

**DESIGN OF GRAVITY TYPE ABUTMENT**

**(Rocker Side)**

NAME OF WORK :- **Construction of Gagal bridge over Siul river**

SPAN	:-	25 Mtr.
TYPE	:-	PSC box girder S/L
DECK LEVEL	:-	1424 Mtr.
CLEAR CARRIAGEWAY	:-	4.25 Mtr.
H.F.L.	:-	999.45 Mtr.
L.W.L.	:-	0 Mtr.
M.S.L.	:-	0 Mtr.
FOUNDING LEVEL	:-	1410.45 Mtr.
SAFE BEARING CAPACITY:-		25 T/M2

**INPUT DATA :-**

L*	5.15	Sup.Str.DL.React(t)	90.00
B*	8.9	MAX. L.L(t)	40.55
H*	13.55	Min L.L. (t)	9.45
h1*	1.84	Hmax(normal) (t)	7.9235
h2*	0.5	Hmin (normal)	8.8565
h3*	9.21	Hmax (seismic)	24.6765
h4*	0.3	Hmin (seismic)	23.744
h5*	11.55	u(Coeff of friction)	0.5 For check against sliding
h6*	0.39	e(Transvers)	0.825
h0(Ht of LL Surcharge)	1.2	S.B.C.(T/M2)	25
b1*	2.7		
b2*	0.3		
b3*	1.2		
b4*	3		
b5*	1.7		
L1*	0.475		
L2*	2		
ka(coeff of active E.P.)	0.235		
y1(Unit wt. Bed block)	2.4		
y2(Unit wt abutment)	2.2		
y3(Wt diff abut.&earth)	0.4		
y4(Unit wt of earth)	1.8		
tan\$	0.32	\$	17.5 0.31
b6*	0.763	Angle of internal Fric.	35 0.61
t1*	0.39		
y5(Wt diff App slab &earth)	0.6		

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**OUTPUT DATA :-**

**Dead Load Of Sub-Structure:-**

Description	Wt.(t)	NORMAL CASE.		SEISMIC CASE.		
		L.A. @Toe(m)	Mt. (t-m)	Wt. (t)	LA@Base	Mt. (t-m)
1APP. SLAB	2.65356	7.55	20.03438	0.265356	13.355	3.54382938
2 DIRT WALL	6.82272	6.05	41.27746	0.682272	12.63	8.61709536
3 BED BLOCK	9.27	5.45	50.5215	0.927	11.46	10.62342
4.Abutment.	156.524	5.45	853.0555	15.6524	6.605	103.384069
5 do	156.524	3.71	580.7039	15.6524	5.0393	78.8771141
6 do	25.61301	7.091	181.6219	2.561301	5.0393	12.9071641
7 wing wall	4.72473	8.009	37.84036	0.472473	6.605	3.12068416
8 do	2.40084	7.55	18.12634	0.240084	12.38	2.97223992
9 do	1.18871	8.009	9.520376	0.118871	5.76261167	0.68500723
10 do	0.735968	7.55	5.556556	0.073597	11.8535	0.87237936
11 Footing	138.6792	5.3	734.9998	0	0	0
12 do	16.37185	1.139	18.64754	0		0

13 do	30.2511	4.45	134.6174	0	0
14 Earth	289.0849	7.55	2182.591	28.90849	7.775 224.763549
15 V.Comp. Earth	74.15626	8.9	659.9907		
TOTAL	915.0008		5529.105	65.55424	450.366551
Sup st. D.L.React.	90	5.463	491.67		
L.L. Max	40.55	5.463	221.5247		
L.L. Min	9.45	5.463	51.62535		
NO LL CASE	1005.001		6020.775		
MAX LL CASE	1045.551		6242.3		
MIN LL CASE	1014.451		6072.4		

ACTIVE EARTH PRESSURE AT BASE:-

Active Earth Pressure Force =  $235.3206430688 L \cdot Ka \cdot y^4 \cdot ho \cdot H + 0.5 \cdot L \cdot Ka \cdot y^4 \cdot H^2$   
Active Earth Pressure Moment =  $1377.5928634039 0.5 \cdot L \cdot Ka \cdot y^4 \cdot ho \cdot H^2 + 0.21 \cdot L \cdot Ka \cdot y^4 \cdot H^3$

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CHECK FOR PRESSURE AT BASE:-

MAX LL CASE :-

NORMAL CASE

W	1045.551	FOS (OVT)	<b>4.245373</b>	>2.00	STAB.Mt./OVT.Mt.
H	243.2441	FOS (SLD)	<b>2.14918</b>	>1.50	u*W/H
REST. Mt.	6242.3	BASE PRESSURES :-			Net. Mt/W
OVT. Mt.	1470.377	z	4.564027		B/2-z
NET Mt.	4771.923	e	-0.114027		W/A(1+6*e/B)+6*Mt/B*L^2
		P1(T/M2)	21.91		W/A(1-6*e/B)-6*Mt/B*L^2
		P2(T/M2)	23.71		

MIN. LL CASE :-

W	1014.451	FOS(OVT)	<b>4.1</b>	>2.00
H	244.1771	FOS (SLD)	<b>2.08</b>	>1.50
REST. Mt.	6072.4	BASE PRESSURES:-		
OVT. Mt.	1481.302	z	4.525698	
NET Mt.	4591.098	e	-0.075698	
		P1(T/M2)	21.2	
		P2(T/M2)	23.06	

SEISMIC CASE

MAX. LL. CASE: (+ve down)	(-ve upward.)	FOS(OVT)	<b>3.05</b>	<b>2.67</b>	>1.50
W	1082.828	1008.2736740432 FOS(SLD)	<b>1.66</b>	<b>1.55</b>	>1.25
H	325.5514	325.5513818107 Base Pressures:-			
REST. Mt.	6465.926	6242.2995997416 z	4.016339	3.86973546	
OVT. Mt.	2116.921	2340.5472086325 e	0.433661	0.58026454	
NET Mt.	4349.004	3901.7523911092 P1(T/M2)	30.73	30.8	
		P2(T/M2)	16.52	13.19	

MIN. LL CASE: -(+ve down)

(-ve upward)

W		FOS(OVT)	<b>2.99</b>	<b>2.61</b>	>1.50
H		FOS(SLD)	<b>1.62</b>	<b>1.51</b>	>1.25
RES. Mt.	1051.728	977.1736740432 Base Pressures:-			
OVT. Mt.	324.6189	324.6188818107 z	3.983944	3.83020211	
NET Mt.	6296.026	6072.4002997416 e	0.466056	0.61979789	
	2106.002	2329.6276336325 P1(T/M2)	30.35	30.43	
	4190.025	3742.7726661092 P2(T/M2)	15.54	12.21	

SPAN DISLODGED CASE.

BASE PRESSURES:-

NORMAL CASE

W	903.8425	FOS(OVT)	<b>4.772614</b>	>2.00
H	199.9119	FOS(SLD)	<b>2.260602</b>	>1.50
RES Mt	5429.796	Base Pressures:-		
OVT Mt	1137.699	z	4.748723	
NET Mt	4292.097	e	-0.298723	
		P1(T/M2)	15.75	
		P2 (T/M2)	23.69	

SEISMIC CASE:-

(+ve down) (-ve upward.)

W	936.6196	871.0653659311 FOS(OVT)	<b>3.544463</b>	<b>3.03831507</b>	>1.50
H	265.4661	265.4661330104 FOS(SLD)	<b>1.764104</b>	<b>1.6406337</b>	>1.25
RES Mt	5628.838	5429.7960075442 Base Pressures:-			
OVT Mt	1588.065	1787.1076205103 z	4.31421	4.18187719	
NET Mt	4040.773	3642.6883870339 e	0.13579	0.26812281	
		P1(T/M2)	22.31	22.44	
		P2 (T/M2)	18.56	15.57	

ACTIVE EARTH PRESSURE AT M.S.L.:-

A.E.P.Force.	175.4349978038	145.2526
A.E.P.Moment.	878.9236798035	704.6205

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CHECK FOR STRESSES AT M.S.L.:-

NORMAL CASE:-

MAX. LL CASE:-

W	841.377
H	183.3585
REST. Mt.	3570.964
OVT. Mt.	955.8609
NET Mt.	2615.103

STRESSES:-

z	3.108123
e	0.491877
P1(T/M2)	33.04
P2(T/M2)	12.34

MIN. LL CASE:-

W	810.277
H	184.2915
REST. Mt.	3453.934
OVT. Mt.	964.9203
NET Mt.	2489.014

STRESSES:-

z	3.071807
e	0.528193
P1(T/M2)	31.72
P2(T/M2)	11.99

SEISMIC CASE:-

Max LL CASE:-(+ve) (-ve)

W	878.6541	804.0998467319
H	265.6657	265.6657365457
REST. Mt.	3786.94	3570.9637779371
OVT. Mt.	1437.791	1653.7665475482
NET Mt.	2349.149	1917.1972303889

STRESSES:-

z	2.673577	2.38427757
e	0.926423	1.21572243
P1(T/M2)	43.04	44.71
P2(T/M2)	4.35	-1.34

MIN LL CASE:-(+ve) (-ve)

W	847.5541	772.9998467319
H	264.7332	264.7332365457
REST. Mt.	3729.176	3453.9344779371
OVT. Mt.	1428.736	1638.8619725482
NET Mt.	2300.44	1815.0725053889

STRESSES:-

z	2.71421	2.34808909
e	0.88579	1.25191091
P1(T/M2)	39.97	42.84
P2(T/M2)	5.74	-1.25

SPAN DISLODGED CASE:-

NORMAL CASE:-

W	701.3156
H	145.2526
REST. Mt.	3011.223
OVT. Mt.	704.6205
NET Mt.	2306.602

STRESSES:-

z	3.288964
e	0.311036
P1(T/M2)	23.82
P2(T/M2)	14.01

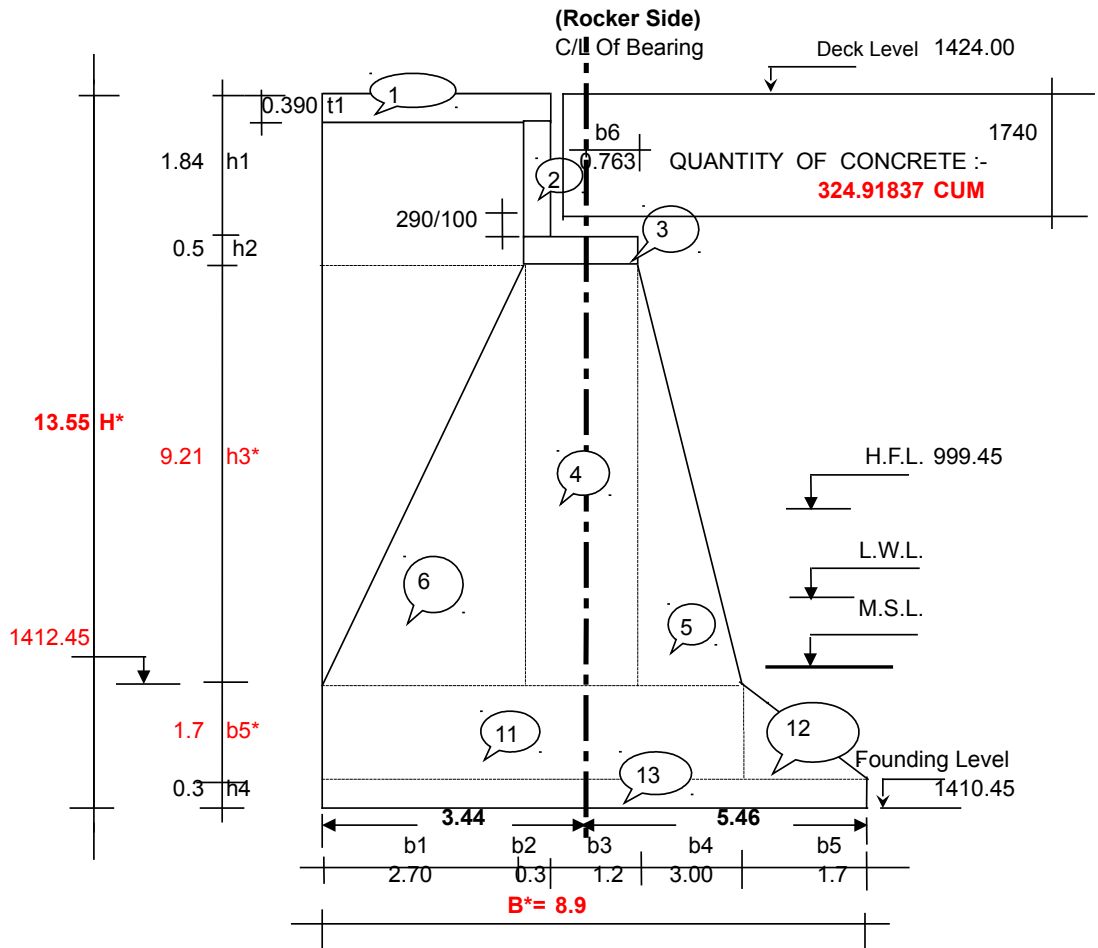
SEISMIC CASE:- (+ve downward) (-ve upward)

W	734.0928	668.538521367
H	210.8069	210.8068713322
REST. Mt.	3210.265	3011.2225853098
OVT. Mt.	1023.879	1222.9210734399
NET Mt.	2186.386	1788.3015118699

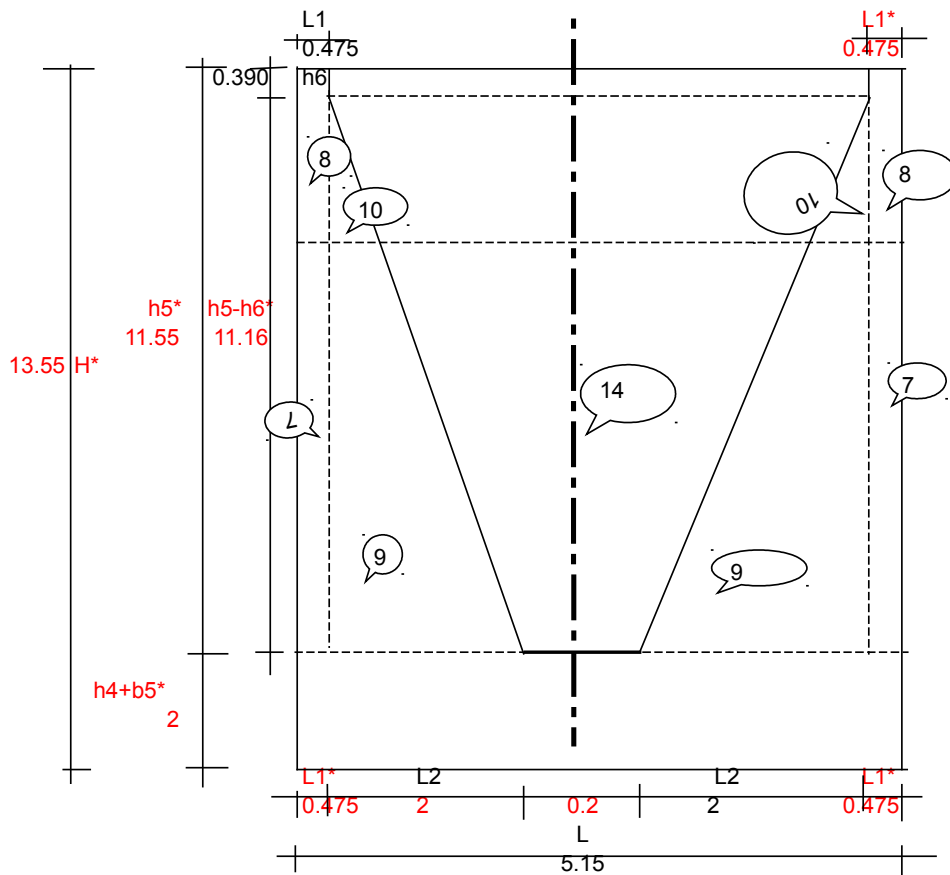
STRESSES:- (+ve) ↓ (-ve) ↑

z	2.97835177	2.67494161
e	0.62164823	0.92505839
P1(T/M2)	30.05	31.93
P2(T/M2)	9.54	4.13

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**FRONT VIEW**



**END VIEW**









**FOS**

	N/C	S/C
FOS (OVT)	<b>4.10</b> >2.00	<b>2.61</b> >1.5
FOS (SLD)	<b>2.08</b> >1.50	<b>1.51</b> >1.25

**SUMMARY OF RESULTS:-**

AT BASE:-				
	NORMAL		SEISMIC	
	P1	P2	P1	P2
Max.LL	21.91	23.71	30.73 30.8	16.52 13.19
Min LL	21.2	23.06	30.35 30.43	15.54 12.21
Span Dislodge	15.75	23.69	22.31 22.44	18.56 15.57
AT M.S.L:-				
Max.LL.	33.04	12.34	43.04 44.71	4.35 -1.34
Min. LL.	31.72	11.99	39.97 42.84	5.74 -1.25
Span Dislodge	23.82	14.01	30.05 31.93	9.54 4.13

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X	Y1	Y2	Y3	Y4
T				
X	Y1	Y2	Y3	Y4
T	21.91	23.71	4.245373	2.14918
T	21.2	23.06	4.1	2.08
T	15.75	23.69	4.772614	2.260602
	21.91	23.06	4.1	2.08

X	Y1	Y2
T		
X	Y1	Y2
T	33.04	12.34
T	31.72	11.99
T	23.82	14.01
	33.04	11.99







X	Y1	Y2	Y3	Y4
T				
X	Y1	Y2	Y3	Y4
T	30.73	16.52	3.05	1.66
T	30.8	13.19	2.67	1.55
T	30.35	15.54	2.99	1.62
T	30.43	12.21	2.61	1.51
T	22.31	18.56	3.544463	1.764104
T	22.44	15.57	3.038315	1.640634
	30.8	12.21	2.61	1.51

X	Y1	Y2
T		
X	Y1	Y2
T	43.04	4.35
T	44.71	-1.34
T	39.97	5.74
T	42.84	-1.25
T	30.05	9.54
T	31.93	4.13
	44.71	-1.34









262.55  
271.88  
283.83  
292.09  
303.87  
313.68  
337.7

2065.6

295.09

383.61142857