = 70.320 "

= 14.210 kN/m

(2) Live load

live load surcharge of axle

$$P = \frac{10 \times 30}{3.50 \times B}$$
 width of despersal of wheel
$$B = 0.300 + 4.00 + 0.500 = 4.80 \text{ m}$$

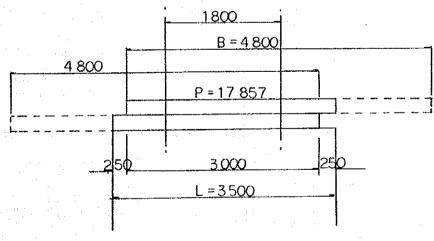
$$= \frac{10 \times 30}{3.50 \times 4.80} = 17.857 \text{ KN/m}^2$$

or live load surcharge of a vihicle

go =
$$\frac{40 \times 30}{3.50 \times 10.0} \doteq 34.300 \text{ KN/m}^2 < 2P = 35.714 \text{ KN/m}^2$$

OF curse the loaded of live load is consider as following

case-1 Vaertical load



For bottom slab

$$P1 = P2 = \frac{2 \times 17.857 \times 3.25}{3.500} = 33.163 \text{ kN/m} < 34.300 \text{ kN/m}$$

case-2 Horizontal load eath pressure of live load surcharge

For side wall: pe = $go \cdot ko = 34.300 \times 0.500 = 17.150 \text{ KN/m}$

BOX FOR DRAINAGE-NO 1 Depth = 4 000

COORDINATES

.No	x (Ш)	y čm)	Where
1 2 3 4	0.0000 0.0000 3.5000 3.5000	0.0000 3.5000 3.5000 0.0000	NO: Each intersecting points. X.Y: Abscissa and Ordinate

CONDITION OF MEMBER

	•		* *	KN.	
No I J	Λ (m2)	l (m4) 1 - J	I. (m)	T E (t/m2)	EPS
1 1 - 2 2 2 - 3 3 3 - 4 4 4 - 1	0.50000 0.50000	0.010417 F1x - F1 0.010417 F1x - F1 0.010417 F1x - F1 0.010417 F1x - F1	x 3.500 x 3.500	2.50E+07 2.50E+07	1.00E-05 1.00E-05 1.00E-05 1.00E-05

CONDITION OF FULCRUM

No	<u>KN</u> x (t/m)	<u>kN</u> † Y (t/m)	KN } M(lm/Rad)
1.	Fix	Fix	Free
	Free	Fix	Free

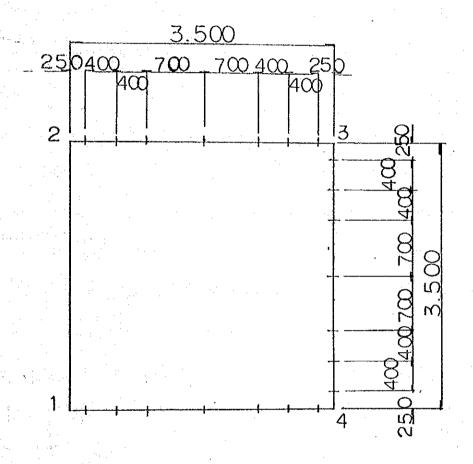
CALCULATION POINTS

NO	no	L-No 1 11	. 2	L-No 3 13	L-No 4 14	L-No 5	L-No 6 16	L-No 7 17
		0.250 0.250 0.250 0.250 0.250	0.650	1.050 1.050		2.450 2.450	2.850 2.850 2.850 2.850	3.250 3.250 3.250 3.250

NOTE: THE DIMENSION (1) BE EXCHANG TO

DIMENSION (KN) INTO THIS CALCULATION

CALCULATION POINTS OF EACH FORCE



BOX FOR DRAINAGE-NO 1

LOAD : Dead load

No	i	- j			Li (m)	Lo (m)	KN 1 Pi (t/m)	KN } Pj (t/m)
1 3 2 4		1- 2 3- 4 2- 3 4- 1	•	Y Y Y	0.000 0.000 0.000 0.000	3.500 3.500 3.500 3.500	-11.800 -11.800 -91.700 115.300	-11.800 -11.800 -91.700 115.300
			ΣΗ		0.000 (t) 0.000 (t)			

BOX FOR DRAINAGE-NO 1

: Earth pressure load
No. : 2

		<u>kN</u>	kИ
No i -j	Li (m) Lo (m)	Pi (t/m)	Pj (t/m)
1 1- 2 X 1 1- 2 X 3 3- 4 X 3 3- 4 X	0.000 1.450 1.450 2.050 0.000 2.050 2.050 1.450	70.320 62.490 -42.400 -62.490	62.490 42.400 -62.490 -70.320
Σ V = Σ H =	0.000 (t) 0.000 (t)		
BOX FOR DRAINAGE-NO 1			

BOX FOR DRAINAGE-NO 1

: Water pressure load

No. : 3

	•						kΝ	ĶΝ
No	i -	j		· •	Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1 3	1 - 3 -	2 4		X	0.000 2.050	1.450 1.450	14.210	0.000 -14.210
			ΣΗ	# . = .	0.000 (t) 0.000 (t)			

: HB live load-VL-	
HB	
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N id	-34.300	
KN Fi	-34.300	
Li (m) Lo (m)	0.000 3.500	0.000 (t) 0.000 (t)
	* *	NΩ > ±
	0.24 1. f.	
No.	0.4	

BOX FOR DRAINAGE-NO 1

: HB live load-HL-

No No

$$\frac{kN}{1-3}$$

Li (m) Lo (m) Pi (t/m) Pj (t/m)

 $\frac{1-2}{3-4}$
 $\frac{X}{X}$

0.000 3.500 17.150 17.150

-17.150 -17.150

 $\frac{\Sigma V = 0.000(\xi)}{\Sigma H = 0.000(\xi)}$

BOX FOR DRAINAGE-NO 1

COMPINITION (11 S)

No C-No 1 C-No 2 No 6 No 7	1 1.3800 1.	2 1.6500 II.	No 4 1.4300 0.0000 No 5 0.0000 1.6500
	CASE OF	CALCULATION	AND LOAD FACTOR

ELECTED CASE FOR MAX OR MIN FORCE

No 1: 6.7

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	ROTA. (mmRad	-0.0841 0.0485 -0.0485 0.0841	ROTA. (mmRad	3.4703 -3.0503 3.0503 -3.4703		
	S Y-DIS.(mm)	000000000000000000000000000000000000000	6 Y-DIS.(mm)	0.00000 -0.94021 -0.94021 0.00000		
	Case. X-DIS.(mm)	0.00000 -0.01086 -0.01442 -0.02529	Case. X-DIS.(mm)	0.00000 -0.06008 -0.47078 -0.53086		
	ROTA.(mmRad)	-2.05728 -1.96817 -1.96817 2.05728	ROTA.(mmRad)	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
	2 Y-DIS.(mm)	000000	5 Y-DIS.(mm)	0.0000000000000000000000000000000000000		
	Case. X-DIS.(mm)	0.00000 -0.02439 -0.28532 -0.30970	Case. X-DIS.(mm)	0.00000	*	
	ROTA.(mmRad)		ROTA.(mmRad)	- 1.17645 - 1.17645 - 1.17645	ROTA.(mmRad)	0.67852 -0.31731 -0.67852 -0.67852
	1 Y-DIS.(mm)	0.00000 -0.50715 0.00000	4 Y-DIS.(mm)	0.00000 -0.16807 -0.16807 0.00000	7 Y-DIS.(mm)	0.000000
DEFLECTION	X-DIS.(mm)	0.00000 -0.01438 0.00000 -0.01438	Case. X-DIS.(mm)	0.00000	Case. X-DIS.(mm)	0.00000 -0.07801 -0.63323 -0.71124
BOX FOR DRAINAGE-NO	, No	H 01 00 4	No.	- 01 CO 44	, oN	- ରାଡସ
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No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. RX (t)	2 RY (t)	RM (tm)	Case. RX (t)	3 RY (t)	RM (tm)
. न प	0.000	0.000	00000	0.000	0.000	0.000	0000.0	0.000	0.000
0 N	Case. 4 RX (t)	RY (t)	EM (tm)	Case. RX (t)	5 RY (t)	RM (tm)	Case. RX (t)	6 RY (t)	RM (tm)
t	000.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
o	Case. 7 RX (t)	RY (t)	RM (tm)						
 	0.000	0.000	0.0000						

	N CEO	0.000	8	00.	ဝို	3 6		00.	. 27	1.27	1.27	1.27	1.27	1.27	-1.271		0000		8	00	8	36	20	5.03	8 03	9.03	9.03	9.03	9.03	9.03	0.03 0.03 0.03	
	pressure load S (t)		80	0.48		70	1.27	1.27	00.	00	00.	96	20.	00.	000.0	•	1.27	. 27	27	.27	٠. ه. ه.	0 00	6.03	.000	.000	000	000	000.	000.	.000.	000	· ·
	3 Water 3 M (tm)	-1.252	9	61 80	ς,	- C	0	0.72	0.72	0.72	0.72	7.00	0.72	0.72	-0.722)	-0.722	0.10	.0	.50	% 60 €	2 (0	. 20	1.25	1.25	1.25	1.25	. 25	2 .	2.0	11.252))
	Case N (t)	0.000	8	00	80.	30	00.	00.	93.19	93.19	ტე. ემ	9 T . K 6	93.19	93.19	194.191) 	0000	00.	8	00.	86	200	8	110.60	110.60	110.60	110.60	110.60	110.60	09.077	110.009)
	pressure load S (t)	110.609	6.04	9.75	တ္တ (၈) (၈) (၈)	3, 50 3, 60 5, 60 5, 60	82.28	93.19	00.	00.	000	300	00	00.	0000))	93.191 82.284	3.56	3.26	3.98	39.75	000	80	000.	000	000.	.000	000	000	000.	000.0)))
	Case 2 Earth M (tm)	-30.615	6.67	7.80	0.0	2 00 17	30.	9.28	29.28	29.28	29.28	200	29.28	29.28	120.286) 1	-29.289 -7.342	8	3.29	0.11	7.80	5.0	0.61	30.61	30.61	30.61	30.61	30.61	30.61	30,61	0 CO CO I	
	N (t)	-201.775	194.10	189.38	181.12	168.14	163.42	160.47	. 13		<u>ო</u> :		8	·	0 to) ! 	-160.475 -163.425	168.14	172.86	181.12	189.38	138.82	201.77	5.13	S. 13	ຕ ເດ	5.13	ლ. ლ.		 	ລ ທ ກ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ ເ	•
	load S (t)	5.135 135		(C)	က <u>(</u>	2 (1)	. I.S.		60.47		00.87	9.00 0.00	64.19	100.87	-137.550		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5.13	5.13		5.13	o 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -	8 H	01.77	9	26.83	80.71	00.00	-80.71	126.83	172.300	
	ase 1 De M (tm	-61.817	58.47	56.42	52.82	47.74	45.12	43.84	3.84		50.	6.57	1	90.1	16.580	! - -	-43.840 -45.194	47.17	49.23	52.82	56.42	50.4	61.81	1.81	14.97	4.98	86.48	4.73	6.48	44.98	-14.975	1 1 1
DRAINAGE-NO 1	L(m	0.000	0.0	1.05	1.75	2 . 4 . 5 . 10	3 . 2 . 3	3.50	0.00	0.25	0.60	1.75	2.45	000	<u>ი</u>		0.000	0.65	1.05	1.75	2.45	, v	0 0 0	0.00	0.25	0.65	1.05	1.75	2.45	20.0	3.250	
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NOTE: DIMENSIONS (+) (tm) BE EXCHAGE TO (KN) (KNM) AT AFTER PAGE

N (t)	364.28	,,,,	353.70	347.18	335.78	324.38	317.87	311.36	307	1.16 67		10.01	146.67	146.67	146.67	46.67	146.67	-146.677	307.29	311.36	317.87	24.38	335.78	347.18	353.70	360.21	364.2	189.59	189.59	189.59	189.59	189.59	189.59	189.59	-189.593	189.59
S (t)	89	0.86	16.05	72.67	0.51	64.30	87.78	128.68	φ	07 20) (C	00.00	00.0	122.91	93.15	263.39	-307.291	46.67	8.68	97.78	64.305	0.51	72.67	116.05	60.86	189.59	64.28	C)	28.97	45.71	0.00	145.71	228.97	-312.245	364.28
Case 6 M (tm)	160.85	-117.062	-61:72	24.02	1.25	21.53	54.04	99.42	.86	α α α	150 40	28.78	1.99	5.01	91.99	8.78	62.52	-133.861	33.86	99.42	4.04	-21.536	1.25	24.02	61.72	117.06	0.85	60.85	76.29	31.95	06.89	57.89	6.89	31.95	-76.291	68.00
N (t)	00.	000.0	00	00.	00.	00.	00.	00.	00	30.01	30.02	30.01	30.01	30.01	30.01	0.01	30.01	30.	.00	00.	00	000.0	00.	8.	ō.	õ.	00.	30.01	30.01	30.01	30.01	30.01	30.01	30.01	130.013	30.05
e load-HL- S (t)	0.01	25.725	8.86	2:00	0.00	12.00	18.86	72	30.01	00	0	8	00	00.	00.	0.000	00.	00	0.01	5.72	8.86	12.005	0.00	12.00	8.86	25.72	30.01	00.	00	00.	00	00.	00.	8	000.0	
ase 5 HB liv % (tm)	8.75	-1.786	7.13	3.30	7.50	.30	7.13	.78	8.75	7.2	7	8.75	8.73	8.75	8.75	-8.754	8.75	8.75	8.75	1.78	7.13	0	7.50	3.30	7,13	1.78	8.7	8.75	8.75	8.75	8.75	8.75	8.75	8.75	48.784	8.73
N (t)	60.02	60	60:02	60.02	60.02	60.02	60.02	60.02	0.02	0.00	00	00	00.	90.	80.	0.000	00.	00.	60.	60 02	60.02	0.02	60.02	60.02	60.02	60.02	60.02	00.	Ö	Ö.	00.	়	ō.	٥.	000.0	٥.
e load-VL- S (t)			00	0	00	00	00.	00.	00.	0.02	51 45	7.73	4.01	0.00	24.01	-37.730	51.45	60.02	0.00.0	00.	00	00.	00.	80.	00.	00.	00.	0.02	4.5	7.73	4.01	0.00	24.01	37.73	-51.450	60.02
se 4 HB live M (tm)	17.50	-17.507	17 50	17.50	17.50	17.50	17.50	17.50	17:50	7.50	-3	4.26	6.61	5.01	6.61	14.263	3.57	7.50	17	17.50	17.50	7.50	17.50	17.50	17.50	17.50	17.50	7.50	3.57	4.26	6.61	5.01	6.61	4.26	13.573	7.30
Ca L(m)	0	0.250	Ġ.	0.0	7.0	3	.85	2.0	00.	00	5	65	.03	73	4.5	2.850	.25	.50		25.	 6	.03	(1) -1	. 45	8	55	0	00.	.25	65	.05	75	4. FO	.8	3.250	. 50
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PICK-UP No. 1 *

⋝	N (t)		400	100000000000000000000000000000000000000) ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	047.10	335.78	324.38	74 715	000	-307.291		146 A7	000	000	000	22.00	2.29	98:29	198.29	198.29	-146.677	1	307.29	311.36	317.87	324.38	335.78	347.18	353.70	360.03	-364.285		189.59	254 01	25.4.00	1 C C C C C C C C C C C C C C C C C C C	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	10.407	254.01	-254.014	188.58
MINIMU	S (t)	u u	000	96	0.0	9 0		64.30	97.78	128 68	-146.677		07.20	000	, ,) L	0 0		80.000	39.20	189 81	307.2		6.67	28.68	97.78	4.30	0.51	72.67	116.05	160.86	-189.593		64.28	38.67	5.02	22		000	00.111	20.071	1/0.007	01.400
×	M (tm)	200	7 0 0	10.7) () (0.71	21.53	54.04	9.42	S		33.86	3.05	-7.24	30) (4 C	0000	47.7	-73.05	33.86		200	74.77	04.04	21.53	1.25	24.02	61.72	117.06	-160.857		0.85	87.69	-4.95	2.32	1.31	0		7 C	100.00.1 100.00.1	20.
	Case	į		ŧ	į	1	 i	í	ı	ī	C- 6		ı	ī	,	ı	ı		- i		ı		1	0 e	ı	ı	ı	ı	ı		,	t		ı	ı	t	ł	ı	ŧ	ŧ	1	 	
N.	N CE)	278.44	274.37	267.86	.35	000000000000000000000000000000000000000	000	200.00	232.04	225.52	221.4		198.29	146.67	146.67	146.67	146.67	146 67	-146.677	740.07	70.00	198.29	221 45	100H	0000	200000000000000000000000000000000000000	00.007	249.95	261.35	267.86	274.37	278.45		254.01	189.59	189.59	189.59	189.59	189,59	189.59	189.59	-254.014	
MAXIMU	s (t)	4.01	12.85	50.26	91.679	-1.58	2 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	77.00	131.01	73.22	198.29		1.45	63.39	93.15	22.91	0.00	122.91	10000	26. 25.	0 0	661.45	98.29	173.25	10.10	10.40		200	-91.67	150.26	2 85	254.01	: :	78.45	12.24	8.97	45.71	0.00	145.71	228 97	12.24	-278.449	•
X	M (tm)	33	94.00	21.51	26.7	57.65	26 46		7 . 00	-77.99	24.46		1124.46	-62.52	28.78	91.99	135.01	91.99	28.784	160.30	1 0 C C C	174.40	-124.46	656.22-	-17.06	26.00) L	07.00	26.73	21.51	4.00	52.33	0	30.301"	67.0/-	. 95	106.89	157.89	8.89	1.95	5.29	-152,331	
	Case	C-2	ı.	1	F	ï	٠,			ì	1		í	ı	j i	ပ်	ပ	ර්	6 -	ڻ د	ئ		ī	C- 4	1	1		í	ı	Ĺ	ı	+	٠.	1 -			Ę	ı	ı	ı	,	C- 7	
	L (m)	0.000	(C)	ဖ	. 05	7.3	.4 .0	i C) (S 1	0.)))	7 4	000	000	750	.450	2.850	.250	C		00.	0.250	65	C) (4 c	Š	2	0	0) (,	ŝ	0.	. 75	4.5	80	3	00	ı
	No.	1 7	r-t :	74 ,							ı	°							ဟ **			-		*							*			-1 - -							<i>\</i>		

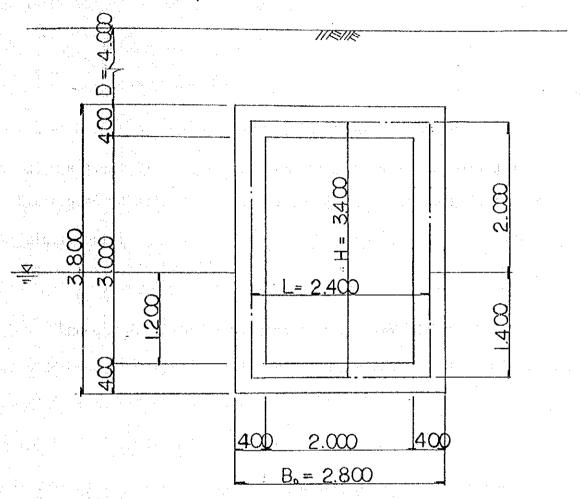
		PICK-UP No	* T						
			Š	MAX 1 MU	×		Ø	MINIMUN	Σ
No.	i (m)	Case	M (tm)	s (£)	N (t)	Case	M (tm)	s (t)	N (t)
5	00	1	52.33	54.01	278.44	1.	160.85	89.59	364.28
	0.250	C - 7	-94.005	212.855	-274.379	9 (- -	-117.062	160.864	-360.214
	က် မ	1.	21.51	50.26	267.86	i	51.72	10.00	07.000
* *	O r	. 1	0.0 	0.0	335 78	. 1.	57.65	5.00	249.95
	- ≥	. 1	9 LC	5.00	324.38	ď	26.46	86.21	238.55
	, w	1	54.04	97.78	317.87	i.	17.06	131.01	232.04
*	23	ł	-99.42	8.68	311.36	1	77.99	3.22	225.52
न । २	96	ŧ	33.86	146.67	307.29	1	24.46	188.28	221.40
4.3	0.0	i	33.86	07.29	146.67		24.46	21.45	198.29
×	200	1	-62.52	63.39	146.67	ı	3.05	9.8	198.29
	65	1	28.78	93.15	146.67	T.	-7.24	39.20	198.29
. ⇔	1.050	9 -5	91.998	122.917	-146.677	C- 7	38.309	œ	-198.255
	7.	ī	9.31	00.0	198.29	Į	S. 03	0.0	146.67
	7.	ı	8.30	-88.58	198.29	ł	91.99	2 91	146.67
	83	1	7.24	139.20	198.29	i,	28 78	193:15	146.67
	.25	i	3.05	9.81	198.29	ı	2 52	263.39	146.67
	က်	1	24.46	221.45	198.29	ı	33.86	307.29	146.67
ნ 1 4	00.	i	24.46	98.29	221.45	1	33.86	6.67	307.29
*	.25	i	7.99	3.22	225.52	ı	9.42	28.68	311.36
	65	i	17.06	31.01	232.04	1	54.04	97.78	317.87
	.05	i	6.46	86.21	238.55	ı	21.53	4.00 0.00 0.00	62.4.50
	(1) -/	1	57.65	100	0.00.000			10.0	000000000000000000000000000000000000000
ж •	4 0	ı	124.027	-72.075 -116.057	13547.107	- K-	121.00	-150.261	-267.865
	o o o n		117.06	60.86	360.21	1	4.00	12.85	274.37
4 1 - w	3.500) ပ (0.85	189.59	364.28	t	52.33	254.01	278.45
	0	1	60.85	64.28	189.59	ì	52.33	78.45	254.01
•	, , , ,	1 %	-76.29	12.24	189.59	1	7 69	38.67	254.01
	, 1 (2)	ı	1.95	. 97	189.59	1	-4.95	.02	254.01
	, C	ı	06.89	45.71	189.59	1	52.32	11.38	254.01
	7.5	ı	91.31	0.00	254.01	;	57.89	0.0	189.59
	4.5	,	2.32	111.38	254.01	1	06.89	145.71	000 000 000 000
	85	ï	-4.93	175.02	254.01	. 1	01.00	78.877	50 C
*	3.250	C- 7	187	-238,673	1254.014	ာ ဖ ၂၂၂ ၂၂	1 1 2 C C C C C C C C C C C C C C C C C	1314.440	7 00 00 00 00 00 00 00 00 00 00 00 00 00
	. 50	1	52.33	278.44	70-407	1	00.00	64.400	n

PICK-UP No. 1 *

				×	. MAXIMUM			×	MINIW.	× ×
F-4	No.	(E)	Case	M (tm)	s (t)	N (t)	Case	M (tm)	s (t)	N Ct
ı	.01	00.0	٠. د	152.33	54.01	278.44		160	89.5	364
*		. C.	J	00:	212.855	-274.379	S-0		O	360.2
*	Ŋ	S	ပ်	-21.51	50.26	267.86	1,	-61.72	16.05	353.7
*	• ពុ	S C	. J	26.73	91.67	261.35		24.02	72.67	347.1
*) 4) (C) t	7.63	-1.58	249.95	ł	1.25	0.51	335.7
¥	י וג) IC	ö	6.46	86.21	238.55	1	21.53	64.30	324.3
×	, עב	י ני ני	င်	17.06	131.01	232.04	ı	54.04	97.78	317.8
X			ာ ပ	77 99	3.22	225.52	j.	9.42	8.68	311.3
ı	·	3.500	O	-124.460	198.29	221.45	ı	33.86	146.67	7 . 2
		. 6	ز	α α	0.6 20	146 67	- 1	24.46	21.45	198.2
) ທ) ຄ	ى ر ا	160 - 60	08.80	146.67	1	-73 05	89.81	198.2
e 9	٠ - د	•) C	200	193.134	-146.677	C- 2	-7.247	139.201	-198.29
· *	a jer) (C	ა ქ	91.99	22.91	146.67		8.30	88.58	198.2
. 4	> ¬		. d	35.01	00.0	146.67	i	9.31	0.00	198.2
*	י יג	. 4	აბ	1.99	122.91	146.67	ŧ	8.30	88.58	198.
×	, (2	85	ქ	28.78	10	146.57	t	-7.24	139.20	198.2
*	7	2	ç	62.52	263.39	146.67	ı	3.05	89.81	198.2
1	. 63	3.500	5	∞	307.29	146.67	ı	24.46	221.45	198.2
			ì			: ;	1	90	76	6 408
ì	ታ ፣ -	8	ပ် င	74.40	100	7 V V V V V V V V V V V V V V V V V V V	. 1	0.00	- α - α - α - α	
* *	C	() () ()	<u>ს</u> ი	~ r	13.225	1220.027) () 	-54.04	97.787	-317.87
* -	S1 Ç	ე (<u>ა</u>	00.40		200	ı	21.53	64.30	324.3
X		, , , , ,	ָל ל ל	יני ניני		249.95	ı	1.25	0.51	335.7
X - 3	1 ¹ n	 	5 d	26.73	91.67	261.35	1	24.02	72.67	347.1
e 4	s. 4) LC) င	21.51	150.26	267.86	i	1.72	116.05	353.7
• •	> t-	, , , ,	ر د	94.00	12.85	274.37	٠,	17.06	60.86	360.2
: I	÷ თ	3.50	0 0 0- 7	-152.331	254.01	278.45	Í	160.85	189.59	364.2
	. ,		,	0	. A 2 2 2	98	1	52.33	78.45	254.0
-H	⊶ •	> c		76.00	12.24	189.59	1	-87.69	38.67	254.0
¥ ·	c	, , , ,		2.0 1.0 1.0	28.97	189,59	1	-4.95	75.02	254.0
⊁ ∢	งจ) c	0	5.71	189.59	ı	2.32	1.38	254.0
€ -}) ·	, , , ,) t	57.89	0.00	189.59	ı	91.31	0.00	254.0
(·)	† t	 . rc		06.89	145.71	189.59		52.32	111.38	254.0
ė -90	י נ		, t	31.95	228.97	189.59	ı	-4.95	175.02	254.0
· *	۰ ۲	, c)	0 -0	-76.291	-312.245	-189.593	C- 1	-87.691	-238.671	-254.0].
: 1 	• 4		-5	0.85	364.28	189.59	į	52.33	278.44	254.0

NO @ BOXCULVERT FOR DRAINAGE

1) Shape and Size



Where $-D^{m}$ depth of asphalt and similar surface soil.

2) Factor of section

$$A = 1.00 \times 0.40 = 0.4000 \text{ m}^2$$

$$I = \frac{1.00 \times 0.40^3}{12} = 0.00533 \text{ m}^4$$

$$EC = 25 \text{ kN/mm}^2 = 2.5 \times 10^7 \text{ kN/m}^2$$

No. ② BOX CULVERT FOR DRAINAGE

1. calculation for bending moment (U.L.S)

$$h = 40$$

$$b = 100^{cm}$$
 $h = 40$ $d = 34.0$

$$' = 6.0$$

a) intersection point 0 = 4 (2 = 3) Mu. min = $-111.4^{\text{KNm}}(-95.5^{\text{KNm}})$

$$A_s = Y_{16} - 150^{c \cdot c} = 13.41$$
 cm

$$X = \frac{0.87 \times 41000 \times 13.41}{0.40 \times 2500 \times 100} = 4.8^{\text{cm}}$$

$$Z = 34.0 - \frac{4.8}{2} = 31.6^{\text{cm}} < 0.95 \times 34.0 = 32.3^{\text{cm}}$$
 OK

$$M_{RS} = 0.87 \times 41000 \times 13.41 \times 31.6 \times 10^{-6} = 151.2^{KNm} > Mu = 111.4^{KNm}$$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 4.8 \times 31.6 \times 10^{-5} = 151.6^{KNm} > Mu = 111.4^{KNm}$$
 OK

b) middle point $\bigcirc \bigcirc \bigcirc = \bigcirc \bigcirc \bigcirc$ Mu. max = 79.2^{KNm}

$$A_s = Y_{12} - 150^{ctc} = 7.54$$
 cm²

$$M_R = 87.4^{KNm} > Mu = 79.2^{KNm}$$

(Where: M_R: From calculation of point⊕~①)

 $4\sim 1 = (2\sim 3)$ Mu. max = 63.1^{KNm} (51.3^{KNm}) c) middle point

$$A_s = Y_{12} - 150^{\text{ctc}} = 1.131/0.15 = 7.54$$
 cm²

$$X = \frac{0.87 \times 41000 \times 7.54}{0.40 \times 2500 \times 100} = 3.0^{\text{cm}}$$

$$Z = 34.0 - \frac{3.0}{2} = 32.5^{\text{cm}} = 0.95 \times 34.0 = 32.3^{\text{cm}}$$
 OK

$$M_{RS} = 0.87 \times 41000 \times 7.54 \times 32.5 \times 10^{-5} = 87.4^{KNm} > Mu = 63.1^{KNm}$$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 3.0 \times 32.5 \times 10^{-5} = 97.5^{KNm} > Mu = 63.1^{KNm}$$

2. calculation for shearing force (U.L.S)

section
$$b = 100^{cm}$$
 $h = 40$ $d = 34.0$ $d' = 6.0$

a) side wall \bigcirc , \bigcirc Su. max = 116.3^{KN}

$$Vc = \frac{116.3 \times 10^3}{100 \times 34.0} = 34.2 \text{ N/cm}^2 < Vca = 43.6 \text{ N/cm}^2 \text{ OK}$$

b) upper slab ②, ③ Su.max = 77.8^{KN}

$$Vc = \frac{77.8 \times 10^3}{100 \times 34.0} = 22.9 \text{ N/cm}^2 < Vca = 43.6 \text{ N/cm}^2 \text{ OK}$$

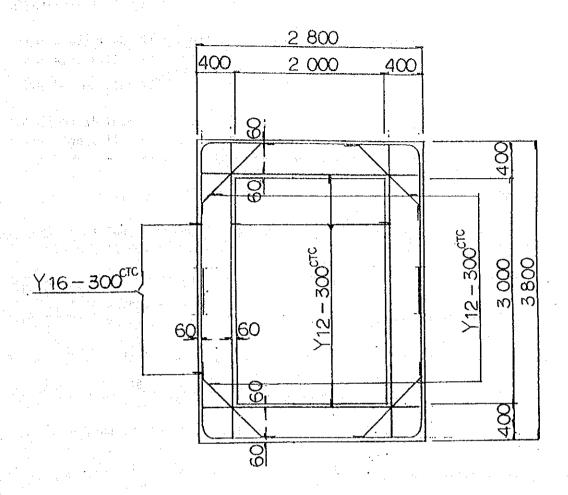
$$Vc = \frac{92.6 \times 10^3}{100 \times 34.0} = 27.3 \text{ N/cm}^2 < Vca = 43.6 \text{ N/cm}^2 \text{ OK}$$

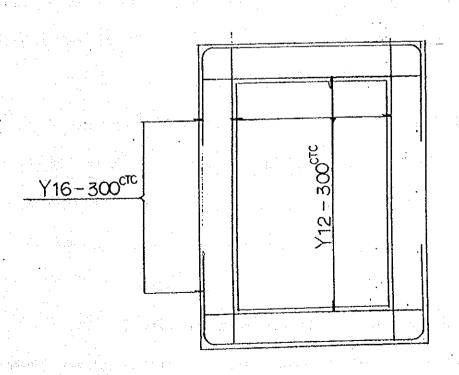
where

$$A_s = Y_{16} - 150^{\text{ctc}} = 13.41 \text{ cm}^2$$

$$P = \frac{13.41}{100 \times 34.0} \times 100 = 0.394 \%$$

: Vca= 35.0
$$+\frac{15}{0.25}$$
 (0.394 -0.25) = 43.6 N/cm²





Load

(1) Dead load

a) Vertical load Where $\alpha = 1.2$ {earth pressure factor of vertical $\frac{D}{B_0} = \frac{4.0}{2.8} = 1.4 > 1.0$

For upper slab $w1 = 22.6 \times 0.50 + 19.6 \times 3.50 \times 1.20 + 23.60 \times 0.400 = 103.060 \text{ kN/m}$ For side wall $w2 = 23.6 \times 0.40$ = 9.440 "

For bottom slab $w3 = 103.060 + \frac{2 \times 9.440 \times 3.40}{2.40}$ = 129.807 "

b) Horizontal load --- earth pressure

For side wall P1 = $(22.6 \times 0.50 + 19.60 \times 3.70) \times 0.500$ = 41.910 kN/m P2 = $(22.6 \times 0.50 + 19.60 \times 5.70) \times 0.500$ = 61.510 " P3 = $(22.6 \times 0.50 + 19.60 \times 5.70 + 10.8 \times 1.40) \times 0.500$ = 69.070 "

C)Horizontal load ---- water Pressure
For side wall Pw = 9.80 × 1.40 = 13.720 kN/m

(2)Live load

live load surcharge of axle

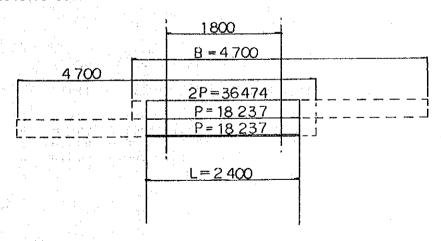
$$P = \frac{10 \times 30}{3.50 \times B}$$
 width of despersal of wheel
$$B = 0.300 + 4.00 + 0.400 = 4.700 \text{ m}$$
$$= \frac{10 \times 30}{3.50 \times 4.70} = 18.237 \text{ KN/m}^2$$

or live load surcharge of vihicle

go =
$$\frac{40 \times 30}{3.50 \times 10.0}$$
 = 34.300 KN/m² < 2P = 36.474 KN/m²

OF curse the loaded of live load is consider as following

case-1 Vaertical load



For upper slab and bottom slab w1 = w2 = 36.474 KN/m case-2 Horizontal load ---- eath pressure of live load surcharge For side wall: pe = $go \cdot ko = 34.300 \times 0.500 = 17.150 \text{ KN/m}$

`No	X	Y
	(m)	(m)
1	0.0000	0.0000
2	0.0000	3.4000
3	2.4000	3.4000
4	2.4000	0.0000

No	1.	j	A (m2)	1 (m4)	1 - 3	L (m)	E (t/m2)	EPS
1	1 -	2	0.40000	0.005330	Fix - Fix	3.400	2.50E+07	1.00E-05
2	2 -	3	0.40000	0.005330	Fix - Fix	2.400	2.50E+07	1.00E-05
3	3 -	4	0.40000	0.005330	Fix - Fix	3.400	2.50E+07	1.00E-05
4	4 -	1	0.40000	0.005330	Fix - Fix	2.400	2.50E+07	1.00E-05

No. 1

No	χ (t/m)	Y (t/m)	. M(tm/Rad)
1 4	Fix	Fix	Free
	Free	Fix	Free

No		L-No	L-No	L-No	L-No	L-No
177		1	2	. 3	4	5
i ta			12	13	14	15
1	5	0.200	0.800	1.700	2.600	3.200
2			0.800	1.200	1.600	2.200
3	5		0.800	1.700	2.600	3.200
4	5	0.200	0.800	1.200	1.600	2.200

NOTE: THE DIMENSION(L) BE EXCHANG TO DIMENSION(KN) INTO THIS CALCULATION

CALCULATION POINTS OF EACH FORCE

