BOX FOR DRIANAGE-NO 2

No	C-No 1	C-No 2
No	No 6	No 7
α	1.0000	1.0000
No 1	1.3800	1.3800
No 2	1.6500	1.6500
No 3	0.0000	1.6500
No 4	1.4300	0.0000
No 5	0.0000	1.6500

BOX FOR DRIANAGE-NO 2

No 1 : 6 7

BOX FOR DRIANAGE-NO 2

: Deadload
No. : 1

				Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	Y	0.000	3.400	-9.440	-9.440
3	3-	4	Y	0.000	3.400	-9.440	-9.440
2	2-	3	Y	0.000	2.400	-103.060	-103.060
4	4-	1	Y	0.000	2.400	129.807	129.807

ΣV = 0.001 (t)
ΣH = 0.000 (t)

BOX FOR DRIANAGE-NO 2

: Earth pressure load
No. : 2

				Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	X	0.000	1.400	69.070	61.510
1	1-	2	X	1.400	2.000	61.510	41.910
3	3-	4	X	0.000	2.000	-41.910	-61.510
3	3-	4	X	2.000	1.400	-61.510	-69.070

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRIANAGE-NO 2

: Water pressure load
No. : 3

				Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	X	0.000	1.400	13.720	0.000
3	3-	4	X	2.000	1.400	0.000	-13.720

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRIANAGE-NO 2

: HB live load-VL
No. : 4

				Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	Y	0.000	2.400	-36.474	-36.474
4	4-	1	Y	0.000	2.400	36.474	36.474

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRIANAGE-NO 2

: HB live load-HL-
No. : 5

				Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	X	0.000	3.400	17.150	17.150
3	3-	4	X	0.000	3.400	-17.150	-17.150

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRIANAGE-NO 2

No.	Case. 1 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 2 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 3 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	3.13708	0.00000	0.00000	-3.01109	0.00000	0.00000	-0.1235
2.	-0.00614	-0.47505	-2.76377	-0.02007	0.00000	2.86181	-0.00882	0.00000	0.0644
3.	0.00000	-0.47505	2.76377	-0.23379	0.00000	-2.86181	-0.01152	0.00000	-0.0644
4.	-0.00614	0.00000	-3.13708	-0.25386	0.00000	3.01109	-0.02035	0.00000	0.1235

No.	Case. 4 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 5 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 6 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	0.92425	0.00000	0.00000	-0.87218	0.00000	0.00000	0.6825
2.	0.00000	-0.14881	-0.92425	0.00000	0.00000	0.87218	-0.04159	-0.86837	-0.4137
3.	0.00000	-0.14881	0.92425	-0.06997	0.00000	-0.87218	-0.38576	-0.86837	0.4137
4.	0.00000	0.00000	-0.92425	-0.06997	0.00000	0.87218	-0.42735	0.00000	-0.6825

No.	Case. 7 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	-2.28204
2.	-0.05615	-0.65557	2.45330
3.	-0.52023	-0.65557	-2.45330
4.	-0.57638	0.00000	2.28204

BOX FOR DRIANAGE-NO 2

No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. 2 RX (t)	RY (t)	RM (tm)	Case. 3 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 4 RX (t)	RY (t)	RM (tm)	Case. 5 RX (t)	RY (t)	RM (tm)	Case. 6 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000

No.	Case. 7 RX (t)	RY (t)	RM (tm)
1.	0.000	-0.001	0.000
4.	0.000	-0.001	0.000

BOX FOR DRIANAGE-NO 2

No	L(m)	Case 4 HB live load-VL M (tm)	S (t)	N (t)	Case 5 HB live load-HL- M (tm)	S (t)	N (t)	Case 6 M (tm)	S (t)	N (t)
1- 2	0.000	-7.244	0.000	-43.769	-9.685	29.155	0.000	-103.441	178.061	-277.549
* 1	0.200	-7.244	0.000	-43.769	-4.197	25.725	0.000	-70.096	155.446	-274.944
* 2	0.800	-7.244	0.000	-43.769	8.151	15.435	0.000	3.299	89.739	-267.127
* 3	1.700	-7.244	0.000	-43.769	15.097	0.000	0.000	41.910	-2.479	-255.403
* 4	2.600	-7.244	0.000	-43.769	8.151	-15.435	0.000	2.505	-82.907	-243.679
* 5	3.200	-7.244	0.000	-43.769	-4.197	-25.725	0.000	-61.433	-129.249	-235.862
2- 1	3.400	-7.244	0.000	-43.769	-9.685	-29.155	0.000	-88.709	-143.402	-233.257
2- 3	0.000	-7.244	43.769	0.000	-9.685	0.000	-29.155	-88.709	233.257	-143.402
* 1	0.200	0.780	36.474	0.000	-9.685	0.000	-29.155	-45.945	194.381	-143.402
* 2	0.800	16.099	14.590	0.000	-9.685	0.000	-29.155	35.695	77.752	-143.402
* 3	1.200	19.017	0.000	0.000	-9.685	0.000	-29.155	51.245	0.000	-143.402
* 4	1.600	16.099	-14.590	0.000	-9.685	0.000	-29.155	35.695	-77.752	-143.402
* 5	2.200	0.780	-36.474	0.000	-9.685	0.000	-29.155	-45.945	-194.381	-143.402
3- 2	2.400	-7.244	-43.769	0.000	-9.685	0.000	-29.155	-88.709	-233.257	-143.402
3- 4	0.000	-7.244	0.000	-43.769	-9.685	29.155	0.000	-88.709	143.402	-233.257
* 1	0.200	-7.244	0.000	-43.769	-4.197	25.725	0.000	-61.433	129.249	-235.862
* 2	0.800	-7.244	0.000	-43.769	8.151	15.435	0.000	2.505	82.907	-243.679
* 3	1.700	-7.244	0.000	-43.769	15.097	0.000	0.000	41.910	2.479	-255.403
* 4	2.600	-7.244	0.000	-43.769	8.151	-15.435	0.000	3.299	-89.739	-267.127
* 5	3.200	-7.244	0.000	-43.769	-4.197	-25.725	0.000	-70.096	-155.446	-274.944
4- 3	3.400	-7.244	0.000	-43.769	-9.685	-29.155	0.000	-103.441	-178.061	-277.549
4- 1	0.000	-7.244	43.769	0.000	-9.685	0.000	-29.155	-103.441	277.550	-178.061
* 1	0.200	0.780	36.474	0.000	-9.685	0.000	-29.155	-52.557	231.291	-178.061
* 2	0.800	16.099	14.590	0.000	-9.685	0.000	-29.155	44.586	92.517	-178.061
* 3	1.200	19.017	0.000	0.000	-9.685	0.000	-29.155	63.089	0.000	-178.061
* 4	1.600	16.099	-14.590	0.000	-9.685	0.000	-29.155	44.586	-92.517	-178.061
* 5	2.200	0.780	-36.474	0.000	-9.685	0.000	-29.155	-52.557	-231.291	-178.061
1- 4	2.400	-7.244	-43.769	0.000	-9.685	0.000	-29.155	-103.441	-277.550	-178.061

BOX FOR DRIANAGE-NO 2

No	L(m)	Case 1 Deadload M (tm)	S (t)	N (t)	Case 2 Earth pressure load M (tm)	S (t)	N (t)	Case 3 Water pressure load M (tm)	S (t)	N (t)
1- 2	0.000	-27.473	2.557	-155.768	-33.436	105.777	0.000	-1.372	8.479	0.000
* 1	0.200	-26.961	2.557	-153.880	-13.654	92.071	0.000	0.063	5.931	0.000
* 2	0.800	-25.427	2.557	-148.216	29.544	52.249	0.000	1.857	0.639	0.000
* 3	1.700	-23.126	2.557	-139.720	51.021	-3.641	0.000	1.198	-1.125	0.000
* 4	2.600	-20.825	2.557	-131.224	25.214	-52.385	0.000	0.185	-1.125	0.000
* 5	3.200	-19.291	2.557	-125.560	-14.820	-80.471	0.000	-0.490	-1.125	0.000
2- 1	3.400	-18.779	2.557	-123.672	-31.778	-89.049	0.000	-0.715	-1.125	0.000
2- 3	0.000	-18.779	123.672	2.557	-31.778	0.000	-89.049	-0.715	0.000	-1.125
* 1	0.200	3.894	103.060	2.557	-31.778	0.000	-89.049	-0.715	0.000	-1.125
* 2	0.800	47.179	41.224	2.557	-31.778	0.000	-89.049	-0.715	0.000	-1.125
* 3	1.200	55.424	0.000	2.557	-31.778	0.000	-89.049	-0.715	0.000	-1.125
* 4	1.600	47.179	-41.224	2.557	-31.778	0.000	-89.049	-0.715	0.000	-1.125
* 5	2.200	3.894	-103.060	2.557	-31.778	0.000	-89.049	-0.715	0.000	-1.125
3- 2	2.400	-18.779	-123.672	2.557	-31.778	0.000	-89.049	-0.715	0.000	-1.125
3- 4	0.000	-18.779	-2.557	-123.672	-31.778	89.049	0.000	-0.715	1.125	0.000
* 1	0.200	-19.291	-2.557	-125.560	-14.820	80.471	0.000	-0.490	1.125	0.000
* 2	0.800	-20.825	-2.557	-131.224	25.214	52.385	0.000	0.185	1.125	0.000
* 3	1.700	-23.126	-2.557	-139.720	51.021	3.641	0.000	1.198	1.125	0.000
* 4	2.600	-25.427	-2.557	-148.216	29.544	-52.249	0.000	1.857	-0.639	0.000
* 5	3.200	-26.961	-2.557	-153.880	-13.654	-92.071	0.000	0.063	-5.931	0.000
4- 3	3.400	-27.473	-2.557	-155.768	-33.436	-105.777	0.000	-1.372	-8.479	0.000
4- 1	0.000	-27.473	155.768	-2.557	-33.436	0.000	-105.777	-1.372	0.000	-8.479
* 1	0.200	1.085	129.807	-2.557	-33.436	0.000	-105.777	-1.372	0.000	-8.479
* 2	0.800	55.604	51.923	-2.557	-33.436	0.000	-105.777	-1.372	0.000	-8.479
* 3	1.200	65.988	0.000	-2.557	-33.436	0.000	-105.777	-1.372	0.000	-8.479
* 4	1.600	55.604	-51.923	-2.557	-33.436	0.000	-105.777	-1.372	0.000	-8.479
* 5	2.200	1.085	-129.807	-2.557	-33.436	0.000	-105.777	-1.372	0.000	-8.479
1- 4	2.400	-27.473	-155.768	-2.557	-33.436	0.000	-105.777	-1.372	0.000	-8.479

BOX FOR DRIANAGE-NO 2

Case 7

No		L(m)	M (tm)	S (t)	N (t)
1-	2	0.000	-111.324	240.157	-214.960
*	1	0.200	-66.558	207.678	-212.354
*	2	0.800	30.173	116.261	-204.538
*	3	1.700	79.156	-4.335	-192.814
*	4	2.600	26.619	-110.231	-181.089
*	5	3.200	-58.806	-173.551	-173.273
2-	1	3.400	-95.509	-193.364	-170.667
2-	3	0.000	-95.509	170.667	-193.364
*	1	0.200	-64.220	142.223	-193.364
*	2	0.800	-4.486	56.889	-193.364
*	3	1.200	6.892	0.000	-193.364
*	4	1.600	-4.486	-56.889	-193.364
*	5	2.200	-64.220	-142.223	-193.364
3-	2	2.400	-95.509	-170.667	-193.364
3-	4	0.000	-95.509	193.364	-170.667
*	1	0.200	-58.806	173.551	-173.273
*	2	0.800	26.619	110.231	-181.089
*	3	1.700	79.156	4.335	-192.814
*	4	2.600	30.173	-116.261	-204.538
*	5	3.200	-66.558	-207.678	-212.354
4-	3	3.400	-111.324	-240.157	-214.960
4-	1	0.000	-111.324	214.960	-240.157
*	1	0.200	-71.915	179.134	-240.157
*	2	0.800	3.321	71.653	-240.157
*	3	1.200	17.652	0.000	-240.157
*	4	1.600	3.321	-71.653	-240.157
*	5	2.200	-71.915	-179.134	-240.157
1-	4	2.400	-111.324	-214.960	-240.157

BOX FOR DRIANAGE-NO 2

PICK-UP No. 1 *

No.	L (m)	M. MAXIMUM Case	M (tm)	S (t)	N (t)	M. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 6	-103.441	178.061	-277.549	C- 7	-111.324	240.157	-214.960
* 1	0.200	C- 7	-66.558	207.678	-212.354	C- 6	-70.096	155.446	-274.944
* 2	0.800	C- 7	30.173	116.261	-204.538	C- 6	3.299	89.739	-267.127
* 3	1.700	C- 7	79.156	-4.335	-192.814	C- 6	41.910	-2.479	-255.403
* 4	2.600	C- 7	26.619	-110.231	-181.089	C- 6	2.505	-82.907	-243.679
* 5	3.200	C- 7	-58.806	-173.551	-173.273	C- 6	-61.433	-129.249	-235.862
2 - 1	3.400	C- 6	-88.709	-143.402	-233.257	C- 7	-95.509	-193.364	-170.667
2 - 3	0.000	C- 6	-88.709	233.257	-143.402	C- 7	-95.509	170.667	-193.364
* 1	0.200	C- 6	-45.945	194.381	-143.402	C- 7	-64.220	142.223	-193.364
* 2	0.800	C- 6	35.695	77.752	-143.402	C- 7	-4.486	56.889	-193.364
* 3	1.200	C- 6	51.245	0.000	-143.402	C- 7	6.892	0.000	-193.364
* 4	1.600	C- 6	35.695	-77.752	-143.402	C- 7	-4.486	-56.889	-193.364
* 5	2.200	C- 6	-45.945	-194.381	-143.402	C- 7	-64.220	-142.223	-193.364
3 - 2	2.400	C- 6	-88.709	-233.257	-143.402	C- 7	-95.509	-170.667	-193.364
3 - 4	0.000	C- 6	-88.709	143.402	-233.257	C- 7	-95.509	193.364	-170.667
* 1	0.200	C- 7	-58.806	173.551	-173.273	C- 6	-61.433	129.249	-235.862
* 2	0.800	C- 7	26.619	110.231	-181.089	C- 6	2.505	82.907	-243.679
* 3	1.700	C- 7	79.156	4.335	-192.814	C- 6	41.910	2.479	-255.403
* 4	2.600	C- 7	30.173	-116.261	-204.538	C- 6	3.299	-89.739	-267.127
* 5	3.200	C- 7	-66.558	-207.678	-212.354	C- 6	-70.096	-155.446	-274.944
4 - 3	3.400	C- 6	-103.441	-178.061	-277.549	C- 7	-111.324	-240.157	-214.960
4 - 1	0.000	C- 6	-103.441	277.550	-178.061	C- 7	-111.324	214.960	-240.157
* 1	0.200	C- 6	-52.557	231.291	-178.061	C- 7	-71.915	179.134	-240.157
* 2	0.800	C- 6	44.586	92.517	-178.061	C- 7	3.321	71.653	-240.157
* 3	1.200	C- 6	63.089	0.000	-178.061	C- 7	17.652	0.000	-240.157
* 4	1.600	C- 6	44.586	-92.517	-178.061	C- 7	3.321	-71.653	-240.157
* 5	2.200	C- 6	-52.557	-231.291	-178.061	C- 7	-71.915	-179.134	-240.157
1 - 4	2.400	C- 6	-103.441	-277.550	-178.061	C- 7	-111.324	-214.960	-240.157

BOX FOR DRIANAGE-NO 2

PICK-UP No. 1 *

No.	L (m)	S. MAXIMUM Case	M (tm)	S (t)	N (t)	S. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 7	-111.324	240.157	-214.960	C- 6	-103.441	178.061	-277.549
* 1	0.200	C- 7	-66.558	207.678	-212.354	C- 6	-70.096	155.446	-274.944
* 2	0.800	C- 7	30.173	116.261	-204.538	C- 6	3.299	89.739	-267.127
* 3	1.700	C- 6	41.910	-2.479	-255.403	C- 7	79.156	-4.335	-192.814
* 4	2.600	C- 6	2.505	-82.907	-243.679	C- 7	26.619	-110.231	-181.089
* 5	3.200	C- 6	-61.433	-129.249	-235.862	C- 7	-58.806	-173.551	-173.273
2 - 1	3.400	C- 6	-88.709	-143.402	-233.257	C- 7	-95.509	-193.364	-170.667
2 - 3	0.000	C- 6	-88.709	233.257	-143.402	C- 7	-95.509	170.667	-193.364
* 1	0.200	C- 6	-45.945	194.381	-143.402	C- 7	-64.220	142.223	-193.364
* 2	0.800	C- 6	35.695	77.752	-143.402	C- 7	-4.486	56.889	-193.364
* 3	1.200	C- 7	6.892	0.000	-193.364	C- 6	51.245	0.000	-143.402
* 4	1.600	C- 7	-4.486	-56.889	-193.364	C- 6	35.695	-77.752	-143.402
* 5	2.200	C- 7	-64.220	-142.223	-193.364	C- 6	-45.945	-194.381	-143.402
3 - 2	2.400	C- 7	-95.509	-170.667	-193.364	C- 6	-88.709	-233.257	-143.402
3 - 4	0.000	C- 7	-95.509	193.364	-170.667	C- 6	-88.709	143.402	-233.257
* 1	0.200	C- 7	-58.806	173.551	-173.273	C- 6	-61.433	129.249	-235.862
* 2	0.800	C- 7	26.619	110.231	-181.089	C- 6	2.505	82.907	-243.679
* 3	1.700	C- 7	79.156	4.335	-192.814	C- 6	41.910	2.479	-255.403
* 4	2.600	C- 6	3.299	-89.739	-267.127	C- 7	30.173	-116.261	-204.538
* 5	3.200	C- 6	-70.096	-155.446	-274.944	C- 7	-66.558	-207.678	-212.354
4 - 3	3.400	C- 6	-103.441	-178.061	-277.549	C- 7	-111.324	-240.157	-214.960
4 - 1	0.000	C- 6	-103.441	277.550	-178.061	C- 7	-111.324	214.960	-240.157
* 1	0.200	C- 6	-52.557	231.291	-178.061	C- 7	-71.915	179.134	-240.157
* 2	0.800	C- 6	44.586	92.517	-178.061	C- 7	3.321	71.653	-240.157
* 3	1.200	C- 7	17.652	0.000	-240.157	C- 6	63.089	0.000	-178.061
* 4	1.600	C- 7	3.321	-71.653	-240.157	C- 6	44.586	-92.517	-178.061
* 5	2.200	C- 7	-71.915	-179.134	-240.157	C- 6	-52.557	-231.291	-178.061
1 - 4	2.400	C- 7	-111.324	-214.960	-240.157	C- 6	-103.441	-277.550	-178.061

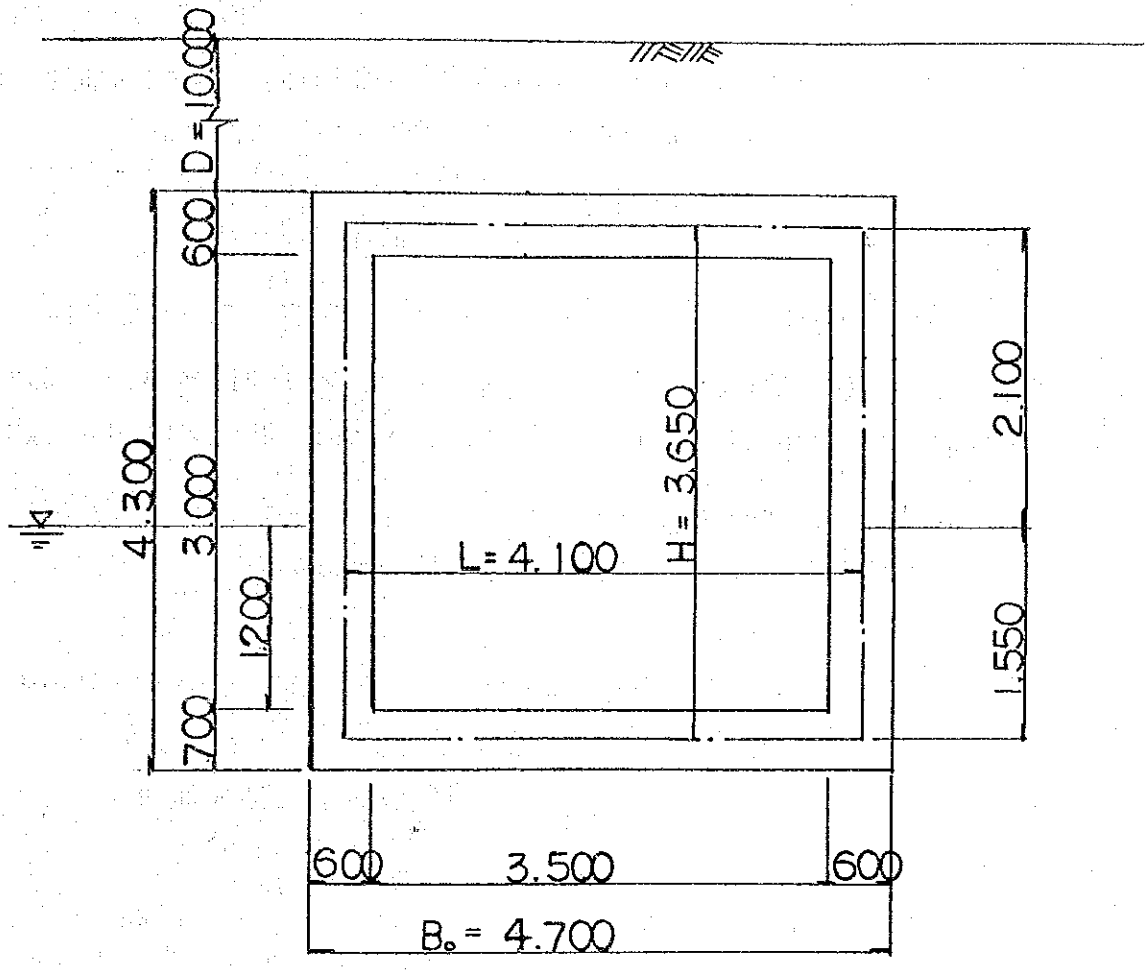
BOX FOR DRIANAGE-NO 2

PICK-UP No. 1 *

No.	L (m)	N. MAXIMUM Case	M (tm)	S (t)	N (t)	N. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 7	-111.324	240.157	-214.960	C- 6	-103.441	178.061	-277.549
* 1	0.200	C- 7	-66.558	207.678	-212.354	C- 6	-70.096	155.446	-274.944
* 2	0.800	C- 7	30.173	116.261	-204.538	C- 6	3.299	89.739	-267.127
* 3	1.700	C- 7	79.156	-4.335	-192.814	C- 6	41.910	-2.479	-255.403
* 4	2.600	C- 7	26.619	-110.231	-181.089	C- 6	2.505	-82.907	-243.679
* 5	3.200	C- 7	-58.806	-173.551	-173.273	C- 6	-61.433	-129.249	-235.862
2 - 1	3.400	C- 7	-95.509	-193.364	-170.667	C- 6	-88.709	-143.402	-233.257
2 - 3	0.000	C- 6	-88.709	233.257	-143.402	C- 7	-95.509	170.667	-193.364
* 1	0.200	C- 6	-45.945	194.381	-143.402	C- 7	-64.220	142.223	-193.364
* 2	0.800	C- 6	35.695	77.752	-143.402	C- 7	-4.486	56.889	-193.364
* 3	1.200	C- 6	51.245	0.000	-143.402	C- 7	6.892	0.000	-193.364
* 4	1.600	C- 6	35.695	-77.752	-143.402	C- 7	-4.486	-56.889	-193.364
* 5	2.200	C- 6	-45.945	-194.381	-143.402	C- 7	-64.220	-142.223	-193.364
3 - 2	2.400	C- 6	-88.709	-233.257	-143.402	C- 7	-95.509	-170.667	-193.364
3 - 4	0.000	C- 7	-95.509	193.364	-170.667	C- 6	-88.709	143.402	-233.257
* 1	0.200	C- 7	-58.806	173.551	-173.273	C- 6	-61.433	129.249	-235.862
* 2	0.800	C- 7	26.619	110.231	-181.089	C- 6	2.505	82.907	-243.679
* 3	1.700	C- 7	79.156	4.335	-192.814	C- 6	41.910	2.479	-255.403
* 4	2.600	C- 7	30.173	-116.261	-204.538	C- 6	3.299	-89.739	-267.127
* 5	3.200	C- 7	-66.558	-207.678	-212.354	C- 6	-70.096	-155.446	-274.944
4 - 3	3.400	C- 7	-111.324	-240.157	-214.960	C- 6	-103.441	-178.061	-277.549
4 - 1	0.000	C- 6	-103.441	277.550	-178.061	C- 7	-111.324	214.960	-240.157
* 1	0.200	C- 6	-52.557	231.291	-178.061	C- 7	-71.915	179.134	-240.157
* 2	0.800	C- 6	44.586	92.517	-178.061	C- 7	3.321	71.653	-240.157
* 3	1.200	C- 6	63.089	0.000	-178.061	C- 7	17.652	0.000	-240.157
* 4	1.600	C- 6	44.586	-92.517	-178.061	C- 7	3.321	-71.653	-240.157
* 5	2.200	C- 6	-52.557	-231.291	-178.061	C- 7	-71.915	-179.134	-240.157
1 - 4	2.400	C- 6	-103.441	-277.550	-178.061	C- 7	-111.324	-214.960	-240.157

NO ③ BOX CULVERT FOR DRAINAGE

1) Shape and Size



Where ··· D^m = depth of asphalt and similar surface soil.

2) Factor of section

$$A = 1.00 \times 0.60(0.70) = 0.6000^{m^2}\ (0.7000)$$

$$I = \frac{1.00 \times 0.60^3}{12}\ (0.70^3) = 0.01800^{m^4}\ (0.02858)$$

$$E_C = 25\ kN/mm^2 = 2.5 \times 10^7\ kN/m^2$$

No.③ BOX CULVERT FOR DRAINAGE (D=10.0m)

1. calculation for bending moment

section b=100cm h=60 d =53.5 d´ =6.5

1) For upper slab

a) intersection point②=③ Mu.min =−387.4KNm

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

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

$$Z = 53.5 - \frac{11.8}{2} = 47.6 \ cm < 0.95\times 53.5 = 50.8 \ cm \quad OK$$

$M_{RS} = 0.87\times 41000 \times 32.73 \times 47.6\times 10^{-5} = 555.7^{KNm} > Mu = 387.4^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 11.8\times 47.6\times 10^{-5} = 561.6^{KNm} > Mu = 387.4^{KNm}$

notice : the bar is decide for sheaing stress as following

$$A_s = \left\{ \begin{matrix} Y_{30}-300^{ctc} \\ Y_{25}-300^{ctc} \end{matrix} \right\} = 43.17 \ cm^2$$

b) middle point ②～③ Mu.max=440.4KNm

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

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

$$Z = 53.5 - \frac{11.8}{2} = 47.6 \ cm < 0.95\times 53.5 = 50.8 \ cm \quad OK$$

$M_{RS} = 0.87\times 41000 \times 32.73 \times 47.6\times 10^{-5} = 555.7^{KNm} > Mu = 440.4^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 11.8\times 47.6\times 10^{-5} = 561.6^{KNm} > Mu = 440.4^{KNm}$

2) For bottom slab

section b=100cm h=70 d =63.5 d´ =6.5

a) intersection point ④=① Mu.min=−359.9KNm

$A_s = Y_{20}-150^{ctc} = 3.142/0.15 = 20.95 \ cm^2$

$$X = \frac{0.87\times 41000 \times 20.95}{0.40\times 2500\times 100} \fallingdotseq 7.6 \ m$$

$$Z = 63.5 - \frac{7.6}{2} = 59.7^{cm} < 0.95\times 63.5 = 60.3^{cm} \quad OK$$

$M_{RS} = 0.87\times 41000 \times 20.95 \times 59.7\times 10^{-5} = 446.1^{KNm} > Mu = 359.9^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 7.6 \times 59.7\times 10^{-5} = 453.7^{KNm} > Mu = 359.9^{KNm}$

notice : the bar is decide for sheaing stress as following

$A_s = Y_{25}-150^{ctc} = 32.73 \ cm^2$

b) middle point ④~① $Mu.max = 542.4^{KNm}$

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

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

$$Z = 63.5 - \frac{11.8}{2} = 57.6 \ ^{cm} < 0.95 \times 63.5 = 60.3^{cm} \quad OK$$

$M_{Rs} = 0.87 \times 41000 \times 32.73 \times 57.6 \times 10^{-5} = 672.4^{KNm} > Mu = 542.4^{KNm}$

$M_{Rc} = 0.40 \times 2500 \times 100 \times 11.8 \times 57.6 \times 10^{-5} = 679.6^{KNm} > Mu = 542.4^{KNm}$ OK

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

a) For upper slab

intersection point ②=③ { Su.max = 492.4^{KN} … d^{cm}, distance
Su.max = 295.5^{KN} … $2d^{cm}$, distance

section b = 100^{cm} h = 60 d = 53.5 d′ = 6.5

$$A_s = \begin{cases} Y_{25} - 300^{c\,t\,c} = 4.909/0.300 \\ Y_{32} - 300^{c\,t\,c} = 8.042/0.300 \end{cases} = 43.17 \ cm^2$$

$$P = \frac{43.17}{100 \times 53.5} \times 100 = 0.807 \ \%$$

$$Vc_1 = \frac{492.4 \times 10^3}{100 \times 53.5} = 92.1 \ N/cm^2$$

$$Vc_2 = \frac{295.5 \times 10^3}{100 \times 53.5} = 55.3 \ N/cm^2$$

$$< Vca_1 = \left\{ 50.0 + 15.0 \times \frac{(0.807 - 0.50)}{0.50} \right\} \times \frac{2d}{d} = 118.4 \ N/cm^2 \quad OK$$

$$< Vca_2 = \left\{ 50.0 + 15.0 \times \frac{(0.807 - 0.50)}{0.50} \right\} \times \frac{2d}{2d} = 59.2 \ N/cm^2 \quad OK$$

b) For botton slab

section b = 100^{cm} h = 70 d = 63.5 d′ = 6.5

intersection point ①, ④ { Su.max = 493.0^{KN} … d^{cm}, distance
Su.max = 235.8^{KN} … $2d^{cm}$, distance

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

$$P = \frac{32.73}{100 \times 63.5} \times 100 = 0.515 \ \%$$

$$Vc_1 = \frac{493.0 \times 10^3}{100 \times 63.5} = 77.7 \ N/cm^2$$

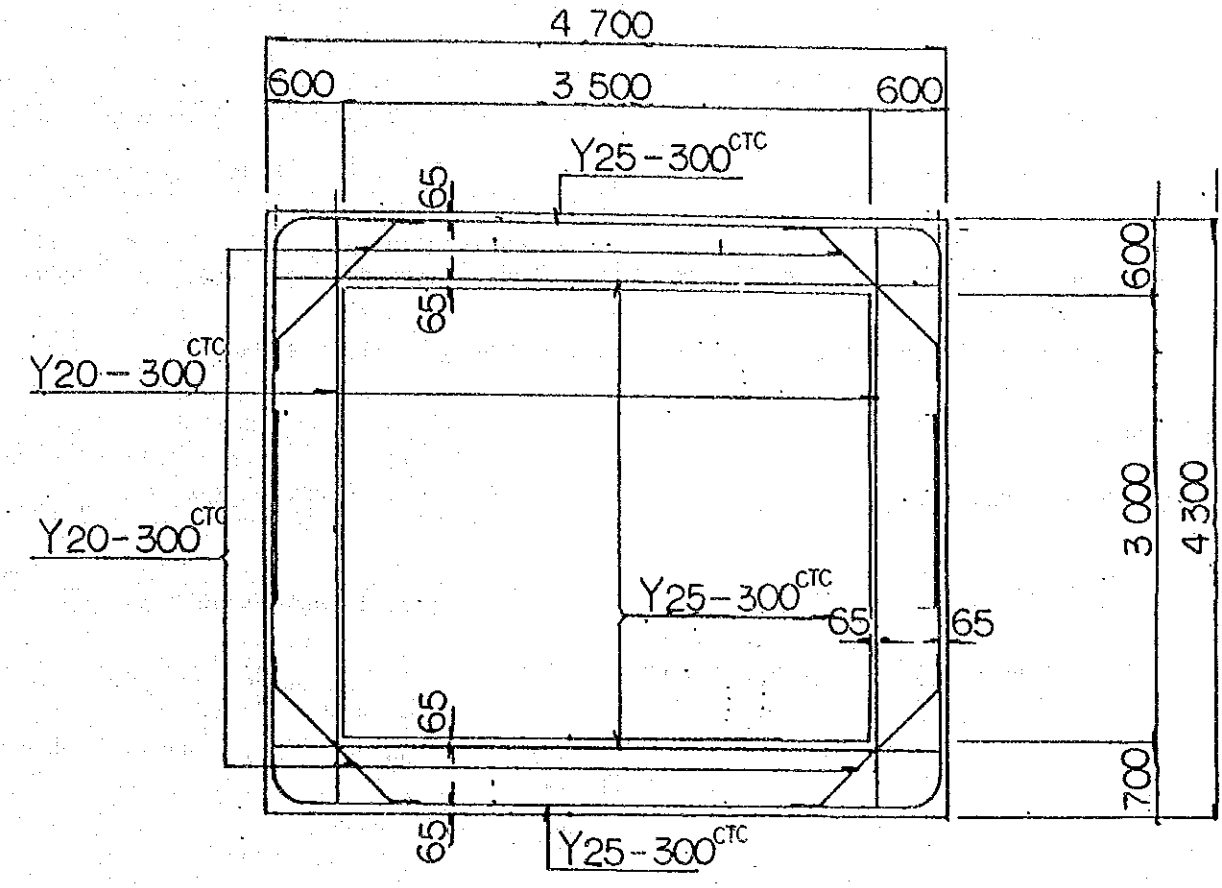
$$Vc_2 = \frac{235.8 \times 10^3}{100 \times 63.5} = 37.2 \ N/cm^2$$

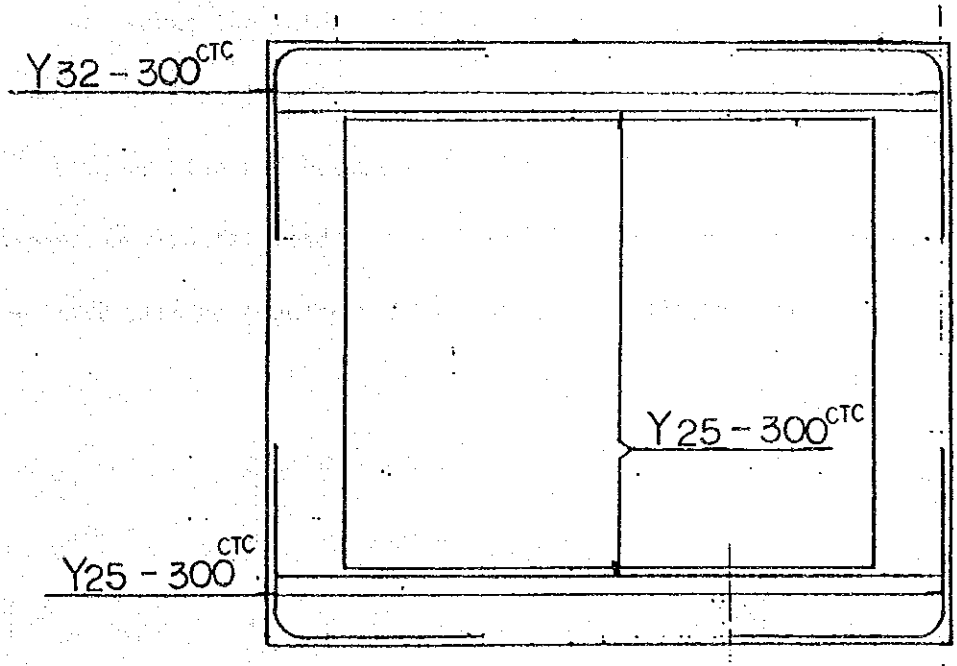
$$< Vca_1 = \left\{ 50 + \frac{15}{0.50} (0.515 - 0.50) \right\} \times \frac{2d}{d} = 100.9 \ N/cm^2 \quad OK$$

$$< Vca_1 = \left\{ 50 + \frac{15}{0.50} (0.515 - 0.50) \right\} \times \frac{2d}{2d} = 50.5 \ N/cm^2 \quad OK$$

notice : the bar is decide for sheaing stress about point ②, ③ and ④, ①

NO③ BOX CULVERT FOR DRAINAGE





NO③ BOX FOR DRAINAGE

Load

(1)Dead load

a)Vertical load Where α = 1.35 (earth pressure factor of vertical) $\because \frac{D}{B_o} = \frac{10.0}{4.7} = 2.2 \begin{matrix} > 2.0 \\ < 3.0 \end{matrix}$

For upper slab w1 = 22.6×0.50+17.5×9.50×1.35+23.60×0.600 = 249.898 kN/m

For side wall w2 = 23.6×0.60 = 14.160 〃

For bottom slab $W3 = 249.898 + \frac{2 \times 14.160 \times 3.65}{4.10}$ = 275.110 〃

b)Horizontal load ----- earth pressure

For side wall P1 = (22.6×0.50+17.50×9.80)×0.500 = 91.400 kN/m

〃 P2 = (22.6×0.50+17.50×11.9)×0.500 = 109.775 〃

〃 P3 = (22.6×0.50+17.50×11.9+8.7×1.55) ×0.500 = 116.518 〃

C)Horizontal load ----- water Pressure

Pw = 9.80 ×1.55 = 15.190 kN/m

(2)Live load

live load surcharge of axle

$$P = \frac{\overset{KN/axle}{10} \times \overset{unite}{30}}{3.50 \times B}$$

width of despersal of wheel

B= 0.300+10.00+0.600 = 10.900 m

$$= \frac{10 \times 30}{3.50 \times 10.90} = 7.864 \ KN/m^2$$

or live load surcharge of vihicle

$$go = \frac{\overset{kN/rihicle}{40} \times \overset{unit}{30}}{3.50 \times 10.0} \fallingdotseq 34.300 \ KN/m^2 > 2P = 15.728 \ KN/m^2$$

OF curse the loaded of live load is consider as following

case-1 Vaertical load

For upper slab and bottom slab w1=w2=34.300 KN/m

case-2 Horizontal load --- eath pressure of live load surcharge

For side wall pe = go·ko = 34.300 × 0.500 = 17.150 KN/m

BOX FOR DRAINAGE-NO 3 Depth = 10.000

No	X (m)	Y (m)
1	0.0000	0.0000
2	0.0000	3.6500
3	4.1000	3.6500
4	4.1000	0.0000

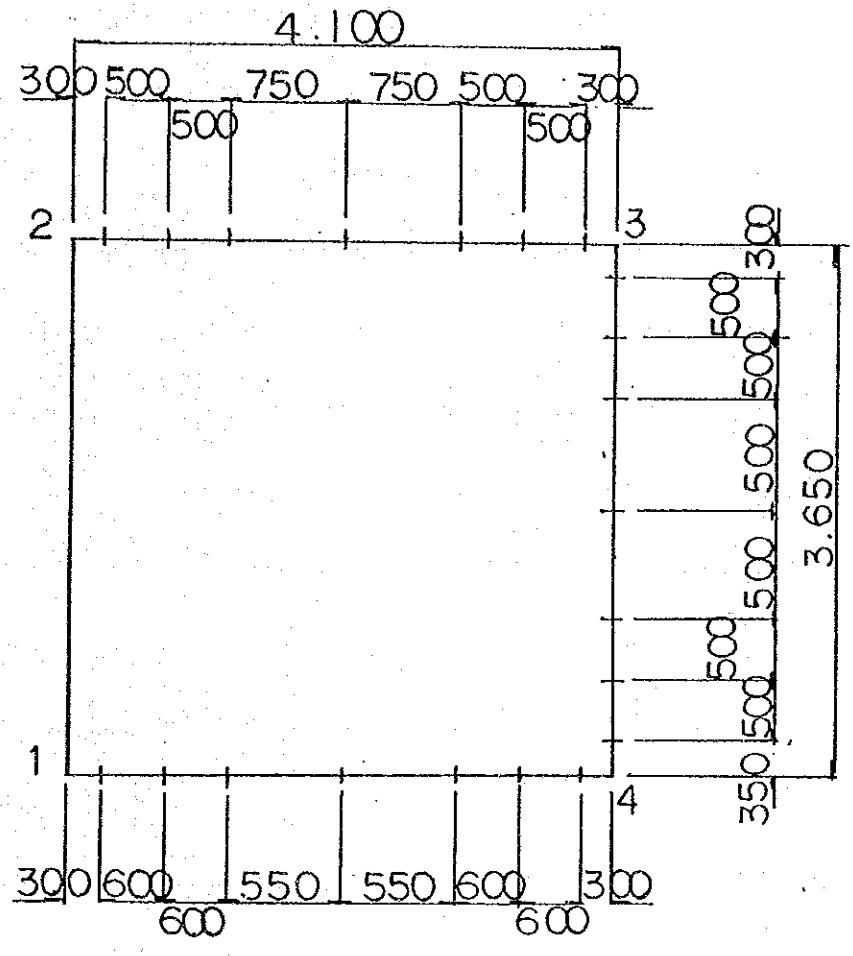
No	I - J	A (m2)	I (m4)	I - J	L (m)	E (t/m2)	EPS
1	1 - 2	0.60000	0.018000	Fix - Fix	3.650	2.50E+07	1.00E-05
2	2 - 3	0.60000	0.018000	Fix - Fix	4.100	2.50E+07	1.00E-05
3	3 - 4	0.60000	0.018000	Fix - Fix	3.650	2.50E+07	1.00E-05
4	4 - 1	0.70000	0.028580	Fix - Fix	4.100	2.50E+07	1.00E-05

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

No		L-No 1 / 11	L-No 2 / 12	L-No 3 / 13	L-No 4 / 14	L-No 5 / 15	L-No 6 / 16	L-No 7 / 17	L-No 8 / 18	L-No 9 / 19	L-No 10 / 20
1	7	0.350	0.850	1.350	1.850	2.350	2.850	3.350			
2	7	0.300	0.800	1.300	2.050	2.800	3.300	3.800			
3	7	0.300	0.800	1.300	1.800	2.300	2.800	3.300			
4	7	0.300	0.900	1.500	2.050	2.600	3.200	3.800			

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

CALCULATION POINTS OF EACH FORCE



: Dead load
No. : 1

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-Y	0.000	3.650	-14.160	-14.160
3	3-	4	-Y	0.000	3.650	-14.160	-14.160
2	2-	3	-Y	0.000	4.100	-249.898	-249.898
4	4-	1	-Y	0.000	4.100	275.110	275.110

: Earth pressure load
No. : 2

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	1.550	116.518	109.775
1	1-	2	-X	1.550	2.100	109.775	91.400
3	3-	4	-X	0.000	2.100	-91.400	-109.775
3	3-	4	-X	2.100	1.550	-109.775	-116.518

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: Water pressure load
No. : 3

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	1.550	15.190	15.190
3	3-	4	-X	2.100	1.550	-15.190	-15.190

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: HB live load-VL-
No. : 4

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	4.100	-34.300	-34.300
4	4-	1	-Y	0.000	4.100	34.300	34.300

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: HB live load-HL-
No. : 5

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	3.650	17.150	17.150
3	3-	4	-X	0.000	3.650	-17.150	-17.150

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRAINAGE-NO 3

No	C-No 1	C-No 2
No	No 6	No 7
α	1.0000	1.0000
No 1	1.3800	1.3800
No 2	1.6500	1.6500
No 3	0.0000	1.6500
No 4	1.4300	0.0000
No 5	0.0000	1.6500

BOX FOR DRAINAGE-NO 3

BOX FOR DRAINAGE-NO 3

No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. 2 RX (t)	RY (t)	RM (tm)	Case. 3 RX (t)	RY (t)	RM (tm)
1.	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 4 RX (t)	RY (t)	RM (tm)	Case. 5 RX (t)	RY (t)	RM (tm)	Case. 6 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000

No.	Case. 7 RX (t)	RY (t)	RM (tm)
1.	0.000	-0.001	0.000
4.	0.000	-0.001	0.000

BOX FOR DRAINAGE-NO 3

No.	Case. 1 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 2 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 3 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	6.69170	0.00000	0.00000	-2.12758	0.00000	0.00000	-0.1396
2.	0.02718	-1.30946	-7.23508	0.00223	0.00000	2.35230	-0.01671	0.00000	0.1024
3.	-0.00209	-1.30946	7.23508	-0.48790	0.00000	-2.35230	-0.02842	0.00000	-0.1024
4.	0.02509	0.00000	-6.69170	-0.48566	0.00000	2.12758	-0.04513	0.00000	0.1396

No.	Case. 4 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 5 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 6 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	0.85401	0.00000	0.00000	-0.33948	0.00000	0.00000	6.9453
2.	0.00587	-0.17110	-0.97136	0.00374	0.00000	0.38356	0.04960	-2.05172	-7.4922
3.	-0.00045	-0.17110	0.97136	-0.07926	0.00000	-0.38356	-0.80856	-2.05172	7.4922
4.	0.00542	0.00000	-0.85401	-0.07552	0.00000	0.33948	-0.75896	0.00000	-6.9453

No.	Case. 7 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	4.93359
2.	0.01980	-1.80705	-5.30121
3.	-0.98558	-1.80705	5.30121
4.	-0.96578	0.00000	-4.93359

BOX FOR DRAINAGE-NO 3

No	L(m)	Case 1 Dead load M (tm)	S (t)	N (t)	Case 2 Earth pressure load M (tm)	S (t)	N (t)	Case 3 Water pressure load M (tm)	S (t)	N (t)
1- 2	0.000	-152.153	-10.711	-563.975	-74.154	207.295	0.000	-4.865	19.262	0.000
* 1	0.350	-155.902	-10.711	-559.019	-8.706	166.780	0.000	0.947	13.946	0.000
* 2	0.850	-161.257	-10.711	-551.939	60.400	109.826	0.000	6.021	6.351	0.000
* 3	1.350	-166.612	-10.711	-544.859	101.301	53.960	0.000	7.297	-1.244	0.000
* 4	1.850	-171.968	-10.711	-537.779	114.560	-0.621	0.000	5.460	-4.282	0.000
* 5	2.350	-177.323	-10.711	-530.699	101.038	-53.102	0.000	3.318	-4.282	0.000
* 6	2.850	-182.678	-10.711	-523.619	61.822	-103.396	0.000	1.177	-4.282	0.000
* 7	3.350	-188.034	-10.711	-516.539	-1.993	-151.502	0.000	-0.964	-4.282	0.000
2- 1	3.650	-191.247	-10.711	-512.291	-51.636	-179.316	0.000	-2.249	-4.282	0.000
2- 3	0.000	-191.247	512.291	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
* 1	0.300	-48.805	437.322	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
* 2	0.800	138.619	312.372	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
* 3	1.300	263.568	187.424	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
* 4	2.050	333.851	0.000	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
* 5	2.800	263.568	-187.424	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
* 6	3.300	138.619	-312.373	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
* 7	3.800	-48.805	-437.322	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
3- 2	4.100	-191.247	-512.291	-10.711	-51.636	0.000	-179.316	-2.249	0.000	-4.282
3- 4	0.000	-191.247	10.711	-512.291	-51.636	179.316	0.000	-2.249	4.282	0.000
* 1	0.300	-188.034	10.711	-516.539	-1.993	151.502	0.000	-0.964	4.282	0.000
* 2	0.800	-182.678	10.711	-523.619	61.822	103.396	0.000	1.177	4.282	0.000
* 3	1.300	-177.323	10.711	-530.699	101.038	53.102	0.000	3.318	4.282	0.000
* 4	1.800	-171.968	10.711	-537.779	114.560	0.621	0.000	5.460	4.282	0.000
* 5	2.300	-166.612	10.711	-544.859	101.301	-53.960	0.000	7.297	1.244	0.000
* 6	2.800	-161.257	10.711	-551.939	60.400	-109.826	0.000	6.021	-6.351	0.000
* 7	3.300	-155.902	10.711	-559.019	-8.706	-166.780	0.000	0.947	-13.946	0.000
4- 3	3.650	-152.153	10.711	-563.975	-74.154	-207.295	0.000	-4.865	-19.262	0.000
4- 1	0.000	-152.153	563.976	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
* 1	0.300	4.660	481.443	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
* 2	0.900	244.005	316.377	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
* 3	1.500	384.311	151.311	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
* 4	2.050	425.922	0.000	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
* 5	2.600	384.311	-151.311	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
* 6	3.200	244.005	-316.377	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
* 7	3.800	4.660	-481.443	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262
1- 4	4.100	-152.153	-563.975	10.711	-74.154	0.000	-207.295	-4.865	0.000	-19.262

No	L(m)	Case 4 HB live load-VL- M (tm)	S (t)	N (t)	Case 5 HB live load-HL- M (tm)	S (t)	N (t)	Case 6 M (tm)	S (t)	N (t)
1- 2	0.000	-18.283	-2.313	-70.315	-11.832	32.234	0.000	-358.470	323.948	-878.836
* 1	0.350	-19.093	-2.313	-70.315	-1.601	26.231	0.000	-256.813	257.098	-871.997
* 2	0.850	-20.249	-2.313	-70.315	9.371	17.656	0.000	-151.832	163.124	-862.226
* 3	1.350	-21.406	-2.313	-70.315	16.055	9.081	0.000	-93.389	70.945	-852.456
* 4	1.850	-22.562	-2.313	-70.315	18.452	0.506	0.000	-80.555	-19.113	-842.685
* 5	2.350	-23.719	-2.313	-70.315	16.562	-8.069	0.000	-111.911	-105.707	-832.915
* 6	2.850	-24.876	-2.313	-70.315	10.383	-16.644	0.000	-185.661	-188.692	-823.145
* 7	3.350	-26.032	-2.313	-70.315	-0.082	-25.219	0.000	-300.001	-268.067	-813.374
2- 1	3.650	-26.726	-2.313	-70.315	-8.420	-30.364	0.000	-387.338	-313.960	-807.512
2- 3	0.000	-26.726	70.315	-2.313	-8.420	0.000	-30.364	-387.338	807.512	-313.960
* 1	0.300	-7.175	60.025	-2.313	-8.420	0.000	-30.364	-162.810	689.339	-313.960
* 2	0.800	18.550	42.875	-2.313	-8.420	0.000	-30.364	132.621	492.385	-313.960
* 3	1.300	35.700	25.725	-2.313	-8.420	0.000	-30.364	329.575	295.431	-313.960
* 4	2.050	45.347	0.000	-2.313	-8.420	0.000	-30.364	440.362	0.000	-313.960
* 5	2.800	35.700	-25.725	-2.313	-8.420	0.000	-30.364	329.575	-295.431	-313.960
* 6	3.300	18.550	-42.875	-2.313	-8.420	0.000	-30.364	132.621	-492.385	-313.960
* 7	3.800	-7.175	-60.025	-2.313	-8.420	0.000	-30.364	-162.810	-689.339	-313.960
3- 2	4.100	-26.726	-70.315	-2.313	-8.420	0.000	-30.364	-387.338	-807.512	-313.960
3- 4	0.000	-26.726	2.313	-70.315	-8.420	30.364	0.000	-387.338	313.960	-807.512
* 1	0.300	-26.032	2.313	-70.315	-0.082	25.219	0.000	-300.001	268.067	-813.374
* 2	0.800	-24.876	2.313	-70.315	10.383	16.644	0.000	-185.661	188.692	-823.145
* 3	1.300	-23.719	2.313	-70.315	16.562	8.069	0.000	-111.911	105.707	-832.915
* 4	1.800	-22.562	2.313	-70.315	18.452	-0.506	0.000	-80.555	19.113	-842.685
* 5	2.300	-21.406	2.313	-70.315	16.055	-9.081	0.000	-93.389	-70.945	-852.456
* 6	2.800	-20.249	2.313	-70.315	9.371	-17.656	0.000	-151.832	-163.124	-862.226
* 7	3.300	-19.093	2.313	-70.315	-1.601	-26.231	0.000	-256.813	-257.098	-871.997
4- 3	3.650	-18.283	2.313	-70.315	-11.832	-32.234	0.000	-358.470	-323.948	-878.836
4- 1	0.000	-18.283	70.315	2.313	-11.832	0.000	-32.234	-358.470	878.837	-323.948
* 1	0.300	1.268	60.025	2.313	-11.832	0.000	-32.234	-114.111	750.226	-323.948
* 2	0.900	31.109	39.445	2.313	-11.832	0.000	-32.234	258.859	493.006	-323.948
* 3	1.500	48.602	18.865	2.313	-11.832	0.000	-32.234	477.496	235.785	-323.948
* 4	2.050	53.790	0.000	2.313	-11.832	0.000	-32.234	542.337	0.000	-323.948
* 5	2.600	48.602	-18.865	2.313	-11.832	0.000	-32.234	477.496	-235.785	-323.948
* 6	3.200	31.109	-39.445	2.313	-11.832	0.000	-32.234	258.859	-493.006	-323.948
* 7	3.800	1.268	-60.025	2.313	-11.832	0.000	-32.234	-114.111	-750.226	-323.948
1- 4	4.100	-18.283	-70.315	2.313	-11.832	0.000	-32.234	-358.470	-878.837	-323.948

BOX FOR DRAINAGE-NO 3

Case 7

No		L(m)	M (tm)	S (t)	N (t)
1-	2	0.000	-359.875	412.224	-778.285
*	1	0.350	-230.590	326.698	-771.446
*	2	0.850	-97.479	206.043	-761.676
*	3	1.350	-24.247	87.183	-751.905
*	4	1.850	-8.836	-22.036	-742.135
*	5	2.350	-45.191	-122.779	-732.364
*	6	2.850	-131.014	-219.913	-722.594
*	7	3.350	-264.502	-313.437	-712.824
2-	1	3.650	-366.722	-367.819	-706.961
2-	3	0.000	-366.722	706.961	-367.819
*	1	0.300	-170.153	603.504	-367.819
*	2	0.800	88.492	431.074	-367.819
*	3	1.300	260.921	258.644	-367.819
*	4	2.050	357.913	0.000	-367.819
*	5	2.800	260.921	-258.644	-367.819
*	6	3.300	88.492	-431.074	-367.819
*	7	3.800	-170.153	-603.504	-367.819
3-	2	4.100	-366.722	-706.961	-367.819
3-	4	0.000	-366.722	367.819	-706.961
*	1	0.300	-264.502	313.437	-712.824
*	2	0.800	-131.014	219.913	-722.594
*	3	1.300	-45.191	122.779	-732.364
*	4	1.800	-8.836	22.036	-742.135
*	5	2.300	-24.247	-87.183	-751.905
*	6	2.800	-97.479	-206.043	-761.676
*	7	3.300	-230.590	-326.698	-771.446
4-	3	3.650	-359.875	-412.224	-778.285
4-	1	0.000	-359.875	778.286	-412.224
*	1	0.300	-143.474	664.391	-412.224
*	2	0.900	186.823	436.600	-412.224
*	3	1.500	380.446	208.808	-412.224
*	4	2.050	437.868	0.000	-412.224
*	5	2.600	380.446	-208.808	-412.224
*	6	3.200	186.823	-436.600	-412.224
*	7	3.800	-143.474	-664.391	-412.224
1-	4	4.100	-359.875	-778.286	-412.224

BOX FOR DRAINAGE-NO 3

PICK-UP No. 1 *

No.	L (m)	M. MAXIMUM Case	M (tm)	S (t)	N (t)	M. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 6	-358.470	323.948	-878.836	C- 7	-359.875	412.224	-778.285
* 1	0.350	C- 7	-230.590	326.698	-771.446	C- 6	-256.813	257.098	-871.997
* 2	0.850	C- 7	-97.479	206.043	-761.676	C- 6	-151.832	163.124	-862.226
* 3	1.350	C- 7	-24.247	87.183	-751.905	C- 6	-93.389	70.945	-852.456
* 4	1.850	C- 7	-8.836	-22.036	-742.135	C- 6	-80.555	-19.113	-842.685
* 5	2.350	C- 7	-45.191	-122.779	-732.364	C- 6	-111.911	-105.707	-832.915
* 6	2.850	C- 7	-131.014	-219.913	-722.594	C- 6	-185.661	-188.692	-823.145
* 7	3.350	C- 7	-264.502	-313.437	-712.824	C- 6	-300.001	-268.067	-813.374
2 - 1	3.650	C- 7	-366.722	-367.819	-706.961	C- 6	-387.338	-313.960	-807.512
2 - 3	0.000	C- 7	-366.722	706.961	-367.819	C- 6	-387.338	807.512	-313.960
* 1	0.300	C- 6	-162.810	689.339	-313.960	C- 7	-170.153	603.504	-367.819
* 2	0.800	C- 6	132.621	492.385	-313.960	C- 7	88.492	431.074	-367.819
* 3	1.300	C- 6	329.575	295.431	-313.960	C- 7	260.921	258.644	-367.819
* 4	2.050	C- 6	440.362	0.000	-313.960	C- 7	357.913	0.000	-367.819
* 5	2.800	C- 6	329.575	-295.431	-313.960	C- 7	260.921	-258.644	-367.819
* 6	3.300	C- 6	132.621	-492.385	-313.960	C- 7	88.492	-431.074	-367.819
* 7	3.800	C- 6	-162.810	-689.339	-313.960	C- 7	-170.153	-603.504	-367.819
3 - 2	4.100	C- 7	-366.722	-706.961	-367.819	C- 6	-387.338	-807.512	-313.960
3 - 4	0.000	C- 7	-366.722	367.819	-706.961	C- 6	-387.338	313.960	-807.512
* 1	0.300	C- 7	-264.502	313.437	-712.824	C- 6	-300.001	268.067	-813.374
* 2	0.800	C- 7	-131.014	219.913	-722.594	C- 6	-185.661	188.692	-823.145
* 3	1.300	C- 7	-45.191	122.779	-732.364	C- 6	-111.911	105.707	-832.915
* 4	1.800	C- 7	-8.836	22.036	-742.135	C- 6	-80.555	19.113	-842.685
* 5	2.300	C- 7	-24.247	-87.183	-751.905	C- 6	-93.389	-70.945	-852.456
* 6	2.800	C- 7	-97.479	-206.043	-761.676	C- 6	-151.832	-163.124	-862.226
* 7	3.300	C- 7	-230.590	-326.698	-771.446	C- 6	-256.813	-257.098	-871.997
4 - 3	3.650	C- 6	-358.470	-323.948	-878.836	C- 7	-359.875	-412.224	-778.285
4 - 1	0.000	C- 6	-358.470	878.837	-323.948	C- 7	-359.875	778.286	-412.224
* 1	0.300	C- 6	-114.111	750.226	-323.948	C- 7	-143.474	664.391	-412.224
* 2	0.900	C- 6	258.859	493.006	-323.948	C- 7	186.823	436.600	-412.224
* 3	1.500	C- 6	477.496	235.785	-323.948	C- 7	380.446	208.808	-412.224
* 4	2.050	C- 6	542.337	0.000	-323.948	C- 7	437.868	0.000	-412.224
* 5	2.600	C- 6	477.496	-235.785	-323.948	C- 7	380.446	-208.808	-412.224
* 6	3.200	C- 6	258.859	-493.006	-323.948	C- 7	186.823	-436.600	-412.224
* 7	3.800	C- 6	-114.111	-750.226	-323.948	C- 7	-143.474	-664.391	-412.224
1 - 4	4.100	C- 6	-358.470	-878.837	-323.948	C- 7	-359.875	-778.286	-412.224

BOX FOR DRAINAGE-NO 3

PICK-UP No. 1 *

No.	L (m)	S. MAXIMUM Case	M (tm)	S (t)	N (t)	S. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 7	-359.875	412.224	-778.285	C- 6	-358.470	323.948	-878.836
* 1	0.350	C- 7	-230.590	326.698	-771.446	C- 6	-256.813	257.098	-871.997
* 2	0.850	C- 7	-97.479	206.043	-761.676	C- 6	-151.832	163.124	-862.225
* 3	1.350	C- 7	-24.247	87.183	-751.905	C- 6	-93.389	70.945	-852.456
* 4	1.850	C- 6	-80.555	-19.113	-842.685	C- 7	-8.836	-22.036	-742.135
* 5	2.350	C- 6	-111.911	-105.707	-832.915	C- 7	-45.191	-122.779	-732.364
* 6	2.850	C- 6	-185.661	-188.692	-823.145	C- 7	-131.014	-219.913	-722.594
* 7	3.350	C- 6	-300.001	-268.067	-813.374	C- 7	-264.502	-313.437	-712.824
2 - 1	3.650	C- 6	-387.338	-313.960	-807.512	C- 7	-366.722	-367.819	-706.961
2 - 3	0.000	C- 6	-387.338	807.512	-313.960	C- 7	-366.722	706.961	-367.819
* 1	0.300	C- 6	-162.810	689.339	-313.960	C- 7	-170.153	603.504	-367.819
* 2	0.800	C- 6	132.621	492.385	-313.960	C- 7	88.492	431.074	-367.819
* 3	1.300	C- 6	329.575	295.431	-313.960	C- 7	260.921	258.644	-367.819
* 4	2.050	C- 7	357.913	0.000	-367.819	C- 6	440.362	0.000	-313.960
* 5	2.800	C- 7	260.921	-258.644	-367.819	C- 6	329.575	-295.431	-313.960
* 6	3.300	C- 7	88.492	-431.074	-367.819	C- 6	132.621	-492.385	-313.960
* 7	3.800	C- 7	-170.153	-603.504	-367.819	C- 6	-162.810	-689.339	-313.960
3 - 2	4.100	C- 7	-366.722	-706.961	-367.819	C- 6	-387.338	-807.512	-313.960
3 - 4	0.000	C- 7	-366.722	367.819	-706.961	C- 6	-387.338	313.960	-807.512
* 1	0.300	C- 7	-264.502	313.437	-712.824	C- 6	-300.001	268.067	-813.374
* 2	0.800	C- 7	-131.014	219.913	-722.594	C- 6	-185.661	188.692	-823.145
* 3	1.300	C- 7	-45.191	122.779	-732.364	C- 6	-111.911	105.707	-832.915
* 4	1.800	C- 7	-8.836	22.036	-742.135	C- 6	-80.555	19.113	-842.685
* 5	2.300	C- 6	-93.389	-70.945	-852.456	C- 7	-24.247	-87.183	-751.905
* 6	2.800	C- 6	-151.832	-163.124	-862.226	C- 7	-97.479	-206.043	-761.676
* 7	3.300	C- 6	-256.813	-257.098	-871.997	C- 7	-230.590	-326.698	-771.446
4 - 3	3.650	C- 6	-358.470	-323.948	-878.836	C- 7	-359.875	-412.224	-778.285
4 - 1	0.000	C- 6	-358.470	878.837	-323.948	C- 7	-359.875	778.286	-412.224
* 1	0.300	C- 6	-114.111	750.226	-323.948	C- 7	-143.474	664.391	-412.224
* 2	0.900	C- 6	258.859	493.006	-323.948	C- 7	186.823	436.600	-412.224
* 3	1.500	C- 6	477.496	235.785	-323.948	C- 7	380.446	208.808	-412.224
* 4	2.050	C- 7	437.868	0.000	-412.224	C- 6	542.337	0.000	-323.948
* 5	2.600	C- 7	380.446	-208.808	-412.224	C- 6	477.496	-235.785	-323.948
* 6	3.200	C- 7	186.823	-436.600	-412.224	C- 6	258.859	-493.006	-323.948
* 7	3.800	C- 7	-143.474	-664.391	-412.224	C- 6	-114.111	-750.226	-323.948
1 - 4	4.100	C- 7	-359.875	-778.286	-412.224	C- 6	-358.470	-878.837	-323.948

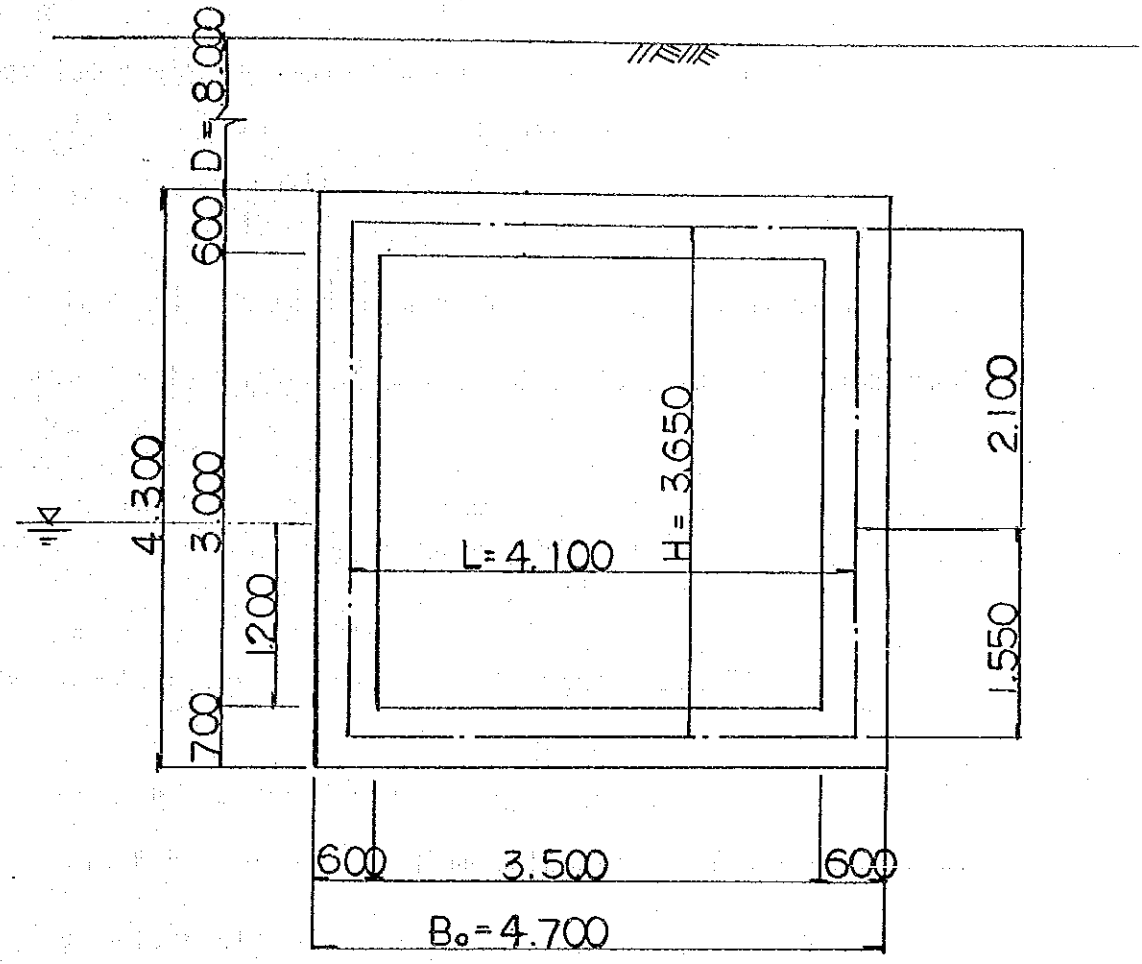
BOX FOR DRAINAGE-NO 3

PICK-UP No. 1 *

No.	L (m)	Case	N. MAXIMUM M (tm)	S (t)	N (t)	Case	N. MINIMUM M (tm)	S (t)	N (t)
1 - 2	0.000	C- 7	-359.875	412.224	-778.285	C- 6	-358.470	323.948	-878.836
* 1	0.350	C- 7	-230.590	326.698	-771.446	C- 6	-256.813	257.098	-871.997
* 2	0.850	C- 7	-97.479	206.043	-761.676	C- 6	-151.832	163.124	-862.226
* 3	1.350	C- 7	-24.247	87.183	-751.905	C- 6	-93.389	70.945	-852.456
* 4	1.850	C- 7	-8.836	-22.036	-742.135	C- 6	-80.555	-19.113	-842.685
* 5	2.350	C- 7	-45.191	-122.779	-732.364	C- 6	-111.911	-105.707	-832.915
* 6	2.850	C- 7	-131.014	-219.913	-722.594	C- 6	-185.661	-188.692	-823.145
* 7	3.350	C- 7	-264.502	-313.437	-712.824	C- 6	-300.001	-268.067	-813.374
2 - 1	3.650	C- 7	-366.722	-367.819	-706.961	C- 6	-387.338	-313.960	-807.512
2 - 3	0.000	C- 6	-387.338	807.512	-313.960	C- 7	-366.722	706.961	-367.819
* 1	0.300	C- 6	-162.810	689.339	-313.960	C- 7	-170.153	603.504	-367.819
* 2	0.800	C- 6	132.621	492.385	-313.960	C- 7	88.492	431.074	-367.819
* 3	1.300	C- 6	329.575	295.431	-313.960	C- 7	260.921	258.644	-367.819
* 4	2.050	C- 6	440.362	0.000	-313.960	C- 7	357.913	0.000	-367.819
* 5	2.800	C- 6	329.575	-295.431	-313.960	C- 7	260.921	-258.644	-367.819
* 6	3.300	C- 6	132.621	-492.385	-313.960	C- 7	88.492	-431.074	-367.819
* 7	3.800	C- 6	-162.810	-689.339	-313.960	C- 7	-170.153	-603.504	-367.819
3 - 2	4.100	C- 6	-387.338	-807.512	-313.960	C- 7	-366.722	-706.961	-367.819
3 - 4	0.000	C- 7	-366.722	367.819	-706.961	C- 6	-387.338	313.960	-807.512
* 1	0.300	C- 7	-264.502	313.437	-712.824	C- 6	-300.001	268.067	-813.374
* 2	0.800	C- 7	-131.014	219.913	-722.594	C- 6	-185.661	188.692	-823.145
* 3	1.300	C- 7	-45.191	122.779	-732.364	C- 6	-111.911	105.707	-832.915
* 4	1.800	C- 7	-8.836	22.036	-742.135	C- 6	-80.555	19.113	-842.685
* 5	2.300	C- 7	-24.247	-87.183	-751.905	C- 6	-93.389	-70.945	-852.456
* 6	2.800	C- 7	-97.479	-206.043	-761.676	C- 6	-151.832	-163.124	-862.226
* 7	3.300	C- 7	-230.590	-326.698	-771.446	C- 6	-256.813	-257.098	-871.997
4 - 3	3.650	C- 7	-359.875	-412.224	-778.285	C- 6	-358.470	-323.948	-878.836
4 - 1	0.000	C- 6	-358.470	878.837	-323.948	C- 7	-359.875	778.286	-412.224
* 1	0.300	C- 6	-114.111	750.226	-323.948	C- 7	-143.474	664.391	-412.224
* 2	0.900	C- 6	258.859	493.006	-323.948	C- 7	186.823	436.600	-412.224
* 3	1.500	C- 6	477.496	235.785	-323.948	C- 7	380.446	208.808	-412.224
* 4	2.050	C- 6	542.337	0.000	-323.948	C- 7	437.868	0.000	-412.224
* 5	2.600	C- 6	477.496	-235.785	-323.948	C- 7	380.446	-208.808	-412.224
* 6	3.200	C- 6	258.859	-493.006	-323.948	C- 7	186.823	-436.600	-412.224
* 7	3.800	C- 6	-114.111	-750.226	-323.948	C- 7	-143.474	-664.391	-412.224
1 - 4	4.100	C- 6	-358.470	-878.837	-323.948	C- 7	-359.875	-778.286	-412.224

NO ④ BOX CULVERT FOR DRAINAGE

1) Shape and Size



Where ··· D^m = depth of asphalt and similar surface soil.

2) Factor of section

$$A = 1.00 \times 0.60(0.70) = 0.6000^{m^2}\ (0.7000)$$

$$I = \frac{1.00 \times 0.60^3}{12}\ (0.70^3) = 0.01800^{m^4}\ (0.02858)$$

$$E_C = 25\ kN/mm^2 = 2.5 \times 10^7\ kN/m^2$$

No.④ BOX CULVERT FOR DRAINAGE

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

1) For upper slab

section $b=100^{cm}$ $h=60$ $d=53.5$ $d'=6.5$

a) intersection point②=③ $Mu.min=-301.2^{KNm}$

$A_s = Y_{20}-150^{ctc} = 3.142/0.15 = 20.95 \ cm^2$

$$X = \frac{0.87\times 41000 \times 20.95}{0.40\times 2500\times 100} = 7.4^{cm}$$

$$Z = 53.5 - \frac{7.4}{2} = 49.8^{cm} < 0.95\times 53.5 = 50.8^{cm} \quad OK$$

$M_{RS} = 0.87\times 41000 \times 20.95 \times 49.8\times 10^{-5} = 372.1^{KNm} > Mu = 301.2^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 7.4 \times 49.8\times 10^{-5} = 368.5^{KNm} > Mu = 301.2^{KNm}$

notice : the bar is decide from sheaing stress as following

$$A_s = \begin{pmatrix} Y_{20}-300^{ctc} \\ Y_{25}-300^{ctc} \end{pmatrix} = 26.84 \ cm^2$$

b) middle point ②~③ $Mu.max=332.5^{KNm}$

$A_s = Y_{20}-150^{ctc} = 20.95 \ cm^2$

$M_R \fallingdotseq 368.5^{KNm} > M_U = 332.5^{KNm}$

(Where … M_R : From calculation of point②)

2) For bottom slab

section $b=100^{cm}$ $h=70$ $d=63.5$ $d'=6.5$

a) intersection point ④=① $Mu.min=-290.8^{KNm}$

$$A_s = \begin{pmatrix} Y_{20}-300^{ctc} = 3.142/0.30 \\ Y_{16}-300^{ctc} = 2.011/0.30 \end{pmatrix} = 17.18 \ cm^2$$

$$X = \frac{0.87\times 41000 \times 17.18}{0.40\times 2500\times 100} = 6.4^{cm}$$

$$Z = 63.5 - \frac{6.4}{2} = 60.3^{cm} \fallingdotseq 0.95\times 63.5 = 60.3^{cm} \quad OK$$

$M_{RS} = 0.87\times 41000 \times 17.18 \times 60.3\times 10^{-5} = 369.5^{KNm} > Mu = 290.8^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 6.2 \times 60.3\times 10^{-5} = 385.9^{KNm} > Mu = 290.8^{KNm}$

b) middle point ④~① $Mu.max=417.4^{KNm}$

$A_s = Y_{20}-150^{ctc} = 3.142/0.15 = 20.95 \ cm^2$

$$X = \frac{0.87\times 41000 \times 20.95}{0.40\times 2500\times 100} = 7.4^{cm}$$

$$Z = 63.5 - \frac{7.4}{2} = 59.8\ ^{cm} < 0.95 \times 63.5 = 60.3^{cm} \quad OK$$

$$M_{RS} = 0.87 \times 41000 \times 20.95 \times 59.8 \times 10^{-5} = 446.8^{KNm} > Mu = 417.4^{KNm}$$

$$M_{RC} = 0.40 \times 2500 \times 100 \times 7.4 \times 59.8 \times 10^{-5} = 442.5^{KNm} > Mu = 417.4^{KNm} \quad OK$$

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

a) For upper slab

section $b = 100^{cm}$ $h = 60$ $d = 53.5$ $d' = 6.5$

intersection point ②=③ $Su.max = 226.2^{KN}$

$$A_s = \begin{cases} Y_{25} - 300^{ctc} = 4.909/0.30 \\ Y_{20} - 300^{ctc} = 3.142/0.30 \end{cases} = 26.84\ cm^2$$

$$P = \frac{26.84}{100 \times 53.5} \times 100 = 0.500\ \%$$

$$Vc = \frac{226.2 \times 10^3}{100 \times 53.5} = 42.3\ N/cm^2$$

$$< Vca = 50.0\ N/cm^2$$

notice : the bar is decide for sheaing stress about point ②, ③

b) For botton slab

section $b = 100^{cm}$ $h = 70$ $d = 63.5$ $d' = 6.5$

intersection point ①=④ $\begin{cases} Su.max_1 = 386.8^{KN} \cdots d^{cm}, distance \\ Su.max_2 = 185.0^{KN} \cdots 2d^{cm}, distance \end{cases}$

$$A_s = \begin{cases} Y_{20} - 300^{ctc} \\ Y_{16} - 300^{ctc} \end{cases} = 17.18\ cm^2$$

$$P = \frac{17.18}{100 \times 63.5} \times 100 = 0.270\ \%$$

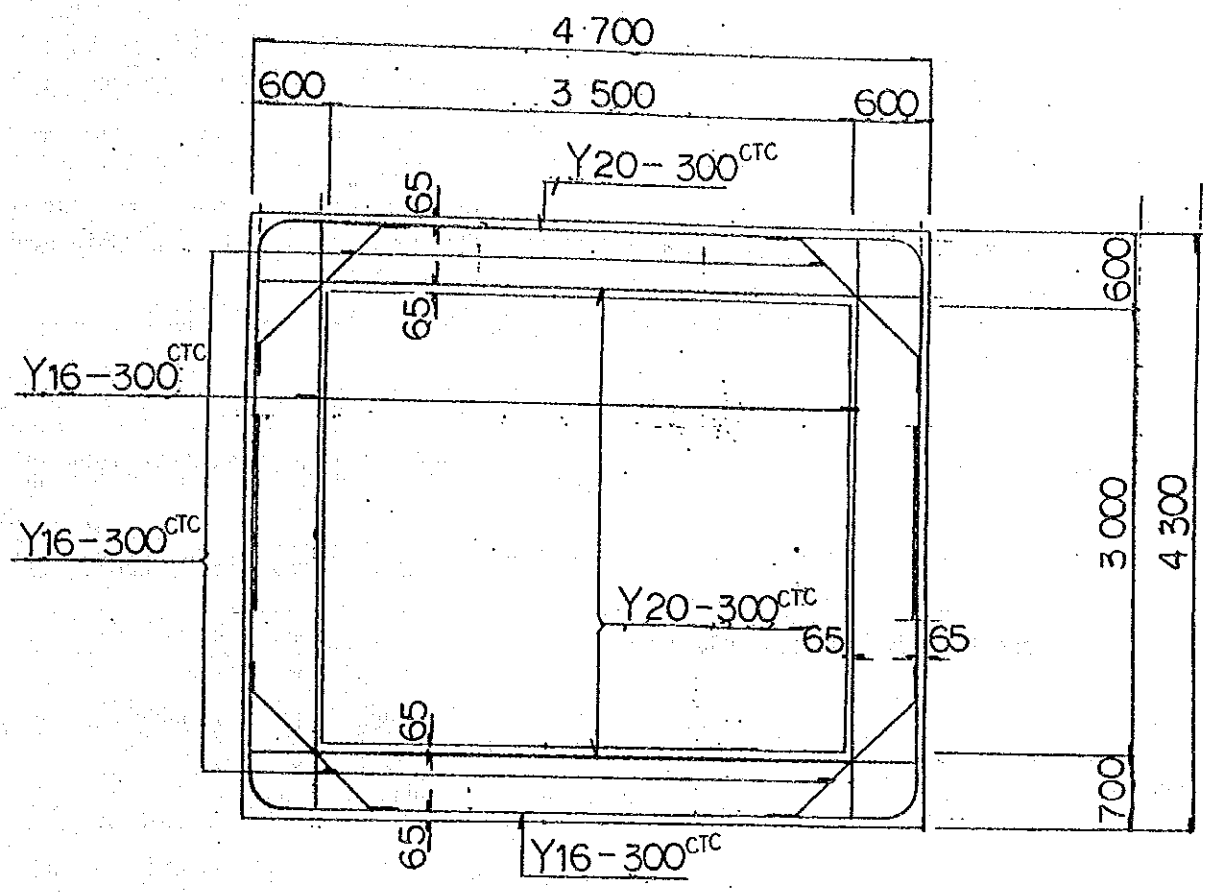
$$Vc_1 = \frac{386.8 \times 10^3}{100 \times 63.5} = 60.9\ N/cm^2$$

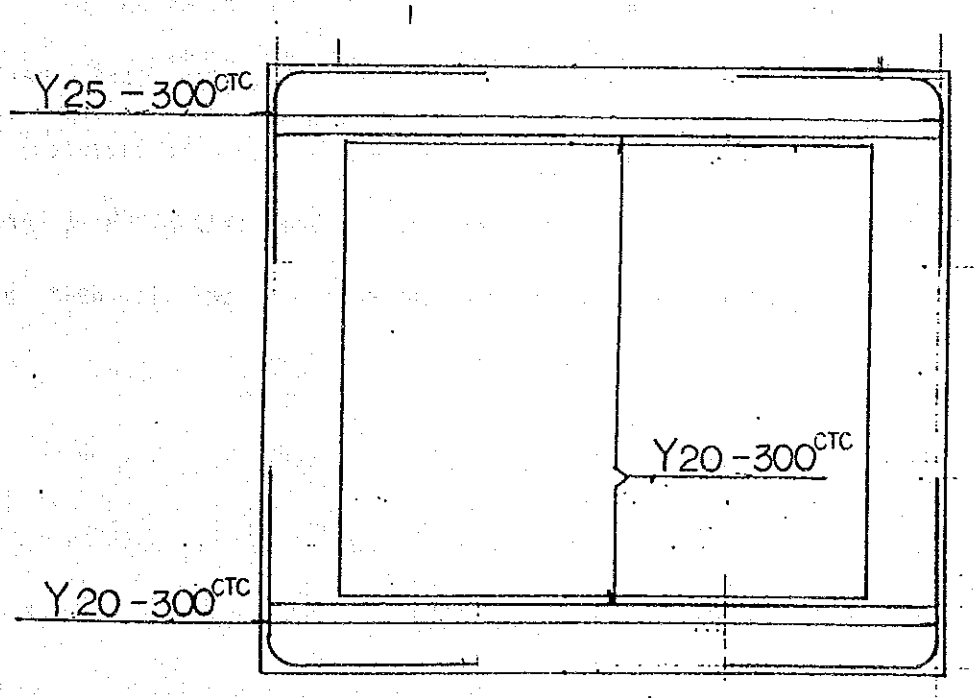
$$Vc_2 = \frac{185.0 \times 10^3}{100 \times 63.5} = 29.2\ N/cm^2$$

$$\tau a_1 = \left\{ 35 + \frac{15}{0.25}(0.270 - 0.25) \right\} \frac{2d}{d} = 72.4\ N/cm^2$$

$$\tau a_2 = \left\{ 35 + \frac{15}{0.25}(0.270 - 0.25) \right\} \frac{2d}{2d} = 36.2\ N/cm^2$$

NO ④ BOX CULVERT FOR DRAINAGE





NO④ BOX FOR DRAINAGE

Load

(1)Dead load

a)Vertical load Where $\alpha = 1.20$ {earth pressure factor of vertical} $\therefore \frac{D}{B_o} = \frac{8.0}{4.7} = 1.7 \begin{matrix} > 1.0 \\ < 2.0 \end{matrix}$

For upper slab $w1 = 22.6\times0.50+17.5\times7.50\times1.2+23.60\times0.60 = 182.960$ kN／m

For side wall $w2 = 23.6\times0.60 = 14.160$ 〃

For bottom slab $W3 = 182.960 + \frac{2\times14.160\times3.65}{4.10} = 208.172$ 〃

b)Horizontal load ----- earth pressure

For side wall $P1 = (22.6\times0.50+17.50\times7.80)\times0.500 = 73.900$ kN／m

〃 $P2 = (22.6\times0.50+17.50\times9.90)\times0.500 = 92.275$ 〃

〃 $P3 = (22.6\times0.50+17.50\times9.90+8.7\times1.55)\times0.500 = 99.018$ 〃

C)Horizontal load ----- water Pressure

For side wall $Pw = 9.80\times1.550 = 15.190$ kN/m

(2)Live load

live load surcharge of axle

$$P = \frac{\overset{KN/axle}{10} \times \overset{unite}{30}}{3.50 \times B}$$

width of despersal of wheel

$B = 0.300+8.00+0.600 = 8.900$ m

$$= \frac{10 \times 30}{3.50 \times 8.90} = 9.631 \text{ KN/m}^2$$

or live load surcharge of vihicle

$$go = \frac{\overset{kN/rihicle}{40} \times \overset{unit}{30}}{3.50 \times 10.0} \fallingdotseq 34.300 \text{ KN/m}^2 > 2P = 19.262 \text{ KN/m}^2$$

OF curse the loaded of live load is consider as following

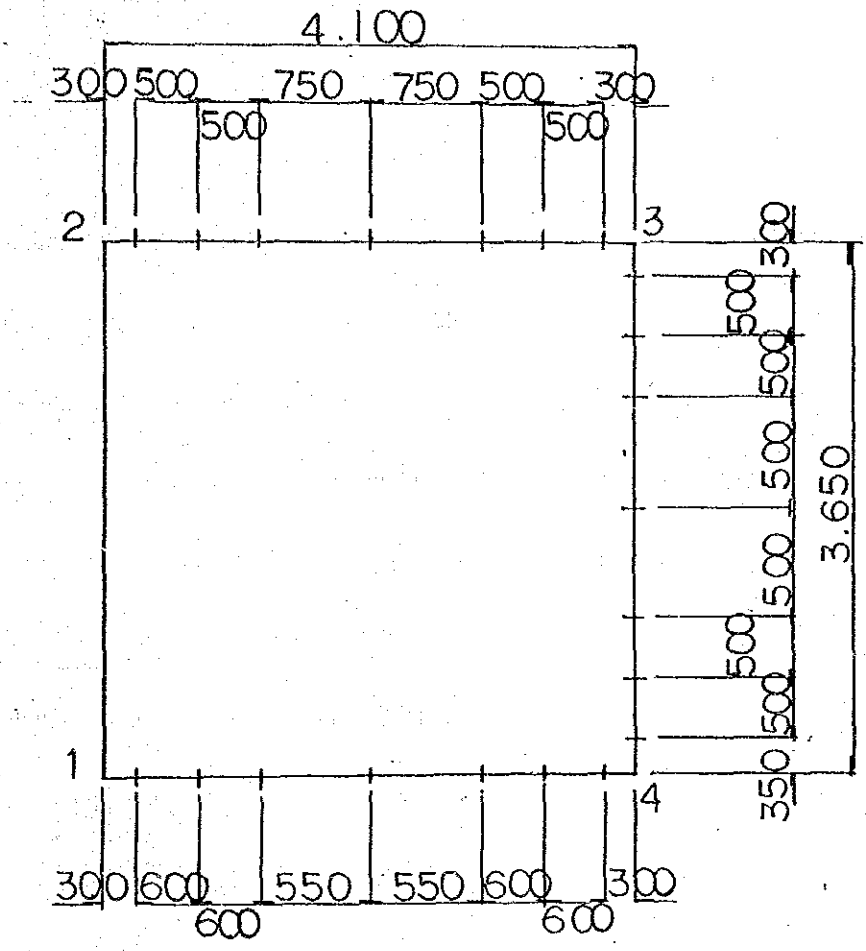
case-1 Vaertical load

For upper slab and bottom slab $w1 = w3 = 34.300$ KN/m

case-2 Horizontal load ----- eath pressure

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

CALCULATION POINTS OF EACH FORCE



BOX FOR DRAINAGE-NO 4 Depth=8.000

No	X (m)	Y (m)
1	0.0000	0.0000
2	0.0000	3.6500
3	4.1000	3.6500
4	4.1000	0.0000

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

No	I	J	A (m2)	I (m4)	I - J	L (m)	E (t/m2)	EPS
1	1	2	0.60000	0.018000	Fix - Fix	3.650	2.50E+07	1.00E-05
2	2	3	0.60000	0.018000	Fix - Fix	4.100	2.50E+07	1.00E-05
3	3	4	0.60000	0.018000	Fix - Fix	3.650	2.50E+07	1.00E-05
4	4	1	0.70000	0.028580	Fix - Fix	4.100	2.50E+07	1.00E-05

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

BOX FOR DRAINAGE-NO 4

No		L-No 1 11	L-No 2 12	L-No 3 13	L-No 4 14	L-No 5 15	L-No 6 16	L-No 7 17	L-No 8 18	L-No 9 19	L-No 10 20
1	7	0.350	0.850	1.350	1.850	2.350	2.850	3.350			
2	7	0.300	0.800	1.300	2.050	2.800	3.300	3.800			
3	7	0.300	0.800	1.300	1.800	2.300	2.800	3.300			
4	7	0.300	0.900	1.500	2.050	2.600	3.200	3.800			

BOX FOR DRAINAGE-NO 4

: Dead load
No. : 1

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-Y	0.000	3.650	-14.160	-14.160
3	3-	4	-Y	0.000	3.650	-14.160	-14.160
2	2-	3	-Y	0.000	4.100	-182.960	-182.960
4	4-	1	-Y	0.000	4.100	208.172	208.172

ΣV = 0.001 (t)
ΣH = 0.000 (t)

: Earth pressure load
No. : 2

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	1.550	99.018	92.275
1	1-	2	-X	1.550	2.100	92.275	73.900
3	3-	4	-X	0.000	2.100	-73.900	-92.275
3	3-	4	-X	2.100	1.550	-92.275	-99.018

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: Water pressure road
No. : 3

No	i	-j	Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	0.000	1.550	15.190	15.190
3	3-	4	2.100	1.550	-15.190	-15.190

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRAINAGE-NO 4

: HB live load-VL-
No. : 4

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	4.100	-34.300	-34.300
4	4-	1	-Y	0.000	4.100	34.300	34.300

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRAINAGE-NO 4

: HB live load-HL-
No. : 5

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	3.650	17.150	17.150
3	3-	4	-X	0.000	3.650	-17.150	-17.150

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR DRAINAGE-NO 4

No		C-No 1 No 6	C-No 2 No 7
	α	1.0000	1.0000
No	1	1.3800	1.3800
No	2	1.6500	1.6500
No	3	0.0000	1.6500
No	4	1.4300	0.0000
No	5	0.0000	1.6500

BOX FOR DRAINAGE-NO 4

No 1 : 6 7

BOX FOR DRAINAGE-NO 4

No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. 2 RX (t)	RY (t)	RM (tm)	Case. 3 RX (t)	RY (t)	RM (tm)
1.	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 4 RX (t)	RY (t)	RM (tm)	Case. 5 RX (t)	RY (t)	RM (tm)	Case. 6 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000

No.	Case. 7 RX (t)	RY (t)	RM (tm)
1.	0.000	-0.001	0.000
4.	0.000	-0.001	0.000

BOX FOR DRAINAGE-NO 4

No.	Case. 1 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 2 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 3 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	5.02506	0.00000	0.00000	-1.78117	0.00000	0.00000	-0.1396
2.	0.01573	-0.97555	-5.33942	-0.00158	0.00000	1.96091	-0.01671	0.00000	0.1024
3.	-0.00121	-0.97555	5.33942	-0.40702	0.00000	-1.96091	-0.02842	0.00000	-0.1024
4.	0.01452	0.00000	-5.02506	-0.40860	0.00000	1.78117	-0.04513	0.00000	0.1396

No.	Case. 4 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 5 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 6 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	0.85401	0.00000	0.00000	-0.33948	0.00000	0.00000	5.2169
2.	0.00587	-0.17110	-0.97136	0.00374	0.00000	0.38356	0.02749	-1.59093	-5.5220
3.	-0.00045	-0.17110	0.97136	-0.07926	0.00000	-0.38356	-0.67390	-1.59093	5.5220
4.	0.00542	0.00000	-0.85401	-0.07552	0.00000	0.33948	-0.64641	0.00000	-5.2169

No.	Case. 7 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	3.20520
2.	-0.00231	-1.34626	-3.33099
3.	-0.85092	-1.34626	3.33099
4.	-0.85323	0.00000	-3.20520

BOX FOR DRAINAGE-NO 4

No	L(m)	Case 1 Dead load M (tm)	S (t)	N (t)	Case 2 Earth pressure load M (tm)	S (t)	N (t)	Case 3 Water pressure road M (tm)	S (t)	N (t)
1- 2	0.000	-116.473	-6.196	-426.752	-62.080	174.403	0.000	-4.865	19.262	0.000
* 1	0.350	-118.641	-6.196	-421.796	-7.073	140.013	0.000	0.947	13.946	0.000
* 2	0.850	-121.740	-6.196	-414.716	50.837	91.809	0.000	6.021	6.351	0.000
* 3	1.350	-124.838	-6.196	-407.636	84.918	44.693	0.000	7.297	-1.244	0.000
* 4	1.850	-127.936	-6.196	-400.556	95.731	-1.138	0.000	5.460	-4.282	0.000
* 5	2.350	-131.034	-6.196	-393.476	84.139	-44.869	0.000	3.318	-4.282	0.000
* 6	2.850	-134.133	-6.196	-386.396	51.227	-86.413	0.000	1.177	-4.282	0.000
* 7	3.350	-137.231	-6.196	-379.316	-1.909	-125.769	0.000	-0.964	-4.282	0.000
2- 1	3.650	-139.090	-6.196	-375.068	-43.044	-148.333	0.000	-2.249	-4.282	0.000
2- 3	0.000	-139.090	375.068	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
* 1	0.300	-34.802	320.180	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
* 2	0.800	102.418	228.700	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
* 3	1.300	193.898	137.220	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
* 4	2.050	245.355	0.000	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
* 5	2.800	193.898	-137.220	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
* 6	3.300	102.418	-228.700	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
* 7	3.800	-34.802	-320.180	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
3- 2	4.100	-139.090	-375.068	-6.196	-43.044	0.000	-148.333	-2.249	0.000	-4.282
3- 4	0.000	-139.090	6.196	-375.068	-43.044	148.333	0.000	-2.249	4.282	0.000
* 1	0.300	-137.231	6.196	-379.316	-1.909	125.769	0.000	-0.964	4.282	0.000
* 2	0.800	-134.133	6.196	-386.396	51.227	86.413	0.000	1.177	4.282	0.000
* 3	1.300	-131.034	6.196	-393.476	84.139	44.869	0.000	3.318	4.282	0.000
* 4	1.800	-127.936	6.196	-400.556	95.731	1.138	0.000	5.460	4.282	0.000
* 5	2.300	-124.838	6.196	-407.636	84.918	-44.693	0.000	7.297	1.244	0.000
* 6	2.800	-121.740	6.196	-414.716	50.837	-91.809	0.000	6.021	-6.351	0.000
* 7	3.300	-118.641	6.196	-421.796	-7.073	-140.013	0.000	0.947	-13.946	0.000
4- 3	3.650	-116.473	6.196	-426.752	-62.080	-174.403	0.000	-4.865	-19.262	0.000
4- 1	0.000	-116.473	426.753	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
* 1	0.300	2.185	364.301	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
* 2	0.900	183.295	239.398	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
* 3	1.500	289.463	114.495	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
* 4	2.050	320.949	0.000	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
* 5	2.600	289.463	-114.495	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
* 6	3.200	183.295	-239.398	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
* 7	3.800	2.185	-364.301	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262
1- 4	4.100	-116.473	-426.753	6.196	-62.080	0.000	-174.403	-4.865	0.000	-19.262

BOX FOR DRAINAGE-NO 4

No	L(m)	Case 4 HB live load-VL- M (tm)	S (t)	N (t)	Case 5 HB live load-HL- M (tm)	S (t)	N (t)	Case 6 M (tm)	S (t)	N (t)
1- 2	0.000	-18.283	-2.313	-70.315	-11.832	32.234	0.000	-289.310	275.906	-689.468
* 1	0.350	-19.093	-2.313	-70.315	-1.601	26.231	0.000	-202.698	219.163	-682.629
* 2	0.850	-20.249	-2.313	-70.315	9.371	17.656	0.000	-113.076	139.627	-672.859
* 3	1.350	-21.406	-2.313	-70.315	16.055	9.081	0.000	-62.773	61.885	-663.088
* 4	1.850	-22.562	-2.313	-70.315	18.452	0.506	0.000	-50.859	-13.736	-653.318
* 5	2.350	-23.719	-2.313	-70.315	16.562	-8.069	0.000	-75.917	-85.892	-643.547
* 6	2.850	-24.876	-2.313	-70.315	10.383	-16.644	0.000	-136.150	-154.440	-633.777
* 7	3.350	-26.032	-2.313	-70.315	-0.082	-25.219	0.000	-229.755	-219.377	-624.007
2- 1	3.650	-26.726	-2.313	-70.315	-8.420	-30.364	0.000	-301.185	-256.608	-618.144
2- 3	0.000	-26.726	70.315	-2.313	-8.420	0.000	-30.364	-301.185	618.144	-256.608
* 1	0.300	-7.175	60.025	-2.313	-8.420	0.000	-30.364	-129.311	527.684	-256.608
* 2	0.800	18.550	42.875	-2.313	-8.420	0.000	-30.364	96.840	376.917	-256.608
* 3	1.300	35.700	25.725	-2.313	-8.420	0.000	-30.364	247.606	226.150	-256.608
* 4	2.050	45.347	0.000	-2.313	-8.420	0.000	-30.364	332.413	0.000	-256.608
* 5	2.800	35.700	-25.725	-2.313	-8.420	0.000	-30.364	247.606	-226.150	-256.608
* 6	3.300	18.550	-42.875	-2.313	-8.420	0.000	-30.364	96.840	-376.917	-256.608
* 7	3.800	-7.175	-60.025	-2.313	-8.420	0.000	-30.364	-129.311	-527.684	-256.608
3- 2	4.100	-26.726	-70.315	-2.313	-8.420	0.000	-30.364	-301.185	-618.144	-256.608
3- 4	0.000	-26.726	2.313	-70.315	-8.420	30.364	0.000	-301.185	256.608	-618.144
* 1	0.300	-26.032	2.313	-70.315	-0.082	25.219	0.000	-229.755	219.377	-624.007
* 2	0.800	-24.876	2.313	-70.315	10.383	16.644	0.000	-136.150	154.440	-633.777
* 3	1.300	-23.719	2.313	-70.315	16.562	8.069	0.000	-75.917	85.892	-643.547
* 4	1.800	-22.562	2.313	-70.315	18.452	-0.506	0.000	-50.859	13.736	-653.318
* 5	2.300	-21.406	2.313	-70.315	16.055	-9.081	0.000	-62.773	-61.885	-663.088
* 6	2.800	-20.249	2.313	-70.315	9.371	-17.656	0.000	-113.076	-139.627	-672.859
* 7	3.300	-19.093	2.313	-70.315	-1.601	-26.231	0.000	-202.698	-219.163	-682.629
4- 3	3.650	-18.283	2.313	-70.315	-11.832	-32.234	0.000	-289.310	-275.906	-689.468
4- 1	0.000	-18.283	70.315	2.313	-11.832	0.000	-32.234	-289.310	689.469	-275.906
* 1	0.300	1.268	60.025	2.313	-11.832	0.000	-32.234	-97.604	588.571	-275.906
* 2	0.900	31.109	39.445	2.313	-11.832	0.000	-32.234	195.000	386.775	-275.906
* 3	1.500	48.602	18.865	2.313	-11.832	0.000	-32.234	366.526	184.979	-275.906
* 4	2.050	53.790	0.000	2.313	-11.832	0.000	-32.234	417.395	0.000	-275.906
* 5	2.600	48.602	-18.865	2.313	-11.832	0.000	-32.234	366.526	-184.979	-275.906
* 6	3.200	31.109	-39.445	2.313	-11.832	0.000	-32.234	195.000	-386.775	-275.906
* 7	3.800	1.268	-60.025	2.313	-11.832	0.000	-32.234	-97.604	-588.571	-275.906
1- 4	4.100	-18.283	-70.315	2.313	-11.832	0.000	-32.234	-289.310	-689.469	-275.906

BOX FOR DRAINAGE-NO 4

Case 7

No		L(m)	M (tm)	S (t)	N (t)
1-	2	0.000	-290.715	364.182	-588.918
*	1	0.350	-176.475	288.762	-582.078
*	2	0.850	-58.723	182.546	-572.308
*	3	1.350	6.369	78.123	-562.538
*	4	1.850	20.860	-16.659	-552.767
*	5	2.350	-9.197	-102.964	-542.997
*	6	2.850	-81.503	-185.660	-533.226
*	7	3.350	-194.255	-264.747	-523.456
2-	1	3.650	-280.570	-310.466	-517.594
2-	3	0.000	-280.570	517.594	-310.466
*	1	0.300	-136.653	441.848	-310.466
*	2	0.800	52.710	315.606	-310.466
*	3	1.300	178.953	189.364	-310.466
*	4	2.050	249.964	0.000	-310.466
*	5	2.800	178.953	-189.364	-310.466
*	6	3.300	52.710	-315.606	-310.466
*	7	3.800	-136.653	-441.848	-310.466
3-	2	4.100	-280.570	-517.594	-310.466
3-	4	0.000	-280.570	310.466	-517.594
*	1	0.300	-194.255	264.747	-523.456
*	2	0.800	-81.503	185.660	-533.226
*	3	1.300	-9.197	102.964	-542.997
*	4	1.800	20.860	16.659	-552.767
*	5	2.300	6.369	-78.123	-562.538
*	6	2.800	-58.723	-182.546	-572.308
*	7	3.300	-176.475	-268.762	-582.078
4-	3	3.650	-290.715	-364.182	-588.918
4-	1	0.000	-290.715	588.919	-364.182
*	1	0.300	-126.967	502.735	-364.182
*	2	0.900	122.965	330.369	-364.182
*	3	1.500	269.476	158.003	-364.182
*	4	2.050	312.927	0.000	-364.182
*	5	2.600	269.476	-158.003	-364.182
*	6	3.200	122.965	-330.369	-364.182
*	7	3.800	-126.967	-502.735	-364.182
1-	4	4.100	-290.715	-588.919	-364.182

BOX FOR DRAINAGE-NO 4

PICK-UP No. 1 *

No.	L (m)	M. MAXIMUM Case	M (tm)	S (t)	N (t)	M. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 6	-289.310	275.906	-689.468	C- 7	-290.715	364.182	-588.918
* 1	0.350	C- 7	-176.475	288.762	-582.078	C- 6	-202.698	219.163	-682.629
* 2	0.850	C- 7	-58.723	182.546	-572.308	C- 6	-113.076	139.627	-672.859
* 3	1.350	C- 7	6.369	78.123	-562.538	C- 6	-62.773	61.885	-663.088
* 4	1.850	C- 7	20.860	-16.659	-552.767	C- 6	-50.859	-13.736	-653.318
* 5	2.350	C- 7	-9.197	-102.964	-542.997	C- 6	-75.917	-85.892	-643.547
* 6	2.850	C- 7	-81.503	-185.660	-533.226	C- 6	-136.150	-154.440	-633.777
* 7	3.350	C- 7	-194.255	-264.747	-523.456	C- 6	-229.755	-219.377	-624.007
2 - 1	3.650	C- 7	-280.570	-310.466	-517.594	C- 6	-301.185	-256.608	-618.144
2 - 3	0.000	C- 7	-280.570	517.594	-310.466	C- 6	-301.185	618.144	-256.608
* 1	0.300	C- 6	-129.311	527.684	-256.608	C- 7	-136.653	441.848	-310.466
* 2	0.800	C- 6	96.840	376.917	-256.608	C- 7	52.710	315.606	-310.466
* 3	1.300	C- 6	247.606	226.150	-256.608	C- 7	178.953	189.364	-310.466
* 4	2.050	C- 6	332.413	0.000	-256.608	C- 7	249.964	0.000	-310.466
* 5	2.800	C- 6	247.606	-226.150	-256.608	C- 7	178.953	-189.364	-310.466
* 6	3.300	C- 6	96.840	-376.917	-256.608	C- 7	52.710	-315.606	-310.466
* 7	3.800	C- 6	-129.311	-527.684	-256.608	C- 7	-136.653	-441.848	-310.466
3 - 2	4.100	C- 7	-280.570	-517.594	-310.466	C- 6	-301.185	-618.144	-256.608
3 - 4	0.000	C- 7	-280.570	310.466	-517.594	C- 6	-301.185	256.608	-618.144
* 1	0.300	C- 7	-194.255	264.747	-523.456	C- 6	-229.755	219.377	-624.007
* 2	0.800	C- 7	-81.503	185.660	-533.226	C- 6	-136.150	154.440	-633.777
* 3	1.300	C- 7	-9.197	102.964	-542.997	C- 6	-75.917	85.892	-643.547
* 4	1.800	C- 7	20.860	16.659	-552.767	C- 6	-50.859	13.736	-653.318
* 5	2.300	C- 7	6.369	-78.123	-562.538	C- 6	-62.773	-61.885	-663.088
* 6	2.800	C- 7	-58.723	-182.546	-572.308	C- 6	-113.076	-139.627	-672.859
* 7	3.300	C- 7	-176.475	-288.762	-582.078	C- 6	-202.698	-219.163	-682.629
4 - 3	3.650	C- 6	-289.310	-275.906	-689.468	C- 7	-290.715	-364.182	-588.918
4 - 1	0.000	C- 6	-289.310	689.469	-275.906	C- 7	-290.715	588.919	-364.182
* 1	0.300	C- 6	-97.604	588.571	-275.906	C- 7	-126.967	502.735	-364.182
* 2	0.900	C- 6	195.000	386.775	-275.906	C- 7	122.965	330.369	-364.182
* 3	1.500	C- 6	366.526	184.979	-275.906	C- 7	269.476	158.003	-364.182
* 4	2.050	C- 6	417.396	0.000	-275.906	C- 7	312.927	0.000	-364.182
* 5	2.600	C- 6	366.526	-184.979	-275.906	C- 7	269.476	-158.003	-364.182
* 6	3.200	C- 6	195.000	-386.775	-275.906	C- 7	122.965	-330.369	-364.182
* 7	3.800	C- 6	-97.604	-588.571	-275.906	C- 7	-126.967	-502.735	-364.182
1 - 4	4.100	C- 6	-289.310	-689.469	-275.906	C- 7	-290.715	-588.919	-364.182

BOX FOR DRAINAGE-NO 4

PICK-UP No. 1 *

No.	L (m)	S.MAXIMUM Case	M (tm)	S (t)	N (t)	S.MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 7	-290.715	364.182	-588.918	C- 6	-289.310	275.906	-689.468
* 1	0.350	C- 7	-176.475	288.762	-582.078	C- 6	-202.698	219.163	-682.629
* 2	0.850	C- 7	-58.723	182.546	-572.308	C- 6	-113.076	139.627	-672.859
* 3	1.350	C- 7	6.369	78.123	-562.538	C- 6	-62.773	61.885	-663.088
* 4	1.850	C- 6	-50.859	-13.736	-653.318	C- 7	20.860	-16.659	-552.767
* 5	2.350	C- 6	-75.917	-85.892	-643.547	C- 7	-9.197	-102.964	-542.997
* 6	2.850	C- 6	-136.150	-154.440	-633.777	C- 7	-81.503	-185.660	-533.226
* 7	3.350	C- 6	-229.755	-219.377	-624.007	C- 7	-194.255	-264.747	-523.456
2 - 1	3.650	C- 6	-301.185	-256.608	-618.144	C- 7	-280.570	-310.466	-517.594
2 - 3	0.000	C- 6	-301.185	618.144	-256.608	C- 7	-280.570	517.594	-310.466
* 1	0.300	C- 6	-129.311	527.684	-256.608	C- 7	-136.653	441.848	-310.466
* 2	0.800	C- 6	96.840	376.917	-256.608	C- 7	52.710	315.606	-310.466
* 3	1.300	C- 6	247.606	226.150	-256.608	C- 7	178.953	189.364	-310.466
* 4	2.050	C- 7	249.964	0.000	-310.466	C- 6	332.413	0.000	-256.608
* 5	2.800	C- 7	178.953	-189.364	-310.466	C- 6	247.606	-226.150	-256.608
* 6	3.300	C- 7	52.710	-315.606	-310.466	C- 6	96.840	-376.917	-256.608
* 7	3.800	C- 7	-136.653	-441.848	-310.466	C- 6	-129.311	-527.684	-256.608
3 - 2	4.100	C- 7	-280.570	-517.594	-310.466	C- 6	-301.185	-618.144	-256.608
3 - 4	0.000	C- 7	-280.570	310.466	-517.594	C- 6	-301.185	256.608	-618.144
* 1	0.300	C- 7	-194.255	264.747	-523.456	C- 6	-229.755	219.377	-624.007
* 2	0.800	C- 7	-81.503	185.660	-533.226	C- 6	-136.150	154.440	-633.777
* 3	1.300	C- 7	-9.197	102.964	-542.997	C- 6	-75.917	85.892	-643.547
* 4	1.800	C- 7	20.860	16.659	-552.767	C- 6	-50.859	13.736	-653.318
* 5	2.300	C- 6	-62.773	-61.885	-663.088	C- 7	6.369	-78.123	-562.538
* 6	2.800	C- 6	-113.076	-139.627	-672.859	C- 7	-58.723	-182.546	-572.308
* 7	3.300	C- 6	-202.698	-219.163	-682.629	C- 7	-176.475	-288.762	-582.078
4 - 3	3.650	C- 6	-289.310	-275.906	-689.468	C- 7	-290.715	-364.182	-588.918
4 - 1	0.000	C- 6	-289.310	689.469	-275.906	C- 7	-290.715	588.919	-364.182
* 1	0.300	C- 6	-97.604	588.571	-275.906	C- 7	-126.967	502.735	-364.182
* 2	0.900	C- 6	195.000	386.775	-275.906	C- 7	122.965	330.369	-364.182
* 3	1.500	C- 6	366.526	184.979	-275.906	C- 7	269.476	158.003	-364.182
* 4	2.050	C- 7	312.927	0.000	-364.182	C- 6	417.396	0.000	-275.906
* 5	2.600	C- 7	269.476	-158.003	-364.182	C- 6	366.526	-184.979	-275.906
* 6	3.200	C- 7	122.965	-330.369	-364.182	C- 6	195.000	-386.775	-275.906
* 7	3.800	C- 7	-126.967	-502.735	-364.182	C- 6	-97.604	-588.571	-275.906
1 - 4	4.100	C- 7	-290.715	-588.919	-364.182	C- 6	-289.310	-689.469	-275.906

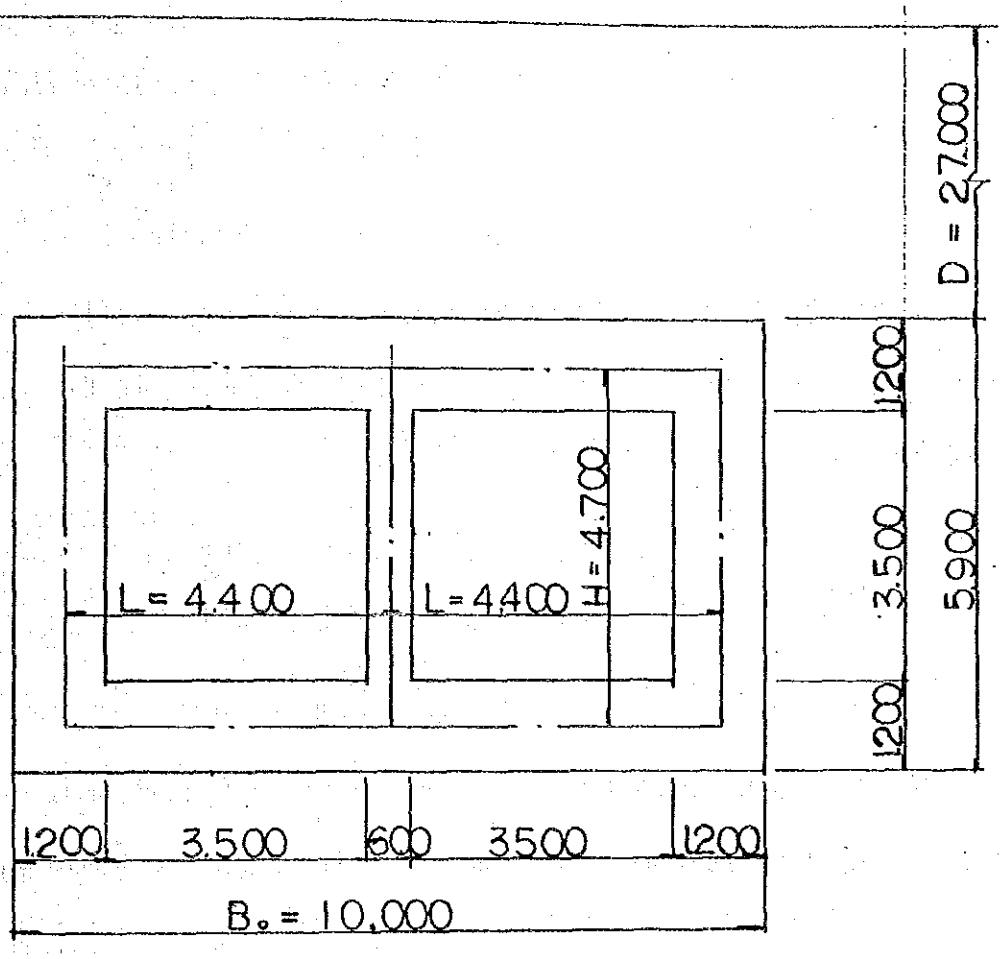
BOX FOR DRAINAGE-NO 4

PICK-UP No. 1 *

No.	L (m)	N. MAXIMUM Case	M (tm)	S (t)	N (t)	N. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 7	-290.715	364.182	-588.918	C- 6	-289.310	275.906	-689.468
* 1	0.350	C- 7	-176.475	288.762	-582.078	C- 6	-202.698	219.163	-682.629
* 2	0.850	C- 7	-58.723	182.546	-572.308	C- 6	-113.076	139.627	-672.859
* 3	1.350	C- 7	6.369	78.123	-562.538	C- 6	-62.773	61.885	-663.088
* 4	1.850	C- 7	20.860	-16.659	-552.767	C- 6	-50.859	-13.736	-653.318
* 5	2.350	C- 7	-9.197	-102.964	-542.997	C- 6	-75.917	-85.892	-643.547
* 6	2.850	C- 7	-81.503	-185.660	-533.226	C- 6	-136.150	-154.440	-633.777
* 7	3.350	C- 7	-194.255	-264.747	-523.456	C- 6	-229.755	-219.377	-624.007
2 - 1	3.650	C- 7	-280.570	-310.466	-517.594	C- 6	-301.185	-256.608	-618.144
2 - 3	0.000	C- 6	-301.185	618.144	-256.608	C- 7	-280.570	517.594	-310.466
* 1	0.300	C- 6	-129.311	527.684	-256.608	C- 7	-136.653	441.848	-310.466
* 2	0.800	C- 6	96.840	376.917	-256.608	C- 7	52.710	315.606	-310.466
* 3	1.300	C- 6	247.606	226.150	-256.608	C- 7	178.953	189.364	-310.466
* 4	2.050	C- 6	332.413	0.000	-256.608	C- 7	249.964	0.000	-310.466
* 5	2.800	C- 6	247.606	-226.150	-256.608	C- 7	178.953	-189.364	-310.466
* 6	3.300	C- 6	96.840	-376.917	-256.608	C- 7	52.710	-315.606	-310.466
* 7	3.800	C- 6	-129.311	-527.684	-256.608	C- 7	-136.653	-441.848	-310.466
3 - 2	4.100	C- 6	-301.185	-618.144	-256.608	C- 7	-280.570	-517.594	-310.466
3 - 4	0.000	C- 7	-280.570	310.466	-517.594	C- 6	-301.185	256.608	-618.144
* 1	0.300	C- 7	-194.255	264.747	-523.456	C- 6	-229.755	219.377	-624.007
* 2	0.800	C- 7	-81.503	185.660	-533.226	C- 6	-136.150	154.440	-633.777
* 3	1.300	C- 7	-9.197	102.964	-542.997	C- 6	-75.917	85.892	-643.547
* 4	1.800	C- 7	20.860	16.659	-552.767	C- 6	-50.859	13.736	-653.318
* 5	2.300	C- 7	6.369	-78.123	-562.538	C- 6	-62.773	-61.885	-663.088
* 6	2.800	C- 7	-58.723	-182.546	-572.308	C- 6	-113.076	-139.627	-672.859
* 7	3.300	C- 7	-176.475	-288.762	-582.078	C- 6	-202.698	-219.163	-682.629
4 - 3	3.650	C- 7	-290.715	-364.182	-588.918	C- 6	-289.310	-275.906	-689.468
4 - 1	0.000	C- 6	-289.310	689.469	-275.906	C- 7	-290.715	588.919	-364.182
* 1	0.300	C- 6	-97.604	588.571	-275.906	C- 7	-126.967	502.735	-364.182
* 2	0.900	C- 6	195.000	386.775	-275.906	C- 7	122.965	330.369	-364.182
* 3	1.500	C- 6	366.526	184.979	-275.906	C- 7	269.476	158.003	-364.182
* 4	2.050	C- 6	417.396	0.000	-275.906	C- 7	312.927	0.000	-364.182
* 5	2.600	C- 6	366.526	-184.979	-275.906	C- 7	269.476	-158.003	-364.182
* 6	3.200	C- 6	195.000	-386.775	-275.906	C- 7	122.965	-330.369	-364.182
* 7	3.800	C- 6	-97.604	-588.571	-275.906	C- 7	-126.967	-502.735	-364.182
1 - 4	4.100	C- 6	-289.310	-689.469	-275.906	C- 7	-290.715	-588.919	-364.182

NO ⑤ BOXCULVERT FOR DRAINAGE

1) Shape and Size



where --- D^{m} = depth of asphalt and similar surface soil

2) Factor of section

$A = 1.00 \times 1.20 = 1.2000\ m^2$

$I = \frac{1.00 \times 1.20^4}{12} = 0.14400\ m^4$

$A = 1.00 \times 0.60 = 0.6000\ m^2$

$I = \frac{1.00 \times 0.60^4}{12} = 0.01800\ m^4$

$E_C = 25\ KN/mm^2 = 2.5 \times 10^7\ KN/m^2$

No.⑤ BOX CULVERT FOR DRAINAGE (D=27.0m)

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

section b=100cm h=120 d =113.0 d´ =7.0

1) For upper slab

a) intersection point②=④ Mu.min =−1147.4KNm

$A_s = Y_{25}-150^{ctc} = 4.909/0.15 = 32.73 \ cm^2$

$$X = \frac{0.87fy \cdot As}{0.40fcu \cdot b} = \frac{0.87\times41000\times32.73}{0.40\times2500\times100} = 11.8 \ cm$$

$$Z = 113.0 - \frac{11.8}{2} = 103.1 \ cm < 0.95\times113.0 = 107.3^{cm}$$

$M_{RS} = 0.87\times41000\times32.73\times107.1\times10^{-5} = 1250.4^{KNm} > Mu = 1147.4^{KNm}$

$M_{RC} = 0.40\times2500\times100\times11.8\times107.1\times10^{-5} = 1263.8^{KNm} > Mu = 1147.4^{KNm}$ OK

b) intersection point ③ Mu.min =−1536.0KNm

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

$$X = \frac{0.87\times41000\times43.17}{0.40\times2500\times100} \fallingdotseq 15.4 \ cm$$

$$Z = 113.0 - \frac{15.4}{2} = 105.3 \ cm < 0.95\times113.0 = 107.3^{cm}$$

$M_{RS} = 0.87\times41000\times43.17\times105.3\times10^{-5} = 1621.5^{KNm} > Mu = 1536.0^{KNm}$

$M_{RC} = 0.40\times2500\times100\times15.4\times105.3\times10^{-5} = 1621.6^{KNm} > Mu = 1536.0^{KNm}$

c) middle point ②~③=③~④ Mu.max =976.0KNm

$$A_s = \left\{ \begin{array}{l} Y_{25}-300^{ctc} = 4.909/0.30 \\ Y_{20}-300^{ctc} = 3.142/0.30 \end{array} \right\} = 26.84 \ cm^2$$

$$X = \frac{0.87\times41000\times26.84}{0.40\times2500\times100} \fallingdotseq 11.4 \ cm$$

$$Z = 113.0 - \frac{11.4}{2} = 107.3 \ cm < 0.95\times113.0 = 107.3^{cm}$$

$M_{RS} = 0.87\times41000\times26.84\times107.3\times10^{-5} = 1027.3^{KNm} > Mu = 976.0^{KNm}$

$M_{RC} = 0.40\times2500\times100\times11.4\times107.3\times10^{-5} = 1223.2^{KNm} > Mu = 976.0^{KNm}$

2) For bottom slab

a) intersection point ⑥ Mu.min =−1430.9KNm

(intersection point ①=⑤ Mu.min =−1345.3KNm)

$$A_s = \left\{ \begin{array}{l} Y_{32}-300^{ctc} \\ Y_{25}-300^{ctc} \end{array} \right\} = 43.17 \ cm^2$$

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

$$Z = 113.0 - \frac{15.4}{2} = 105.3\ ^{cm} < 0.95\times 113.0 = 107.3^{cm}\quad OK$$

$M_{Rs} = 0.87\times 41000 \times 43.17 \times 105.3 \times 10^{-5} = 1621.5^{KNm} > Mu = 1430.9^{KNm}$

$M_{Rc} = 0.40\times 2500\times 100 \times 15.4\times 105.3 \times 10^{-5} = 1621.6^{KNm} > Mu = 1430.9^{KNm}$

b) middle point ⑤～⑥＝⑥～① Middle $Mu = 1065.7^{KNm}$

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

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

$$Z = 113.0 - \frac{11.8}{2} = 107.1^{cm} < 0.95\times 113.0 = 107.3^{cm}\quad OK$$

$M_{Rs} = 0.87\times 41000 \times 32.73 \times 107.1 \times 10^{-5} = 1250.4^{KNm} > Mu = 1065.7^{KNm}$

$M_{Rc} = 0.40\times 2500\times 100 \times 11.8\times 107.1 \times 10^{-5} = 1263.8^{KNm} > Mu = 1065.7^{KNm}$

OK

3) For middle wall

section $b = 100^{cm}$ $h = 60$ $d = 54.0$ $d' = 6.0$

Nu.min = 4526.4 ^{KN}

$$\sigma c = \frac{4526.4 \times 10^3}{100 \times 54.0} = 838.3\ N/cm^2 < \sigma ca = 2500\times 0.40 = 1000\ N/cm^2$$

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

section $b = 100^{cm}$ $h = 120$ $d = 113.0$ $d' = 7.0$

1) For upper slab

a) intersection point ③ Su.max = 862.5^{KN}… d^{cm}, distance

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

$$P = \frac{43.17}{100 \times 113.0}\times 100 = 0.382\ \%$$

$$Vc = \frac{862.5\times 10^3}{100\times 113.0} = 76.4\ N/cm^2$$

$$< Vca = \left\{ 35.0 + 15.0\times \frac{0.382 - 0.25}{0.25} \right\} \times \frac{2d}{d} = 85.8\ N/cm^2\quad OK$$

b) intersection point ②, ④ Su.max =395.5^{KN}

$A_s = Y_{2s} - 150^{c\,t\,c} = 4.909/0.150 = 32.73\ cm^2$

$$P = \frac{32.73}{100 \times 113.0} \times 100 = 0.290\ \%$$

$$Vc = \frac{395.5 \times 10^3}{100 \times 113.0} = 35.0\ N/cm^2$$

$$< Vca = \left\{ 35.0 + 15.0 \times \frac{0.290 - 0.25}{0.25} \right\} \times \frac{2d}{d} = 74.8\ N/cm^2 \quad OK$$

2) For bottom slab

a) intersection point ⑥ Su.max =835.4^{KN}

$$Vc = \frac{835.4 \times 10^3}{100 \times 113.0} = 74.0\ N/cm^2 < Vca = 85.8\ N/cm^2$$

Where … Vca: From calculation of point③

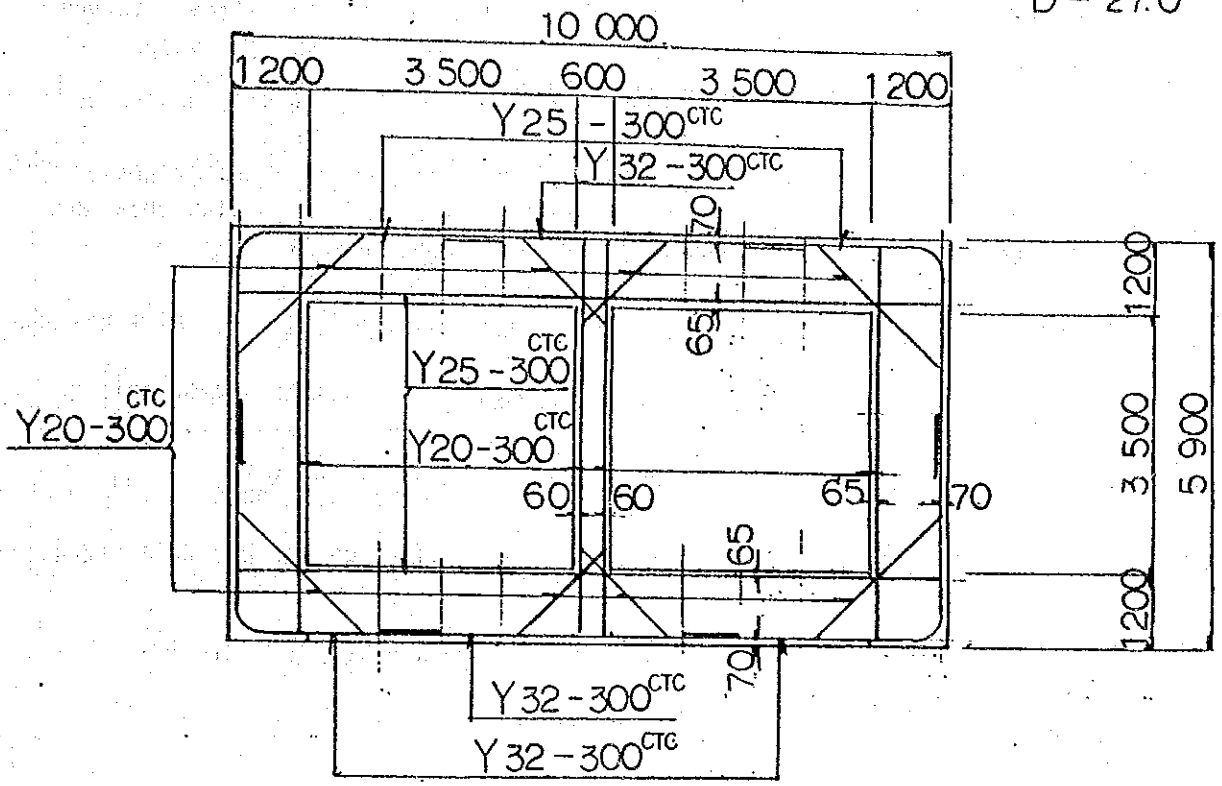
b) intersection point ①=⑤ Su.max =490.5^{KN}

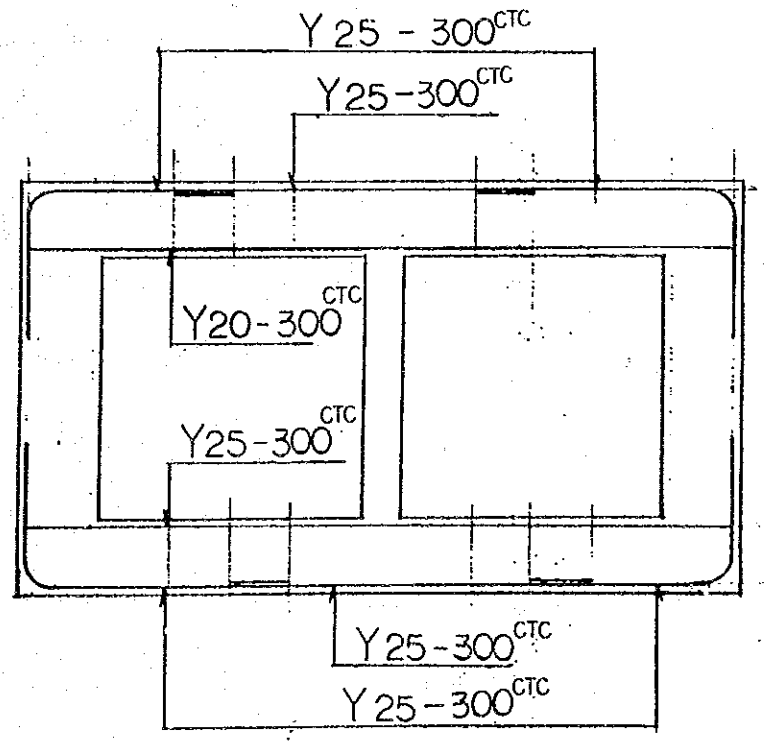
$$Vc = \frac{490.5 \times 10^3}{100 \times 113.0} = 43.4\ N/cm^2 < Vca = 85.8\ N/cm^2$$

Where … Vca: From calculation of point③

NO ⑤ BOX CULVERT FOR DRAINAGE

D = 27.0m





NO⑤ BOX FOR DRAINAGE

Load

(1)Dead load

a)Vertical load Where $\alpha = 1.35$ {earth pressure factor of vertical} $\because \frac{D}{B_o} = \frac{27.00}{10.00} = 2.7 \begin{matrix} > 2.0 \\ < 3.0 \end{matrix}$

For upper slab $w1 = 22.6\times0.50+17.5\times26.5\times1.35+23.60\times1.20 = 665.683$ kN／m

For side wall $w2 = 23.6\times1.20 = 28.320$ 〃

For center wal $w2' = 23.6\times0.60 = 14.160$ 〃

For bottom slab $W3 = 665.683 + \frac{(2\times28.320+14.160)\times4.70}{8.80} = 703.497$ 〃

b)Horizontal load --- earth pressure

For side wall $P1 = (22.6\times0.50+17.50\times27.10)\times0.500 = 242.775$ kN／m

〃 $P2 = (22.6\times0.50+17.50\times31.80)\times0.500 = 283.900$ 〃

(2)Live load

or live load surcharge of vihicle

$$go = \frac{\overset{kN/rihicle}{40} \times \overset{unit}{30}}{3.50 \times 10.0} = 34.300 \text{ KN／m}$$

For upper slab and bottom slab

P1 = P2 = 34.300 KN/m

BOX FOR DRAINAGE-NO5 ----- Depth = 27.000

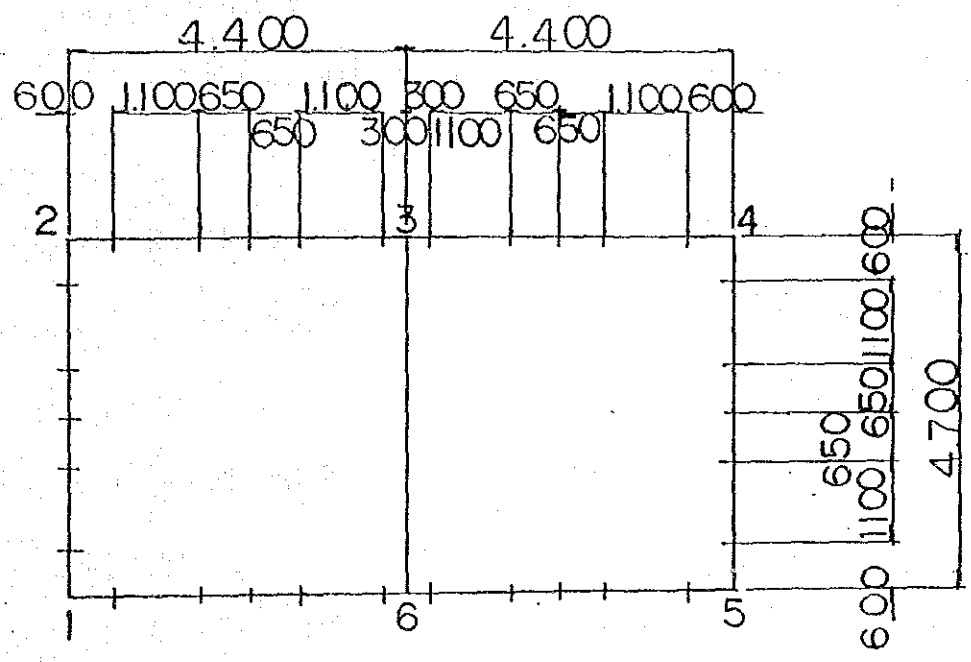
No	X (m)	Y (m)
1	0.0000	0.0000
2	0.0000	4.7000
3	4.4000	4.7000
4	8.8000	4.7000
5	8.8000	0.0000
6	4.4000	0.0000

No	I	J	A (m2)	I (m4)	I - J	L (m)	E (t/m2)	EPS
1	1	2	1.20000	0.144000	Fix - Fix	4.700	2.50E+07	1.00E-05
2	2	3	1.20000	0.144000	Fix - Fix	4.400	2.50E+07	1.00E-05
3	3	4	1.20000	0.144000	Fix - Fix	4.400	2.50E+07	1.00E-05
4	4	5	1.20000	0.144000	Fix - Fix	4.700	2.50E+07	1.00E-05
5	5	6	1.20000	0.144000	Fix - Fix	4.400	2.50E+07	1.00E-05
6	6	1	1.20000	0.144000	Fix - Fix	4.400	2.50E+07	1.00E-05
7	3	6	0.60000	0.018000	Fix - Fix	4.700	2.50E+07	1.00E-05

No	X (t/m)	Y (t/m)	M(tm/Rad)
1	Fix	Fix	Free
5	Free	Fix	Free

No		L-No 1 / 11	L-No 2 / 12	L-No 3 / 13	L-No 4 / 14	L-No 5 / 15	L-No 6 / 16	L-No 7 / 17	L-No 8 / 18	L-No 9 / 19	L-No 10 / 20
1	5	0.600	1.700	2.350	3.000	4.100					
2	5	0.600	1.700	2.350	3.000	4.100					
3	5	0.300	1.400	2.050	2.700	3.800					
4	5	0.600	1.700	2.350	3.000	4.100					
5	5	0.600	1.700	2.350	3.000	4.100					
6	5	0.300	1.400	2.050	2.700	3.800					
7		2.350									

CALCULATION POINTS OF EACH FORCE



: Dead load
No. : 1

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-Y	0.000	4.700	-28.320	-28.320
2	2-	3	-Y	0.000	4.400	-665.683	-665.683
3	3-	4	-Y	0.000	4.400	-665.683	-665.683
4	4-	5	-Y	0.000	4.700	-28.320	-28.320
5	5-	6	-Y	0.000	4.400	703.497	703.497
6	6-	1	-Y	0.000	4.400	703.497	703.497
7	3-	6	-Y	0.000	4.700	-14.160	-14.160

ΣV = 0.003 (t)
ΣH = 0.000 (t)

: Earth pressure
No. : 2

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	4.700	283.900	242.775
4	4-	5	-X	0.000	4.700	-242.775	-283.900

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: BH live load-VL-
No. : 3

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	4.400	-34.300	-34.300
3	3-	4	-Y	0.000	4.400	-34.300	-34.300
5	5-	6	-Y	0.000	4.400	34.300	34.300
6	6-	1	-Y	0.000	4.400	34.300	34.300

BOX FOR DRAINAGE-NO5

No C-No 1
No No 4

No 1 1.3800
No 2 1.6500
No 3 1.4300

BOX FOR DRAINAGE-NO5

No 1 : 4

BOX FOR DRAINAGE-NO5

No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. 2 RX (t)	RY (t)	RM (tm)	Case. 3 RX (t)	RY (t)	RM (tm)
1.	0.000	-0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.	0.000	-0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 4 RX (t)	RY (t)	RM (tm)
1.	0.000	-0.002	0.000
5.	0.000	-0.002	0.000

BOX FOR DRAINAGE-NO5

No.	Case. 1 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 2 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 3 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	3.43428	0.00000	0.00000	-1.10761	0.00000	0.00000	0.1634
2.	-0.08886	-2.11869	-3.08666	-0.04779	-0.16074	1.09691	0.00000	-0.10615	-0.1634
3.	-0.04443	-5.38567	0.00000	-0.93153	0.22934	0.00000	0.00000	-0.31365	0.0000
4.	0.00000	-2.11869	3.08666	-1.81527	-0.16074	-1.09691	0.00000	-0.10615	0.1634
5.	-0.08886	0.00000	-3.43428	-1.86307	0.00000	1.10761	0.00000	0.00000	-0.1634
6.	-0.04443	5.01598	0.00000	-0.93153	-0.41362	0.00000	0.00000	0.20750	0.0000

No.	Case. 4 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	3.14535
2.	-0.20149	-3.34081	-2.68330
3.	-1.59834	-7.50235	0.00000
4.	-2.99520	-3.34081	2.68330
5.	-3.19669	0.00000	-3.14535
6.	-1.59834	6.53631	0.00000

No	L(m)	Case 1 Dead load M (tm)	S (t)	N (t)	Case 2 Earth pressure M (tm)	S (t)	N (t)	Case 3 BH live load-VL- M (tm)	S (t)	N (t)
1- 2	0.000	-570.665	30.293	-1418.908	-316.342	635.137	-102.600	-25.025	0.000	-67.757
* 1	0.600	-552.489	30.293	-1401.916	13.953	466.372	-102.600	-25.025	0.000	-67.757
* 2	1.700	-519.166	30.293	-1370.764	360.320	165.150	-102.600	-25.025	0.000	-67.757
* 3	2.350	-499.476	30.293	-1352.356	411.237	-7.867	-102.600	-25.025	0.000	-67.757
* 4	3.000	-479.785	30.293	-1333.948	350.893	-177.188	-102.600	-25.025	0.000	-67.757
* 5	4.100	-446.463	30.293	-1302.796	2.049	-455.310	-102.600	-25.025	0.000	-67.757
2- 1	4.700	-428.287	30.293	-1285.804	-315.466	-602.550	-102.600	-25.025	0.000	-67.757
2- 3	0.000	-428.287	1285.804	30.293	-315.466	102.600	-602.550	-25.025	67.757	0.000
* 1	0.600	223.373	886.394	30.293	-253.906	102.600	-602.550	9.455	47.177	0.000
* 2	1.700	795.668	154.143	30.293	-141.047	102.600	-602.550	40.598	9.447	0.000
* 3	2.350	755.235	-278.551	30.293	-74.357	102.600	-602.550	39.493	-12.848	0.000
* 4	3.000	433.552	-711.245	30.293	-7.667	102.600	-602.550	23.896	-35.143	0.000
* 5	4.100	-751.556	-1443.496	30.293	105.193	102.600	-602.550	-35.513	-72.873	0.000
3- 2	4.400	-1214.560	-1643.201	30.293	135.973	102.600	-602.550	-58.918	-83.163	0.000
3- 4	0.000	-1214.560	1643.201	30.293	135.973	-102.600	-602.550	-58.918	83.163	0.000
* 1	0.300	-751.556	1443.496	30.293	105.193	-102.600	-602.550	-35.513	72.873	0.000
* 2	1.400	433.552	711.245	30.293	-7.667	-102.600	-602.550	23.896	35.143	0.000
* 3	2.050	755.235	278.551	30.293	-74.357	-102.600	-602.550	39.493	12.848	0.000
* 4	2.700	795.668	-154.143	30.293	-141.047	-102.600	-602.550	40.598	-9.447	0.000
* 5	3.800	223.373	-886.394	30.293	-253.906	-102.600	-602.550	9.455	-47.177	0.000
4- 3	4.400	-428.287	-1285.804	30.293	-315.466	-102.600	-602.550	-25.025	-67.757	0.000
4- 5	0.000	-428.287	-30.293	-1285.804	-315.466	602.550	-102.600	-25.025	0.000	-67.757
* 1	0.600	-446.463	-30.293	-1302.796	2.049	455.310	-102.600	-25.025	0.000	-67.757
* 2	1.700	-479.785	-30.293	-1333.948	350.893	177.188	-102.600	-25.025	0.000	-67.757
* 3	2.350	-499.476	-30.293	-1352.356	411.237	7.867	-102.600	-25.025	0.000	-67.757
* 4	3.000	-519.166	-30.293	-1370.764	360.320	-165.150	-102.600	-25.025	0.000	-67.757
* 5	4.100	-552.489	-30.293	-1401.916	13.953	-466.372	-102.600	-25.025	0.000	-67.757
5- 4	4.700	-570.665	-30.293	-1418.908	-316.342	-635.137	-102.600	-25.025	0.000	-67.757
5- 6	0.000	-570.665	1418.910	-30.293	-316.342	102.600	-635.137	-25.025	67.757	0.000
* 1	0.600	154.052	996.812	-30.293	-254.782	102.600	-635.137	9.455	47.177	0.000
* 2	1.700	824.929	222.965	-30.293	-141.922	102.600	-635.137	40.598	9.447	0.000
* 3	2.350	821.242	-234.308	-30.293	-75.232	102.600	-635.137	39.493	-12.848	0.000
* 4	3.000	520.328	-691.581	-30.293	-8.543	102.600	-635.137	23.896	-35.143	0.000
* 5	4.100	-666.027	-1465.428	-30.293	104.317	102.600	-635.137	-35.513	-72.873	0.000
6- 5	4.400	-1137.313	-1676.477	-30.293	135.097	102.600	-635.137	-58.918	-83.163	0.000
6- 1	0.000	-1137.313	1676.477	-30.293	135.097	-102.600	-635.137	-58.918	83.163	0.000
* 1	0.300	-666.027	1465.428	-30.293	104.317	-102.600	-635.137	-35.513	72.873	0.000
* 2	1.400	520.328	691.581	-30.293	-8.543	-102.600	-635.137	23.896	35.143	0.000
* 3	2.050	821.242	234.308	-30.293	-75.232	-102.600	-635.137	39.493	12.848	0.000
* 4	2.700	824.929	-222.965	-30.293	-141.922	-102.600	-635.137	40.598	-9.447	0.000
* 5	3.800	154.052	-996.812	-30.293	-254.782	-102.600	-635.137	9.455	-47.177	0.000
1- 6	4.400	-570.665	-1418.910	-30.293	-316.342	-102.600	-635.137	-25.025	-67.757	0.000
3- 6	0.000	0.000	0.000	-3286.402	0.000	0.000	205.200	0.000	0.000	-166.326
* 1	2.350	0.000	0.000	-3319.678	0.000	0.000	205.200	0.000	0.000	-166.326
6- 3	4.700	0.000	0.000	-3352.954	0.000	0.000	205.200	0.000	0.000	-166.326

Case 4

	No	L(m)	M (tm)	S (t)	N (t)
1-	2	0.000	-1345.268	1089.780	-2224.275
*	1	0.600	-775.198	811.318	-2200.827
*	2	1.700	-157.708	314.303	-2157.837
*	3	2.350	-46.523	28.823	-2132.434
*	4	3.000	-118.916	-250.556	-2107.031
*	5	4.100	-648.524	-709.456	-2064.041
2-	1	4.700	-1147.342	-952.402	-2040.592
2-	3	0.000	-1147.342	2040.592	-952.402
*	1	0.600	-97.171	1459.977	-952.402
*	2	1.700	923.350	395.516	-952.402
*	3	2.350	976.011	-233.483	-952.402
*	4	3.000	619.822	-862.483	-952.402
*	5	4.100	-914.362	-1926.943	-952.402
3-	2	4.400	-1535.991	-2217.251	-952.402
3-	4	0.000	-1535.991	2217.251	-952.402
*	1	0.300	-914.362	1926.943	-952.402
*	2	1.400	619.822	862.483	-952.402
*	3	2.050	976.011	233.483	-952.402
*	4	2.700	923.350	-395.516	-952.402
*	5	3.800	-97.171	-1459.977	-952.402
4-	3	4.400	-1147.342	-2040.592	-952.402
4-	5	0.000	-1147.342	952.402	-2040.592
*	1	0.600	-648.524	709.456	-2064.041
*	2	1.700	-118.916	250.556	-2107.031
*	3	2.350	-46.523	-28.823	-2132.434
*	4	3.000	-157.708	-314.303	-2157.837
*	5	4.100	-775.198	-811.318	-2200.827
5-	4	4.700	-1345.268	-1089.780	-2224.275
5-	6	0.000	-1345.268	2224.278	-1089.780
*	1	0.600	-194.279	1612.353	-1089.780
*	2	1.700	962.285	490.490	-1089.780
*	3	2.350	1065.655	-172.428	-1089.780
*	4	3.000	738.128	-835.347	-1089.780
*	5	4.100	-797.777	-1957.209	-1089.780
6-	5	4.400	-1430.835	-2263.172	-1089.780
6-	1	0.000	-1430.835	2263.172	-1089.780
*	1	0.300	-797.777	1957.209	-1089.780
*	2	1.400	738.128	835.347	-1089.780
*	3	2.050	1065.655	172.428	-1089.780
*	4	2.700	962.285	-490.490	-1089.780
*	5	3.800	-194.279	-1612.353	-1089.780
1-	6	4.400	-1345.268	-2224.278	-1089.780
3-	6	0.000	0.000	0.000	-4434.502
*	1	2.350	0.000	0.000	-4480.422
6-	3	4.700	0.000	0.000	-4526.343

PICK-UP No. 1 *

No.	L (m)	M. MAXIMUM Case	M (tm)	S (t)	N (t)	M. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 4	-1345.268	1089.780	-2224.275	C- 4	-1345.268	1089.780	-2224.275
* 1	0.600	C- 4	-775.198	811.318	-2200.827	C- 4	-775.198	811.318	-2200.827
* 2	1.700	C- 4	-157.708	314.303	-2157.837	C- 4	-157.708	314.303	-2157.837
* 3	2.350	C- 4	-46.523	28.823	-2132.434	C- 4	-46.523	28.823	-2132.434
* 4	3.000	C- 4	-118.916	-250.556	-2107.031	C- 4	-118.916	-250.556	-2107.031
* 5	4.100	C- 4	-648.524	-709.456	-2064.041	C- 4	-648.524	-709.456	-2064.041
2 - 1	4.700	C- 4	-1147.342	-952.402	-2040.592	C- 4	-1147.342	-952.402	-2040.592
2 - 3	0.000	C- 4	-1147.342	2040.592	-952.402	C- 4	-1147.342	2040.592	-952.402
* 1	0.600	C- 4	-97.171	1459.977	-952.402	C- 4	-97.171	1459.977	-952.402
* 2	1.700	C- 4	923.350	395.516	-952.402	C- 4	923.350	395.516	-952.402
* 3	2.350	C- 4	976.011	-233.483	-952.402	C- 4	976.011	-233.483	-952.402
* 4	3.000	C- 4	619.822	-862.483	-952.402	C- 4	619.822	-862.483	-952.402
* 5	4.100	C- 4	-914.362	-1926.943	-952.402	C- 4	-914.362	-1926.943	-952.402
3 - 2	4.400	C- 4	-1535.991	-2217.251	-952.402	C- 4	-1535.991	-2217.251	-952.402
3 - 4	0.000	C- 4	-1535.991	2217.251	-952.402	C- 4	-1535.991	2217.251	-952.402
* 1	0.300	C- 4	-914.362	1926.943	-952.402	C- 4	-914.362	1926.943	-952.402
* 2	1.400	C- 4	619.822	862.483	-952.402	C- 4	619.822	862.483	-952.402
* 3	2.050	C- 4	976.011	233.483	-952.402	C- 4	976.011	233.483	-952.402
* 4	2.700	C- 4	923.350	-395.516	-952.402	C- 4	923.350	-395.516	-952.402
* 5	3.800	C- 4	-97.171	-1459.977	-952.402	C- 4	-97.171	-1459.977	-952.402
4 - 3	4.400	C- 4	-1147.342	-2040.592	-952.402	C- 4	-1147.342	-2040.592	-952.402
4 - 5	0.000	C- 4	-1147.342	952.402	-2040.592	C- 4	-1147.342	952.402	-2040.592
* 1	0.600	C- 4	-648.524	709.456	-2064.041	C- 4	-648.524	709.456	-2064.041
* 2	1.700	C- 4	-118.916	250.556	-2107.031	C- 4	-118.916	250.556	-2107.031
* 3	2.350	C- 4	-46.523	-28.823	-2132.434	C- 4	-46.523	-28.823	-2132.434
* 4	3.000	C- 4	-157.708	-314.303	-2157.837	C- 4	-157.708	-314.303	-2157.837
* 5	4.100	C- 4	-775.198	-811.318	-2200.827	C- 4	-775.198	-811.318	-2200.827
5 - 4	4.700	C- 4	-1345.268	-1089.780	-2224.275	C- 4	-1345.268	-1089.780	-2224.275
5 - 6	0.000	C- 4	-1345.268	2224.278	-1089.780	C- 4	-1345.268	2224.278	-1089.780
* 1	0.600	C- 4	-194.279	1612.353	-1089.780	C- 4	-194.279	1612.353	-1089.780
* 2	1.700	C- 4	962.285	490.490	-1089.780	C- 4	962.285	490.490	-1089.780
* 3	2.350	C- 4	1065.655	-172.428	-1089.780	C- 4	1065.655	-172.428	-1089.780
* 4	3.000	C- 4	738.128	-835.347	-1089.780	C- 4	738.128	-835.347	-1089.780
* 5	4.100	C- 4	-797.777	-1957.209	-1089.780	C- 4	-797.777	-1957.209	-1089.780
6 - 5	4.400	C- 4	-1430.835	-2263.172	-1089.780	C- 4	-1430.835	-2263.172	-1089.780
6 - 1	0.000	C- 4	-1430.835	2263.172	-1089.780	C- 4	-1430.835	2263.172	-1089.780
* 1	0.300	C- 4	-797.777	1957.209	-1089.780	C- 4	-797.777	1957.209	-1089.780
* 2	1.400	C- 4	738.128	835.347	-1089.780	C- 4	738.128	835.347	-1089.780
* 3	2.050	C- 4	1065.655	172.428	-1089.780	C- 4	1065.655	172.428	-1089.780
* 4	2.700	C- 4	962.285	-490.490	-1089.780	C- 4	962.285	-490.490	-1089.780
* 5	3.800	C- 4	-194.279	-1612.353	-1089.780	C- 4	-194.279	-1612.353	-1089.780
1 - 6	4.400	C- 4	-1345.268	-2224.278	-1089.780	C- 4	-1345.268	-2224.278	-1089.780
3 - 6	0.000	C- 4	0.000	0.000	-4434.502	C- 4	0.000	0.000	-4434.502
* 1	2.350	C- 4	0.000	0.000	-4480.422	C- 4	0.000	0.000	-4480.422
6 - 3	1.700	C- 4	0.000	0.000	-4526.343	C- 4	0.000	0.000	-4526.343

PICK-UP No. 1 *

	No.	L (m)	S. MAXIMUM Case	M (tm)	S (t)	N (t)	S. MINIMUM Case	M (tm)	S (t)	N (t)
1 -	2	0.000	C- 4	-1345.268	1089.780	-2224.275	C- 4	-1345.268	1089.780	-2224.275
*	1	0.600	C- 4	-775.198	811.318	-2200.827	C- 4	-775.198	811.318	-2200.827
*	2	1.700	C- 4	-157.708	314.303	-2157.837	C- 4	-157.708	314.303	-2157.837
*	3	2.350	C- 4	-46.523	28.823	-2132.434	C- 4	-46.523	28.823	-2132.434
*	4	3.000	C- 4	-118.916	-250.556	-2107.031	C- 4	-118.916	-250.556	-2107.031
*	5	4.100	C- 4	-648.524	-709.456	-2064.041	C- 4	-648.524	-709.456	-2064.041
2 -	1	4.700	C- 4	-1147.342	-952.402	-2040.592	C- 4	-1147.342	-952.402	-2040.592
2 -	3	0.000	C- 4	-1147.342	2040.592	-952.402	C- 4	-1147.342	2040.592	-952.402
*	1	0.600	C- 4	-97.171	1459.977	-952.402	C- 4	-97.171	1459.977	-952.402
*	2	1.700	C- 4	923.350	395.516	-952.402	C- 4	923.350	395.516	-952.402
*	3	2.350	C- 4	976.011	-233.483	-952.402	C- 4	976.011	-233.483	-952.402
*	4	3.000	C- 4	619.822	-862.483	-952.402	C- 4	619.822	-862.483	-952.402
*	5	4.100	C- 4	-914.362	-1926.943	-952.402	C- 4	-914.362	-1926.943	-952.402
3 -	2	4.400	C- 4	-1535.991	-2217.251	-952.402	C- 4	-1535.991	-2217.251	-952.402
3 -	4	0.000	C- 4	-1535.991	2217.251	-952.402	C- 4	-1535.991	2217.251	-952.402
*	1	0.300	C- 4	-914.362	1926.943	-952.402	C- 4	-914.362	1926.943	-952.402
*	2	1.400	C- 4	619.822	862.483	-952.402	C- 4	619.822	862.483	-952.402
*	3	2.050	C- 4	976.011	233.483	-952.402	C- 4	976.011	233.483	-952.402
*	4	2.700	C- 4	923.350	-395.516	-952.402	C- 4	923.350	-395.516	-952.402
*	5	3.800	C- 4	-97.171	-1459.977	-952.402	C- 4	-97.171	-1459.977	-952.402
4 -	3	4.400	C- 4	-1147.342	-2040.592	-952.402	C- 4	-1147.342	-2040.592	-952.402
4 -	5	0.000	C- 4	-1147.342	952.402	-2040.592	C- 4	-1147.342	952.402	-2040.592
*	1	0.600	C- 4	-648.524	709.456	-2064.041	C- 4	-648.524	709.456	-2064.041
*	2	1.700	C- 4	-118.916	250.556	-2107.031	C- 4	-118.916	250.556	-2107.031
*	3	2.350	C- 4	-46.523	-28.823	-2132.434	C- 4	-46.523	-28.823	-2132.434
*	4	3.000	C- 4	-157.708	-314.303	-2157.837	C- 4	-157.708	-314.303	-2157.837
*	5	4.100	C- 4	-775.198	-811.318	-2200.827	C- 4	-775.198	-811.318	-2200.827
5 -	4	4.700	C- 4	-1345.268	-1089.780	-2224.275	C- 4	-1345.268	-1089.780	-2224.275
5 -	6	0.000	C- 4	-1345.268	2224.278	-1089.780	C- 4	-1345.268	2224.278	-1089.780
*	1	0.600	C- 4	-194.279	1612.353	-1089.780	C- 4	-194.279	1612.353	-1089.780
*	2	1.700	C- 4	962.285	490.490	-1089.780	C- 4	962.285	490.490	-1089.780
*	3	2.350	C- 4	1065.655	-172.428	-1089.780	C- 4	1065.655	-172.428	-1089.780
*	4	3.000	C- 4	738.128	-835.347	-1089.780	C- 4	738.128	-835.347	-1089.780
*	5	4.100	C- 4	-797.777	-1957.209	-1089.780	C- 4	-797.777	-1957.209	-1089.780
6 -	5	4.400	C- 4	-1430.835	-2263.172	-1089.780	C- 4	-1430.835	-2263.172	-1089.780
6 -	1	0.000	C- 4	-1430.835	2263.172	-1089.780	C- 4	-1430.835	2263.172	-1089.780
*	1	0.300	C- 4	-797.777	1957.209	-1089.780	C- 4	-797.777	1957.209	-1089.780
*	2	1.400	C- 4	738.128	835.347	-1089.780	C- 4	738.128	835.347	-1089.780
*	3	2.050	C- 4	1065.655	172.428	-1089.780	C- 4	1065.655	172.428	-1089.780
*	4	2.700	C- 4	962.285	-490.490	-1089.780	C- 4	962.285	-490.490	-1089.780
*	5	3.800	C- 4	-194.279	-1612.353	-1089.780	C- 4	-194.279	-1612.353	-1089.780
1 -	6	4.400	C- 4	-1345.268	-2224.278	-1089.780	C- 4	-1345.268	-2224.278	-1089.780
3 -	6	0.000	C- 4	0.000	0.000	-4434.502	C- 4	0.000	0.000	-4434.502
*	1	2.350	C- 4	0.000	0.000	-4480.422	C- 4	0.000	0.000	-4480.422
6 -	3	1.700	C- 4	0.000	0.000	-4526.343	C- 4	0.000	0.000	-4526.343

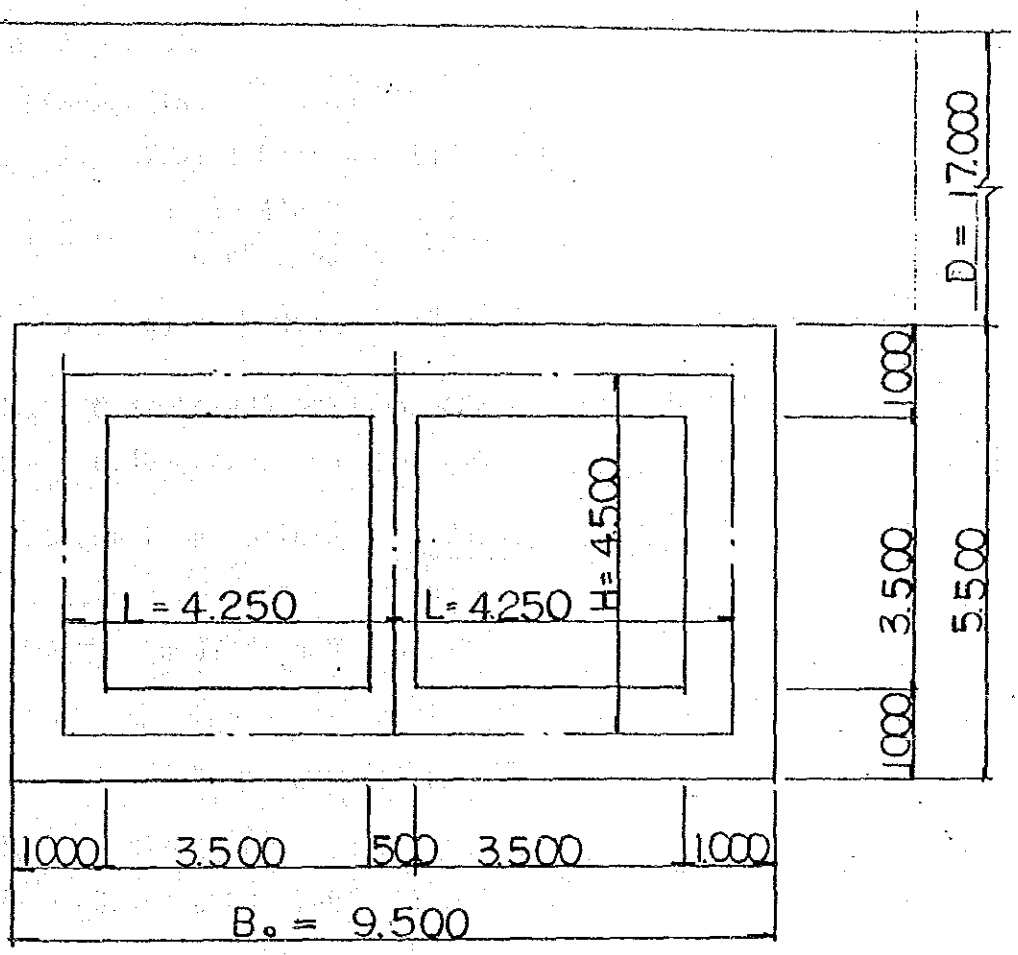
BOX FOR DRAINAGE-NOS

PICK-UP No. 1 *

No.	L (m)	Case	N. MAXIMUM M (tm)	S (t)	N (t)	Case	N. MINIMUM M (tm)	S (t)	N (t)
1 - 2	0.000	C- 4	-1345.268	1089.780	-2224.275	C- 4	-1345.268	1089.780	-2224.275
* 1	0.600	C- 4	-775.198	811.318	-2200.827	C- 4	-775.198	811.318	-2200.827
* 2	1.700	C- 4	-157.708	314.303	-2157.837	C- 4	-157.708	314.303	-2157.837
* 3	2.350	C- 4	-46.523	28.823	-2132.434	C- 4	-46.523	28.823	-2132.434
* 4	3.000	C- 4	-118.916	-250.556	-2107.031	C- 4	-118.916	-250.556	-2107.031
* 5	4.100	C- 4	-648.524	-709.456	-2064.041	C- 4	-648.524	-709.456	-2064.041
2 - 1	4.700	C- 4	-1147.342	-952.402	-2040.592	C- 4	-1147.342	-952.402	-2040.592
2 - 3	0.000	C- 4	-1147.342	2040.592	-952.402	C- 4	-1147.342	2040.592	-952.402
* 1	0.600	C- 4	-97.171	1459.977	-952.402	C- 4	-97.171	1459.977	-952.402
* 2	1.700	C- 4	923.350	395.516	-952.402	C- 4	923.350	395.516	-952.402
* 3	2.350	C- 4	976.011	-233.483	-952.402	C- 4	976.011	-233.483	-952.402
* 4	3.000	C- 4	619.822	-862.483	-952.402	C- 4	619.822	-862.483	-952.402
* 5	4.100	C- 4	-914.362	-1926.943	-952.402	C- 4	-914.362	-1926.943	-952.402
3 - 2	4.400	C- 4	-1535.991	-2217.251	-952.402	C- 4	-1535.991	-2217.251	-952.402
3 - 4	0.000	C- 4	-1535.991	2217.251	-952.402	C- 4	-1535.991	2217.251	-952.402
* 1	0.300	C- 4	-914.362	1926.943	-952.402	C- 4	-914.362	1926.943	-952.402
* 2	1.400	C- 4	619.822	862.483	-952.402	C- 4	619.822	862.483	-952.402
* 3	2.050	C- 4	976.011	233.483	-952.402	C- 4	976.011	233.483	-952.402
* 4	2.700	C- 4	923.350	-395.516	-952.402	C- 4	923.350	-395.516	-952.402
* 5	3.800	C- 4	-97.171	-1459.977	-952.402	C- 4	-97.171	-1459.977	-952.402
4 - 3	4.400	C- 4	-1147.342	-2040.592	-952.402	C- 4	-1147.342	-2040.592	-952.402
4 - 5	0.000	C- 4	-1147.342	952.402	-2040.592	C- 4	-1147.342	952.402	-2040.592
* 1	0.600	C- 4	-648.524	709.456	-2064.041	C- 4	-648.524	709.456	-2064.041
* 2	1.700	C- 4	-118.916	250.556	-2107.031	C- 4	-118.916	250.556	-2107.031
* 3	2.350	C- 4	-46.523	-28.823	-2132.434	C- 4	-46.523	-28.823	-2132.434
* 4	3.000	C- 4	-157.708	-314.303	-2157.837	C- 4	-157.708	-314.303	-2157.837
* 5	4.100	C- 4	-775.198	-811.318	-2200.827	C- 4	-775.198	-811.318	-2200.827
5 - 4	4.700	C- 4	-1345.268	-1089.780	-2224.275	C- 4	-1345.268	-1089.780	-2224.275
5 - 6	0.000	C- 4	-1345.268	2224.278	-1089.780	C- 4	-1345.268	2224.278	-1089.780
* 1	0.600	C- 4	-194.279	1612.353	-1089.780	C- 4	-194.279	1612.353	-1089.780
* 2	1.700	C- 4	962.285	490.490	-1089.780	C- 4	962.285	490.490	-1089.780
* 3	2.350	C- 4	1065.655	-172.428	-1089.780	C- 4	1065.655	-172.428	-1089.780
* 4	3.000	C- 4	738.128	-835.347	-1089.780	C- 4	738.128	-835.347	-1089.780
* 5	4.100	C- 4	-797.777	-1957.209	-1089.780	C- 4	-797.777	-1957.209	-1089.780
6 - 5	4.400	C- 4	-1430.835	-2263.172	-1089.780	C- 4	-1430.835	-2263.172	-1089.780
6 - 1	0.000	C- 4	-1430.835	2263.172	-1089.780	C- 4	-1430.835	2263.172	-1089.780
* 1	0.300	C- 4	-797.777	1957.209	-1089.780	C- 4	-797.777	1957.209	-1089.780
* 2	1.400	C- 4	738.128	835.347	-1089.780	C- 4	738.128	835.347	-1089.780
* 3	2.050	C- 4	1065.655	172.428	-1089.780	C- 4	1065.655	172.428	-1089.780
* 4	2.700	C- 4	962.285	-490.490	-1089.780	C- 4	962.285	-490.490	-1089.780
* 5	3.800	C- 4	-194.279	-1612.353	-1089.780	C- 4	-194.279	-1612.353	-1089.780
1 - 6	4.400	C- 4	-1345.268	-2224.278	-1089.780	C- 4	-1345.268	-2224.278	-1089.780
3 - 6	0.000	C- 4	0.000	0.000	-4434.502	C- 4	0.000	0.000	-4434.502
* 1	2.350	C- 4	0.000	0.000	-4480.422	C- 4	0.000	0.000	-4480.422
6 - 3	4.700	C- 4	0.000	0.000	-4526.343	C- 4	0.000	0.000	-4526.343

NO ⑤ BOXCULVERT FOR DRAINAGE

1) Shape and Size



where ··· D^m = depth of asphalt and similar surface soil

2) Factor of section

$A = 1.00 \times 1.00 = 1.0000\ m^2$

$I = \frac{1.00^4}{12} = 008333\ m^4$

$A = 1.00 \times 0.50 = 0.5000\ m^2$

$I = \frac{1.00 \times 0.50^3}{12} = 0.01041\ m^4$

$Ec = 25\ KN/mm^2 = 2.5 \times 10^7\ KN/m^2$

No.⑤' BOX CULVERT FOR DRAINAGE (D=17.0)

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

section b=100^{cm} h=100 d=93.5 d'=6.5

1) For upper slab

a) intersection point②=④ Mu.min =−620.6^{KNm}

$A_s = Y_{20} - 150^{ctc} = 3.142/0.15 = 20.95\ cm^2$

$$X = \frac{0.87\times 41000 \times 20.95}{0.40\times 2500\times 100} \fallingdotseq 9.4^{cm}$$

$$Z = 93.5 - \frac{9.4}{2} = 88.8^{cm} \fallingdotseq 0.95\times 93.5 = 88.8^{cm}\ \ OK$$

$M_{RS} = 0.87\times 41000 \times 20.95 \times 88.8\times 10^{-5} = 657.2^{KNm} > Mu = 620.6^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 9.4 \times 88.8\times 10^{-5} = 834.7^{KNm} > Mu = 620.6^{KNm}$ OK

b) intersection point③ Mu.min =−913.8^{KNm}

$A_s = Y_{25} - 150^{ctc} = 4.909/0.15 = 32.73\ cm^2$

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

$$Z = 93.5 - \frac{11.8}{2} = 87.6^{cm} < 0.95\times 93.5 = 88.8^{cm}\ \ OK$$

$M_{RS} = 0.87\times 41000 \times 32.73 \times 87.6\times 10^{-5} = 1022.7^{KNm} > Mu = 913.8^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 11.8\times 87.6\times 10^{-5} = 1033.6^{KNm} > Mu = 913.8^{KNm}$ OK

c) middle point ②~③=③~④ Mu.max=518.8^{KNm}

$A_s = Y_{20} - 150^{ctc} = 20.95\ cm^2$

$M_R = 657.2^{KNm} > Mu = 518.8^{KNm}$

Where… M_R : From calculation of point②

2) For bottom slab

a) intersection point⑤, ① Mu.min =−774.7^{KNm}

$$A_s = \left\{ \begin{array}{l} Y_{25} - 300^{ctc} = 4.909/0.30 \\ Y_{20} - 300^{ctc} = 3.142/0.30 \end{array} \right\} = 26.83\ cm^2$$

$$X = \frac{0.87\times 41000 \times 26.83}{0.40\times 2500\times 100} = 9.6^{cm}$$

$$Z = 93.5 - \frac{9.6}{2} = 88.7^{cm} < 0.95\times 93.5 = 88.8^{cm}$$

$M_{RS} = 0.87\times 41000 \times 26.83 \times 88.7\times 10^{-5} = 848.8^{KNm} > Mu = 774.7^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 9.6 \times 88.7\times 10^{-5} = 831.5^{KNm} > Mu = 774.7^{KNm}$ OK

b) intersection point⑥ Mu.min $=-834.3^{KNm}$

$A_s = Y_{25}-150^{ctc} = 4.909/0.15 = 32.73\ cm^2$

$$X = \frac{0.87\times 41000 \times 32.73}{0.40\times 2500\times 100} = 11.6^{m}$$

$$Z = 93.5 - \frac{11.6}{2} = 87.7^{cm} < 0.95\times 93.5 = 88.8^{cm}$$

$M_{RS} = 0.87\times 41000 \times 32.73 \times 87.7\times 10^{-5} = 1023.9^{KNm} > Mu = 834.3^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 11.6\times 87.7\times 10^{-5} = 1017.3^{KNm} > Mu = 834.3^{KNm}$ OK

c) intersection point⑤~⑥=⑥~① Mu.max $=585.5^{KNm}$

$A_s = Y_{20}-150^{ctc} = 20.95\ cm^2$

$M_R = 657.2^{KNm} > Mu = 585.5^{KNm}$

(M_R : From calculation of point②, ④)

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

section b=100cm h=100 d=93.5 d´=6.5

1) For upper slab

a) intersection point③ Su.max $=630.0^{KN}$

$A_s = Y_{25}-150^{ctc} = 32.73\ cm^2$

$$P = \frac{32.73}{100\times 93.5}\times 100 = 0.350\ \%$$

$$Vc = \frac{630.0\times 10^3}{100\times 93.5} = 67.4\ N/cm^2$$

$$< Vca = \left\{ 35.0 + \frac{15}{0.25}(0.350 - 0.25) \right\} \times \frac{2d}{d} = 82.0\ N/cm^2 \quad OK$$

b) intersection point②=④ Su.max $=348.2^{KN}$

$A_s = Y_{20}-150^{ctc} = 3.0406/0.150 = 20.95\ cm^2$

$$P = \frac{20.95}{100\times 93.5} = 0.224\ \%$$

$$Vc = \frac{348.2\times 10^3}{100\times 93.5} = 37.2\ N/cm^2$$

$$< Vca = \left\{ 35.0 + \frac{0.224}{0.250} \right\} \times \frac{2d}{d} = 62.7\ N/cm^2$$

2) For bottom slab

a) intersection point⑥ Su.max $=617.1^{KN}$

$$Vc = \frac{617.1\times 10^3}{100\times 93.5} = 66.0\ N/cm^2 < Vca = 82.0\ N/cm^2$$

Where… Vca : From calculation of point③

b) intersection point⑤=①　　Su.max =434.4^{KN}

$$A_s = \left\{ \begin{array}{l} Y_{25}-300^{ctc} = \\ Y_{20}-300^{ctc} = \end{array} \right\} = 26.83 \ cm^2$$

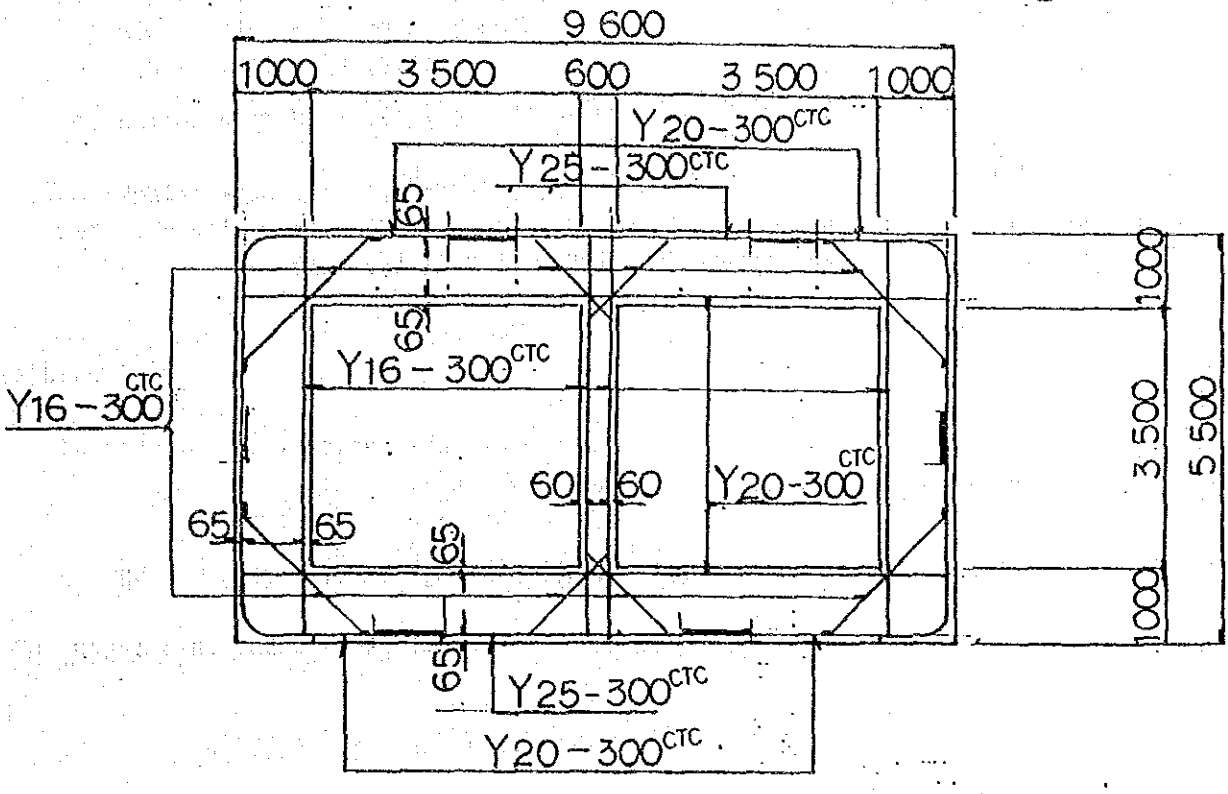
$$P = \frac{26.83}{100 \times 93.5} = 0.287 \ \%$$

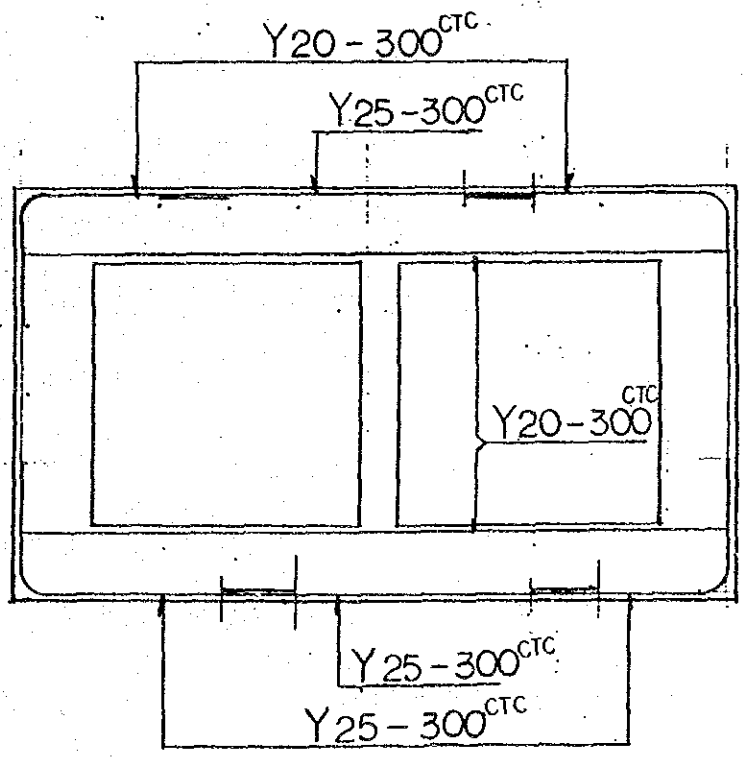
$$Vc = \frac{434.4 \times 10^3}{100 \times 93.5} = 46.5 \ N/cm^2$$

$$< Vca = \left\{ 35.0 + \frac{15}{0.25}(0.287-0.25) \right\} \times \frac{2d}{d} = 74.4 \ N/cm^2$$

NO⑤ BOX CULVERT FOR DRAINAGE

D = 17.0 m





NO⑤' BOX FOR DRAINAGE

Load

(1)Dead load

a)Vertical load Where $\alpha = 1.2$ (earth pressure factor of vertical) $\frac{D}{B_o} = \frac{17.00}{9.50} = 1.8$ $\begin{matrix}>1.0\\<2.0\end{matrix}$

For upper slab $w1 = 22.6\times0.50+17.5\times16.5\times1.2+23.60\times1.00 = 381.400$ kN/m

For side wall $w2 = 23.6\times1.00 = 23.600$ 〃

For center wall $w2' = 23.6\times0.50 = 11.800$ 〃

For bottom slab $W3 = 381.400 + \frac{(2\times23.600+11.800)\times4.50}{8.500} = 412.635$ 〃

b)Horizontal load --- earth pressure

For side wall $P1 = (22.6\times0.50+17.50\times17.00)\times0.500 = 154.400$ kN/m

$P2 = (22.6\times0.50+17.50\times21.50)\times0.500 = 193.775$ 〃

(2)Live load

or live load surcharge of a vihicle

$$go = \frac{\overset{kN/rihicle}{40} \times \overset{unit}{30}}{3.50 \times 10.0} \fallingdotseq 34.300 \text{ kN/m}$$

For upper slab and bottom slab

P1 = P2 = 34.300 KN/m

BOX FOR DRAINAGE-NO5 ---Depth = 17.000

No	X (m)	Y (m)
1	0.0000	0.0000
2	0.0000	4.5000
3	4.2500	4.5000
4	8.5000	4.5000
5	8.5000	0.0000
6	4.2500	0.0000

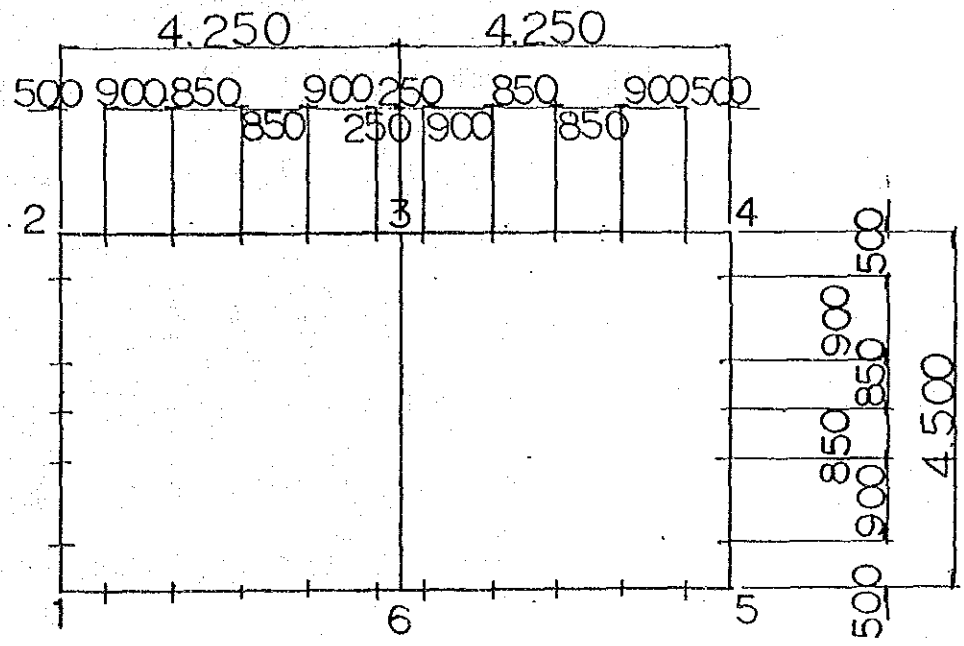
NOTE: THE DIMENSION(t) BE EXCHANG TO DIMENSION(KN) INTO THIS CALCULATION

No	I	J	A (m2)	I (m4)	I - J	L (m)	E (t/m2)	EPS
1	1	2	1.00000	0.083330	Fix - Fix	4.500	2.50E+07	1.00E-05
2	2	3	1.00000	0.083330	Fix - Fix	4.250	2.50E+07	1.00E-05
3	3	4	1.00000	0.083330	Fix - Fix	4.250	2.50E+07	1.00E-05
4	4	5	1.00000	0.083330	Fix - Fix	4.500	2.50E+07	1.00E-05
5	5	6	1.00000	0.083330	Fix - Fix	4.250	2.50E+07	1.00E-05
6	6	1	1.00000	0.083330	Fix - Fix	4.250	2.50E+07	1.00E-05
7	3	6	0.50000	0.010417	Fix - Fix	4.500	2.50E+07	1.00E-05

No	X (t/m)	Y (t/m)	M(tm/Rad)
1	Fix	Fix	Free
5	Free	Fix	Free

No		L-No 1 / 11	L-No 2 / 12	L-No 3 / 13	L-No 4 / 14	L-No 5 / 15	L-No 6 / 16	L-No 7 / 17	L-No 8 / 18	L-No 9 / 19	L-No 10 / 20
1	5	0.500	1.400	2.250	3.100	4.000					
2	5	0.500	1.400	2.250	3.100	4.000					
3	5	0.250	1.150	2.000	2.850	3.750					
4	5	0.500	1.400	2.250	3.100	4.000					
5	5	0.500	1.400	2.250	3.100	4.000					
6	5	0.250	1.150	2.000	2.850	3.750					
7	1	2.250									

CALCULATION POINTS OF EACH FORCE



: Dead load
No. : 1

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-Y	0.000	4.500	-23.600	-23.600
2	2-	3	-Y	0.000	4.250	-381.400	-381.400
3	3-	4	-Y	0.000	4.250	-381.400	-381.400
4	4-	5	-Y	0.000	4.500	-23.600	-23.600
5	5-	6	-Y	0.000	4.250	412.635	412.635
6	6-	1	-Y	0.000	4.250	412.635	412.635
7	3-	6	-Y	0.000	4.500	-11.800	-11.800

ΣV = -0.002 (t)
ΣH = 0.000 (t)

: Earth pressure
No. : 2

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	4.500	193.775	154.400
4	4-	5	-X	0.000	4.500	-154.400	-193.775

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: BH live load-VL-
No. : 3

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	4.250	-34.300	-34.300
3	3-	4	-Y	0.000	4.250	-34.300	-34.300
5	5-	6	-Y	0.000	4.250	34.300	34.300
6	6-	1	-Y	0.000	4.250	34.300	34.300

BOX FOR DRAINAGE-NO5'

No C-No 1
No No 4

No 1 1.3800
No 2 1.6500
No 3 1.4300

BOX FOR DRAINAGE-NO5'

No 1 : 4

BOX FOR DRAINAGE-NO5'

No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. 2 RX (t)	RY (t)	RM (tm)	Case. 3 RX (t)	RY (t)	RM (tm)
1.	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 4 RX (t)	RY (t)	RM (tm)
1.	0.000	0.002	0.000
5.	0.000	0.002	0.000

BOX FOR DRAINAGE-NO5'

No.	Case. 1 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 2 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 3 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	2.94106	0.00000	0.00000	-1.09930	0.00000	0.00000	0.2353
2.	-0.08338	-1.33912	-2.50672	-0.05100	-0.11827	1.07789	0.00000	-0.11569	-0.2353
3.	-0.04169	-2.99275	0.00000	-0.69138	0.15466	0.00000	0.00000	-0.35125	0.0000
4.	0.00000	-1.33912	2.50672	-1.33177	-0.11827	-1.07789	0.00000	-0.11569	0.2353
5.	-0.08338	0.00000	-2.94106	-1.38277	0.00000	1.09930	0.00000	0.00000	-0.2353
6.	-0.04169	3.79950	0.00000	-0.69138	-0.31841	0.00000	0.00000	0.23556	0.0000

No.	Case. 4 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	2.58134
2.	-0.19920	-2.20857	-2.01726
3.	-1.19831	-4.37709	0.00000
4.	-2.19742	-2.20857	2.01726
5.	-2.39662	0.00000	-2.58134
6.	-1.19831	5.05479	0.00000

	No	L(m)	Case 1 Dead load M (tm)	S (t)	N (t)	Case 2 Earth pressure M (tm)	S (t)	N (t)	Case 3 BH live load-VL- M (tm)	S (t)	N (t)
1-	2	0.000	-307.378	24.523	-797.057	-193.505	406.696	-65.704	-21.789	0.000	-64.274
*	1	0.500	-295.116	24.523	-785.257	-14.197	310.902	-65.704	-21.789	0.000	-64.274
*	2	1.400	-273.046	24.523	-764.017	189.971	143.986	-65.704	-21.789	0.000	-64.274
*	3	2.250	-252.202	24.523	-743.957	247.678	-7.150	-65.704	-21.789	0.000	-64.274
*	4	3.100	-231.357	24.523	-723.897	179.607	-151.963	-65.704	-21.789	0.000	-64.274
*	5	4.000	-209.287	24.523	-702.657	-23.590	-298.404	-65.704	-21.789	0.000	-64.274
2-	1	4.500	-197.026	24.523	-690.857	-192.456	-376.698	-65.704	-21.789	0.000	-64.274
2-	3	0.000	-197.026	690.857	24.523	-192.456	65.704	-376.698	-21.789	64.274	0.000
*	1	0.500	100.728	500.157	24.523	-159.604	65.704	-376.698	6.061	47.124	0.000
*	2	1.400	396.403	156.897	24.523	-100.471	65.704	-376.698	34.580	16.254	0.000
*	3	2.250	391.985	-167.293	24.523	-44.623	65.704	-376.698	36.005	-12.901	0.000
*	4	3.100	112.005	-491.483	24.523	11.225	65.704	-376.698	12.648	-42.056	0.000
*	5	4.000	-484.796	-834.743	24.523	70.359	65.704	-376.698	-39.095	-72.926	0.000
3-	2	4.250	-705.400	-930.093	24.523	86.785	65.704	-376.698	-58.398	-81.501	0.000
3-	4	0.000	-705.400	930.093	24.523	86.785	-65.704	-376.698	-58.398	81.501	0.000
*	1	0.250	-484.796	834.743	24.523	70.359	-65.704	-376.698	-39.095	72.926	0.000
*	2	1.150	112.005	491.483	24.523	11.225	-65.704	-376.698	12.648	42.056	0.000
*	3	2.000	391.985	167.293	24.523	-44.623	-65.704	-376.698	36.005	12.901	0.000
*	4	2.850	396.403	-156.897	24.523	-100.471	-65.704	-376.698	34.580	-16.254	0.000
*	5	3.750	100.728	-500.157	24.523	-159.604	-65.704	-376.698	6.061	-47.124	0.000
4-	3	4.250	-197.026	-690.857	24.523	-192.456	-65.704	-376.698	-21.789	-64.274	0.000
4-	5	0.000	-197.026	-24.523	-690.857	-192.456	376.698	-65.704	-21.789	0.000	-64.274
*	1	0.500	-209.287	-24.523	-702.657	-23.590	298.404	-65.704	-21.789	0.000	-64.274
*	2	1.400	-231.357	-24.523	-723.897	179.607	151.963	-65.704	-21.789	0.000	-64.274
*	3	2.250	-252.202	-24.523	-743.957	247.678	7.150	-65.704	-21.789	0.000	-64.274
*	4	3.100	-273.046	-24.523	-764.017	189.971	-143.986	-65.704	-21.789	0.000	-64.274
*	5	4.000	-295.116	-24.523	-785.257	-14.197	-310.902	-65.704	-21.789	0.000	-64.274
5-	4	4.500	-307.378	-24.523	-797.057	-193.505	-406.696	-65.704	-21.789	0.000	-64.274
5-	6	0.000	-307.378	797.056	-24.523	-193.505	65.704	-406.696	-21.789	64.274	0.000
*	1	0.500	39.571	590.739	-24.523	-160.654	65.704	-406.696	6.061	47.124	0.000
*	2	1.400	404.119	219.367	-24.523	-101.520	65.704	-406.696	34.580	16.254	0.000
*	3	2.250	441.517	-131.373	-24.523	-45.672	65.704	-406.696	36.005	-12.901	0.000
*	4	3.100	180.786	-482.112	-24.523	10.176	65.704	-406.696	12.648	-42.056	0.000
*	5	4.000	-420.233	-853.484	-24.523	69.310	65.704	-406.696	-39.095	-72.926	0.000
6-	5	4.250	-646.498	-956.643	-24.523	85.736	65.704	-406.696	-58.398	-81.501	0.000
6-	1	0.000	-646.498	956.643	-24.523	85.736	-65.704	-406.696	-58.398	81.501	0.000
*	1	0.250	-420.233	853.484	-24.523	69.310	-65.704	-406.696	-39.095	72.926	0.000
*	2	1.150	180.786	482.112	-24.523	10.176	-65.704	-406.696	12.648	42.056	0.000
*	3	2.000	441.517	131.373	-24.523	-45.672	-65.704	-406.696	36.005	12.901	0.000
*	4	2.850	404.119	-219.367	-24.523	-101.520	-65.704	-406.696	34.580	-16.254	0.000
*	5	3.750	39.571	-590.739	-24.523	-160.654	-65.704	-406.696	6.061	-47.124	0.000
1-	6	4.250	-307.378	-797.056	-24.523	-193.505	-65.704	-406.696	-21.789	-64.274	0.000
3-	6	0.000	0.000	0.000	-1860.185	0.000	0.000	131.408	0.000	0.000	-163.003
*	1	2.250	0.000	0.000	-1886.735	0.000	0.000	131.408	0.000	0.000	-163.003
6-	3	4.500	0.000	0.000	-1913.285	0.000	0.000	131.408	0.000	0.000	-163.003

Case 4

No		L(m)	M (tm)	S (t)	N (t)
1-	2	0.000	-774.623	704.889	-1300.262
*	1	0.500	-461.844	546.829	-1283.978
*	2	1.400	-94.510	271.417	-1254.667
*	3	2.250	29.473	22.044	-1226.984
*	4	3.100	-54.079	-216.898	-1199.301
*	5	4.000	-358.897	-458.526	-1169.990
2-	1	4.500	-620.607	-587.711	-1153.706
2-	3	0.000	-620.607	1153.706	-587.711
*	1	0.500	-115.676	866.015	-587.711
*	2	1.400	430.708	348.172	-587.711
*	3	2.250	518.798	-140.902	-587.711
*	4	3.100	191.175	-629.975	-587.711
*	5	4.000	-608.832	-1147.818	-587.711
3-	2	4.250	-913.767	-1291.664	-587.711
3-	4	0.000	-913.767	1291.664	-587.711
*	1	0.250	-608.832	1147.818	-587.711
*	2	1.150	191.175	629.975	-587.711
*	3	2.000	518.798	140.902	-587.711
*	4	2.850	430.708	-348.172	-587.711
*	5	3.750	-115.676	-866.015	-587.711
4-	3	4.250	-620.607	-1153.706	-587.711
4-	5	0.000	-620.607	587.711	-1153.706
*	1	0.500	-358.897	458.526	-1169.990
*	2	1.400	-54.079	216.898	-1199.301
*	3	2.250	29.473	-22.044	-1226.984
*	4	3.100	-94.510	-271.417	-1254.667
*	5	4.000	-461.844	-546.829	-1283.978
5-	4	4.500	-774.623	-704.889	-1300.262
5-	6	0.000	-774.623	1300.260	-704.889
*	1	0.500	-201.804	991.017	-704.889
*	2	1.400	439.626	434.381	-704.889
*	3	2.250	585.421	-91.332	-704.889
*	4	3.100	284.361	-617.044	-704.889
*	5	4.000	-521.465	-1173.681	-704.889
6-	5	4.250	-834.213	-1328.303	-704.889
6-	1	0.000	-834.213	1328.303	-704.889
*	1	0.250	-521.465	1173.681	-704.889
*	2	1.150	284.361	617.044	-704.889
*	3	2.000	585.421	91.332	-704.889
*	4	2.850	439.626	-434.381	-704.889
*	5	3.750	-201.804	-991.017	-704.889
1-	6	4.250	-774.623	-1300.260	-704.889
3-	6	0.000	0.000	0.000	-2583.327
*	1	2.250	0.000	0.000	-2619.966
6-	3	4.500	0.000	0.000	-2656.605

BOX FOR DRAINAGE-NO5'

PICK-UP No. 1 *

No.	L (m)	M. MAXIMUM Case	M (tm)	S (t)	N (t)	M. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 4	-774.623	704.889	-1300.262	C- 4	-774.623	704.889	-1300.262
* 1	0.500	C- 4	-461.844	546.829	-1283.978	C- 4	-461.844	546.829	-1283.978
* 2	1.400	C- 4	-94.510	271.417	-1254.667	C- 4	-94.510	271.417	-1254.667
* 3	2.250	C- 4	29.473	22.044	-1226.984	C- 4	29.473	22.044	-1226.984
* 4	3.100	C- 4	-54.079	-216.898	-1199.301	C- 4	-54.079	-216.898	-1199.301
* 5	4.000	C- 4	-358.897	-458.526	-1169.990	C- 4	-358.897	-458.526	-1169.990
2 - 1	4.500	C- 4	-620.607	-587.711	-1153.706	C- 4	-620.607	-587.711	-1153.706
2 - 3	0.000	C- 4	-620.607	1153.706	-587.711	C- 4	-620.607	1153.706	-587.711
* 1	0.500	C- 4	-115.676	866.015	-587.711	C- 4	-115.676	866.015	-587.711
* 2	1.400	C- 4	430.708	348.172	-587.711	C- 4	430.708	348.172	-587.711
* 3	2.250	C- 4	518.798	-140.902	-587.711	C- 4	518.798	-140.902	-587.711
* 4	3.100	C- 4	191.175	-629.975	-587.711	C- 4	191.175	-629.975	-587.711
* 5	4.000	C- 4	-608.832	-1147.818	-587.711	C- 4	-608.832	-1147.818	-587.711
3 - 2	4.250	C- 4	-913.767	-1291.664	-587.711	C- 4	-913.767	-1291.664	-587.711
3 - 4	0.000	C- 4	-913.767	1291.664	-587.711	C- 4	-913.767	1291.664	-587.711
* 1	0.250	C- 4	-608.832	1147.818	-587.711	C- 4	-608.832	1147.818	-587.711
* 2	1.150	C- 4	191.175	629.975	-587.711	C- 4	191.175	629.975	-587.711
* 3	2.000	C- 4	518.798	140.902	-587.711	C- 4	518.798	140.902	-587.711
* 4	2.850	C- 4	430.708	-348.172	-587.711	C- 4	430.708	-348.172	-587.711
* 5	3.750	C- 4	-115.676	-866.015	-587.711	C- 4	-115.676	-866.015	-587.711
4 - 3	4.250	C- 4	-620.607	-1153.706	-587.711	C- 4	-620.607	-1153.706	-587.711
4 - 5	0.000	C- 4	-620.607	587.711	-1153.706	C- 4	-620.607	587.711	-1153.706
* 1	0.500	C- 4	-358.897	458.526	-1169.990	C- 4	-358.897	458.526	-1169.990
* 2	1.400	C- 4	-54.079	216.898	-1199.301	C- 4	-54.079	216.898	-1199.301
* 3	2.250	C- 4	29.473	-22.044	-1226.984	C- 4	29.473	-22.044	-1226.984
* 4	3.100	C- 4	-94.510	-271.417	-1254.667	C- 4	-94.510	-271.417	-1254.667
* 5	4.000	C- 4	-461.844	-546.829	-1283.978	C- 4	-461.844	-546.829	-1283.978
5 - 4	4.500	C- 4	-774.623	-704.889	-1300.262	C- 4	-774.623	-704.889	-1300.262
5 - 6	0.000	C- 4	-774.623	1300.260	-704.889	C- 4	-774.623	1300.260	-704.889
* 1	0.500	C- 4	-201.804	991.017	-704.889	C- 4	-201.804	991.017	-704.889
* 2	1.400	C- 4	439.626	434.381	-704.889	C- 4	439.626	434.381	-704.889
* 3	2.250	C- 4	585.421	-91.332	-704.889	C- 4	585.421	-91.332	-704.889
* 4	3.100	C- 4	284.361	-617.044	-704.889	C- 4	284.361	-617.044	-704.889
* 5	4.000	C- 4	-521.465	-1173.681	-704.889	C- 4	-521.465	-1173.681	-704.889
6 - 5	4.250	C- 4	-834.213	-1328.303	-704.889	C- 4	-834.213	-1328.303	-704.889
6 - 1	0.000	C- 4	-834.213	1328.303	-704.889	C- 4	-834.213	1328.303	-704.889
* 1	0.250	C- 4	-521.465	1173.681	-704.889	C- 4	-521.465	1173.681	-704.889
* 2	1.150	C- 4	284.361	617.044	-704.889	C- 4	284.361	617.044	-704.889
* 3	2.000	C- 4	585.421	91.332	-704.889	C- 4	585.421	91.332	-704.889
* 4	2.850	C- 4	439.626	-434.381	-704.889	C- 4	439.626	-434.381	-704.889
* 5	3.750	C- 4	-201.804	-991.017	-704.889	C- 4	-201.804	-991.017	-704.889
1 - 6	4.250	C- 4	-774.623	-1300.260	-704.889	C- 4	-774.623	-1300.260	-704.889
3 - 6	0.000	C- 4	0.000	0.000	-2583.327	C- 4	0.000	0.000	-2583.327
* 1	2.250	C- 4	0.000	0.000	-2619.966	C- 4	0.000	0.000	-2619.966
6 - 3	4.500	C- 4	0.000	0.000	-2656.605	C- 4	0.000	0.000	-2656.605

BOX FOR DRAINAGE-NO5'

PICK-UP No. 1 *

No.	L (m)	S.MAXIMUM Case	M (tm)	S (t)	N (t)	S.MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 4	-774.623	704.889	-1300.262	C- 4	-774.623	704.889	-1300.262
* 1	0.500	C- 4	-461.844	546.829	-1283.978	C- 4	-461.844	546.829	-1283.978
* 2	1.400	C- 4	-94.510	271.417	-1254.667	C- 4	-94.510	271.417	-1254.667
* 3	2.250	C- 4	29.473	22.044	-1226.984	C- 4	29.473	22.044	-1226.984
* 4	3.100	C- 4	-54.079	-216.898	-1199.301	C- 4	-54.079	-216.898	-1199.301
* 5	4.000	C- 4	-358.897	-458.526	-1169.990	C- 4	-358.897	-458.526	-1169.990
2 - 1	4.500	C- 4	-620.607	-587.711	-1153.706	C- 4	-620.607	-587.711	-1153.706
2 - 3	0.000	C- 4	-620.607	1153.706	-587.711	C- 4	-620.607	1153.706	-587.711
* 1	0.500	C- 4	-115.676	866.015	-587.711	C- 4	-115.676	866.015	-587.711
* 2	1.400	C- 4	430.708	348.172	-587.711	C- 4	430.708	348.172	-587.711
* 3	2.250	C- 4	518.798	-140.902	-587.711	C- 4	518.798	-140.902	-587.711
* 4	3.100	C- 4	191.175	-629.975	-587.711	C- 4	191.175	-629.975	-587.711
* 5	4.000	C- 4	-608.832	-1147.818	-587.711	C- 4	-608.832	-1147.818	-587.711
3 - 2	4.250	C- 4	-913.767	-1291.664	-587.711	C- 4	-913.767	-1291.664	-587.711
3 - 4	0.000	C- 4	-913.767	1291.664	-587.711	C- 4	-913.767	1291.664	-587.711
* 1	0.250	C- 4	-608.832	1147.818	-587.711	C- 4	-608.832	1147.818	-587.711
* 2	1.150	C- 4	191.175	629.975	-587.711	C- 4	191.175	629.975	-587.711
* 3	2.000	C- 4	518.798	140.902	-587.711	C- 4	518.798	140.902	-587.711
* 4	2.850	C- 4	430.708	-348.172	-587.711	C- 4	430.708	-348.172	-587.711
* 5	3.750	C- 4	-115.676	-866.015	-587.711	C- 4	-115.676	-866.015	-587.711
4 - 3	4.250	C- 4	-620.607	-1153.706	-587.711	C- 4	-620.607	-1153.706	-587.711
4 - 5	0.000	C- 4	-620.607	587.711	-1153.706	C- 4	-620.607	587.711	-1153.706
* 1	0.500	C- 4	-358.897	458.526	-1169.990	C- 4	-358.897	458.526	-1169.990
* 2	1.400	C- 4	-54.079	216.898	-1199.301	C- 4	-54.079	216.898	-1199.301
* 3	2.250	C- 4	29.473	-22.044	-1226.984	C- 4	29.473	-22.044	-1226.984
* 4	3.100	C- 4	-94.510	-271.417	-1254.667	C- 4	-94.510	-271.417	-1254.667
* 5	4.000	C- 4	-461.844	-546.829	-1283.978	C- 4	-461.844	-546.829	-1283.978
5 - 4	4.500	C- 4	-774.623	-704.889	-1300.262	C- 4	-774.623	-704.889	-1300.262
5 - 6	0.000	C- 4	-774.623	1300.260	-704.889	C- 4	-774.623	1300.260	-704.889
* 1	0.500	C- 4	-201.804	991.017	-704.889	C- 4	-201.804	991.017	-704.889
* 2	1.400	C- 4	439.626	434.381	-704.889	C- 4	439.626	434.381	-704.889
* 3	2.250	C- 4	585.421	-91.332	-704.889	C- 4	585.421	-91.332	-704.889
* 4	3.100	C- 4	284.361	-617.044	-704.889	C- 4	284.361	-617.044	-704.889
* 5	4.000	C- 4	-521.465	-1173.681	-704.889	C- 4	-521.465	-1173.681	-704.889
6 - 5	4.250	C- 4	-834.213	-1328.303	-704.889	C- 4	-834.213	-1328.303	-704.889
6 - 1	0.000	C- 4	-834.213	1328.303	-704.889	C- 4	-834.213	1328.303	-704.889
* 1	0.250	C- 4	-521.465	1173.681	-704.889	C- 4	-521.465	1173.681	-704.889
* 2	1.150	C- 4	284.361	617.044	-704.889	C- 4	284.361	617.044	-704.889
* 3	2.000	C- 4	585.421	91.332	-704.889	C- 4	585.421	91.332	-704.889
* 4	2.850	C- 4	439.626	-434.381	-704.889	C- 4	439.626	-434.381	-704.889
* 5	3.750	C- 4	-201.804	-991.017	-704.889	C- 4	-201.804	-991.017	-704.889
1 - 6	4.250	C- 4	-774.623	-1300.260	-704.889	C- 4	-774.623	-1300.260	-704.889
3 - 6	0.000	C- 4	0.000	0.000	-2583.327	C- 4	0.000	0.000	-2583.327
* 1	2.250	C- 4	0.000	0.000	-2619.966	C- 4	0.000	0.000	-2619.966
6 - 3	4.500	C- 4	0.000	0.000	-2656.605	C- 4	0.000	0.000	-2656.605

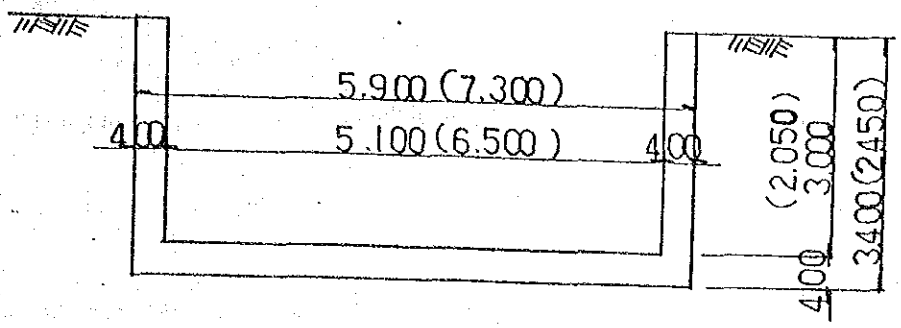
BOX FOR DRAINAGE-NO5

PICK-UP No. 1 *

No.	L (m)	N.MAXIMUM Case	M (tm)	S (t)	N (t)	N.MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 4	-774.623	704.889	-1300.262	C- 4	-774.623	704.889	-1300.262
* 1	0.500	C- 4	-461.844	546.829	-1283.978	C- 4	-461.844	546.829	-1283.978
* 2	1.400	C- 4	-94.510	271.417	-1254.667	C- 4	-94.510	271.417	-1254.667
* 3	2.250	C- 4	29.473	22.044	-1226.984	C- 4	29.473	22.044	-1226.984
* 4	3.100	C- 4	-54.079	-216.898	-1199.301	C- 4	-54.079	-216.898	-1199.301
* 5	4.000	C- 4	-358.897	-458.526	-1169.990	C- 4	-358.897	-458.526	-1169.990
2 - 1	4.500	C- 4	-620.607	-587.711	-1153.706	C- 4	-620.607	-587.711	-1153.706
2 - 3	0.000	C- 4	-620.607	1153.706	-587.711	C- 4	-620.607	1153.706	-587.711
* 1	0.500	C- 4	-115.676	866.015	-587.711	C- 4	-115.676	866.015	-587.711
* 2	1.400	C- 4	430.708	348.172	-587.711	C- 4	430.708	348.172	-587.711
* 3	2.250	C- 4	518.798	-140.902	-587.711	C- 4	518.798	-140.902	-587.711
* 4	3.100	C- 4	191.175	-629.975	-587.711	C- 4	191.175	-629.975	-587.711
* 5	4.000	C- 4	-608.832	-1147.818	-587.711	C- 4	-608.832	-1147.818	-587.711
3 - 2	4.250	C- 4	-913.767	-1291.664	-587.711	C- 4	-913.767	-1291.664	-587.711
3 - 4	0.000	C- 4	-913.767	1291.664	-587.711	C- 4	-913.767	1291.664	-587.711
* 1	0.250	C- 4	-608.832	1147.818	-587.711	C- 4	-608.832	1147.818	-587.711
* 2	1.150	C- 4	191.175	629.975	-587.711	C- 4	191.175	629.975	-587.711
* 3	2.000	C- 4	518.798	140.902	-587.711	C- 4	518.798	140.902	-587.711
* 4	2.850	C- 4	430.708	-348.172	-587.711	C- 4	430.708	-348.172	-587.711
* 5	3.750	C- 4	-115.676	-866.015	-587.711	C- 4	-115.676	-866.015	-587.711
4 - 3	4.250	C- 4	-620.607	-1153.706	-587.711	C- 4	-620.607	-1153.706	-587.711
4 - 5	0.000	C- 4	-620.607	587.711	-1153.706	C- 4	-620.607	587.711	-1153.706
* 1	0.500	C- 4	-358.897	458.526	-1169.990	C- 4	-358.897	458.526	-1169.990
* 2	1.400	C- 4	-54.079	216.898	-1199.301	C- 4	-54.079	216.898	-1199.301
* 3	2.250	C- 4	29.473	-22.044	-1226.984	C- 4	29.473	-22.044	-1226.984
* 4	3.100	C- 4	-94.510	-271.417	-1254.667	C- 4	-94.510	-271.417	-1254.667
* 5	4.000	C- 4	-461.844	-546.829	-1283.978	C- 4	-461.844	-546.829	-1283.978
5 - 4	4.500	C- 4	-774.623	-704.889	-1300.262	C- 4	-774.623	-704.889	-1300.262
5 - 6	0.000	C- 4	-774.623	1300.260	-704.889	C- 4	-774.623	1300.260	-704.889
* 1	0.500	C- 4	-201.804	991.017	-704.889	C- 4	-201.804	991.017	-704.889
* 2	1.400	C- 4	439.626	434.381	-704.889	C- 4	439.626	434.381	-704.889
* 3	2.250	C- 4	585.421	-91.332	-704.889	C- 4	585.421	-91.332	-704.889
* 4	3.100	C- 4	284.361	-617.044	-704.889	C- 4	284.361	-617.044	-704.889
* 5	4.000	C- 4	-521.465	-1173.681	-704.889	C- 4	-521.465	-1173.681	-704.889
6 - 5	4.250	C- 4	-834.213	-1328.303	-704.889	C- 4	-834.213	-1328.303	-704.889
6 - 1	0.000	C- 4	-834.213	1328.303	-704.889	C- 4	-834.213	1328.303	-704.889
* 1	0.250	C- 4	-521.465	1173.681	-704.889	C- 4	-521.465	1173.681	-704.889
* 2	1.150	C- 4	284.361	617.044	-704.889	C- 4	284.361	617.044	-704.889
* 3	2.000	C- 4	585.421	91.332	-704.889	C- 4	585.421	91.332	-704.889
* 4	2.850	C- 4	439.626	-434.381	-704.889	C- 4	439.626	-434.381	-704.889
* 5	3.750	C- 4	-201.804	-991.017	-704.889	C- 4	-201.804	-991.017	-704.889
1 - 6	4.250	C- 4	-774.623	-1300.260	-704.889	C- 4	-774.623	-1300.260	-704.889
3 - 6	0.000	C- 4	0.000	0.000	-2583.327	C- 4	0.000	0.000	-2583.327
* 1	2.250	C- 4	0.000	0.000	-2619.966	C- 4	0.000	0.000	-2619.966
6 - 3	4.500	C- 4	0.000	0.000	-2656.605	C- 4	0.000	0.000	-2656.605

Retaining wall

Shape-U wall of NO①~④ BOX FOR DRAINAGE



the factor of earth pressure

$r = 19.6\ KN/m^3 \quad \phi = 35°$

$$k = \tan^2(45° - \frac{\phi}{2}) = \tan^2(45° - \frac{35°}{2}) = 0.271 \fallingdotseq 0.300$$

notice

the calculation point takeup gravity to structure

1) calculation of bending moment and shearing force weight of side wall

$$Ws = 2 \times 23.6 \times 0.40 \times 3.00 \quad \begin{matrix}(2.050)\\(38.704)\end{matrix} = 56.640\ KN/m$$

reaction of contact pressure for bottom slab

$$qb = Ws/l = 56.640 / 5.50 \quad \begin{matrix}(38.704)\\(6.90)\\(5.600)\end{matrix} = 10.300\ KN/m$$

calculation of moment and shear for side wall

$$Ms = -\frac{1}{6} \times 19.60 \times 0.30 \times 3.20^3 \quad \begin{matrix}(2.25^3)\\(-11.2)\end{matrix} = -32.2\ KNm$$

$$S = \frac{1}{2} \times 19.60 \times 0.30 \times 3.00^2 \quad \begin{matrix}(2.05^2)\\(12.4)\end{matrix} = 26.5\ KN$$

calculation of moment and shear for bottom slab

$$Mb = Ms + \frac{1}{8} ql^2 = -32.2 + \frac{1}{8} \times 10.30 \times 5.50^2 \quad \begin{matrix}(-11.2)\\(5.60)\\(6.90^2)\\(22.2)\end{matrix} = 6.8\ KNm$$

$$Sb = -\frac{1}{2} ql = -\frac{1}{2} \times 10.30 \times 5.50 \quad \begin{matrix}(5.60)\\(6.90)\\(19.4)\end{matrix} = 28.4\ KN$$

2) calculation of stress for reinforced bar and concrete

a) side wall (U, L, S)

$M = -60.4 \times 1.5 \times 1.15 = -104.3 \text{KNm}$

$S = 40.3 \times 1.5 \times 1.15 = 69.5 \text{ KN}$

AS = D16-200 ^{CTC}

notice

this section abridge from calculation of bottom slab

b) bottom slab (U, L, S)

$M = 80.1 \times 1.5 \times 1.15 = 138.2 \text{ KNm}$

$S = 43.7 \times 1.5 \times 1.15 = 75.4 \text{ KN}$

b=100 h=50 d=44.0 d'=6.0

As = D16-200^{ctc} = 2.011 / 0.200 = 10.055cm^2

$$P = \frac{10.055}{100 \times 44.0} = 0.228\% > 0.15\%$$

$$X = \frac{0.87 \times 41000 \times 10.055}{0.40 \times 2500 \times 100} \fallingdotseq 5.000\text{cm}$$

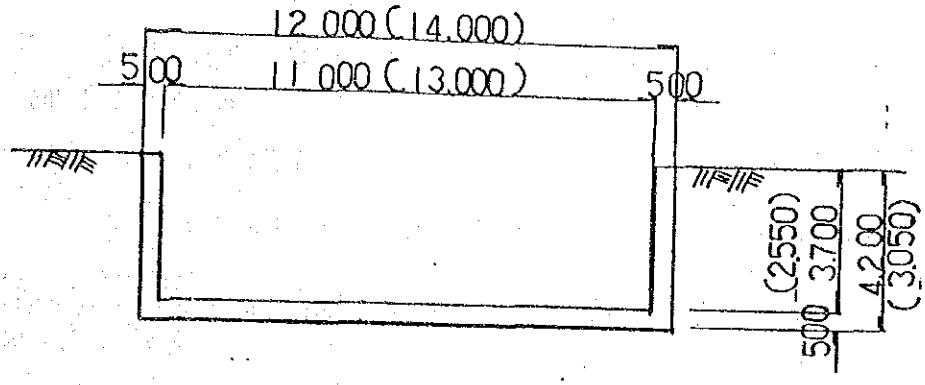
$$Z = 44.0 - \frac{1}{2} \times 5.0 = 41.5\text{cm} < 0.95 \times 44.0 = 41.8\text{cm}$$

$MRS = 0.87 \times 41000 \times 10.055 \times 41.5 \times 10^{-5} = 148.8 \text{ KNm} > M = 138.2 \text{ KNm}$

$$\tau = \frac{75.4 \times 10^3}{100 \times 44.0} = 17.2 \text{ N/cm}^2 < \tau a = 35.0 \times \frac{0.228}{0.25} \fallingdotseq 32.0 \text{ N/cm}^2 \quad \text{OK}$$

Retaining wall

Shape-U wall of NO⑤ BOX FOR DRAINAGE



1) calculation of bending moment and shearing force weight of side wall

$$Ws = 2\times 23.6\times 0.50\times \underset{(2.55)}{3.70} = \underset{(60.180)}{87.320}\ KN/m$$

reaction of contact pressure for bottom slab

$$qb = ws/l = \underset{(60.180)}{87.320} / \underset{(13.50)}{11.50} = \underset{(4.460)}{7.600}\ KN/m$$

calculation of moment and shear for side wall

$$M = \frac{1}{6}\times 19.6\times 0.300\times \underset{(2.80^3)}{3.95^3} = \underset{(-21.5)}{-60.4}\ KNm$$

$$S = \frac{1}{2}\times 19.6\times 0.30\times \underset{(2.55^2)}{3.70^2} = \underset{(19.2)}{40.3}\ KN$$

calculation of moment and shear for bottom slab

$$M = \underset{(-21.5)}{-60.4} + \frac{1}{8}\underset{(4.460\times 13.50^2)}{7600\times 11.50^2} = \underset{(80.1)}{65.3}\ KNm$$

$$S = \frac{1}{2}\times \underset{(4.460\times 13.50)}{7.60\times 11.50} = \underset{(30.1)}{43.7}\ KN$$

2) calculation of stress for reinforced bar and concrete

a) side wall (U, L, S)

$M = -32.2 \times 1.5 \times 1.15 = 55.4$ KN

$S = 26.5 \times 1.5 \times 1.15 = 45.7$ KN

b=100cm h=40 d=34.0 d'=6.0

$AS = Y16-300^{CTC} = 2.011 cm^2 / 0.300 = 6.703\ cm^2$

$$P = \frac{AS}{bd} \times 100 = \frac{6.703}{100 \times 34.0} \times 100 = 0.197\% > 0.150\%$$

$$X = \frac{0.87 \times 41000 \times 6.703}{0.40 \times 2500 \times 100} = 2.40 \text{ cm}$$

$$Z = 34.0 - \frac{1}{2} \times 2.40 = 32.3 \text{ cm} \leqq 0.95 \times 34.0 = 32.3 \text{ cm}$$

$MRS = 0.87 \times 41000 \times 6.703 \times 32.3 \times 10^{-5} = 77.2$ KNm $> M = 55.4$ KNm

$MRC = 0.40 \times 2500 \times 100 \times 2.40 \times 32.3 \times 10^{-5} = 77.5$ KNm $> M = 55.4$ KNm

$$= \frac{45.7 \times 10^3}{100 \times 340} = 13.5\ N/cm^2 < \tau a = 35.0 \times \frac{0.197}{0.250} = 27.6\ N/cm^2 \quad OK$$

b) bottom slab

$M = 22.2 \times 1.5 \times 1.15 = 38.3$KNm

$S = 28.4 \times 1.5 \times 1.15 = 49.0$ KN

$\therefore AS = Y16-300^{CTC}$

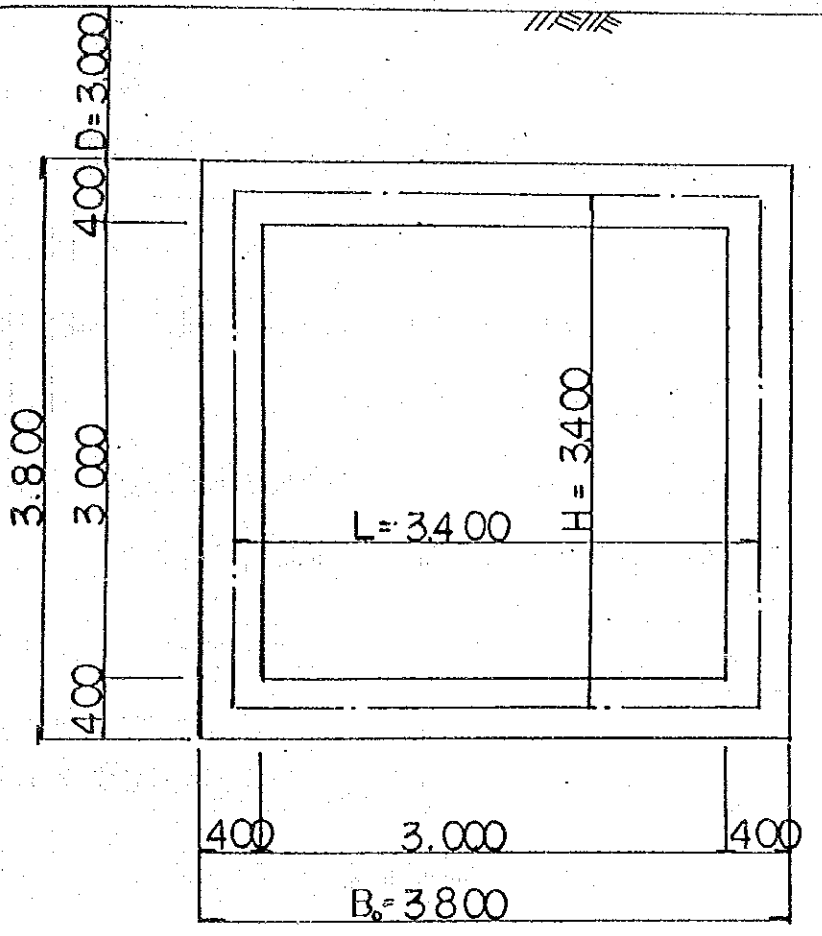
notice

this section abridge from calculation of side wall

PEDESTRIAN BOX CULVERTS

NO① BOX CULVERT FOR FOOTPATH

1) Shape and Size



Where ··· D^m = depth of asphalt and similar surface soil.

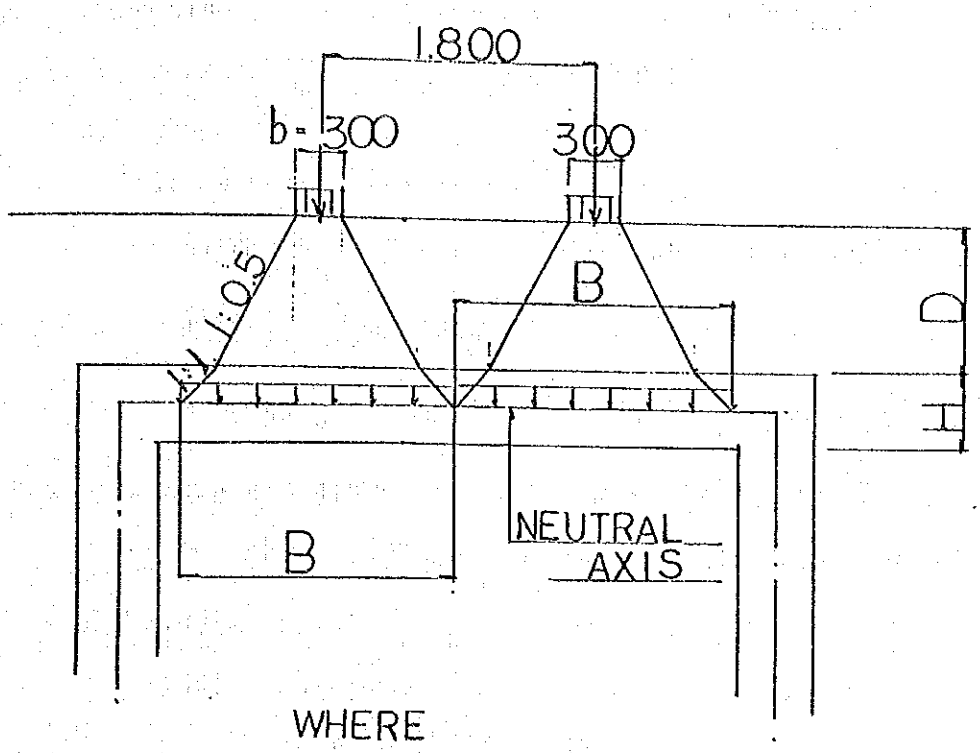
2) Factor of section

$A = 1.00 \times 0.40 = 0.4000\ m^2$

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

$Ec = 25\ kN/mm^2 = 2.5 \times 10^7\ kN/m^2$

LIVE LOAD --- HB loading



WHERE

D = DEPTH OF ASPHALT AND SIMILAR SURFACE SOIL

H = DEPTH OF CONCRTE SLAB

DISPERSAL OF WHEEL

$$B^{m} = b + D + H$$

LOADED STRENGTH

$$P = \frac{10.0 \times Uno}{B \times L} \quad (KN/m^2)$$

WHERE

Uno = NUMBER OF UNITS = 30

L = WIDTH OF HB-VEHICLE = 3.500^{m}

No.① BOX CULVERT FOR FOOTPATH (D=3.000m)

section b=100cm h=40 d =34.0(35.0) d´ =6.0(5.0)

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

a) intersection point①=④ Mu.min =−127.4KNm

(intersection point②=③ Mu.min =−109.5KNm)

$A_s = Y_{16} - 150^{ctc} = 2.011/0.150 = 13.40\ cm^2$

$$X = \frac{0.87\times 41000 \times 13.40}{0.40\times 2500\times 100} \fallingdotseq 4.8\ cm$$

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

$M_{RS} = 0.87\times 41000 \times 13.40 \times 31.6\times 10^{-5} = 151.0^{KNm} > Mu = 127.4^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 4.8 \times 31.6\times 10^{-5} = 151.6^{KNm} > Mu = 127.4^{KNm}$ OK

b) middle point ④~① Mu.max =125.3KNm

(middle point ②~③ Mu.max =116.0KNm)

$A_s = Y_{16} - 150^{ctc} = 13.40\ cm^2$

$M_R \fallingdotseq 151.0^{KNm} > Mu = 125.3^{KNm}$

c) middle point ①~②=③~④ Mu.max =52.2KNm

$A_s = Y_{16} - 300^{ctc} = 6.70\ cm^2$

$$X = \frac{0.87\times 41000 \times 6.70}{0.40\times 2500\times 100} = 3.60^{cm}$$

$$Z = 35.0 - \frac{3.6}{2} = 33.2^{cm} \fallingdotseq 0.95\times 35.0 = 33.2^{cm}$$ OK

$M_{RS} = 0.87\times 41000 \times 6.70\times 33.2\times 10^{-5} = 79.3^{KNm} > 52.2^{KNm}$

$M_{RC} = 0.40\times 2500\times 100 \times 3.60\times 33.2\times 10^{-5} = 119.5^{KNm} > Mu = 52.2^{KNm}$ OK

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

intersection point①=④ Su.max =146.1KN

(intersection point②=③ Su.max =136.5KN)

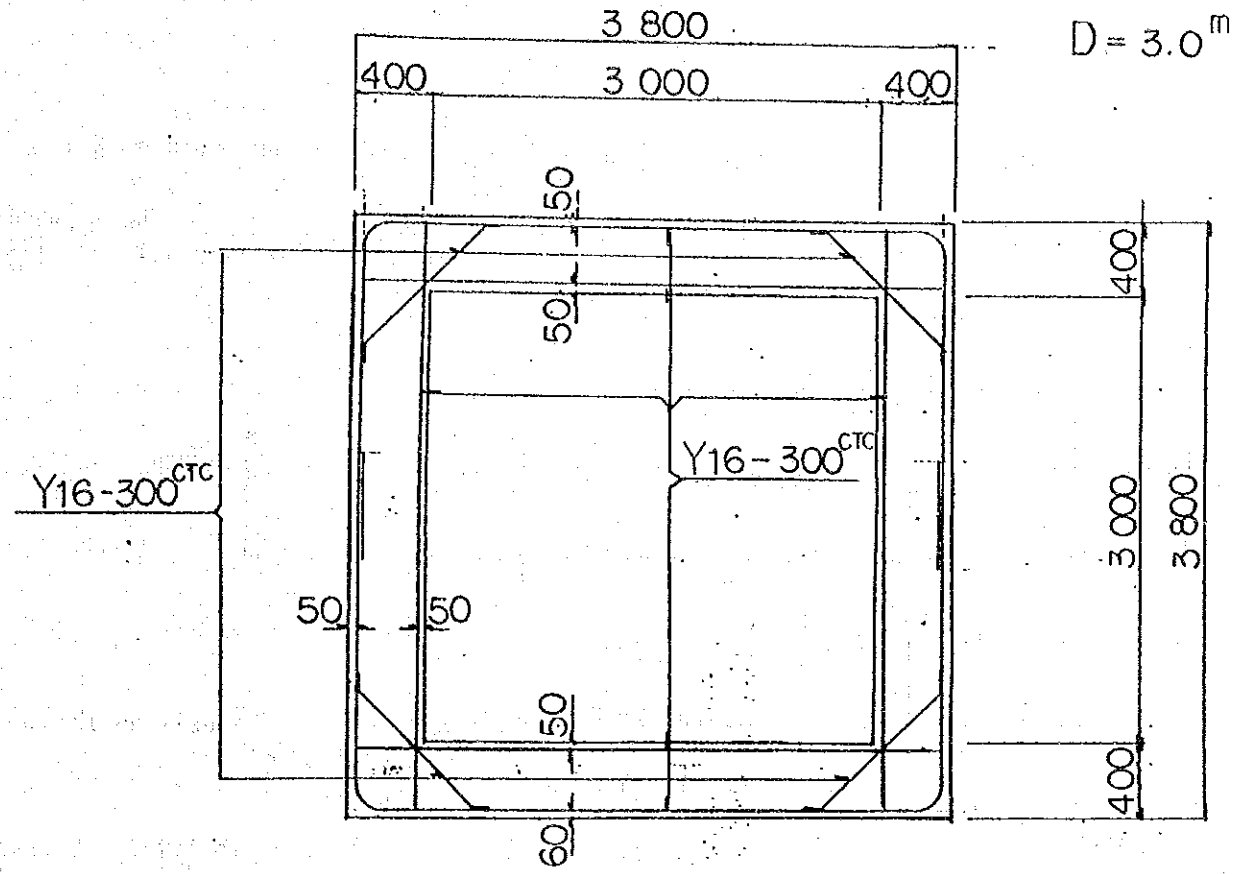
$A_s = Y_{16} - 150^{ctc} = 13.40\ cm^2$

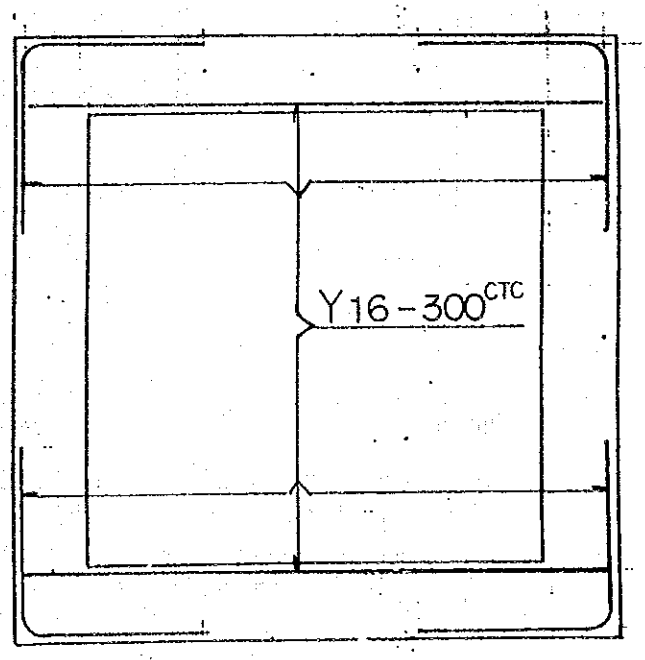
$$P = \frac{13.40}{100\times 34.0}\times 100 = 0.394\ \%$$

$$Vc = \frac{146.1\times 10^3}{100\times 34.0} = 43.0\ N/cm^2$$

$$< Vca = 35.0 + 15.0\ \frac{(0.394-0.250)}{0.250} = 43.6\ N/cm^2$$ OK

NO ① BOX CULVERT FOR FOOTPATH





NO① BOX CULVERT FOR FOOTPATH (D=3.000m)

. Load

1)Dead load

a)Vertical load

For upper slab w1 = 22.6×0.50+19.6×2.50+23.6×0.40 = 69.740 kN/m

For side wall w2 = 23.6×0.40 = 9.440 〃

For bottom slab $w3 = 69.74 + \frac{2\times 9.440\times 3.40}{3.40}$ = 88.620 〃

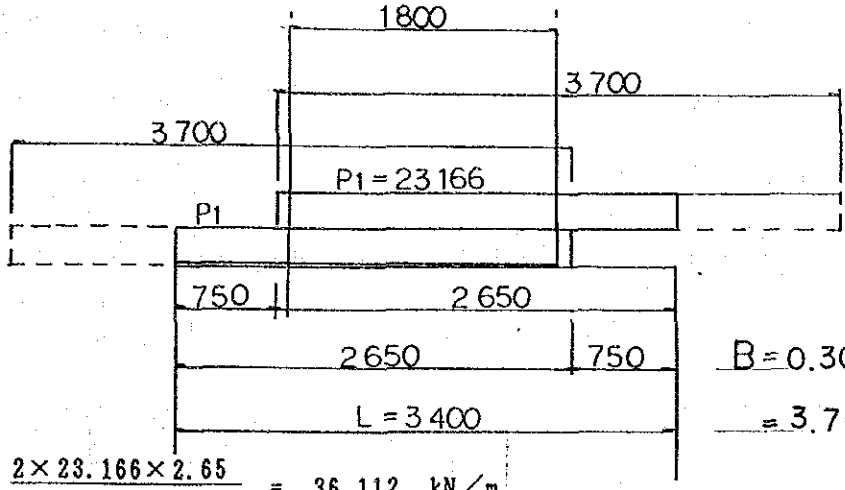
b)Horizontal load (earth pressure)

For side slab pe1 = (22.6×0.50+19.6×2.70) ×0.500 = 32.110 kN/m

〃 pe2 = (22.6×0.50+19.6×6.10) ×0.500 = 65.430 〃

2)Live load

case-1 Vertical load of symmetry



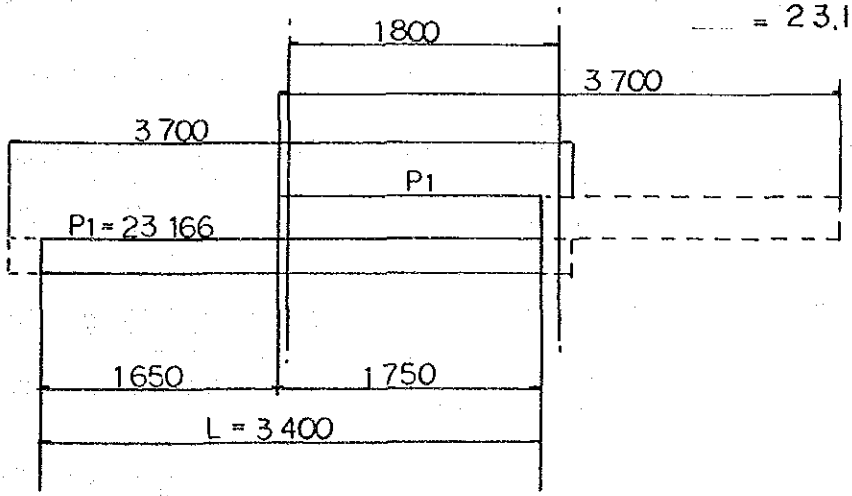
B=0.30+3.00+0.40
=3.700 m

For bottom slab

$P2 = \frac{2\times 23.166\times 2.65}{3.40}$ = 36.112 kN/m

$P = \frac{10\times 30}{3.70\times 3.50}$
= 23.166 KN/m

case-2 Vertical load of partial for sentral span



For bottom slab

$P2 = \frac{23.166(3.40+1.750)}{3.40} \pm \frac{6\times 23.166\times 1.75\times 0.825}{3.40^2}$

= 35.090 ± 17.359 = P2-1 = 52.449 kN/m, P2-2 = 17.731 〃

case-3 Horizontal load ------ earth pressure of live load surcharge

Live load surcharge : $go = \frac{40.0\times 30.0}{3.50\times 10.0}$ = 34.300 kN/m²

For side wall : Pe = 34.300 × 0.500 = 17.150 kN/m²

Where Loaded strength = P1

B = 0.300+3.00+0.400 = 3.700 m

$P1 = \frac{10.0\times 30.0}{3.70\times 3.50}\times 1.00$ = 23.166 kN/m

BOX FOR FOOTPATH Depth = 3.000

NO.1 BOX

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

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

No	I - J	A (m2)	I (m4)	I - J	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	3.400	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	3.400	2.50E+07	1.00E-05

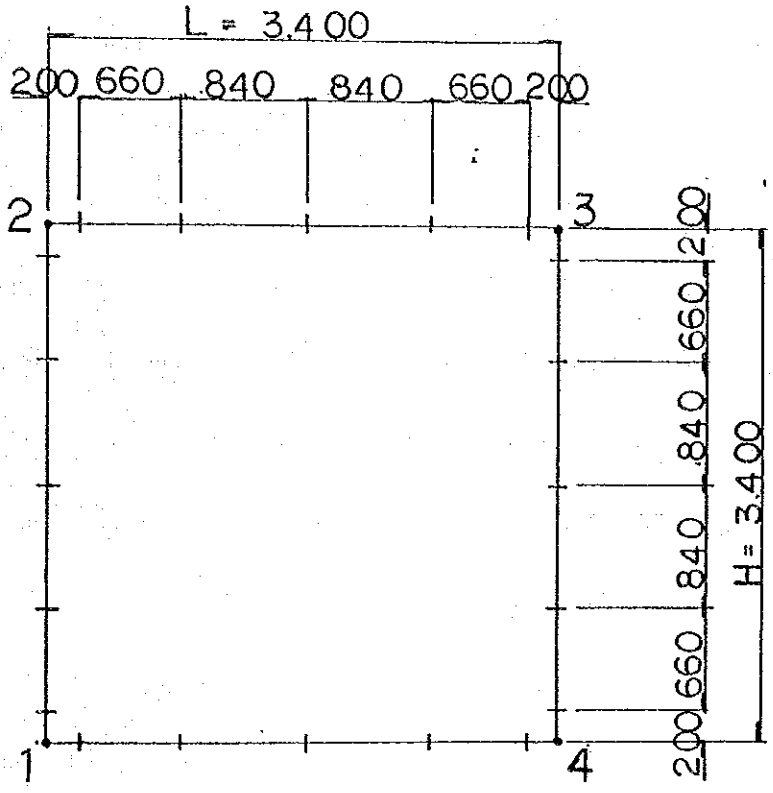
BOX FOR FOOTPATH

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

BOX FOR FOOTPATH

No		L-No 1 / 11	L-No 2 / 12	L-No 3 / 13	L-No 4 / 14	L-No 5 / 15	L-No 6 / 16	L-No 7 / 17	L-No 8 / 18	L-No 9 / 19	L-No 10 / 20
1	5	0.200	0.860	1.700	2.540	3.200					
2	5	0.200	0.860	1.700	2.540	3.200					
3	5	0.200	0.860	1.700	2.540	3.200					
4	5	0.200	0.860	1.700	2.540	3.200					

CALCULATION POINTS OF EACH FORCE



: Dead load
No. : 1

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-Y	0.000	3.400	-9.440	-9.440
3	3-	4	-Y	0.000	3.400	-9.440	-9.440
2	2-	3	-Y	0.000	3.400	-69.740	-69.740
4	4-	1	-Y	0.000	3.400	88.620	88.620

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: Earth pressure load
No. : 2

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	3.400	65.430	32.110
3	3-	4	-X	0.000	3.400	-32.110	-65.430

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: HB live load-VL-
No. : 3

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	2.650	-23.166	-23.166
2	2-	3	-Y	0.750	2.650	-23.166	-23.166
4	4-	1	-Y	0.000	3.400	36.112	36.112

BOX FOR FOOTPATH

: HB live load-VL-
No. : 4

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	1.750	-23.166	-23.166
2	2-	3	-Y	0.000	3.400	-23.166	-23.166
4	4-	1	-Y	0.000	3.400	17.731	52.449

ΣV = 0.001 (t)
ΣH = 0.000 (t)

BOX FOR FOOTPATH

: HB live load-HL-
No. : 5

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	3.400	17.150	17.150
3	3-	4	-X	0.000	3.400	-17.150	-17.150

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR FOOTPATH

No No	C-No 1 No 6	C-No 2 No 7	C-No 3 No 8
No 1	1.3800	1.3800	1.3800
No 2	1.6500	1.6500	1.6500
No 3	1.4300	0.0000	0.0000
No 4	0.0000	1.4300	0.0000
No 5	0.0000	0.0000	1.6500

BOX FOR FOOTPATH

No 1 : 6 7 8

BOX FOR FOOTPATH

No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. 2 RX (t)	RY (t)	RM (tm)	Case. 3 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 4 RX (t)	RY (t)	RM (tm)	Case. 5 RX (t)	RY (t)	RM (tm)	Case. 6 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
4.	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	-0.001	0.000

No.	Case. 7 RX (t)	RY (t)	RM (tm)	Case. 8 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000
4.	0.000	-0.001	0.000	0.000	0.000	0.000

No.	Case. 1 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 2 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 3 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	5.15873	0.00000	0.00000	-3.09193	0.00000	0.00000	2.2868
2.	-0.01359	-0.45766	-4.57264	-0.03359	0.00000	2.90199	0.00320	-0.20873	-2.4250
3.	0.00000	-0.45766	4.57264	-0.28189	0.00000	-2.90199	0.00000	-0.20873	2.4250
4.	-0.01359	0.00000	-5.15873	-0.31548	0.00000	3.09193	0.00320	0.00000	-2.2868

No.	Case. 4 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 5 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 6 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	2.26373	0.00000	0.00000	-1.05388	0.00000	0.00000	5.2875
2.	0.02511	-0.23802	-2.28370	0.00000	0.00000	1.05388	-0.06960	-0.93005	-4.9897
3.	0.02499	-0.16761	2.04463	-0.09913	0.00000	-1.05388	-0.46512	-0.93005	4.9897
4.	0.00012	0.00000	-2.05406	-0.09913	0.00000	1.05388	-0.53471	0.00000	-5.2875

No.	Case. 7 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 8 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	5.25450	0.00000	0.00000	0.27846
2.	-0.03827	-0.97194	-4.78765	-0.07418	-0.63157	0.21696
3.	-0.42938	-0.87126	4.44578	-0.62868	-0.63157	-0.21696
4.	-0.53912	0.00000	-4.95467	-0.70286	0.00000	-0.27846

BOX FOR FOOTPATH

No	L(m)	Case 1 Dead load M (tm)	S (t)	N (t)	Case 2 Earth pressure load M (tm)	S (t)	N (t)	Case 3 HB live load-VL- M (tm)	S (t)	N (t)
1- 2	0.000	-44.935	3.998	-150.654	-24.235	92.788	0.000	-16.863	-0.943	-61.390
* 1	0.200	-44.136	3.998	-148.766	-6.973	79.898	0.000	-17.052	-0.943	-61.390
* 2	0.860	-41.497	3.998	-142.536	32.405	40.142	0.000	-17.674	-0.943	-61.390
* 3	1.700	-38.138	3.998	-134.606	46.982	-4.282	0.000	-18.466	-0.943	-61.390
* 4	2.540	-34.780	3.998	-126.676	27.147	-41.792	0.000	-19.258	-0.943	-61.390
* 5	3.200	-32.141	3.998	-120.446	-8.796	-66.412	0.000	-19.880	-0.943	-61.390
2- 1	3.400	-31.341	3.998	-118.558	-22.746	-73.030	0.000	-20.068	-0.943	-61.390
2- 3	0.000	-31.341	118.558	3.998	-22.746	0.000	-73.030	-20.068	61.390	-0.943
* 1	0.200	-9.025	104.610	3.998	-22.746	0.000	-73.030	-8.254	56.757	-0.943
* 2	0.860	44.829	58.582	3.998	-22.746	0.000	-73.030	24.020	38.919	-0.943
* 3	1.700	69.433	0.000	3.998	-22.746	0.000	-73.030	40.366	0.000	-0.943
* 4	2.540	44.829	-58.582	3.998	-22.746	0.000	-73.030	24.020	-38.919	-0.943
* 5	3.200	-9.025	-104.610	3.998	-22.746	0.000	-73.030	-8.254	-56.757	-0.943
3- 2	3.400	-31.341	-118.558	3.998	-22.746	0.000	-73.030	-20.068	-61.390	-0.943
3- 4	0.000	-31.341	-3.998	-118.558	-22.746	73.030	0.000	-20.068	0.943	-61.390
* 1	0.200	-32.141	-3.998	-120.446	-8.796	66.412	0.000	-19.880	0.943	-61.390
* 2	0.860	-34.780	-3.998	-126.676	27.147	41.792	0.000	-19.258	0.943	-61.390
* 3	1.700	-38.138	-3.998	-134.606	46.982	4.282	0.000	-18.466	0.943	-61.390
* 4	2.540	-41.497	-3.998	-142.536	32.405	-40.142	0.000	-17.674	0.943	-61.390
* 5	3.200	-44.136	-3.998	-148.766	-6.973	-79.898	0.000	-17.052	0.943	-61.390
4- 3	3.400	-44.935	-3.998	-150.654	-24.235	-92.788	0.000	-16.863	0.943	-61.390
4- 1	0.000	-44.935	150.654	-3.998	-24.235	0.000	-92.788	-16.863	61.390	0.943
* 1	0.200	-16.577	132.930	-3.998	-24.235	0.000	-92.788	-5.308	54.168	0.943
* 2	0.860	51.856	74.441	-3.998	-24.235	0.000	-92.788	22.578	30.334	0.943
* 3	1.700	83.121	0.000	-3.998	-24.235	0.000	-92.788	35.318	0.000	0.943
* 4	2.540	51.856	-74.441	-3.998	-24.235	0.000	-92.788	22.578	-30.334	0.943
* 5	3.200	-16.577	-132.930	-3.998	-24.235	0.000	-92.788	-5.308	-54.168	0.943
1- 4	3.400	-44.935	-150.654	-3.998	-24.235	0.000	-92.788	-16.863	-61.390	0.943

No	L(m)	Case 4 HB live load-VL- M (tm)	S (t)	N (t)	Case 5 HD live load-HL- M (tm)	S (t)	N (t)	Case 6 M (tm)	S (t)	N (t)
1- 2	0.000	-17.761	-0.036	-70.007	-8.261	29.155	0.000	-126.114	157.269	-295.690
* 1	0.200	-17.768	-0.036	-70.007	-2.773	25.725	0.000	-96.797	136.000	-293.085
* 2	0.860	-17.792	-0.036	-70.007	10.471	14.406	0.000	-29.072	70.403	-284.487
* 3	1.700	-17.822	-0.036	-70.007	16.521	0.000	0.000	-1.517	-2.897	-273.544
* 4	2.540	-17.852	-0.036	-70.007	10.471	-14.406	0.000	-30.743	-64.787	-262.601
* 5	3.200	-17.876	-0.036	-70.007	-2.773	-25.725	0.000	-87.296	-105.411	-254.003
2- 1	3.400	-17.883	-0.036	-70.007	-8.261	-29.155	0.000	-109.481	-116.331	-251.398
2- 3	0.000	-17.883	70.007	-0.036	-8.261	0.000	-29.155	-109.481	251.398	-116.331
* 1	0.200	-4.808	60.740	-0.036	-8.261	0.000	-29.155	-61.789	225.524	-116.331
* 2	0.860	25.189	30.161	-0.036	-8.261	0.000	-29.155	58.680	136.497	-116.331
* 3	1.700	34.179	-8.758	-0.036	-8.261	0.000	-29.155	116.009	0.000	-116.331
* 4	2.540	17.705	-29.375	-0.036	-8.261	0.000	-29.155	58.680	-136.497	-116.331
* 5	3.200	-6.728	-44.665	-0.036	-8.261	0.000	-29.155	-61.789	-225.524	-116.331
3- 2	3.400	-16.124	-49.298	-0.036	-8.261	0.000	-29.155	-109.481	-251.398	-116.331
3- 4	0.000	-16.124	0.036	-49.298	-8.261	29.155	0.000	-109.481	116.331	-251.398
* 1	0.200	-16.117	0.036	-49.298	-2.773	25.725	0.000	-87.296	105.411	-254.003
* 2	0.860	-16.093	0.036	-49.298	10.471	14.406	0.000	-30.743	64.787	-262.601
* 3	1.700	-16.063	0.036	-49.298	16.521	0.000	0.000	-1.517	2.897	-273.544
* 4	2.540	-16.033	0.036	-49.298	10.471	-14.406	0.000	-29.072	-70.403	-284.487
* 5	3.200	-16.009	0.036	-49.298	-2.773	-25.725	0.000	-96.797	-136.000	-293.085
4- 3	3.400	-16.002	0.036	-49.298	-8.261	-29.155	0.000	-126.114	-157.269	-295.690
4- 1	0.000	-16.002	49.299	0.036	-8.261	0.000	-29.155	-126.114	295.691	-157.269
* 1	0.200	-6.511	45.549	0.036	-8.261	0.000	-29.155	-70.454	260.904	-157.269
* 2	0.860	18.756	30.274	0.036	-8.261	0.000	-29.155	63.859	146.106	-157.269
* 3	1.700	33.824	4.401	0.036	-8.261	0.000	-29.155	125.224	0.000	-157.269
* 4	2.540	24.132	-28.677	0.036	-8.261	0.000	-29.155	63.859	-146.106	-157.269
* 5	3.200	-4.795	-59.721	0.036	-8.261	0.000	-29.155	-70.454	-260.904	-157.269
1- 4	3.400	-17.761	-70.007	0.036	-8.261	0.000	-29.155	-126.114	-295.691	-157.269

BOX FOR FOOTPATH

	No	L(m)	Case 7 M (tm)	S (t)	N (t)	Case 8 M (tm)	S (t)	N (t)
1-	2	0.000	-127.397	158.565	-308.012	-115.629	206.723	-207.903
*	1	0.200	-97.821	137.297	-305.407	-76.988	179.795	-205.297
*	2	0.860	-29.240	71.700	-296.809	13.479	95.521	-196.699
*	3	1.700	-0.596	-1.600	-285.866	52.149	-1.549	-185.756
*	4	2.540	-28.733	-63.490	-274.923	14.072	-87.209	-174.813
*	5	3.200	-84.430	-104.115	-266.325	-63.442	-146.509	-166.215
2-	1	3.400	-106.356	-115.034	-263.720	-94.413	-163.089	-163.610
2-	3	0.000	-106.356	263.720	-115.034	-94.413	163.610	-163.089
*	1	0.200	-56.862	231.220	-115.034	-63.616	144.362	-163.089
*	2	0.860	60.352	123.973	-115.034	10.702	80.843	-163.089
*	3	1.700	107.161	-12.523	-115.034	44.656	0.000	-163.089
*	4	2.540	49.650	-122.849	-115.034	10.702	-80.843	-163.089
*	5	3.200	-59.607	-208.233	-115.034	-63.616	-144.362	-163.089
3-	2	3.400	-103.841	-234.106	-115.034	-94.413	-163.610	-163.089
3-	4	0.000	-103.841	115.034	-234.106	-94.413	163.089	-163.610
*	1	0.200	-81.915	104.115	-236.712	-63.442	146.509	-166.215
*	2	0.860	-26.218	63.490	-245.310	14.072	87.209	-174.813
*	3	1.700	1.919	1.600	-256.253	52.149	1.549	-185.756
*	4	2.540	-26.725	-71.700	-267.195	13.479	-95.521	-196.699
*	5	3.200	-95.306	-137.297	-275.793	-76.988	-179.795	-205.297
4-	3	3.400	-124.882	-158.565	-278.399	-115.629	-206.723	-207.903
4-	1	0.000	-124.882	278.400	-158.565	-115.629	207.903	-206.723
*	1	0.200	-72.174	248.578	-158.565	-76.494	183.443	-206.723
*	2	0.860	58.393	146.020	-158.565	17.942	102.728	-206.723
*	3	1.700	123.086	6.294	-158.565	61.088	0.000	-206.723
*	4	2.540	66.081	-143.736	-158.565	17.942	-102.728	-206.723
*	5	3.200	-69.721	-268.845	-158.565	-76.494	-183.443	-206.723
1-	4	3.400	-127.397	-308.013	-158.565	-115.629	-207.903	-206.723

BOX FOR FOOTPATH

PICK-UP No. 1 *

No.	L (m)	M. MAXIMUM Case	M (tm)	S (t)	N (t)	M. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 8	-115.629	206.723	-207.903	C- 7	-127.397	158.565	-308.012
* 1	0.200	C- 8	-76.988	179.795	-205.297	C- 7	-97.821	137.297	-305.407
* 2	0.860	C- 8	13.479	95.521	-196.699	C- 7	-29.240	71.700	-296.809
* 3	1.700	C- 8	52.149	-1.549	-185.756	C- 6	-1.517	-2.897	-273.544
* 4	2.540	C- 8	14.072	-87.209	-174.813	C- 6	-30.743	-64.787	-262.601
* 5	3.200	C- 8	-63.442	-146.509	-166.215	C- 6	-87.296	-105.411	-254.003
2 - 1	3.400	C- 8	-94.413	-163.089	-163.610	C- 6	-109.481	-116.331	-251.398
2 - 3	0.000	C- 8	-94.413	163.610	-163.089	C- 6	-109.481	251.398	-116.331
* 1	0.200	C- 7	-56.862	231.220	-115.034	C- 8	-63.616	144.362	-163.089
* 2	0.860	C- 7	60.352	123.973	-115.034	C- 8	10.702	80.843	-163.089
* 3	1.700	C- 6	116.009	0.000	-116.331	C- 8	44.656	0.000	-163.089
* 4	2.540	C- 6	58.680	-136.497	-116.331	C- 8	10.702	-80.843	-163.089
* 5	3.200	C- 7	-59.607	-208.233	-115.034	C- 8	-63.616	-144.362	-163.089
3 - 2	3.400	C- 8	-94.413	-163.610	-163.089	C- 6	-109.481	-251.398	-116.331
3 - 4	0.000	C- 8	-94.413	163.089	-163.610	C- 6	-109.481	116.331	-251.398
* 1	0.200	C- 8	-63.442	146.509	-166.215	C- 6	-87.296	105.411	-254.003
* 2	0.860	C- 8	14.072	87.209	-174.813	C- 6	-30.743	64.787	-262.601
* 3	1.700	C- 8	52.149	1.549	-185.756	C- 6	-1.517	2.897	-273.544
* 4	2.540	C- 8	13.479	-95.521	-196.699	C- 6	-29.072	-70.403	-284.487
* 5	3.200	C- 8	-76.988	-179.795	-205.297	C- 6	-96.797	-130.000	-293.085
4 - 3	3.400	C- 8	-115.629	-206.723	-207.903	C- 6	-126.114	-157.269	-295.690
4 - 1	0.000	C- 8	-115.629	207.903	-206.723	C- 6	-126.114	295.691	-157.269
* 1	0.200	C- 6	-70.454	260.904	-157.269	C- 8	-76.494	183.443	-206.723
* 2	0.860	C- 6	63.859	146.106	-157.269	C- 8	17.942	102.728	-206.723
* 3	1.700	C- 6	125.224	0.000	-157.269	C- 8	61.088	0.000	-206.723
* 4	2.540	C- 7	66.081	-143.736	-158.565	C- 8	17.942	-102.728	-206.723
* 5	3.200	C- 7	-69.721	-268.845	-158.565	C- 8	-76.494	-183.443	-206.723
1 - 4	3.400	C- 8	-115.629	-207.903	-206.723	C- 7	-127.397	-308.013	-158.565

PICK-UP No. 1 *

No.	L (m)	S. MAXIMUM Case	M (tm)	S (t)	N (t)	S. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 8	-115.629	206.723	-207.903	C- 6	-126.114	157.269	-295.690
* 1	0.200	C- 8	-76.988	179.795	-205.297	C- 6	-96.797	136.000	-293.085
* 2	0.860	C- 8	13.479	95.521	-196.699	C- 6	-29.072	70.403	-284.487
* 3	1.700	C- 8	52.149	-1.549	-185.756	C- 6	-1.517	-2.897	-273.544
* 4	2.540	C- 7	-28.733	-63.490	-274.923	C- 8	14.072	-87.209	-174.813
* 5	3.200	C- 7	-84.430	-104.115	-266.325	C- 8	-63.442	-146.509	-166.215
2 - 1	3.400	C- 7	-106.356	-115.034	-263.720	C- 8	-94.413	-163.089	-163.610
2 - 3	0.000	C- 7	-106.356	263.720	-115.034	C- 8	-94.413	163.610	-163.089
* 1	0.200	C- 7	-56.862	231.220	-115.034	C- 8	-63.616	144.362	-163.089
* 2	0.860	C- 6	58.680	136.497	-116.331	C- 8	10.702	80.843	-163.089
* 3	1.700	C- 8	44.656	0.000	-163.089	C- 7	107.161	-12.523	-115.034
* 4	2.540	C- 8	10.702	-80.843	-163.089	C- 6	58.680	-136.497	-116.331
* 5	3.200	C- 8	-63.616	-144.362	-163.089	C- 6	-61.789	-225.524	-116.331
3 - 2	3.400	C- 8	-94.413	-163.610	-163.089	C- 6	-109.481	-251.398	-116.331
3 - 4	0.000	C- 8	-94.413	163.089	-163.610	C- 7	-103.841	115.034	-234.106
* 1	0.200	C- 8	-63.442	146.509	-166.215	C- 7	-81.915	104.115	-236.712
* 2	0.860	C- 8	14.072	87.209	-174.813	C- 7	-26.216	63.490	-245.310
* 3	1.700	C- 6	-1.517	2.897	-273.544	C- 8	52.149	1.549	-185.756
* 4	2.540	C- 6	-29.072	-70.403	-284.487	C- 8	13.479	-95.521	-196.699
* 5	3.200	C- 6	-96.797	-136.000	-293.085	C- 8	-76.988	-179.795	-205.297
4 - 3	3.400	C- 6	-126.114	-157.269	-295.690	C- 8	-115.629	-206.723	-207.903
4 - 1	0.000	C- 6	-126.114	295.691	-157.269	C- 8	-115.629	207.903	-206.723
* 1	0.200	C- 6	-70.454	260.904	-157.269	C- 8	-76.494	183.443	-206.723
* 2	0.860	C- 6	63.859	146.106	-157.269	C- 8	17.942	102.728	-206.723
* 3	1.700	C- 7	123.086	6.294	-158.565	C- 6	125.224	0.000	-157.269
* 4	2.540	C- 8	17.942	-102.728	-206.723	C- 6	63.859	-146.106	-157.269
* 5	3.200	C- 8	-76.494	-183.443	-206.723	C- 7	-69.721	-268.845	-158.565
1 - 4	3.400	C- 8	-115.629	-207.903	-206.723	C- 7	-127.397	-308.013	-158.565

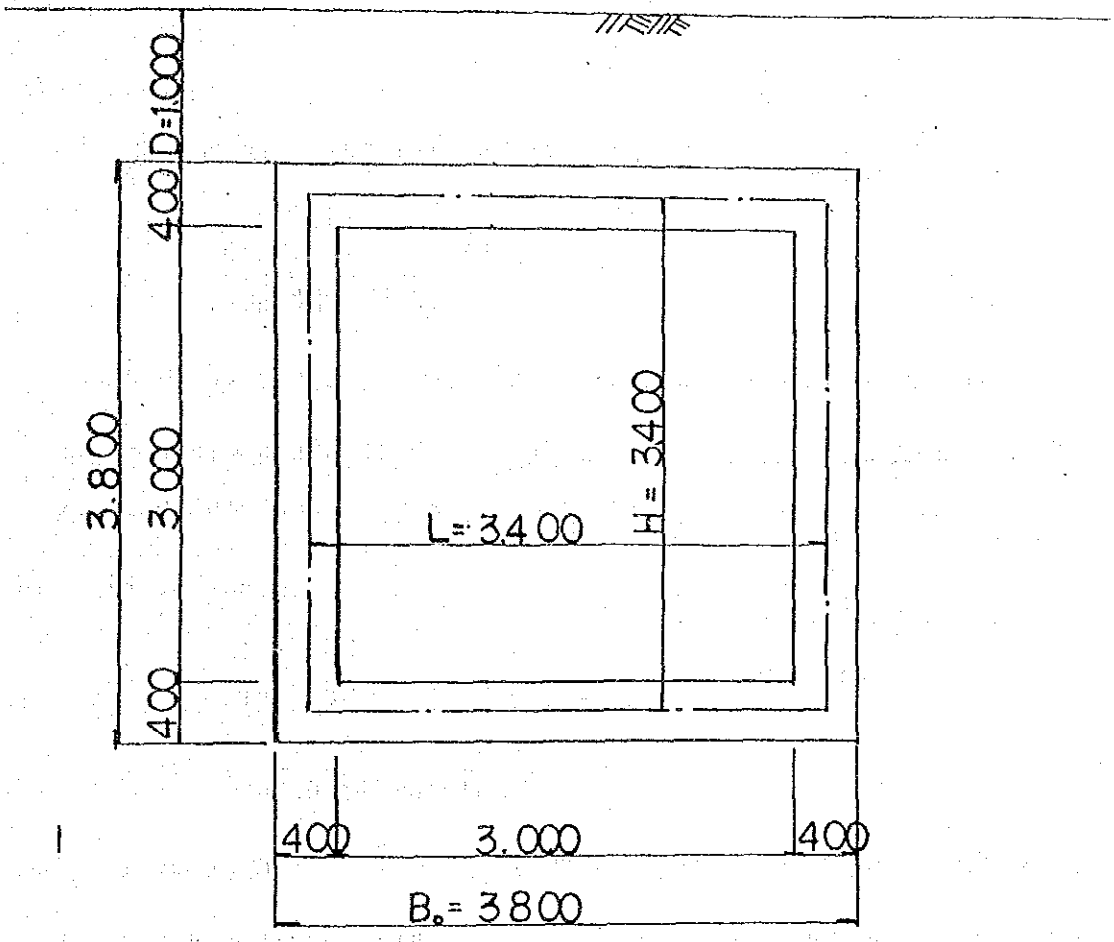
BOX FOR FOOTPATH

PICK-UP No. 1 *

No.	L (m)	N. MAXIMUM Case	M (tm)	S (t)	N (t)	N. MINIMUM Case	M (tm)	S (t)	N (t)
1 - 2	0.000	C- 8	-115.629	206.723	-207.903	C- 7	-127.397	158.565	-308.012
* 1	0.200	C- 8	-76.988	179.795	-205.297	C- 7	-97.821	137.297	-305.407
* 2	0.860	C- 8	13.479	95.521	-196.699	C- 7	-29.240	71.700	-296.809
* 3	1.700	C- 8	52.149	-1.549	-185.756	C- 7	-0.596	-1.600	-285.866
* 4	2.540	C- 8	14.072	-87.209	-174.813	C- 7	-28.733	-63.490	-274.923
* 5	3.200	C- 8	-63.442	-146.509	-166.215	C- 7	-84.430	-104.115	-266.325
2 - 1	3.400	C- 8	-94.413	-163.089	-163.610	C- 7	-106.356	-115.034	-263.720
2 - 3	0.000	C- 7	-106.356	263.720	-115.034	C- 8	-94.413	163.610	-163.089
* 1	0.200	C- 7	-56.862	231.220	-115.034	C- 8	-63.616	144.362	-163.089
* 2	0.860	C- 7	60.352	123.973	-115.034	C- 8	10.702	80.843	-163.089
* 3	1.700	C- 7	107.161	-12.523	-115.034	C- 8	44.656	0.000	-163.089
* 4	2.540	C- 7	49.650	-122.849	-115.034	C- 8	10.702	-80.843	-163.089
* 5	3.200	C- 7	-59.607	-208.233	-115.034	C- 8	-63.616	-144.362	-163.089
3 - 2	3.400	C- 7	-103.841	-234.106	-115.034	C- 8	-94.413	-163.610	-163.089
3 - 4	0.000	C- 8	-94.413	163.089	-163.610	C- 6	-109.481	116.331	-251.398
* 1	0.200	C- 8	-63.442	146.509	-166.215	C- 6	-87.296	105.411	-254.003
* 2	0.860	C- 8	14.072	87.209	-174.813	C- 6	-30.743	64.787	-262.601
* 3	1.700	C- 8	52.149	1.549	-185.756	C- 6	-1.517	2.897	-273.544
* 4	2.540	C- 8	13.479	-95.521	-196.699	C- 6	-29.072	-70.403	-284.487
* 5	3.200	C- 8	-76.988	-179.795	-205.297	C- 6	-96.797	-136.000	-293.085
4 - 3	3.400	C- 8	-115.629	-206.723	-207.903	C- 6	-126.114	-157.269	-295.690
4 - 1	0.000	C- 6	-126.114	295.691	-157.269	C- 8	-115.629	207.903	-206.723
* 1	0.200	C- 6	-70.454	260.904	-157.269	C- 8	-76.494	183.443	-206.723
* 2	0.860	C- 6	63.859	146.106	-157.269	C- 8	17.942	102.728	-206.723
* 3	1.700	C- 6	125.224	0.000	-157.269	C- 8	61.088	0.000	-206.723
* 4	2.540	C- 6	63.859	-146.106	-157.269	C- 8	17.942	-102.728	-206.723
* 5	3.200	C- 6	-70.454	-260.904	-157.269	C- 8	-76.494	-183.443	-206.723
1 - 4	3.400	C- 6	-126.114	-295.691	-157.269	C- 8	-115.629	-207.903	-206.723

NO②③④BOX CULVERT FOR FOOTPATH

1) Shape and Size



Where ··· D^m = depth of asphalt and similar surface soil.

2) Factor of section

$A = 1.00 \times 0.40 = 0.4000\ m^2$

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

$E_C = 25\ kN/mm^2 = 2.5 \times 10^7\ kN/m^2$

No.②, ③and ④ BOX CULVERT FOR FOOTPATH (D=1.000m)

section b=100cm h=40 d =34.0(35.0) d´ =6.0(5.0)

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

1) For botton slab

a) intersection point①=④ Mu.min =−94.2KNm

$$A_s = \begin{cases} Y_{12}-300^{ctc} = 1.131/0.30 \\ Y_{16}-300^{ctc} = 2.011/0.30 \end{cases} = 10.47\ cm^2$$

$$X = \frac{0.87\times 41000\times 10.47}{0.40\times 2500\times 100} \fallingdotseq 3.8\ cm$$

$$Z = 34.0 - \frac{3.8}{2} = 32.1^{cm} < 0.95\times 34.0 = 32.3^{cm}\quad OK$$

$M_{RS} = 0.87\times 41000\times 10.47\times 32.1\times 10^{-5} = 119.5^{KNm} > Mu = 94.2^{KNm}$

$M_{RC} = 0.40\times 2500\times 100\times 3.8\times 32.1\times 10^{-5} = 122.0^{KNm} > Mu = 94.2^{KNm}$ OK

b) middle point ④~① Mu.max =105.5KNm

$$A_s = \begin{cases} Y_{12}-300^{ctc} = 1.131/0.30 \\ Y_{16}-300^{ctc} = 2.011/0.30 \end{cases} = 10.47\ cm^2$$

$$X = \frac{0.87\times 41000\times 10.47}{0.40\times 2500\times 100} = 3.8\ cm$$

$$Z = 35.0 - \frac{3.8}{2} = 33.1^{cm} < 0.95\times 35.0 = 33.2^{cm}\quad OK$$

$M_{RS} = 0.87\times 41000\times 10.47\times 33.1\times 10^{-5} = 123.6^{KNm} > Mu = 105.5^{KNm}$

$M_{RC} = 0.40\times 2500\times 100\times 3.8\times 33.1\times 10^{-5} = 125.8^{KNm} > Mu = 105.5^{KNm}$ OK

2) For upper slab

middle point②~③ Mu.max= 86.9KNm

(intersection point②=③ Mu.min=−72.3KNm)

$M_R = 123.6^{KNm} > Mu = 86.9^{KNm}$

$$A_s = \begin{cases} Y_{12}-300^{ctc} \\ Y_{16}-300^{ctc} \end{cases} = 10.47\ cm^2$$

Where… M_R : From calculation of point④~①

2) For side wall

middle point①~②, ③~④ Mu.max= 47.1KNm

$A_s = Y_{16}-300^{ctc} = 2.011/0.30 = 6.70\ cm^2$

$$X = \frac{0.87\times 41000\times 6.70}{0.40\times 2500\times 100} \fallingdotseq 3.6\ cm$$

$$Z = 35.0 - \frac{3.6}{2} = 33.2^{cm} < 0.95 \times 35.0 = 33.2^{cm} \quad OK$$

$$M_{Rs} = 0.87 \times 41000 \times 6.70 \times 33.2 \times 10^{-5} = 79.3^{KNm} > Mu = 47.1^{KNm}$$

$$M_{Rc} = 0.40 \times 2500 \times 100 \times 3.6 \times 33.2 \times 10^{-5} = 119.5^{KNm} > Mu = 47.1^{KNm} \quad OK$$

2. calculation for shearing force

a) intersection point①=④ Su.max $= 116.1^{KN}$

intersection point②=③ Su.max $= 101.1^{KN}$

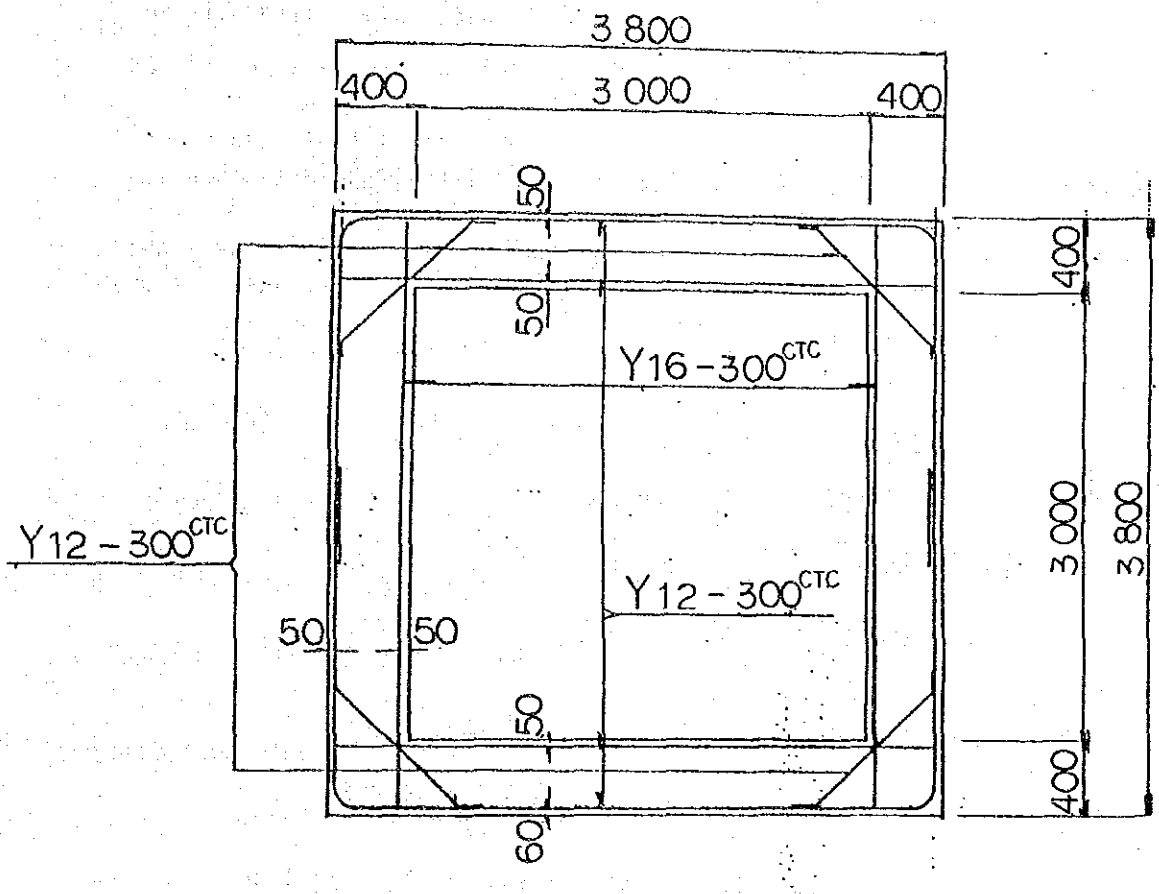
$$A_s = \left\{ \begin{array}{l} Y_{12} - 300^{ctc} \\ Y_{16} - 300^{ctc} \end{array} \right\} = 10.47 \ cm^2$$

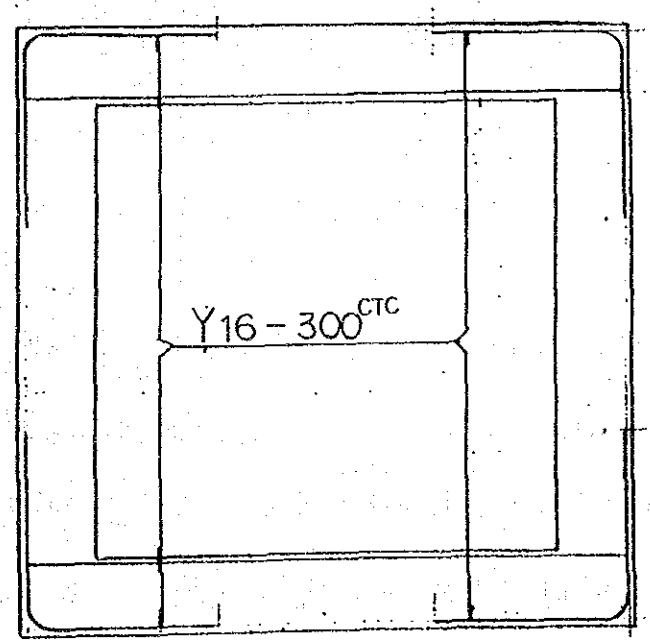
$$P = \frac{10.47}{100 \times 35.0} \times 100 = 0.299 \ \%$$

$$Vc = \frac{116.1 \times 10^3}{100 \times 35.0} = 33.2 \ N/cm^2$$

$$< Vca = \left\{ 35.0 + \frac{15}{0.25}(0.299 - 0.25) \right\} = 38.0 \ N/cm^2 \quad OK$$

NO ②③④ BOX CULVERT FOR FOOTPATH





NO②③and④ BOX CULVERTS FOR FOOTPATH (D=1.000m)

Load

1)Dead load

a)Vertical load

For upper slab w1 = 22.6×0.50+19.6×0.50+23.60×0.40 = 30.540 kN/m

For side wall w2 = 23.6×0.40 = 9.440 〃

For bottom slab $w3 = 30.540 + \frac{2\times 9.440\times 3.40}{3.40}$ = 49.420 〃

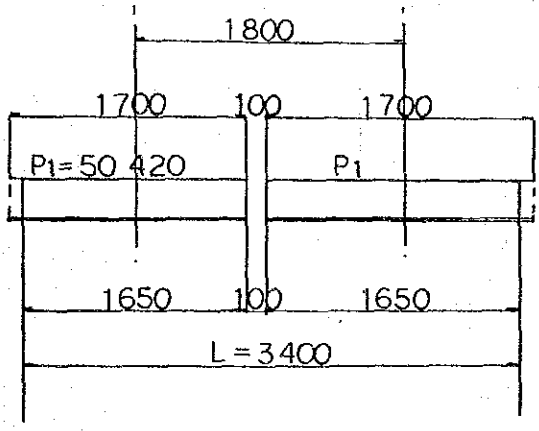
b)Horizontal load (earth pressure)

For side slab Pe1 = (22.6×0.50+19.6×0.70) ×0.500 = 12.510 kN/m

〃 Pe2 = (22.6×0.50+19.6×4.10) ×0.500 = 45.830 〃

2)Live load

case-1 Vertical load of symmetry



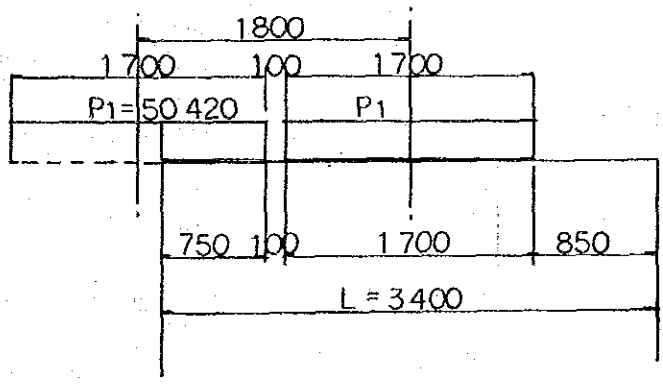
B=0.30+1.00+0.40
= 1.700 m

For bottom slab

$P2 = \frac{2\times 50.420\times 1.65}{3.40}$ = 48.937 kN/m

$P = \frac{10\times 30}{1.70\times 3.50}$
= 50.420 KN/m

case-2 Vertical load of partial for sentral span



For bottom slab

$P2 = \frac{50.420(0.750+1.700)}{3.40} \pm \frac{6\times 50.420\times 0.75\times 1.325}{3.40^2}$

$= 36.332 \pm 26.006 = \begin{cases} P2\text{-}1 = 62.338 \text{ kN/m} \\ P2\text{-}2 = 10.326 \text{ 〃} \end{cases}$

case-3 Horizontal load ------- eath pressure of liveload surcharge

Live load surcharg go : $\frac{40.0\times 30.0}{3.50\times 10.0}$ = 34.300 kN/m²

For side wall: Pe = 34.300 × 0.500 = 17.150 kN/m

Where

Load strength = P1

B = 0.300 + 1.000 + 0.400 = 1.700 m

$P1 = \frac{10.0\times 30.0}{1.70\times 3.50} \times 1.00$ = 50.420 kN/m

BOX FOR FOOTPATH Depth = 1.000

NO.2.3.4 BOXS

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

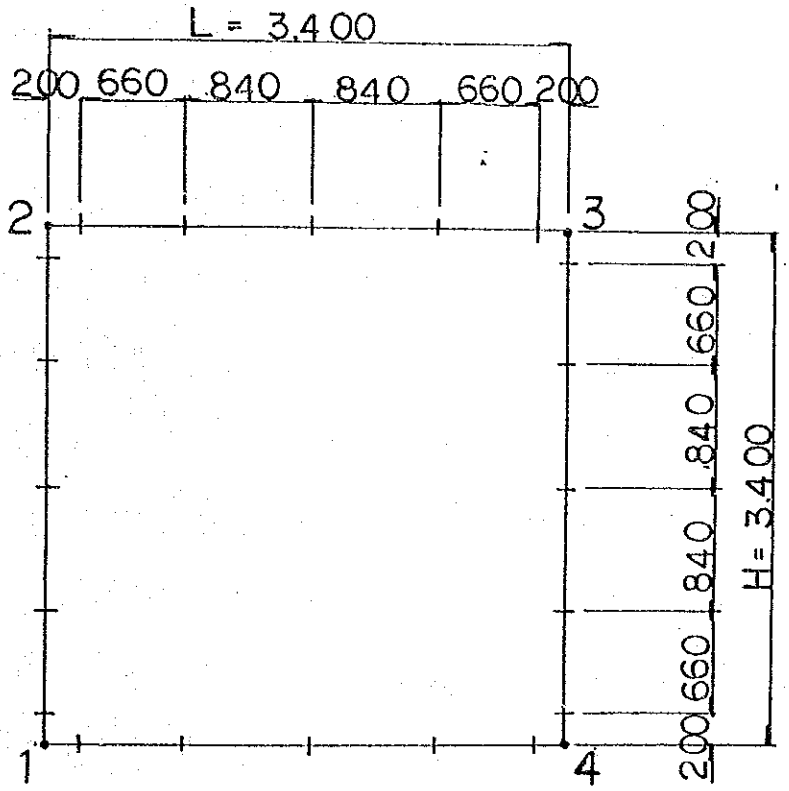
No	X (m)	Y (m)
1	0.0000	0.0000
2	0.0000	3.4000
3	3.4000	3.4000
4	3.4000	0.0000

No	I	J	A (m2)	I (m4)	I - J	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	3.400	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	3.400	2.50E+07	1.00E-05

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

No		L-No 1 11	L-No 2 12	L-No 3 13	L-No 4 14	L-No 5 15	L-No 6 16	L-No 7 17	L-No 8 18	L-No 9 19	L-No 10 20
1	5	0.200	0.860	1.700	2.540	3.200					
2	5	0.200	0.860	1.700	2.540	3.200					
3	5	0.200	0.860	1.700	2.540	3.200					
4	5	0.200	0.860	1.700	2.540	3.200					

CALCULATION POINTS OF EACH FORCE



: Dead load
No. : 1

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-Y	0.000	3.400	-9.440	-9.440
3	3-	4	-Y	0.000	3.400	-9.440	-9.440
2	2-	3	-Y	0.000	3.400	-30.540	-30.540
4	4-	1	-Y	0.000	3.400	49.420	49.420

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: Earth pressure load
No. : 2

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	3.400	45.830	12.510
3	3-	4	-X	0.000	3.400	-12.510	-45.830

ΣV = 0.000 (t)
ΣH = 0.000 (t)

: HB live load-VL-
No. : 3

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	1.650	-50.420	-50.420
2	2-	3	-Y	1.750	1.650	-50.420	-50.420
4	4-	1	-Y	0.000	3.400	48.937	48.937

: HB live load-VL-
No. : 4

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
2	2-	3	-Y	0.000	0.750	-50.420	-50.420
2	2-	3	-Y	0.850	1.700	-50.420	-50.420
4	4-	1	-Y	0.000	3.400	10.326	62.338

ΣV = -0.000 (t)
ΣH = 0.000 (t)

: HB live load-HL-
No. : 5

No	i	-j		Li (m)	Lo (m)	Pi (t/m)	Pj (t/m)
1	1-	2	-X	0.000	3.400	17.150	17.150
3	3-	4	-X	0.000	3.400	-17.150	-17.150

ΣV = 0.000 (t)
ΣH = 0.000 (t)

BOX FOR FOOTPATH

No	C-No 1 No 6	C-No 2 No 7	C-No 3 No 8
No 1	1.3800	1.3800	1.3800
No 2	1.6500	1.6500	1.6500
No 3	1.4300	0.0000	0.0000
No 4	0.0000	1.4300	0.0000
No 5	0.0000	0.0000	1.6500

BOX FOR FOOTPATH

No 1 : 6 7 8

BOX FOR FOOTPATH

No.	Case. 1 RX (t)	RY (t)	RM (tm)	Case. 2 RX (t)	RY (t)	RM (tm)	Case. 3 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 4 RX (t)	RY (t)	RM (tm)	Case. 5 RX (t)	RY (t)	RM (tm)	Case. 6 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

No.	Case. 7 RX (t)	RY (t)	RM (tm)	Case. 8 RX (t)	RY (t)	RM (tm)
1.	0.000	0.000	0.000	0.000	0.000	0.000
4.	0.000	0.000	0.000	0.000	0.000	0.000

BOX FOR FOOTPATH

No.	Case. 1 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 2 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 3 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	2.74985	0.00000	0.00000	-1.88749	0.00000	0.00000	2.9960
2.	-0.01359	-0.23108	-2.16376	-0.03359	0.00000	1.69755	-0.00053	-0.28286	-2.9730
3.	0.00000	-0.23108	2.16376	-0.16860	0.00000	-1.69755	0.00000	-0.28286	2.9730
4.	-0.01359	0.00000	-2.74985	-0.20219	0.00000	1.88749	-0.00053	0.00000	-2.9960

No.	Case. 4 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 5 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 6 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	2.47011	0.00000	0.00000	-1.05388	0.00000	0.00000	4.9647
2.	-0.09978	-0.26225	-2.55256	0.00000	0.00000	1.05388	-0.07494	-0.72338	-4.4364
3.	-0.10309	-0.15775	2.33907	-0.09913	0.00000	-1.05388	-0.27819	-0.72338	4.4364
4.	0.00332	0.00000	-2.13533	-0.09913	0.00000	1.05388	-0.35314	0.00000	-4.9647

No.	Case. 7 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)	Case. 8 X-DIS.(mm)	Y-DIS.(mm)	ROTA.(mmRad)
1.	0.00000	0.00000	4.21269	0.00000	0.00000	-1.05847
2.	-0.21686	-0.69392	-3.83518	-0.07418	-0.31890	1.55388
3.	-0.42562	-0.54447	3.52989	-0.44175	-0.31890	-1.55388
4.	-0.34763	0.00000	-3.73396	-0.51593	0.00000	1.05847

BOX FOR FOOTPATH

	No	L(m)	Case 1 Dead load M (tm)	S (t)	N (t)	Case 2 Earth pressure load M (tm)	S (t)	N (t)	Case 3 HB live load-VL- M (tm)	S (t)	N (t)
1-	2	0.000	-26.054	3.998	-84.014	-14.795	59.468	0.000	-23.660	0.157	-83.193
*	1	0.200	-25.254	3.998	-82.126	-3.805	50.498	0.000	-23.628	0.157	-83.193
*	2	0.860	-22.615	3.998	-75.896	20.438	23.678	0.000	-23.525	0.157	-83.193
*	3	1.700	-19.257	3.998	-67.966	28.100	-4.282	0.000	-23.393	0.157	-83.193
*	4	2.540	-15.899	3.998	-60.036	15.180	-25.328	0.000	-23.261	0.157	-83.193
*	5	3.200	-13.260	3.998	-53.806	-5.627	-37.012	0.000	-23.158	0.157	-83.193
2-	1	3.400	-12.460	3.998	-51.918	-13.306	-39.710	0.000	-23.126	0.157	-83.193
2-	3	0.000	-12.460	51.918	3.998	-13.306	0.000	-39.710	-23.126	83.193	0.157
*	1	0.200	-2.687	45.810	3.998	-13.306	0.000	-39.710	-7.496	73.109	0.157
*	2	0.860	20.896	25.654	3.998	-13.306	0.000	-39.710	29.774	39.832	0.157
*	3	1.700	31.670	0.000	3.998	-13.306	0.000	-39.710	45.508	0.000	0.157
*	4	2.540	20.896	-25.654	3.998	-13.306	0.000	-39.710	29.774	-39.832	0.157
*	5	3.200	-2.687	-45.810	3.998	-13.306	0.000	-39.710	-7.496	-73.109	0.157
3-	2	3.400	-12.460	-51.918	3.998	-13.306	0.000	-39.710	-23.126	-83.193	0.157
3-	4	0.000	-12.460	-3.998	-51.918	-13.306	39.710	0.000	-23.126	-0.157	-83.193
*	1	0.200	-13.260	-3.998	-53.806	-5.627	37.012	0.000	-23.158	-0.157	-83.193
*	2	0.860	-15.899	-3.998	-60.036	15.180	25.328	0.000	-23.261	-0.157	-83.193
*	3	1.700	-19.257	-3.998	-67.966	28.100	4.282	0.000	-23.393	-0.157	-83.193
*	4	2.540	-22.615	-3.998	-75.896	20.438	-23.678	0.000	-23.525	-0.157	-83.193
*	5	3.200	-25.254	-3.998	-82.126	-3.805	-50.498	0.000	-23.628	-0.157	-83.193
4-	3	3.400	-26.054	-3.998	-84.014	-14.795	-59.468	0.000	-23.660	-0.157	-83.193
4-	1	0.000	-26.054	84.014	-3.998	-14.795	0.000	-59.468	-23.660	83.193	-0.157
*	1	0.200	-10.240	74.130	-3.998	-14.795	0.000	-59.468	-8.000	73.405	-0.157
*	2	0.860	27.923	41.513	-3.998	-14.795	0.000	-59.468	29.789	41.107	-0.157
*	3	1.700	45.358	0.000	-3.998	-14.795	0.000	-59.468	47.054	0.000	-0.157
*	4	2.540	27.923	-41.513	-3.998	-14.795	0.000	-59.468	29.789	-41.107	-0.157
*	5	3.200	-10.240	-74.130	-3.998	-14.795	0.000	-59.468	-8.000	-73.406	-0.157
1-	4	3.400	-26.054	-84.014	-3.998	-14.795	0.000	-59.468	-23.660	-83.193	-0.157