3.3.2 STABILITY ANALYSIS

a. In Longitudinal Direction

1) Dead Load + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	-	0,475	-			
Eh				62,035	1,247	77,337
				(22,464)	0,333	(7,488)
Ev	22,577	(2,875)	(64,910)			
	(0,788)	2,875	(2,264)			
Ha				-	5,530	-
Sub Total	26,805		(64,792)	39,571		69,849
W(Abutment)	286,203	(0,611)	(174,915)			
Total	313,008		(239,707)			

ΣM = (169,858) q = V/b x (1 +- 6e/b)

Σv = 313,008 qa = 4.289 tf/m2

Σ H = 39,571 qb = 15.505 tf/m2

e = M/N = (0,543) < b/6 = 0,958

2) Dead Load + Earth Pressuse (LL)

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	-	0,475	-			
Eh				62,035	1,247	77,337
				15,327	3,315	50,809
				(22,464)	0,333	(7,488)
Ev	22,577	(2,875)	(64,910)			
	(0,788)	2,875	(2,264)			
	5,578	(2,875)	(16,037)			
Ha				-	5,530	-
Sub Total	32,383		(83,212)	54,898		120,659
W(Abutment)	286,203	(0,611)	(174,915)			
Total	318,586		(258,127)			

ΣM = (137,468) q = V/b x (1 +- 6e/b)

Σv = 318,586 qa = 5.538 tf/m2

ΣH = 54,898 qb = 14.61 tf/m2

e = M/N = (0,431) < b/6 = 0,958

3) Dead Load + Train load + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Eh				62,035	1,247	77,337
				15,327	3,315	50,809
				(22,464)	0,333	(7,488)
Ev	22,577	(2,875)	(64,910)			
	(0,788)	2,875	(2,264)			
	5,578	(2,875)	(16,037)			
Ha				-	5,530	-
Sub Total	84,883		(55,892)	54,898		120,659
W(Abutment)	286,203	(0,611)	(174,915)			
Total	371,086		(230,807)			

ΣM =	(110,148)		q = V/b x (1 +- 6e/b)		
ΣV =	371,086		qa =	8,1	tf/m2
ΣH =	54,898		qb =	15,368	tf/m2
e =	M/N =	(0,297)	< b/6 =	0,958	

4) Dead Load + Train Load + Impact + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Va [I]	33,128	0,475	15,736			
Eh				62,035	1,247	77,337
				15,327	3,315	50,809
				(22,464)	0,333	(7,488)
Ev	22,577	(2,875)	(64,910)			
	(0,788)	2,875	(2,264)			
	5,578	(2,875)	(16,037)			
Ha				-	5,530	-
Sub Total	118,011		(40,156)	54,898		120,659
W(Abutment)	286,203	(0,611)	(174,915)			
Total	404,214		(215,071)			

ΣM =	(94,413)		q = V/b x (1 +- 6e/b)		
ΣV =	404,214		qa =	9,66	tf/m2
ΣH =	54,898		qb =	15,877	tf/m2
e =	M/N =	(0,234)	< b/6 =	0,958	

5) Dead Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	/ 5,015	0,475	2,382		0,031	
Va (LL)	-	0,475	-		0,006	
Va [Ir]	/ 0,982	0,475	0,466			
Eh				62,035	1,247	77,337
				(22,464)	0,333	(7,488)
Ev	/ 22,577	(2,875)	(64,910)			
	/ (0,788)	2,875	(2,264)			
Ha				9,120	5,530	50,434
Sub Total	27,787		(64,326)	39,571		120,283
W(Abutment)	286,203	(0,611)	(174,915)			
Total	313,990		(239,241)			

ΣM =	(118,958)	q = V/b x (1 +- 6e/b)			
Σς =	313,990	qa =	6.003	tf/m2	
ΣH =	39,571	qb =	13.854	tf/m2	
e =	M/N =	(0,379)	< b/6 =	0,958	

6) Dead Load + Train Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Va [Ir]	0,982	0,475	0,466			
Eh				62,035	1,247	77,337
				15,327	3,315	50,809
				(22,464)	0,333	(7,488)
Ev	/ 22,577	(2,875)	(64,910)			
	/ 5,578	2,875	16,037			
	/ (0,788)	2,875	(2,264)			
Ha				9,120	5,530	50,434
Sub Total	85,865		(23,351)	54,898		171,092
W(Abutment)	286,203	(0,611)	(174,915)			
Total	372,068		(198,266)			

ΣM =	(27,173)	q = V/b x (1 +- 6e/b)			
Σς =	372,068	qa =	10.868	tf/m2	
ΣH =	54,898	qb =	12.662	tf/m2	
e =	M/N =	(0,073)	< b/6 =	0,958	

7) Dead Load + Train Load + Impact + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Va (I)	33,128	0,475	15,736			
Va [Ir]	0,982	0,475	0,466			
Eh				62,035	1,247	77,337
				15,327	3,315	50,809
				(22,464)	0,333	(7,488)
Ev	22,577	(2,875)	(64,910)			
	5,578	(2,875)	(16,037)			
	(0,788)	2,875	(2,264)			
Ha				9,120	5,530	50,434
Sub Total	118,993		(42,072)	54,898		171,092
W(Abutment)	286,203	(0,611)	(174,915)			
Total	405,196		(216,987)			

ΣM =	(45,895)		q = V/b x (1 +- 6e/b)		
Σς =	405,196		qa =	11.298	tf/m2
ΣH =	54,898		qb =	14.327	tf/m2
e = M/N =	(0,113)	< b/6 =	0,958		

8 Dead Load + Train Load + Break Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Va [Ir]	2,107	0,475	1,001			
Eh				62,035	1,247	77,337
				15,327	3,315	50,809
				(22,464)	0,333	(7,488)
Ev	22,577	(2,875)	(64,910)			
	5,578	(0,875)	(4,881)			
	(0,788)	2,875	(2,264)			
Ha				23,977	5,530	132,593
Sub Total	86,990		(43,735)	54,898		253,251
W(Abutment)	286,203	(0,611)	(174,915)			
Total	373,193		(218,650)			

ΣM =	34,602		q = V/b x (1 +- 6e/b)		
Σς =	373,193		qa =	12.942	tf/m2
ΣH =	54,898		qb =	10.654	tf/m2
e = M/N =	0,093	< b/6 =	0,958		

11) Dead Load + Earth Pressuse + Seismic (LL)

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	22,000	0,475	10,450			
Va [Eq]	1,711	0,475	0,813			
Eh				63,824	1,263	80,610
				(22,464)	0,333	(7,481)
Ev	27,500	(2,875)	(79,063)			
	5,578	(2,875)	(16,037)			
	(0,788)	2,875	(2,266)			
Ha				23,977	5,630	134,991
Sub Total	61,016		(83,721)	41,360		208,120
W(Abutment)	286,203	(0,611)	(174,915)			
Total	347,219		(258,635)			

ΣM = (50,516) q = V/b x (1 +- 6e/b)

Σ = 347,219 qa = 9.312 tf/m2

ΣH = 41,360 qb = 12.646 tf/m2

e = M/N = (0,145) < b/6 = 0,958

b IN TRANVERSAL DIRECTION

1) Dead Load + Train Load + Impact + Lateral Load + Wind Load + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Va [Lr]	0,982	0,475	0,466			
Eh				62,035	1,247	77,358
				15,327	3,315	50,809
				(22,464)	0,333	(7,481)
Ev	22,577	(2,875)	(64,910)			
	5,578	(2,875)	(16,037)			
	(0,788)	2,875	(2,266)			
Sub Total	85,865		(55,427)	54,898		120,687
W(Abutment)	286,203	(0,611)	(174,915)	-	2,770	-
Total	372,067		(230,342)	54,898		120,687
H [Lr]				5,250	5,640	29,610
H (W)				1,980	5,640	11,167
Total				7,230		40,777

Σ M	=	(211,342)	(longitudinal)
Σ M	=	40,777	(Tranversal)
Σ V	=	372,067	
ΣH	=	54,898	(Longitudinal)
ΣH	=	7,230	(transversal)

e	=	M/N	=	(0,568) (Longitudinal)
e	=	M/N	=	0,110 (Transversal)

q max	=	18.738	t/m2 (Longitudinal)
q max	=	13.225	t/m2 (tranfersal)

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2) Dead Load + Earth Pressuse + Seismic

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	22,000	0,475	10,450			
Va [Eq]	0,318	0,475	0,151			
Eh				62,035	1,247	77,358
				(22,464)	0.333	(7,481)
Ev	22,577	(2,875)	(64,910)			
	(0,788)	2,875	(2,264)			
Eq (DL)				4,316	5,640	24,341
Sub Total	49,123		(54,191)	43,887		94,219
W(Abutment)	286,203	(0.611)	(174,915)	51,516	2.759	142,141
Total	335,326		(229,106)	95,404		236,360
Eq [LL]				51,516	5,630	290,038

ΣM = (210,106) (longitudinal)
ΣM = 290,038 (Tranversal)
ΣV = 335,326
ΣH = 95,404 (Longitudinal)
ΣH = 51,516 (transversal)

e = M/N = (0,627) (Longitudinal)
e = M/N = 0,865 (Transversal)

q max = 17.536 t/m2 (Longitudinal)
q max = 20.35 t/m2 (tranfersal)

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STABILITY ANALISYS OF BEARING CAPACITY

BEARING CAPACITY ANALYSIS AT NORMAL CONDITION

In This Location is no Soil investigation, from Design Criteria Report can be estimed by N value. See Design Criteria page I-25 & I-29

$$Qu = A' \{ \alpha . k . c . Nc + k . q . Nq + 1/2 . \gamma 1 . \beta . B' . N\gamma \}$$

$A' = B' \times L'$

$B' = B - 2\ eB = 4{,}614$ m

$L' = L - 2\ eL = 5{,}281$ m

$A' = 24{,}365$ m^2

$\alpha = 1{,}3$

$\beta = 0{,}6$

$k = 1+0.3 \times Df/B' = 1{,}130$ $\quad Df = 2{,}000$ m

$q = \gamma . Df = 3{,}4$ $\quad \gamma 1 = 1.7$ t/m

$C = N/11 = 5/11 = 0{,}455$ (for soft clay, N < 10)

$\phi = 15 + (15*N)^{0.5} = 23{,}660$ degree

$Nc = 18{,}000$

$Nq = 9{,}000$

$N\gamma = 5{,}000$

$Qu = 1.422{,}072$ ton

TheUltimate Bearing capacity $qu = Qu/A' = 58{,}364$ ton/m2

From the stability analisis qa max = 15.897 t/m2

The safety factor $SF = qu / qa\ max = 3.661 > 3$

The Bearing Capacity its all right.

BEARING CAPACITY ANALYSIS AT SEISMIC CONDITION

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BEARING CAPACITY ANALYSIS AT SEISMIC CONDITION

Qa = Qu/Sf

Qu = A' (α . k . c . Nc + k . q . Nq + 1/2 . γ1 . β . B' . Ng)

A ' = B' x L'

B' = B - 2 eB = 4,497 m

L' = L - 2 eL = 3,770 m

A' = 16,954 m^2

α = 1,3

β = 0,6

k = 1+0.3x Df/B' Df = 2,000 m

= 1,133

q = g . Df g1 = 1,7 t/m

= 3,4

C = N/11= 5/11 = 0,455 (for soft clay, N < 10)

ϕ = 15 + (15*N)^ 0.5 = 23,660 degree

Nc = 18,000

Nq = 9,000

Nγ = 5,000

Qu = 986,793

TheUltimate Bearing capacity qu = Qu/A' = 58,205 ton/m2

From the stability analisis qa max = 20.35 t/m2

The safety factor SF = qu / qa max = 2.86 > 2

The Bearing Capacity its all right.

3.3.2. LOAD COMBINATION

a. In Longitudinal Direction

1) Dead Load + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	-	0,475	-			
Eh				48,147	1,247	60,023
				(22,464)	0,333	(7,488)
Ev	17,523	(2,875)	(50,378)			
	(0,788)	2,875	(2,264)			
Ha				-	5,530	-
Sub Total	21,750		(50,260)	25,683		52,535
W(Abutment)	257,095	(0,560)	(143,992)			
Total	278,845		(194,252)			

ΣM = (141,717) q = V/b x (1 +- 6e/b)

ΣV = 278,845 qa = 4.143 tf/m²

ΣH = 25,683 qb = 13.491 tf/m²

e = M/N = -0,508229396

2) Dead Load + Earth Pressuse (LL)

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	-	0,475	-			
Eh				48,147	1,247	60,023
				13,298	3,315	44,083
				(22,464)	0,333	(7,488)
Ev	17,523	(2,875)	(50,378)			
	(0,788)	2,875	(2,264)			
	4,840	(2,875)	(13,914)			
Ha				-	5,530	-
Sub Total	26,590		(66,557)	38,981		96,618
W(Abutment)	257,095	(0,560)	(143,992)			
Total	283,685		(210,549)			

ΣM = (113,931) q = V/b x (1 +- 6e/b)

ΣV = 283,685 qa = 5.211 tf/m²

ΣH = 38,981 qb = 12.730 tf/m²

e = M/N = -0,401609343

3.3.2. LOAD COMBINATION

a. In Longitudinal Direction

1) Dead Load + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	-	0,475	-			
Eh				48,147	1,247	60,023
				(22,464)	0,333	(7,488)
Ev	17,523	(2,875)	(50,378)			
	(0,788)	2,875	(2,264)			
Ha	-			-	5,530	-
Sub Total	21,750		(50,260)	25,683		52,535
W(Abutment)	257,095	(0,560)	(143,992)			
Total	278,845		(194,252)			

ΣM = (141,717) q = V/b x (1 +- 6e/b)

ΣV = 278,845 qa = 4.143 tf/m²

ΣH = 25,683 qb = 13.491 tf/m²

e = M/N = -0,508229396

2) Dead Load + Earth Pressuse (LL)

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	-	0,475	-			
Eh				48,147	1,247	60,023
				13,298	3,315	44,083
				(22,464)	0,333	(7,488)
Ev	17,523	(2,875)	(50,378)			
	(0,788)	2,875	(2,264)			
	4,840	(2,875)	(13,914)			
Ha				-	5,530	-
Sub Total	26,590		(66,557)	38,981		96,618
W(Abutment)	257,095	(0,560)	(143,992)			
Total	283,685		(210,549)			

ΣM = (113,931) q = V/b x (1 +- 6e/b)

ΣV = 283,685 qa = 5.211 tf/m²

ΣH = 38,981 qb = 12.730 tf/m²

e = M/N = -0,401609343

3) Dead Load + Train load + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Eh				48,147	1,247	60,023
				13,298	3,315	44,083
				(22,464)	0,333	(7,488)
Ev	17,523	(2,875)	(50,378)			
	(0,788)	2,875	(2,264)			
	4,840	(2,875)	(13,914)			
Ha				-	5,530	-
Sub Total	79,090		(39,237)	38,981		96,618
W(Abutment)	257,095	(0,560)	(143,992)			
Total	336,185		(183,229)			

ΣM = (86,611) q = V/b x (1 +- 6e/b)
ΣV = 336,185 qa = 7.772 tf/m²
ΣH = 38,981 qb = 13.487 tf/m²
e = M/N = -0,257628781

4) Dead Load + Train Load + Impact + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382			
Va (LL)	52,500	0,475	24,938			
Va [I]	33,128	0,475	15,736			
Eh				48,147	1,247	60,023
				13,298	3,315	44,083
				(22,464)	0,333	(7,488)
Ev	17,523	(2,875)	(50,378)			
	(0,788)	2,875	(2,264)			
	4,840	(2,875)	(13,914)			
Ha				-	5,530	-
Sub Total	112,218		(23,501)	38,981		96,618
W(Abutment)	257,095	(0,560)	(143,992)			
Total	369,313		(167,494)			

ΣM = (70,875) q = V/b x (1 +- 6e/b)
ΣV = 369,313 qa = 9.929 tf/m²
ΣH = 38,981 qb = 14.016 tf/m²
e = M/N = -0,191910754

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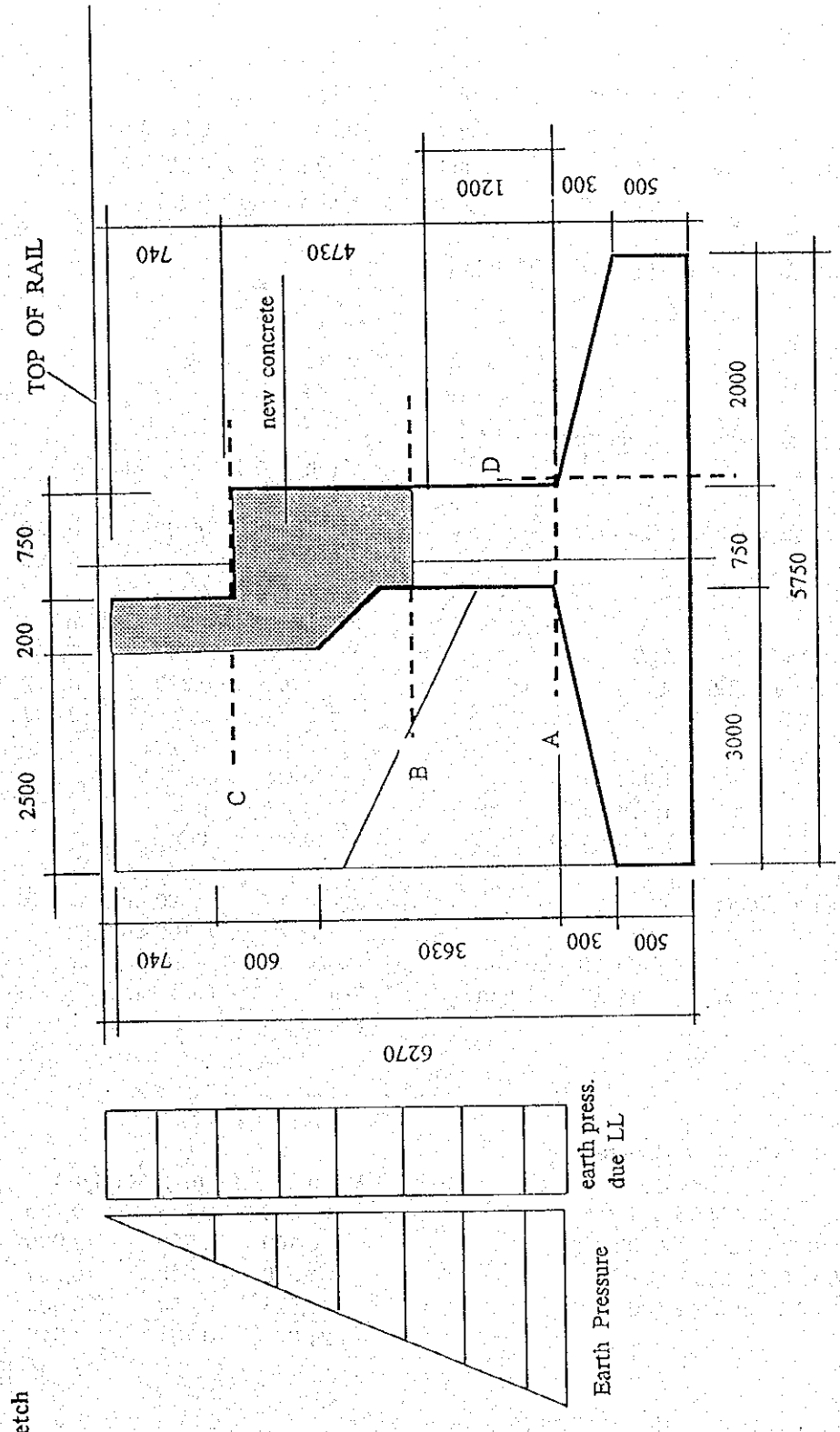
3.3.3 REINFORCING ANALYSIS

Sketch



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EARTH PRESSURE

y =	0 m	ph =	0.00 t / m²	
y c =	0,74 m	ph c =	0.74 x 2.00 x 0.2973 =	0,440 t / m²
y b =	1,57 m	ph b =	1.57 x 2.00 x 0.2973 =	0,934 t / m²
y a =	5,47 m	ph c =	5.47 x 2.00 x 0.2973 =	3,312 t / m²

EARTH PRESSURE DUE TO LIVE LOAD (LL)

q ll = 8.75 tf/m

SECTION C - C

Vertical Dead Load (Concrete)

		V (tf)	X (m)	M (tf m)
0.200 x 0.740 x 4.500 x 2.400	=	1,598	0,100	0,160
		1,598		0,160

Horizontal Load

		H (m)	X (m)	M (tf m)
0.5 x 0.740 x 0.440 x 4.500	=	0,733	0,247	0,181
0.740 x 8.75 x 0.2973	=	1,925	0,370	0,712
		2,658		0,893

M =	1,053 / 4.50	=	0,234	tf-m
V =	1,598 / 4.50	=	0,355	tf
H =	2,658 / 4.50	=	0,591	tf

Reinforceng Concrete =

A = D 19 - 20 Cm
A' = D 19 - 20 Cm

h = 20 cm
b = 100 cm
Compression C = 31,2 kg / Cm² < 75 Kg/ Cm²
Tension S = 507,2 kg / Cm² < 2250 Kg/ Cm²
Shear Stres T = 2,20 kg / Cm² < 6 Kg/ Cm²

SECTION B - B

Vertical Dead Load (Concrete)

		V (tf)	X (m)	M (tf m)
0.200 x 0.740 x 4.500 x 2.400	=	1,598	-0,475	-0,759
1.250 x 0.600 x 4.500 x 2.400	=	8,100	-0,250	-2,025
0.50 x0.50 x 0.5 x 4.500 x 2.400	=	1,350	-0,542	-0,731
0.750 x 1.33 x 4.500 x 2.400	=	10,773	0,000	0,000
		21,821	-0,161	-3,515

Horizontal Load

		H (m)	y (m)	M (tf m)
0.5 x 1.57 x 0.940 x 4.500	=	3,321	0,523	1,738
1.570 x 8.75 x 0.2973	=	4,087	0,870	3,556
		7,407	0,715	5,293

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	29/51

a. Dead Load + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	-	(0,025)	-			
Eh				7,407	0,998	7,393
Ha				-	1,930	-
Sub Total	5,015		(0,125)	7,407		7,393
W(Abutment)	21,821	(0,161)	(3,515)			
Total	26,836		(3,641)			

Σ M =	3,752 / 4.50	=	0,83373	tf-m
Σ V =	26,836 / 4.50	=	5,96364	tf
Σ H =	7,407 / 4.50	=	1,6461	tf

b. Dead Load + Train Load + Impact + Earth Pressuse

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va [I]	33,128	(0,025)	(0,828)			
Eh				7,407	0,998	7,393
Ha				-	1,930	-
Sub Total	90,643		(2,266)	7,407		7,393
W(Abutment)	21,821	(0,161)	(3,515)			
Total	112,464		(5,782)			

Σ M =	1,611 / 4.50	=	0,35802	tf-m
Σ V =	112,464 / 4.50	=	24,9921	tf
Σ H =	7,407 / 4.50	=	1,6461	tf

c. Dead Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	-	(0,025)	-			
Va [Ir]	0,982	(0,025)	(0,025)			
Eh				7,407	0,998	7,393
Ha				9,120	1,930	17,602
Sub Total	5,997		(0,150)	7,407		24,994
W(Abutment)	21,821	(0,161)	(3,515)			
Total	27,818		(3,665)			

Σ M =	21,329 / 4.50	=	4,73974	tf-m
Σ V =	27,818 / 4.50	=	6,18187	tf
Σ H =	7,407 / 4.50	=	1,6461	tf

d. Dead Load + Train Load + Impact + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va (I)	33,128	(0,025)	(0,828)			
Va [Ir]	0,982	(0,025)	(0,025)			
Eh				7,407	0,998	7,393
Ha				6,474	1,930	12,495
Sub Total	91,625		(2,291)	13,881		19,887
W(Abutment)	21,821	(0,161)	(3,515)			
Total	113,446		(5,806)			
	Σ M =	14,081	/ 4.50	=	3,12919	tf-m
	Σ V =	113,446	/ 4.50	=	25,2103	tf
	Σ H =	13,881	/ 4.50	=	3,08477	tf

e. Dead Load + Train Load + Break Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va [Ir]	2,107	(0,025)	(0,053)			
Eh				7,407	0,998	7,393
Ha				23,977	1,930	46,276
Sub Total	59,622		(1,491)	7,407		53,668
W(Abutment)	21,821	(0,161)	(3,515)			
Total	81,443		(3,515)			
	Σ M =	50,153	/ 4.50	=	11,1451	tf-m
	Σ V =	81,443	/ 4.50	=	18,0985	tf
	Σ H =	7,407	/ 4.50	=	1,6461	tf

f. Dead Load + Train Load + Impact + Break Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va [I]	33,125	(0,025)	(0,828)			
Va [Ir]	0,983	(0,025)	(0,025)			
Eh				7,407	0,998	7,393
Ha				23,977	1,930	46,276
Sub Total	91,623		(2,291)	7,407		53,668
W(Abutment)	21,821	(0,161)	(3,515)			
Total	113,444		(3,515)			
	Σ M =	50,153	/ 4.50	=	11,1451	tf-m
	Σ V =	113,444	/ 4.50	=	25,2099	tf
	Σ H =	7,407	/ 4.50	=	1,6461	tf

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g. Dead Load + Earth Pressuse + Seismic (LL)

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	22,000	(0,025)	(0,550)			
Va [Eq]	1,711	(0,025)	(0,043)			
Eh				7,407	1,263	9,356
Ha				23,977	1,930	46,276
Sub Total	28,726		(0,718)	7,407		55,631
W(Abutment)	21,821	(0,161)	(3,515)			
Total	50,547		(4,234)			
	Σ M =	51,398	/ 4.50	=	11,4217	tf-m
	Σ V =	50,547	/ 4.50	=	11,2328	tf
	Σ H =	7,407	/ 4.50	=	1,6461	tf

REINFORCING ANALYSIS

ITEM	CASE a	b	c	d	e	f	g
Internal Force							
M (tf m)	0,83	0,36	4,74	3,13	11,15	11,15	11,42
V (tf)	5,96	24,99	6,18	25,21	18,10	25,21	11,23
H (tf)	1,65	1,65	1,65	3,08	1,65	1,65	1,65
b (m)	1,00	1,00	1,00	1,00	1,00	1,00	1,00
ht (m)	0,75	0,75	0,75	0,75	0,75	0,75	0,75
h (m)	0,65	0,65	0,65	0,65	0,65	0,65	0,65
d (m)	0,10	0,10	0,10	0,10	0,10	0,10	0,10
n	21,00	21,00	21,00	21,00	21,00	21,00	21,00
ϕ o	1,43	1,43	1,43	1,43	1,43	1,43	1,43
e o1 (m)	0,14	0,01	0,77	0,12	0,62	0,44	1,02
e o2 (m)	0,03	0,03	0,03	0,03	0,03	0,03	0,03
e o (m)	0,16	0,04	0,79	0,15	0,64	0,47	1,04
eo/ht	0,22	0,05	1,06	0,20	0,85	0,62	1,39
C1	1,00	1,00	1,00	1,00	1,00	1,00	1,00
C	7,70	7,41	7,70	7,56	7,55	7,43	7,68
Lk (m)	1,93	1,93	1,93	1,93	1,93	1,93	1,93
e 1 (m)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
e 2 (m)	0,11	0,11	0,11	0,11	0,11	0,11	0,11
e (m)	0,28	0,15	0,91	0,26	0,75	0,58	1,16
e a (m)	0,60	0,48	1,23	0,59	1,08	0,91	1,48
N ea (tf m)	3,60	11,95	7,61	14,82	19,54	22,83	16,63
Ca	10,17	5,58	7,00	5,01	5,22	4,83	5,66
δ	0,06	0,19	0,54	0,03	0,47	0,37	0,62
ϕ	6,41	3,35	4,56	3,32	3,44	3,08	3,76
ϕ!	24,71	5,92	10,25	5,21	6,20	5,21	7,18
ξ	0,14	0,21	0,18	0,24	0,22	0,25	0,21
ζ	0,96	0,92	0,94	0,92	0,92	0,91	0,92
Cb	3,83	2,90	3,27	2,96	2,83	2,74	2,95
nω	0,01	0,04	0,02	0,04	0,04	0,04	0,03

REINFORCEMENT							
i	(35,01)	(3,94)	1,98	(54,23)	2,25	2,87	1,68
A (Cm^2)	(0,06)	(2,79)	3,12	(0,21)	5,50	4,64	0,06
A' (Cm^2)	(0,00)	(0,53)	1,68	(0,01)	2,60	1,73	0,03
Amin (Cm^2)	18,75	18,75	18,75	18,75	18,75	18,75	18,75
Therefore							
A (Cm^2)	(0,06)	(2,79)	3,12	(0,21)	5,50	4,64	0,06
Rebar diameter	19,00	19,00	19,00	19,00	19,00	19,00	19,00
Distance (Cm)	15,00	15,00	15,00	15,00	15,00	15,00	15,00
A (Cm)	18,91	18,91	18,91	18,91	18,91	18,91	18,91

The Existing rebar is dia ~~25~~ 22 - 150 its all right

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SECTION A - A

Vertical Dead Load (Concrete)

		V (tf)	X (m)	M (tf m)
0.200 x 0.740 x 4.500 x 2.400	=	1,598	-0,475	-0,759
1.250 x 0.600 x 4.500 x 2.400	=	8,100	-0,250	-2,025
0.50 x0.50 x 0.5 x 4.500 x 2.400	=	1,350	-0,542	-0,731
0.750 x 4.83 x 4.500 x 2.400	=	39,123	0,000	0,000
		50,171	-0,070	-3,515

Horizontal Load

		H (m)	y (m)	M (tf m)
0.5 x 5.57 x 3.312 x 4.500	=	11,781	1,857	21,873
5.470 x 8.75 x 0.2973	=	14,230	2,785	39,629
		26,010	2,365	61,502

a. **Dead Load + Earth Pressuse**

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	-	(0,025)	-			
Eh				26,010	2,365	61,502
Ha				-	4,730	-
Sub Total	5,015		(0,125)	26,010		61,502
W(Abutment)	50,171	(0,070)	(3,515)			
Total	55,186		(3,641)			

Σ M =	57,861	/4.500	=	12,86	tf-m/m
Σ V =	55,186	/4.500	=	9,200	tf-m/m
Σ H =	26,010	/4.500	=	4,336	tf-m/m

b. **Dead Load + Train Load + Impact + Earth Pressuse**

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va [I]	33,128	(0,025)	(0,828)			
Eh				26,010	2,365	61,502
Ha				-	4,730	-
Sub Total	90,643		(2,266)	26,010		61,502
W(Abutment)	50,171	(0,070)	(3,515)			
Total	140,814		(5,782)			

Σ M =	55,720	/4.500	=	12,38	tf-m/m
Σ V =	140,814	/4.500	=	23,474	tf-m/m
Σ H =	26,010	/4.500	=	4,336	tf-m/m

c. Dead Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	-	(0,025)	-			
Va [Ir]	0,982	(0,025)	(0,025)			
Eh				26,010	2,365	61,502
Ha				9,120	4,730	43,138
Sub Total	5,997		(0,150)	26,010		104,639
W(Abutment)	50,171	(0,070)	(3,515)			
Total	56,168		(3,665)			

Σ M =	100,974	/4.500	=	22,439	tf-m/m
Σ V =	56,168	/4.500	=	9,363	tf-m/m
Σ H =	26,010	/4.500	=	4,336	tf-m/m

d. Dead Load + Train Load + Impact + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va (I)	33,128	(0,025)	(0,828)			
Va [Ir]	0,982	(0,025)	(0,025)			
Eh				26,010	2,365	61,502
Ha				6,474	4,730	30,622
Sub Total	91,625		(2,291)	32,484		92,124
W(Abutment)	50,171	(0,178)	(8,931)			
Total	141,796		(11,221)			

Σ M =	80,903	/4.500	=	17,98	tf-m/m
Σ V =	141,796	/4.500	=	23,637	tf-m/m
Σ H =	32,484	/4.500	=	5,415	tf-m/m

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e. Dead Load + Train Load + Break Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va [Ir]	2,107	(0,025)	(0,053)			
Eh				26,010	2,365	61,502
Ha				23,977	4,730	113,411
Sub Total	59,622		(1,491)	26,010		174,913
W(Abutment)	50,171	(0,178)	(8,931)			
Total	109,793		(8,931)			

Σ M =	165,982	/4.500	=	36,885	tf-m/m
Σ V =	109,793	/4.500	=	18,303	tf-m/m
Σ H =	26,010	/4.500	=	4,336	tf-m/m

f. Dead Load + Train Load +Impact + Break Load + Earth Pressuse + Long Rail Load

ITEM	V (tf)	x (m)	M (tf-m)	H (tf)	y (m)	M (tf-m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	52,500	(0,025)	(1,313)			
Va [I]	33,125	(0,025)	(0,828)			
Va [Ir]	0,983	(0,025)	(0,025)			
Eh				26,010	2,365	61,502
Ha				23,977	4,730	113,411
Sub Total	91,623		(2,291)	26,010		174,913
W(Abutment)	50,171	(0,178)	(8,931)			
Total	141,794		(8,931)			

Σ M =	165,982	/4.500	=	36,885	tf-m/m
Σ V =	141,794	/4.500	=	23,637	tf-m/m
Σ H =	26,010	/4.500	=	4,336	tf-m/m

g. Dead Load + Earth Pressuse + Seismic (LL)

ITEM	V (tf)	x (m)	M (tf - m)	H (tf)	y (m)	M (tf - m)
Va (DL)	5,015	(0,025)	(0,125)			
Va (LL)	22,000	(0,025)	(0,550)			
Va [Eq]	1,711	(0,025)	(0,043)			
Eh				26,010	2,365	61,502
Ha				23,977	4,730	113,411
Sub Total	28,726		(0,718)	26,010		174,913
W(Abutment)	50,171	(0,178)	(8,931)			
Total	78,897		(9,649)			

Σ M =	165,264	/4.500	=	36,725	tf-m/m
Σ V =	78,897	/4.500	=	13,152	tf-m/m
Σ H =	26,010	/4.500	=	4,336	tf-m/m

REINFORCING ANALYSIS

ITEM	CASE						
	a	b	c	d	e	f	g
Internal Force							
M (tf m)	12,858	22,439	22,439	17,978	36,885	36,885	36,725
V (tf)	9,200	9,363	9,363	23,637	18,303	23,637	13,152
H (tf)	4,336	4,336	4,336	5,415	4,336	4,336	4,336
b (m)	1,000	1,000	1,000	1,000	1,000	1,000	1,000
ht (m)	0,750	0,750	0,750	0,750	0,750	0,750	0,750
h (m)	0,650	0,650	0,650	0,650	0,650	0,650	0,650
d (m)	0,100	0,100	0,100	0,100	0,100	0,100	0,100
n	21,000	21,000	21,000	21,000	21,000	21,000	21,000
ϕ o	1,429	1,429	1,429	1,429	1,429	1,429	1,429
e o1 (m)	1,398	2,396	2,396	0,761	2,015	1,560	2,792
e o2 (m)	0,025	0,025	0,025	0,025	0,025	0,025	0,025
e o (m)	1,423	2,421	2,421	0,786	2,040	1,585	2,817
eo/ht	1,897	3,229	3,229	1,047	2,720	2,114	3,756
C1	1,000	1,000	1,000	1,000	1,000	1,000	1,000
C	7,700	7,410	7,700	7,560	7,550	7,430	7,680
Lk (m)	4,730	4,730	4,730	4,730	4,730	4,730	4,730
e 1 (m)	0,007	0,007	0,007	0,007	0,007	0,007	0,007
e 2 (m)	0,113	0,113	0,113	0,113	0,113	0,113	0,113
e (m)	1,542	2,541	2,541	0,905	2,160	1,705	2,937
e a (m)	1,867	2,866	2,866	1,230	2,485	2,030	3,262
N ea (tf m)	17,180	26,835	26,837	29,08	45,480	47,983	42,904
Ca	4,655	3,724	3,724	3,578	3,424	3,333	3,525
δ	0,695	0,802	0,802	0,538	0,771	0,720	0,826
ϕ	3,000	2,460	2,460	2,390	2,333	2,226	2,390
ϕ!	5,000	3,865	3,865	3,615	3,500	3,286	3,615
ξ	0,245	0,285	0,285	0,300	0,300	0,310	0,295
ζ	0,915	0,904	0,904	0,900	0,900	0,897	0,901
Cb	2,568	2,359	2,359	2,298	2,268	2,209	2,298
nw	0,049	0,072	0,072	0,079	0,090	0,092	0,079

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REINFORCEMENT							
i	1,467	1,258	1,258	1,907	1,308	1,403	1,219
A (Cm 2)	10,336	17,630	17,631	12,857	21,299	20,308	20,139
A' (Cm 2)	7,188	14,132	14,132	6,913	16,424	14,618	16,627
Amin (Cm 2)	18,750	18,750	18,750	18,750	18,750	18,750	18,750
Therefore							
A (Cm 2)	10,336	17,630	17,631	12,857	21,299	20,308	20,139
Rebar diameter	22,000	22,000	22,000	22,000	22,000	22,000	22,000
Distance (Cm)	15,000	15,000	15,000	15,000	15,000	15,000	15,000
A (Cm)	25,352	25,352	25,352	25,352	25,352	25,352	25,352
	The Existing Rebar are dia 22 - 150 its all right						

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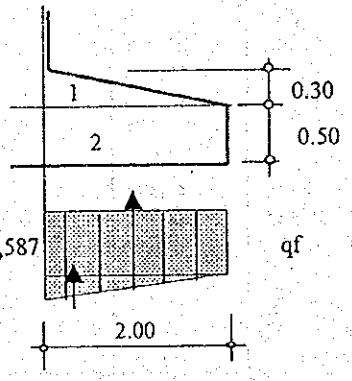
SECTION D - D

Front Footing

a. Dead Load + Eart Pressure



qfl = 9,587 qf = 8,878 tf/m2

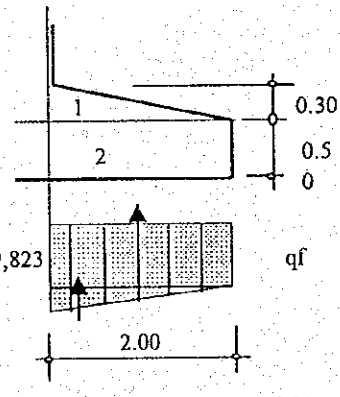
M =	+ 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00	=	0,480	
	+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00	=	2,400	
	- 8.878 x 2.00 x 0.50 x 2.00	=	(17,757)	
	(0,709) x 2.00 x 0.5 x 1/3 x 2 00		(0,473)	
			(15,350)	tf m

A = 25,352 Cm 2 (D22 - 150)

A' = 12,676 Cm 2 (D22 - 300)

Compression	C	=	11,900	kg f / Cm2
Tension	S	=	1.116,200	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

b. Dead Load + Eart Pressure LL



qfl = 9,823 qf = 9,249 tf/m2

M =	+ 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00	=	0,480	
	+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00	=	2,400	
	-9.249 x 2.00 x 0.50 x 2.00	=	(18,498)	
	0,574 x 2.00 x 0.5 x 1/3 x 2 00	=	(0,382)	
			(16,001)	tf m

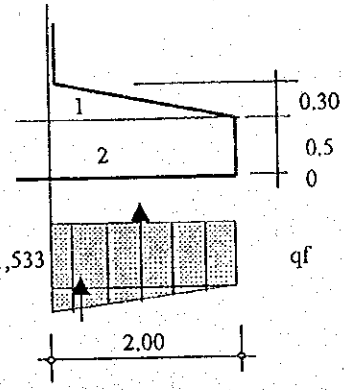
A = 25,352 Cm 2 (D22 - 150)

A' = 1,268 Cm 2 (D22 - 300)

Compression	C	=	12,400	kg f / Cm2
Tension	S	=	1.164,800	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	151

c. Dead Load + Eart Pressure LL



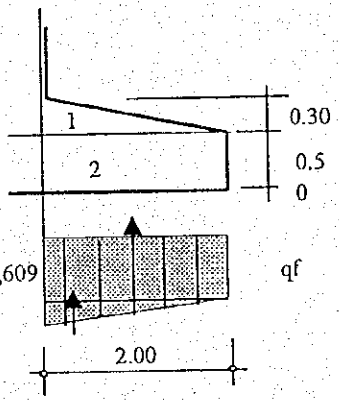
qfl = 11,533 qf = 11,073 tf/m2

M = + 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00 = 0,480
+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00 = 2,400
- 11.2073 x 2.00 x 0.50 x 2.00 (22,146)
(0,460) x 2.00 x 0.5 x 1/3 x 2 00 = (0,306)
(19,573) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression C = 15,100 kg f / Cm2
Tension S = 1.421,800 kg f / Cm2
Shear Stress t = - kg f / Cm2

d. Dead Load + Train Load + Impact + Eart Pressure



qfl = 12,609 qf = 12,215 tf/m2

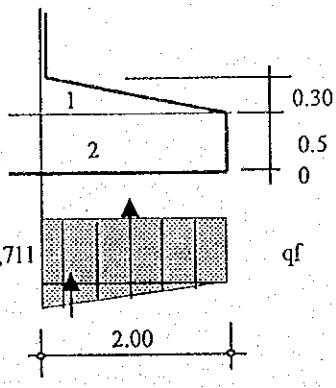
M = + 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00 = 0,480
+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00 = 2,400
-12.215 x 2.00 x 0.50 x 2.00 = (24,430)
(0,394) x 2.00 x 0.5 x 1/3 x 2 00 = (0,263)
(21,813) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression C = 16,800 kg f / Cm2
Tension S = 1.581,600 kg f / Cm2
Shear Stress t = - kg f / Cm2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	40/51

e Dead Load + Long Rail Load + Impact + Eart Pressure



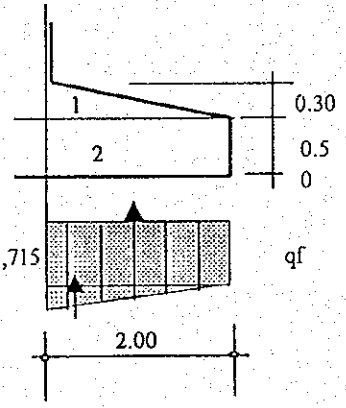
qfl = 9,711 qf = 9,215 tf/m2

M = + 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00 = 0,480
+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00 = 2,400
- 9.215 x 2.00 x 0.50 x 2.00 = (18,430)
(0,496) x 2.00 x 0.5 x 1/3 x 2 00 = (0,331)
(15,881) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression C = 12,400 kg f / Cm2
Tension S = 1.160,900 kg f / Cm2
Shear Stress t = - kg f / Cm2

f. Dead Load + Train Load + Earth Pressure + Long Rail Load



qfl = 11,715 qf = 11,602 tf/m2

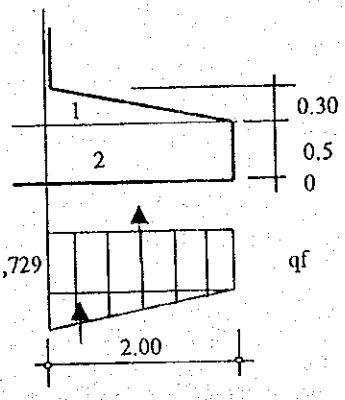
M = + 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00 = 0,480
+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00 = 2,400
- 11.602 x 2.00 x 0.50 x 2.00 = (23,204)
(0,113) x 2.00 x 0.5 x 1/3 x 2 00 = (0,076)
(20,400) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression C = 15,900 kg f / Cm2
Tension S = 1.491,900 kg f / Cm2
Shear Stress t = - kg f / Cm2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	41/51

g. Dead Load + Train Load +Impact + Earth Pressure + Long Rail Load



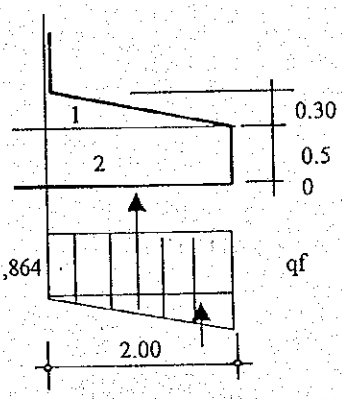
qfl = 12,729 qf = 12,537 tf/m2

M = + 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00 = 0,480
+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00 = 2,400
- 12.537 x 2.00 x 0.50 x 2.00 = (25,074)
(0,192) x 2.00 x 0.5 x 1/3 x 2 00 = (0,128)
(22,322) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression C = 17,300 kg f / Cm2
Tension S = 1.622,500 kg f / Cm2
Shear Stress t = - kg f / Cm2

h. Dead Load + Train Load + Brack Load + Earth Pressure + Long Rail Load



qfl = 11,864 qf = 12,008 tf/m2

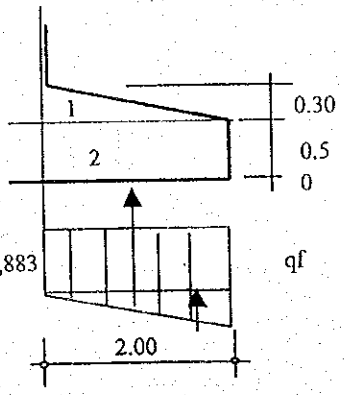
M = + 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00 = 0,480
+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00 = 2,400
- 12.008 x 2.00 x 0.50 x 2.00 = (23,727)
0,144 x 2.00 x 0.5 x 2/3 x 2 00 = 0,193
(20,655) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression C = 16,100 kg f / Cm2
Tension S = 1.509,700 kg f / Cm2
Shear Stress t = - kg f / Cm2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	42/51

i. Dead Load + Train Load + Impact + Brack Load + Earth Pressure + Long Rail Load



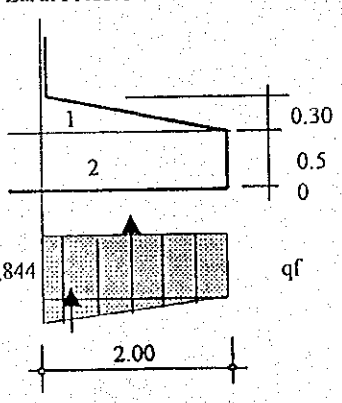
qf1 = 12,883 qf = 13,044 tf/m2

M =	+ 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00	=	0,480
	+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00	=	2,400
	- 13.044 x 2.00 x 0.50 x 2.00	=	(25,766)
	0,161 x 2.00 x 0.5 x 2/3 x 2 00	=	0,215
			(22,671) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression	C	=	17,600	kg f / Cm2
Tension	S	=	1.651,400	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

j Dead Load + Earth Pressure + Seismic



qf1 = 9,844 qf = 9,699 tf/m2

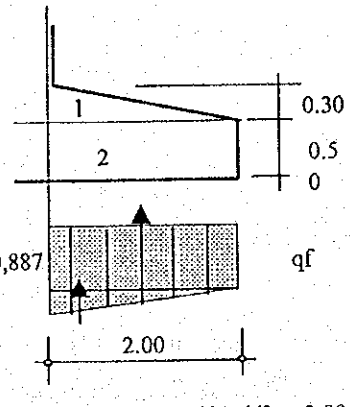
M =	+ 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00	=	0,480
	+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00	=	2,400
	- 9.699 x 2.00 x 0.50 x 2.00	=	(19,399)
	(0,145) x 2.00 x 0.5 x 1/3 x 2 00	=	(0,097)
			(16,615) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

Compression	C	=	13,000	kg f / Cm2
Tension	S	=	1.224,700	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	43/51

k Dead Load + Earth Pressure + Seismic (LL)



qf1 = 10,887 qf = 10,676 tf/m2

M = + 0.3 x 2.00 x 0.5 x 2.40 x 1/3 x 2.00 = 0,480
+ 0.50 x 2.00 x 2.40 x 0.5 x 2.00 = 2,400
- 10.676 x 2.00 x 0.50 x 2.00 = (21,352)
(0,211) x 2.00 x 0.5 x 1/3 x 2 00 = (0,141)
(18,613) tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 1,268 Cm 2 (D22 - 300)

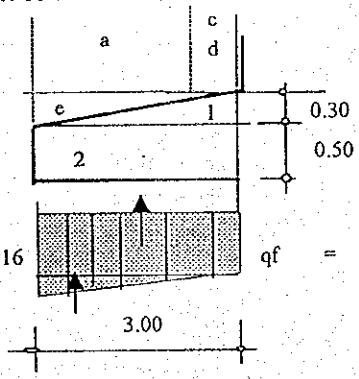
Compression	C	=	14,500	kg f / Cm2
Tension	S	=	1.362,900	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	44/51

SECTION E - E

Rear Footing

a. Dead Load + Eart Pressure



qf1 = 10,916 qf = 9,853 tf/m2

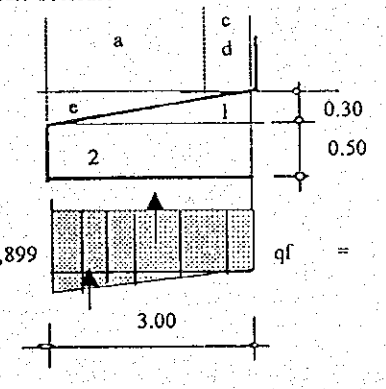
M =	1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00	=	1,080
	2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00	=	5,400
	a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5)	=	50,313
	c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50	=	0,083
	d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50	=	0,933
	e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00	=	1,800
	- 9.853 x 3.00 x 0.50 x 3.00	=	(44,339)
	(1,063) x 3.00 x 0.5 x 2/3 x 3.00	=	(3,190)
			12,079 tf m

A = 25,352 Cm 2 (D22 - 150)

A' = 12,676 Cm 2 (D22-300)

Compression	C	=	-	kg f / Cm2
Tension	S	=	3,800	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

b. Dead Load + Eart Pressure



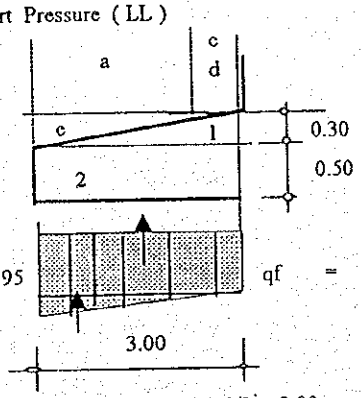
qf1 = 10,899 qf = 10,038 tf/m2

M =	1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00	=	1,080
	2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00	=	5,400
	a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5)	=	50,313
	c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50	=	0,083
	d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50	=	0,933
	e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00	=	1,800
	- 10.1038 x 3.00 x 0.50 x 3.00	=	(45,171)
	(0,861) x 3.00 x 0.5 x 2/3 x 3.00	=	(2,582)
			11,856 tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression	C	=	0,200	kg f / Cm2
Tension	S	=	14,200	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

C. Dead Load + Eart Pressure (LL)



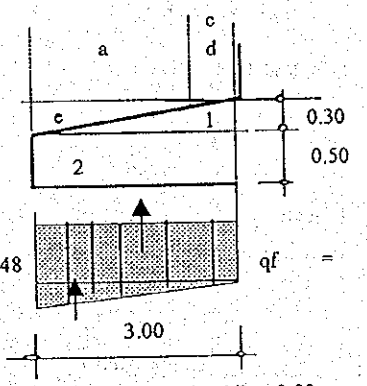
qfl = 12,395 qf = 11,705 tf/m2

M = 1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00	=	1,080	
2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00	=	5,400	
a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5)	=	50,313	
c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50	=	0,083	
d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50	=	0,933	
e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00	=	1,800	
- 11.705 x 3.00 x 0.50 x 3.00	=	(52,673)	
(0,690) x 3.00 x 0.5 x 2/3 x 3. 00	=	(2,069)	
		4,866	tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression	C	=	5,300	kg f / Cm2
Tension	S	=	494,600	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

d. Dead Load + Train Load + Impact + Eart Pressure



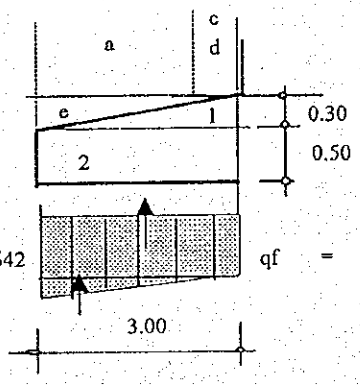
qfl = 13,348 qf = 12,757 tf/m2

M = 1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00	=	1,080	
2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00	=	5,400	
a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5)	=	50,313	
c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50	=	0,083	
d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50	=	0,933	
e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00	=	1,800	
- 12.757 x 3.00 x 0.50 x 3.00	=	(57,406)	
(0,591) x 3.00 x 0.5 x 2/3 x 3. 00	=	(1,773)	
		0,429	tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression	C	=	8,500	kg f / Cm2
Tension	S	=	802,300	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

c. Dead Load + Eart Pressure + Long Rail load



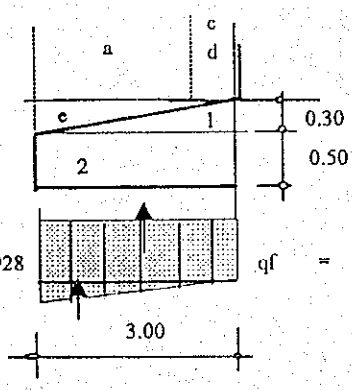
qf1 = 10,642 qf = 9,897 tf/m2

M = 1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00 = 1,080
2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00 = 5,400
a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5) = 50,313
c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50 = 0,083
d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50 = 0,933
e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00 = 1,800
- 19.897 x 3.00 x 0.50 x 3.00 = (44,539)
(0,745) x 3.00 x 0.5 x 2/3 x 3.00 = (2,234)
12,836 tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression	C	=	0,700	kg f / Cm2
Tension	S	=	63,400	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

f. Dead Load + Train Load + Eart Pressure + Long Rail load



qf1 = 11,928 qf = 11,758 tf/m2

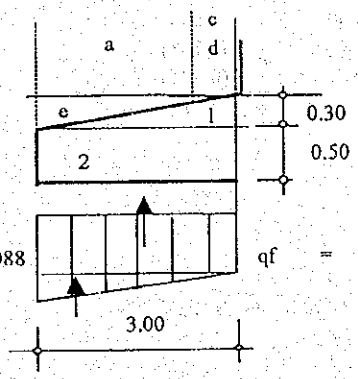
Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	47/51

M = 1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00 = 1,080
2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00 = 5,400
a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5) = 50,313
c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50 = 0,083
d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50 = 0,933
e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00 = 1,800
- 11.917 x 3.00 x 0.50 x 3.00 = (52,911)
(0,170) x 3.00 x 0.5 x 2/3 x 3.00 = (0,510)
6,187 tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression	C	=	4,000	kg f / Cm2
Tension	S	=	378,800	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

g Dead Load + Train Load + Impact + Eart Pressure + Long Rail load



qf1 = 13,088 qf = 12,801 tf/m2

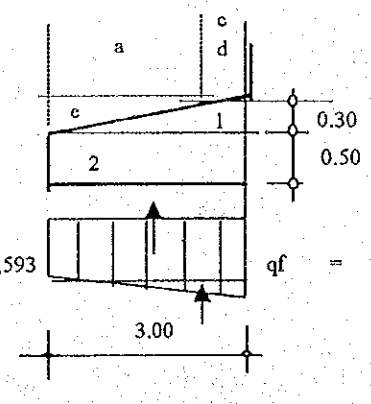
M = 1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00 = 1,080
2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00 = 5,400
a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5) = 50,313
c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50 = 0,083
d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50 = 0,933
e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00 = 1,800
- 12.801 x 3.00 x 0.50 x 3.00 = (58,895)
0,287 x 3.00 x 0.5 x 1/3 x 3.00 = 0,431
1,144 tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression	C	=	7,900	kg f / Cm2
Tension	S	=	742,300	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	48/51

h. Dead Load + Train Load + Breack Load + Eart Pressure + Long Rail load



qfl = 11,593 qf = 11,810 tf/m2

M =	1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00	=	1,080
	2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00	=	5,400
	a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5)	=	50,313
	c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50	=	0,083
	d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50	=	0,933
	e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00	=	1,800
	- 11.810 x 3.00 x 0.50 x 3.00	=	(52,168)
	(0,217) x 3.00 x 0.5 x 1/3 x 3.00	=	(0,325)
			7,115 tf m

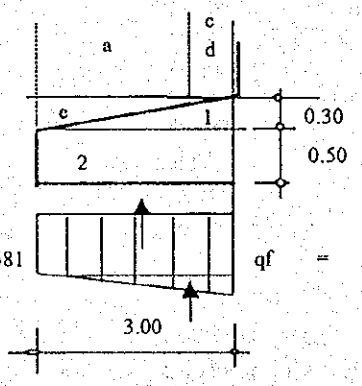
A = 25,352 Cm 2 (D22 - 150)

A' = 12,676 Cm 2 (D22-300)

Compression C = 3,200 kg f / Cm2

Tension S = 296,600 kg f / Cm2

i. Dead Load + Train Load + Impact + Breack Load + Eart Pressure + Long Rail load



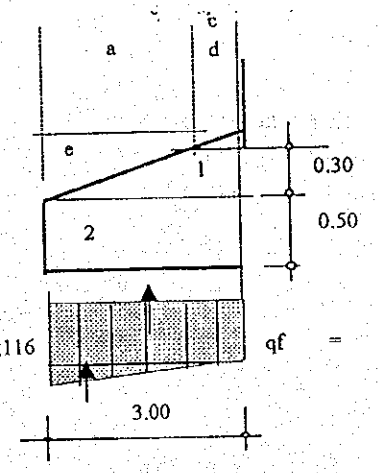
qfl = 12,581 qf = 12,823 tf/m2

M =	1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00	=	1,080
	2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00	=	5,400
	a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5)	=	50,313
	c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50	=	0,083
	d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50	=	0,933
	e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00	=	1,800
	- 12.823 x 3.00 x 0.50 x 3.00	=	(56,613)
	(0,242) x 3.00 x 0.5 x 1/3 x 3.00	=	(0,363)
			2,633 tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression C = 6,500 kg f / Cm2
Tension S = 610,000 kg f / Cm2

j Dead Load + Eart Pressure + Seismic



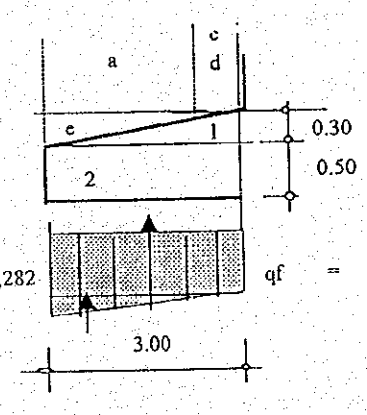
qf1 = 10,116 qf = 9,898 tf/m2

M = 1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00 = 1,080
2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00 = 5,400
a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5) = 50,313
c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50 = 0,083
d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50 = 0,933
e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00 = 1,800
- 9.898 x 3.00 x 0.50 x 3.00 = (44,543)
(0,217) x 3.00 x 0.5 x 2/3 x 3. 00 = (0,651)
14,414 tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression C = 2,100 kg f / Cm2
Tension S = 197,600 kg f / Cm2
Shear Stress t = - kg f / Cm2

k Dead Load + Eart Pressure + Seismic (LL)



qf1 = 11,282 qf = 10,966 tf/m2

Name Of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	50/51.

M = 1. + 0.3 x 3.00 x 0.5 x 2.40 x 1/3 x 3.00 = 1,080
2. + 0.50 x 3.00 x 2.40 x 0.5 x 3.00 = 5,400
a. + 2.5 x 5.75 x 2.00 x (2.50 / 2 + 0.5) = 50,313
c. + 0.50 x 0.50 x 0.50 x 2.00 x 2/3 x 0.50 = 0,083
d. + 0.50 x 3.73 x 2.00 x 0.5 x 0.50 = 0,933
e. + 0.5 x 0.30 x 3.00 x 2.00 x 2/3 x 3.00 = 1,800
- 10.966 x 3.00 x 0.50 x 3.00 = (49,347)
(0,316) x 3.00 x 0.5 x 2/3 x 3.00 = (0,949)
9,312 tf m

A = 25,352 Cm 2 (D22 - 150)
A' = 12,676 Cm 2 (D22-300)

Compression	C	=	1,800	kg f / Cm2
Tension	S	=	165,500	kg f / Cm2
Shear Stress	t	=	-	kg f / Cm2

3.3.4. BEARING CAPACITY OF PILE TEMPORARY SUPPORT

$$Ra = \{ qa . A . + U \Sigma (li . fi) \} / SF$$

Ra = Allowable Bearing capacity of pile (tf)
qa = Ultimate bearing capacity per unit area pile tip (tf/m^2)
A = Area of Pile (m^2)
U = Circumferential length of pile (m)
l i = Stratum depth (m)
f i = Maximum skin friction of stratum (tf / m^2)
SF = Safety Factor = 4 for friction

Bearing Capacity Of Coconut Pile / Friction pile

Pile dia = 30 Cm 0,3 m
U = Round of Pile = 22/7 . 0.3 = 0,942857 m
A = Area Of Pile = 1/4 . 22/7 . 0.3^2 = 0,07065 m^2
Li = 5 m
fi = C N = 5 C = N/11
fi = 0,455 Kg/Cm2 = 4.55 t / m2

Ra = { 0 + 0.943 x (5 x 4.55) / 4
5,36 tf / pile

Maximum Loading to Coconut Pile (Qa)

Dead Load + Train Load + Impact + Long Rail Road

Va (DL) :	5,015	tf
Va (LL) :	52,500	tf
Va (I) :	33,128	tf
Va (Ir) :	0,982	tf
Σ Va :	91,625	tf

Number of Coconut pile n : 18,00 nos

Qa = Σ Va / n
Qa = 91.625/18 = 5,09 tf < 5,36 tf Its All right
It's all right