7.4.6 BOX CULVERT (LOCATION 2 + 331M)

4		 	 			
	Name of	Category of		Page		
	Structure	calculation		Lage	•	

RESULT OF DESIGN CALCULATION

1. Existing Abutment

Stability Analisys of bearing Capacity

a. At normal condition qu = 58.599 t/m2

q max = 14.016 t/m2SF = 4.181 > 3

b. At Seismic condition qu = 58.424 t/m2

q max = 18.119 t/m2SF = 3.224 > 2

2. Raising Abutment

Stability Analisys of bearing Capacity

a. At normal condition qu = 58.364 t/m2

q max = 15.897 t/m2SF = 3.661 > 3

b. At Seismic condition $qu = 58.205 t/m^2$

q max = 20.350 t/m2SF = 2.860 > 2

3. Reinforcing Bar

From existing concrete

- on body/wall = D22 - 150 - on footing = D22 - 150

4. From Calculation of raising abutment

- on joint of concrete to new concrete necessary D19 - 150

- on footing = D22 - 150

The existing reinforcing bar is all right

Name of	Railway Bridge	Category of	Structure	Page	
Structure.	BH - 13	Calculation	Calculation		

DESIGN CALCULATION REPORT

RAILWAY BRIDGE BH - 13
PART 1

STABILITY ANALISYS OF EXISTING ABUTMENT

Name of	Railway Bridge	Category of	Structure	Page	. ,	
Structure	BH - 13	 Calculation	Calculation		1/22	

CALCULATION REPORT

PART-1

(STABILITY ANALYSIS FOR EXISTING ABUTMENT)

RAILWAY BRIDGE BH. 13 (STEEL BRIDGE 8.00 M)

Table content

- 1. DESIGN CONDITION
 - 1,1 Existing Super Structure
 - 1,2 Track Condition
 - 1,3 Regulation reference
 - 1,4 Material Quality
 - 1,5 Loading
- 2. DIMENSION OF EXISTING ABUTMENT
- 3. STABILITY ANALISYS OF EXISTING ABUTMENT
 - 3,1 Dimension of Abutment
 - 3,2 Loading
 - 3.2.1 Vertical Force
 - 3.2.2 Longitudinal Horizontal Force
 - 3.2.3 Tranversal Horizontal Force
 - 3,3 External Stability Calculation
 - 3.3.1. Weight of Abutment
 - 3.3.2 Load Combination
 - 3.3.3 Stability Analysis

Name of Railway Bridge Structure BH - 13	Category of Calculation	Structure Calculation	Page 2/22
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1. DESIGN CONDITION

1,1 EXISTING CONDITION

a. Superstructure

- Type : Girder
- Total weight : 10,03 tf
- Effective Span (c.t.c) : 8,80 m
- Total Lenght of girder : 9,60 m
- Center to center of main Girder : 3,00 m
- Distance between top of rail up to top of : 0,90 m

Concrete Bearing

- Material of Bearing Shoe : Steel Bearing

b. Substructure

- Material : concrete K 225

Type : cantilever
 Visual Condition : good
 Crack on Structure : nothing
 Displesement : nothing

- Fondation : concrete slab

1,2 TRACK CONDITION

- Track Plan : Straigt

- Track Elevation : 0,0044 gradien

1,3 REGULATION REFERENCE

- Spesifikation of Perumka Railway Bridge Design (AVBP 1932)
- PD-10
- Indonesian Concrete Code
- Elastic Analysis of concrete section (Departement PU)

1,4 MATERIAL QUALITY

- Concrete K 225
- Plain / Lean Concrete K-125
- Reinforced Steel bar U-39 (Deform steel)

	Name of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	3/22
1		<u> </u>	<u> </u>			<u>i </u>

1,5 LOADINGS

- Train Load

- Impact

Brake.

- Longitudinal Load due to Long Rails

- Break Load

- Lateral Load

- Wind Load

- Eart Pressure

- Stream Flow

- Seismic Load

: based on 100 % Load Scheme 1921

 $[0.2 + 25 / (L + 50)] \times Train Load$

: 1.00 tf/m' (per one track) max. 200 tf

: 1/6 Locomotive + 1/10 Wagon

: 1/10 train Load

: 0.10 tf/m²

: bassed on Collomb teory

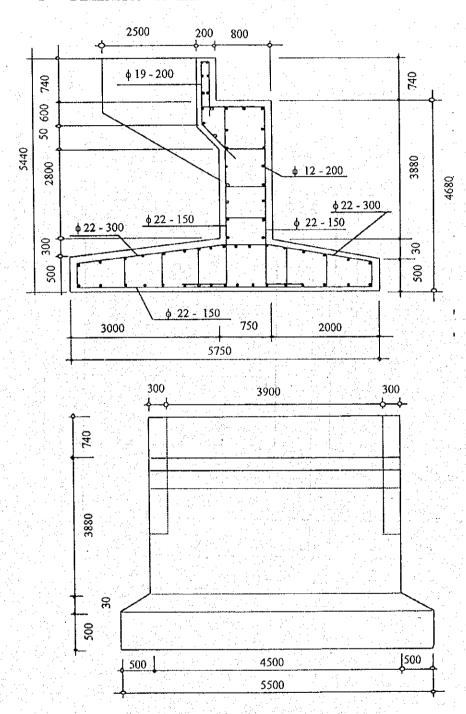
: based on the equivalent static force and design

: bassed on the equivalent static force and design seismic intensity expressed as followings:

KH = 0.18KV = 0.00

Name of	Railway Bridge	Category of	Structure	Page	111
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2 DIMENSION OF EXISTING ABUTMENT

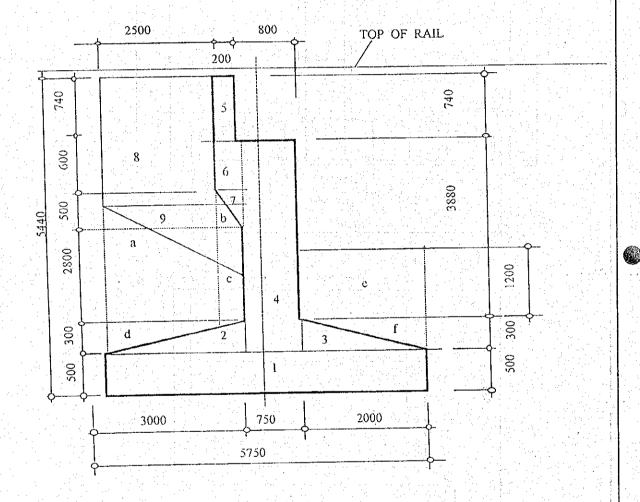


This data from SUDP Kodia Dati II Semarang 1994/1995

ı							
	Name of	Railway Bridge	Category of	Structure	Page	54.	- 1
1	Structure	BH - 13	Calculation	Calculation		722	

3 ABUTMENT

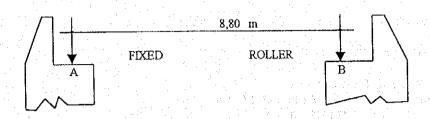
3.1' DIMENSION OF ABUTMENT



r						
	Name of	Railway Bridge	Category of	Structure	Page	61
I	Structure	BH - 13	Calculation	Calculation		22
ı	Diractare	B11 10	100			

3,2 LOADING

3.2.1 VERTICAL FORCE



- a. Dead Load Vb = Va = 5,015
- b. Train Load (Live Load)
 q tr : 7 x 15.00 x 0.5 = 52,500 tf
 Vb = Va = 52,500 tf
- c. Impact Load

Impact Coefficient

$$I = 0.200 + 25/(8.00 + 50.00) = 0,631$$

 $V_a = V_b = 52.50 \times 0.631 = 33,128$

d. Train Load for Seismic

$$q = 15.00 / 2.4 = 6,250 tf/m$$
 $Va = 6.250 x 8.8 x 0.5 = 27,500 tf$
 $Vb = 6.250 x 8.8 x 0.5 = 27,500 tf$

SUMMARY OF VERTICAL FORCE

ІТЕМ	Support A (ton-f)	Support B (ton - f)
Dead load (DL)	5,015	
Train Load (LL) Impact Load (I)	52,500 33,128	33,128
Train for Seismic (LL)	27,500	27,500

3.2.2. LONGITUDINAL HORIZONTAL FORCE

a. DEAD LOAD + LONG RAIL LOAD

TOTAL HORIZONTAL FORCE

$$\Sigma$$
 H = 9.6 x 1.00 = 9,600 tf

HORIZONTAL FORCE ON SUPPORT

Name of Structure	R	ailway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	7/22
				Carculation	<u> </u>	/
		therefore Ha =	9,12 tf			
		VERTICAL FORCE				
		$Va = 9.6 \times 0.9$	/ 8.8 =	0,982 tf		
	b.	LONG RAIL LOAD + B	RAKE LOAD			
		TOTAL HORIZONTAL $\Sigma H = 0 \times 15.00 \times 10^{-10}$		667 + 9.6		
		HORIZONTAL FORCE Ha = Σ H - $1/2 \times \mu$ = 27.1035 = therefore Ha = 23.977 tf	x Vb - 0.5 x 0.10 x (10.0	03+52.50) x 27.1035 = 13.5518 tf		
		VERTICAL FORCE Va = 23.977 x 0.		2,452 tf		
	С.	TRAIN LOAD + LONG TOTAL HORIZONTAL				
		$\Sigma H = 9.6 \times 1.00$		9,600 tf		
		= therefore	x Vb 5 x 0.10 x (10.03+52	2.50) x 9.600 = 4.80 tf		
		Ha = 6.474 tf VERTICAL FORCE Va = 9.6 x 0.9/8	.8	0,982 tf		
	d.	DEAD LOAD FOR SEI	SMICC			
		TOTAL HORIZONTAL ΣΗ = 10.03 x 2 x		3,611 (f	Entre P De Nobe Se kroe	
		HORIZONTAL FORCE Ha = Σ H - $1/2$ x μ = 3.611 -	x Vb 0.5 x 0.10 x 10.03	$\times 3.611 = 1.805$ tf		
		therefore Ha = 3.110 tf VERTICAL FORCE Va = 3.110 x 0.9	/8.8 =	0,318 tf		
	ć.	TOTAL HORIZONTAL	FORCE			
		HORIZONTAL FORCE Ha = Σ H - $1/2 \times \mu$ = 13.511	ON SUPPORT x Vb -0.5 x 0.10 x (10.0) 11,635 tf > 1/2			

Name of		Railway Bridge	 Category of	Structure	Page	0/
Structure	`	BH - 13	Calculation	Calculation		6/22

therefore

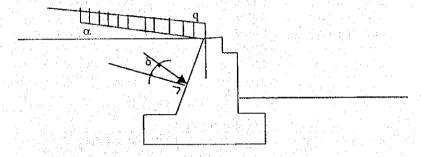
$$Ha = 11.635$$
 tf

VERTICAL FORCE

$$V_a = 11.635 \times 0.9 / 8.8$$

1,190 tf

f. EART PRESSURE



1) NORMAL CONDITION COEFFICIENT OF EARTH PRESSURE

$$Ka = \frac{\cos^2(\phi - \theta)}{\cos^2\theta \cos(\theta + \delta)[1 + \sqrt{\frac{\sin(\phi + \delta)\sin(\phi - \alpha)}{\cos(\theta + \delta)\cos(\theta - \alpha)}}]^2}$$

$$Kp = \frac{\cos^2(\phi + \theta)}{\cos^2\theta \cos(\theta + \delta)[1 + \sqrt{\frac{\sin(\phi + \delta)\sin(\phi + \alpha)}{\cos(\phi + \delta)\sin(\phi + \alpha)}}]^2}$$

Fill material

$$\theta = 0 \\
\phi = 30 \\
\delta = 20$$

$$\theta = 0$$

$$\phi = 3$$

 $Cos(\theta + \delta) Cos(\theta - \alpha)$

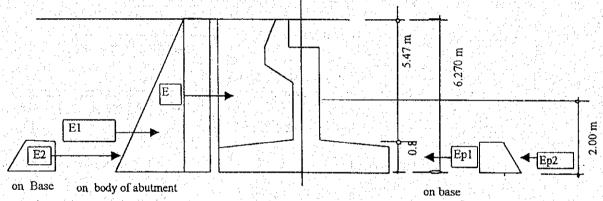
	Name of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	9/22
1				* •		

```
(\phi - \theta)
                              0,8662
                                                                                                  0,9986
Cos
                              0,8662
                                                                Cos
                                                                                                  0,9986
                                                                Cos 0
Cos \theta
                               1,0000
                                                                                                  1,0000
Cos
         (\theta + \delta)
                              0,9398
                                                                Cos
                                                                          (\theta + \delta)
                                                                                                  0,9994
Sin
         (\phi + \delta)
                              0,7658
                                                                Sin
                                                                         (\phi + \delta)
                                                                                                  0,0871
Sin
        (\phi - \delta)
                              0,1736
                                                                Sin
                                                                         (\phi - \delta)
                                                                                                  0,0174
                                                                         (\phi - \alpha)
Sin
        (\phi - \alpha)
                               0,4998
                                                                Sin
                                                                                                  0,0523
Sin
                               0,4998
                                                                Sin
         (\phi + \alpha)
                                                                         (\phi + \alpha)
                                                                                                  0,0523
Cos
         (\theta + \delta)
                              0,9398
                                                                Cos
                                                                          (\theta + \delta)
                                                                                                  0,9994
                                                                Cos
Cos
         (\theta - \alpha)
                               1,0000
                                                                         (\theta - \alpha)
                                                                                                  1,0000
```

Active Earth Pressure

Ka =
$$\frac{0.8660 \times 0.8660}{1.000 \times 0.9398 \times \left[1 + \sqrt{\frac{0.7660 \times 0.5000}{0.9397 \times 1.000}}\right]^{2}}$$
= 0,2973

a. Due to Earth Pressure



8,798

2,588

tľ/m

tf/m

Active Earth Pressure

E1 = $0.5 \times 2.00 \times 5.440 \times 5.440 \times 0.2973 =$

 $E2 = 0.8 \times 2.00 \times 5.440 \times 0.2973$

1000				Talle of the	
El h	= E1 Cos δ = 8.798 x 0.9397 =		8,268	tf/m	
E2 h	= E2 Cos δ = 2.588 x 0.9397 =		2,432	tf/m	
El v	= E1 Sin δ = 8.798 x 0.342 =		3,009	tf/m	
E2 v	= E2 Sin δ = 2.588 x 0.342 =		0,885	ti/m	# 3.5 P.
Total	force per abutment				
Elh	= 8.268 x 4.5 = 37	,204 tf	yl =	2,093	m
E2h	$= 2.588 \times 4.5 = 10$,942 tf	y2 =	0,400	m
	48	,147 tf	y =	1,247	m
Elv	$= 3.009 \times 4.50 = 13$,540 tf	x1 =	2,875	m
E2v	$= 0.885 \times 4.50 = $,982 tf	×2 =	2,875	m
41 43		,523 tf	x =	2,875	m

Name of Structure	Railway Bridge BH - 13	Category of , Calculation	Structure Calculation	Page	10/22
Structure	DII - 13	Guidalation	04.04.4		
	en e				
	Passive Earth Pressure				
		0.9986 x			
	Ka ≕	1,000 x 0.9994 x	$(1+\sqrt{\frac{0.0672}{0.0672}})$	c 0.0523	
		1,000 X 0.9994 X	0.9994	k 1.000	
	- 영화에 하는 사람들이 함께 보다. 대한민국 등 기가 있는 사람	1,1477			
	$Ep1 = 2.00 \times 1.60 \times$	1.1477 =		/m²	
	$Ep2 = 2.80 \times 1.60 \times$	1.1477 =	5,142 tf.	/m²	
	$Ep1 = 0.80 \times 3.673$		•	/m	
	$Ep2 = 0.5 \times 0.8 \times 5.$	142 =	2, 057 tf	7m	
		e de la Colon Region. Roja de m			
	Eplh = El Cos δ = Ep2 h = E2 Cos δ =			/m /m	
	Epl v = El Sin δ =	$2.938 \times 0.0349 =$		7m	
	Ep2 v = E1 Sin δ =	2.057 x 0.0349 =	0,072 tf	/m	
	Total force per abutment				
	$Eplh = 2.936 \times 4.50$		212 tf yl =	0,400 m	
	$Ep1h = 2.956 \times 4.50$ $Ep2h = 2.056 \times 4.50$	<u> </u>	252 tf y2 =	0,267 m	
		22,	464 tf y =	0,333 m	
	$Ep1v = 0.103 \times 4.50$		464 tf x1 =	2,875 m	
	$Ep2v = 0.072 \times 4.50$		$\frac{324 \text{ tf}}{788 \text{ tf}}$ $x^2 =$	2,875 m 2,875 m	
	b). Do to live Load				
	Total force per Abutment		la la trada de la composición de la co La composición de la		
	$E = 8.75 \times 0.2973$		14,151	tf	
	Eh = E Cos δ = Ev = E Sin δ =	14.151 x 0.9397 14.151 x 0.3420		tf-m tf-m	
	2). EARTQUAKE CONDI	IION			
	COEFFICIENT OF E	arth pressure			
		Cos² (c	-θο-θ)		
	Kea = -		Sin (¢	+δ) Sin (φ - c	$x - \theta o$
	$\cos^2 \theta$ o	Cos θ Cos (θο+θ+δ)[1+ 1/		
			V Cos (θ	$(+\theta + \delta)$ Cos	$s(\theta-\alpha)$
		Cos ² (φ-θο+θ)		
	Kea =			S \ C \ \ (\lambda \ 1 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	. 90.)
	Cos ² Ao	Cos θ Cos (θo-θ+δ)[1.1	-δ) Sin(φ+o	$ 1^2$
	Cos 60	2530 253 (35-54-0)[Cos (€) - θo +δ) Co	$s(0-\alpha)$
	Fill m	aterial	S. S	oil (Assumsion	same with BH 10)
	$\theta o =$	10,20	The state of the s	o = 10,	20
	θ =	0,00 30,00	6	0,0 0 = 3,0	
	φ = δ =	0,00	8	5 = 0,0	0
7.1	$\alpha =$	0,00	. N	x = 0.0	0

			_		·	
Name of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page		11/22
			a (1	0 0 0	4	0.0001
	• •	$\theta_0 - \theta_0 = 0.9408$		→ θo −θ .)·		0,9921
		$\theta_0 + \theta$) = 0,9408		- θo +θ)		0,9921
	Cos θo	= 0,9842	Cos 0			0,9842
	Cos θ	= 1,0000	Cos θ		=	1,0000
	Cos (θ			θ +θο+δ)	. .	0,9842
	Cos (0			$\theta + \theta + \delta$)	=	0,9842
* "	Sin ($(\phi + \delta)$	=	0,0524
	Sin (4 +			+δ−θo)	= , + ,	-0,1254
•	Sin ($(\phi - \delta)$	=	0,0524
eg ta		α -00) = 0,3386		+α-θο)	=	-0,1253
	Cos ($\theta - \alpha) = 1,0000$	Cos	$(\theta - \alpha)$. -	1,0000
\$ - 1 To 1	and the first of the second				12.	
•	Active Earth press					
		0,9842	X	0,9408		
	Kea =					
			0.5000 x 0	.3387		
In the English	0.984	2 x 1.000x1.000 + 0.9842	: [1 ± √]2	
			V 0.9842 x	1.000		
	보이하는 이 그러지만 그렇는 듯.	0,4566				
	a). Due to Earth Pressur	re		Personal Services		
					4 1	
	E1 =	= 0.500 x 1.90 x 5.	440 x 5,440 x 0,4566	= 1	2,837	tf/m
	E2	= 0.800 x 1.90 x 5.	440 x 0.4566	. .	3,776	tf/m
		ARREST CONTRACTOR				
	Elh =	E Cos δ =	12.837 x 1.000	= 1	2,837	tf/m
	E2h =	E Cos δ =	3.776 x 1.000	in, e ali balib	3,776	tf/m
	$\mathbf{E}\mathbf{i}\mathbf{v}' =$	E Sin δ =	12.837 x 0.000	. =	0.000	tf/m
	E2v =	E Sin δ =	3.776 x 0.000	=	0,000	tf/m
		regional and the		数4.6 1 1 634 年 7. 1	100 mg/mg/ 100 mg/mg/ 100 mg/mg/ 100 mg/mg/ 100 mg/mg/ 100 mg/mg/ 100 mg/mg/ 100 mg/ 100 mg/ 1	
	Total fo	orce per abutment				
					ere les	
	Elh	$= 12.837 \times 4.50 =$	57,766 tf	yl =	2,090	m
1 1 1 1 1 1		$= 3.776 \times 4.50 =$	16,990 tf		0,400	m
			74,756 tf		1,245	m
4						
1	Elv	$= 0.000 \times 4.50 =$	0,000 tf	x1 =	2,875	m
		$= 0.000 \times 4.50 =$	0,000 tf		2,875	m
			0,000 tf		2,875	1.2
1.0	Passive Earth pre	ssure			 1000	
		0,9408	X	0,9408		
	Kep = -			and the state of t	_	
			$\int 0.0523 x$	- 0.1253	-	
	Λο	42 x 1,000x1.000 + 0.984	ing the constitution of th		12	
	0.98	42 A 1,000A1,000 T 0,364	0.9842 x	1 000	1	
		mas manaltia	I U.7042 X	1.000		

1						
	Name of	Railway Bridge	Category of	Structure	Page	12/22
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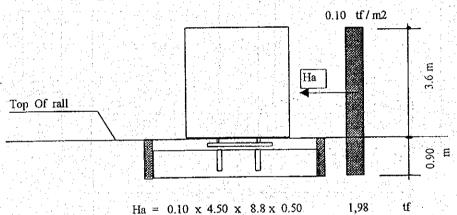
SUMMARY DUE TO LONGITUDINAL HORIZONTAL FORCE

	FORCE ON S	UPPORT
ΠΈΜ	Ha	Va
Long Rail (DL)	9,120	0,982
Long (DL)+Brake(B)	23,977	2,452
Long Rail (LL)	6,474	0,982
Seismic (DL)	3,110	0,318
Seismic (LL)	11,635	1,190
建筑 医多性囊胚层 化环烷基二烷	1 - 200	

3.3.3. TRANVERSAL HORIZONTAL FORCE

a. LATERAL LOAD $Ha = 0.5 \times 0.1 \times 7 \times 15 = 5,25 \text{ tf}$

b. WIND LOAD



c. DEAD LOAD FOR SEISMIC LOAD

 $Ea = 10.03 \times 0.18 =$

= 1,8054

tf

d. LIVE LOAD FOR SEISMIC LOAD

 $Ea = 23.977 \times 0.18$

4,31586

tf

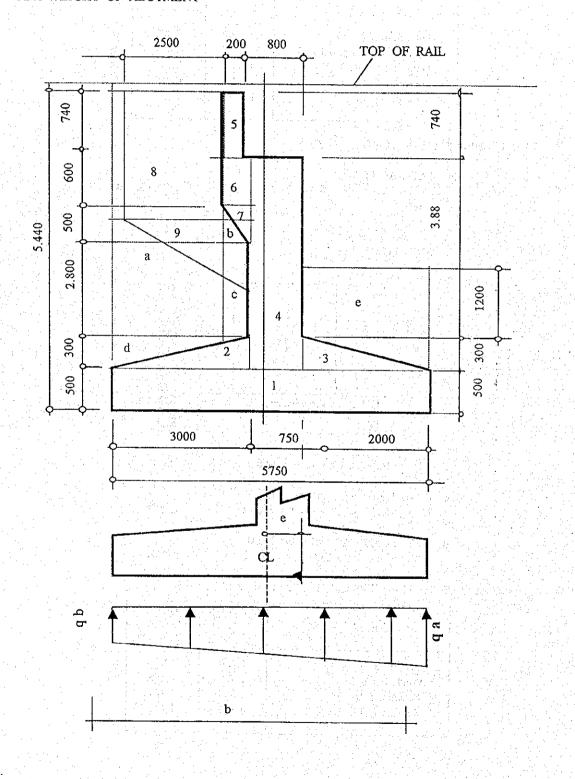
SUMMARY DUE TO TRANVERSAL HORIZONTAL FORCE

	FORCE ON SUPPORT			
ПЕМ	H (ton-f)	Y (m)		
Lateral Load (Lr) Wind Load (W) Seismic (DL) Seismic (LL)	5,250 1,980 1,805 4,316	1,225 2,575 1,225 1,225		

Name of Railway Bridge Structure BH - 13	Category of Calculation	Structure Calculation	Page	13/22
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3.5 EXTERNAL STABILITY CALCULATION

3.3.1 WEIGHT OF ABUTMENT



()

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Structure	BH - 13	Calculation	Calculation		722

ITEM	WIGHT OF ABUTMENT		(tf)	Х	Мx	Y	Му
1 I CIVI	MIGHT OF ADOTMENT		(4)	4	(tf-m)	(m)	(tf-m)
	CONCRETE						
1	5.750 x 0.500 x 5.500 x	2.400 =	= 37,950	-	•	0,250	9,488
2	$0.50 \times 3.000 \times 0.500 \times 5.000 \times$	2.400 =	= 9,000	(0,875)	(7,875)	0,600	5,400
3	0.50 x 2.000 x 0.500 x 5.000 x	2.400 =	= 6,000	1,542	9,250	0,600	3,600
4	0.750 x 3.88 x 4.500 x	2.400 =	= 31,428	0,500	15,714	3,165	99,470
5	0.200 x 0.740 x 4.000 x	2.400 =	= 1,421	(0,075)	(0,107)	5,900	8,383
6	0.500 x 0.600 x 4.000 x	2.400 =	= 2,880	(0,125)	(0,360)	5,230	15,062
7	0.50 x 0.500 x 0.500 x 4.000 x	2.400 =	= 1,200	(0,042)	(0,050)	4,763	5,716
8	$2.900 \times 1.570 \times 0.250 \times 2.0 \times$	2.400 =	= 5,464	(1,475)	(8,059)	5,485	29,968
9	0.50 x 2.700 x 2.00 x 0.25 x 2.0	2.400 =	= 3,240	(0,875)	(2,835)	4,033	13,068
	SOIL						A Section 1
а	2.500 x 4.64 x 5.500 x	1.800	= 114,840	(1,625)			405,959
b	$0.50 \times 0.500 \times 0.500 \times 0.500 \times$	1.800	= 0,113	(0,208)		1	0,517
С	0.500 x 3.380 x 5.000 x	1.800	= 15,210	(0,125)	10 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m 1 m		39,774
d	0.50 x 3.000 x 0.300 x 5.000 x	1.800	= 4,050	(1,875)			2,835
е	2.000 x 1.200 x 5.000 x	1.800	= 21,600	1,875	40,500	2,300	49,680
f	$0.50 \times 2.000 \times 0.300 \times 5.000 \times$	1.800	= 2,700	2,208	5,963	0,700	1,890
					garante de la companya de la company		
	(1) 12 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)		257,095		(143,992)		690,810
	X = -0,56007	اري الاستوادات الموادي الموادي الموادي الموادي المواد					
	Y = 2,686984				1 1 1 1		

)

Name of	Railway Bridge	Category of	Structure	Page	
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	<u> </u>				14

3.3.2. LOAD COMBINATION

a. In Longitudinal Direction

1) Dead Load + Earth Pressuse

1		,				V 1	
		V	X X	М	Н	у	М
1	ITEM	(tf)	(m)	(tf - m)	(11)	(m)	(tf-m)
	Va (DL)	5,015	0,475	2,382		harrina en	
	Va(LL)		0,475	•			
	Eh				48,147	1,247	60,023
l					(22,464)		(7,488)
	Ev	17,523	(2,875)	(50,378)			(,,,,,,,,
		(0,788)	2,875	(2,264)			
	Ha		41.7			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+-6c/b)	
		$\Sigma V = \{0, 1, \dots, n\}$	278,845		qa =	4,143	tf/m ²
		ΣΗ =	25,683		qb =	13.491	经收益 化氯化甲基二甲基甲基二甲基
٠		c =	M/N =	-0,508229396			
					다 되겠게		

2) Dead Load + Earth Pressuse (LL)

(f)	(m)	M (tf-m)	(uf)	(m)	(tf-m)
1000 1000					
5,015	0,475	2.382			
			48.147	1 247	60,023
			13,298	3.4 (6) (6)	44,083
			(22,464)	1 1 1 1 1 1	(7,488)
17,523	(2,875)	(50,378)			
(0,788)	2,875	(2,264)			
4,840	(2,875)				
				5.530	
26,590		(66,557)	38,981		96,618
257,095	(0,560)	and the second s			
283,685					
	5,015 17,523 (0,788) 4,840 26,590 257,095	(tf) (m) 5,015 0,475 0,475 17,523 (2,875) (0,788) 2,875 4,840 (2,875) 26,590 257,095 (0,560)	(tf) (m) (tf-m) 5,015 0,475 2,382 0,475 2,382 0,475 (50,378) (0,788) 2,875 (2,264) 4,840 (2,875) (13,914) 26,590 (66,557) 257,095 (0,560) (143,992)	(tf) (m) (tf-m) (tf) 5,015 0,475 2,382 0,475 0,475 48,147 13,298 (22,464) 17,523 (2,875) (50,378) (0,788) 2,875 (2,264) 4,840 (2,875) (13,914) 26,590 (66,557) 38,981 257,095 (0,560) (143,992)	(tf) (m) (tf-m) (tf) (m) 5,015 0,475 2,382 0,475 0,475 33,298 3,315 17,523 (2,875) (50,378) (22,464) 0,333 17,523 (2,875) (2,264) 4,840 (2,875) (13,914) 5,530 26,590 257,095 (0,560) (143,992)

 $\Sigma M =$ (113,931) $q = V/b \times (1 + -6e/b)$ $\Sigma V =$ 283,685 qa = 5.211 tI/m^2 $\Sigma H =$ 38,981 qb = 12.730 tI/m^2 c = M/N = -0,401609343

Name of	Railway Bridge	Category of	Structure	Page	167
Structure	BH - 13	Calculation	Calculation	•	7/22

3) Dead Load + Train load + Earth Pressuse

					<u> </u>		
	ITEM	V (Մ)	x (m)	M (tf-m)	H (f)	y (m)	M (tf-m)
	Va (DL)	5,015	0,475	2,382			
	Va(DL)	52,500	0,475	24,938			
.i	Eh				48,147 13,298	1,247 3,315	60,023 44,083
					(22,464)	1	(7,488)
	Ev	17,523 (0,788)	(2,875) 2,875	(50,378) (2,264)			
		4,840	(2,875)		1	5 630	
	Ha Sub Total	79,090		(39,237)	38,981	5,530	96,618
	W(Abutment) Total	257,095 336,185	(0,560)	(143,992)	4		
	Tour			(.03.22)			
		$\Sigma M = \Sigma V = 0$	(86,611) 336,185		q = V/b x qa =	(1+-6c/b) 7.772	tf/m ²
		ΣH =	38,981		qb =	13.487	tf/m ²
		c =	M/N =	-0,257628781			

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

		<u></u>				
	V	X	M	on H of the state	у	M
ITEM	(tf)	(m)	(tf - m)	(ជ)	(m)	(tf - m)
						100
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)
Eγ	17,523	(2,875)	(50,378)			
	(0,788)		(2,264)	No. 2, 25 (24.25)		
	4,840	(2,875)			in in the latest states	
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)			
		100000000000000000000000000000000000000				
	ΣM =	(70,875)		q = V/b x	(1+-6c/b)	

14.016 t/m²

qb =

-0,191910754

M/N =

369,313

38,981

me of	Railway Bridge	Category of	Structure	Page	
ucture	BH - 13	Calculation	Calculation		//22

5) Dead Load + Earth Pressuse + Long Rail Load

	,					
ITEM	(if)	x (m)	M (tf-m)	H ((f)	y (m)	M (tf - m)
Va (DL)	5,015	0,475	2,382		0,03112791	
Va(LL)	•	0,475	-		0,00558706	
Va[lr]	0,982	0,475	0,466			
Eh				48,147	1,247	60,023
				(22,464)		(7,488)
Ev	17,523	(2,875)	(50,378)			(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	(0,788)	2,875	(2,264)			
Ha				9,120	5,530	50,434
Sub Total	22,732		(49,794)	25,683		102,969
W(Abutment)	257,095	(0,560)	(143,992)			
Total	279.827		(193,786)			
	ΣM =	(90,817)		q = V/b x	(1+-6e/b)	

$$\Sigma M = (90.817)$$
 $q = V/b \times (1 + -6e/b)$
 $\Sigma V = 279.827$ $qa = 5.852$ $ga = 5.852$ $ga = 11.845$ $ga = 11.845$

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

		T				
ITEM	(tr.)	X (iii)	M (tf - m)	H	у	М
		<u> </u>	((" 111)	((f ·)	(m)	្រា(មាន់m)
Va(DL)	5,015	0,475	2,382			
Va(LL)	52,500	0,175	24,938		4 1 2 1 as t	
Va[lr]	0,982	0,475	0,466			
Eh				48,147	1,247	60,023
				13,298	3,315	44,083
				(22,464)	0,333	(7,488)
Ev	1 7 ,523	(2,875)	(50,378)			
	4,840	2,875	13,914			
	(0,788)	2,875	(2,264)			
Ha				9,120	5,530	50,434
Sub Total	80,072		(10,942)		4,414,13	
W(Abutment)	257,095	(0,560)				177,052
Total	337,167		(154,934)			
	257,095	(0,560)	(10,942) (143,992) (154,934)	38,981		147,052

$$\Sigma M = (7.882)$$
 $q = V/b \times (1 + -6c/b)$
 $\Sigma V = 337.167$ $qa = 10.401 \text{ tf/m}^2$
 $\Sigma H = 38.981$ $qb = 10.922 \text{ tf/m}^2$
 $c = M/N = -0.023377177$

المرابع المناوي في النواج لمناطقة في المناطقة والمرابع المرابع المرابع المرابع المرابع المرابع المرابع المرابع					
Name of	Railway Bridge	Category of	Structure	Page	18%
Structure	BH - 13	Calculation	Calculation		722

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

	37		λ (TI) (
	V	×	M	Н	y	M
ITEM	(11)	(m)	(tf-m)	(tf)	(m)	(៤-៣)
		1 1 1 1 1				
Va(DL)	5,015	0,475	2,382			
Va(LL)	52,500	0,475	24,938			
	1					
Va(I)	33,128	0,475	15,736	4 1 1 1 1 1		
Va[lr]	0,982	0.475	0,466			
Eh				48,147	1,247	60,023
				13,298	3,315	44,083
				(22,464)		(7,488)
Ev	17,523	(2,875)	(50,378)		.,,,,,,	(7,100)
EV	1	10 to		1		
	4,840	(2,875)				
	(0,788)	2,875	(2,264)			
Ha				9,120	5,530	50,434
Sub Total	113,200		(25,417)	38,981		147,052
W(Abutment)	257,095	(0,560)	(143,992)			
Total	370.295		(169,409)			
					128 3 207 12 10 3	
	ΣM =	(22,357)		q = V/b x	(1 +- 6c/b)	
	$\Sigma \Lambda$ =	370,295		qa =	10.971	tf/m²
	ΣH =	38,981		qb =	12.447	tt/m²
		MM =	-0,060376782			
		11011	5,770702			

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

	V	X	M	Н	У	M
ITEM	(ប)	(m)	(tf - m)	(ប)	(m)	(Մ-ա)
Va(DL)	5,015	0,475	2,382			
Va(LL)	52,500	0,475	24,938			
Va[lr]	2,107	0,475	1,001			
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)			
	4,840	(0,875)	(4,235)			
	(0,788)	2,875	(2,264)			
Ha	들이 유민은			23,977	5,530	132,593
Sub Total	81,197		(28,557)	38,981		229,211
W(Abutment)	257,095	(0,560)	(143,992)			
Total	338,292		(172,549)		inga Ashi	
	ΣM =	56,662		q = V/b x	(1 +- 6c/b)	
	$\Sigma V =$	338,292		qa =	12.566	tf/m²
	ΣΗ =	38,981		qb =	8.827	tf/m²
	c =	M/N =	0,167495199			

e of	Railway Bridge	Category of	Structure	Page	
ture	BH - 13	Calculation	Calculation		19/22

9) Dead Load + Train Load + Impact + Break Load + Long rail Load + Earth Pressuse

		·				to the second section (section)
	V	x	M	Н	у	M
ITEM	(11)	(m)	(ប - កា)	(ប)	(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[lr]	0,982	0,475	0,466			
Eh				48,147	1,247	60,023
				13,298	3,315	
				(22,464)	0,333	44,083
Ev	17,523	(2,875)	(50,378)		0,555	(7,481)
	4,840	(2,875)	(13,914)			
	(0,788)	2,875	(2,266)			
На		2,073	(2,200)	27 027	6 620	
Sub Total	113,200		(23,036)	23,977 38,981	5,530	132,593
W(Abutment)	257,095	(0,560)	(143,992)	30,761		229.219
Total	370,295	(0,500).				
10001	370,273		(167,029)			
	ΣΗ =	62.100				
		62,190		x d/V = 0	(1+-6e/b)	
	$\Sigma \Lambda =$	370,295		qa =	13.761	tt/m²
	ΣΗ =	38,981		qb =	9.659	
	c =	M/N =	0,167947807			
		Acceptance of the Control of the Con	and the second section is a second section.	process of the contract of the	and the second second second second	

10) Dead Load + Earth Pressuse + Seismic

	F-2 22 50			·		
TEM	(tf)	×	М	Н	У	M
I I I I I I I	(u)	(m)	(tf-m)	(tf)	(m)	(tf-m)
Va (DL)	5,015	0,475	2,382			
Va(LL)	•	0,475				
Va[Eq]	0,318	0,475	0,151			
Eh				48,147	1,247	60,039
Ev	17,523	(2.075)	(50, 250)	(22,464)	0,333	(7,481)
	(0,788)	(2,875) 2,875				
Ha	(0,700)		(2,266)	23,977	5,630	134,991
Sub Total	22,068		(50,111)	25,683		187,549
W(Abutment)	257,095	(0,560)	(143,992)			
Total	279,163		(194,103)			
	ΣM =	(6,554)		q = V/b x	(1+-6c/b)	
	ΣV =	279,163		qa =	8.611	tt/m²
	ΣΗ =	25,683	and the second of the second o	qb =	9.043	tí/m²
	c =	MW =	-0,023476271			
1	Carlo Marcola Control of the Control		the second of the second of the second		化邻苯基苯甲酚 经基础	the above the control of the

Name of	Railway Bridge	Category of	Structure	Page	20/
Structure	ВН - 13	Calculation	Calculation		20/22

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

····				l l		М
	V	×	М	Н	У	
ITEM	(·tf)	(m)	(tf - m)	((((((((((((((((((((((m)	(tl-m)
						* #
Va(DL)	5,015	0,475	2,382	to an area of		
Va(LL)	22,000	0,475	10,450			
Va[Eq]	1,711	0,475	0,813			
Eh	land to be a			63,824	1.263	80,610
			San Parish Service	(22,464)	0,333	(7,481)
Ev	27,500	(2,875)	(79,063)			
	4,840	(2,875)	(13,914)			
	(0.788)	2,875	(2.266)			
Ha				23,977	5.630	134,991
Sub Total	60,278		(81,593)	41,360		208,120
W(Abutment)	257.095	(0,560)	(143,992)			
Total	317,373		(225,590)			
		Tanggapan S				
	± H2	(17,470)		q = V/b x	(1+-6ლ)	
	= V2	317,373		qa ≖	9.459	ti'm
		41,360		qb =	10.612	· ·
the about of the	ΣΗ ,=	And the second of the first	0,055016291		10.012	
	. c .	MN =	16201-0660			
		4.00		<u> </u>	<u></u>	<u> </u>

Name of	Railway Bridge	Category of	Structure	Page	
Structure	BH - 13	Calculation	Calculation	1 1 1	21/22

b. IN TRANVERSAL DIRECTION

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

	٧	Х	М	11	ý	M			
ITEM	(11)	(m)	(tf-m)	(tf)	(m)	(tt-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		100				
Eh				48,147	1,247	60,039			
				13,298	3,315	41,083			
			100	(22,464)	0.333	(7,481)			
Lv	17,523	(2,875)	(50,378)						
	4,840	(2,875)	(13,914)						
	(0,788)	2,875	(2,266)		10 Mar				
Sub Total	80,072	*	(38,772)	38,981	1. 3. 5.	96,642			
W(Abutment)	257,095	(0,560)	(143,992)		2.770	<u> </u>			
Total	337,167		(182,764)	38,981	44.5 5 1.1	96,642			
H [Lr]			19-12-13	5,250	5,640	29,610			
H(W)				1,980	5,640	11,167			
Total				7.230	.,,,,,,,,	40,777			
	ΣM =	(163.261)				40,777			
		(163,764)	(longitu						
	= M2	40,777	(Tranve	rsai)	amay -	16.065.44	371		
	ΣH = .	337,167			quax -	- 10.003 (1/1	m2 (longitudinal)		
	ΣΗ =	38.981		udinal)	qmax =	: 12.006 tf/r	n2 (transersal)		
SH = 7,230 (transversal)									
	c =	M/N =	(0,436)	(Longitud	inul)				
	c = .	WM =	0,121	(Transver	sal)				
		\$ 1 at the							

2) Dead Load + Earth Pressuse + Scismic

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		<del>,</del>			1 1 1		
	V	x	M	Н	у	M	
ITEM	( (( )	(m)	(tf-m)	( tf )	(m)	(tt-m)	
		1.1					
Va(DL)	5,015	0,475	2,382		1.0		
Va(LL)	22,000	0.475	10,450	1.25 No. 11			
Va [Eq.]	0,318	0,475	0,151	18 P. C.			
Eh				48,147	1,247	60,039	
				(22,464)	0,333	(7,481)	
Ev	17,523	(2.875)	(50,378)		50.00	(,,,,,,,	
	(0,788)		(2,264)				
	(-), -0)		(2,20.)		4		
Eq(DL)				4,316	5,640	24241	
Sub Total	44,068		(39,659)		3,040	24,341	
W( Abutment)	257,095	(0,560)	(143,992)	46,277	2 ( 0 2	76,900	
Total	301,163	(0,300)	(183,651)		2,687	124,346	and the same
Total	301,103		(105,051)	76,276		201,246	
Calif.				16.077			
Eq [LL]				46,277	5,630	260,540	
N							
	ΣM =	(164,651)	( longitu	dinal )	17111	e daga tili	
	ΣM =	260,540	( Tranve				
	ΣV =	301,163	( 114410	on d	ax = 14	956 tf/m2 (	longitudinal)
	ΣΗ =	76,276	( Longit	- 1 to 1 t	the second second		- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1
and the second of	ΣΗ =	46,277	( transv		iax - 10.	i i y tiviniz (	tranfersal)
		40,277	( nansy	cisul j			
		M/N =	(0.517)				
	C =		(0,547)	( Longitud	A CONTRACTOR		
And the second	c -	W/N =	0,865	( Transver	sa )		

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Structure	BH - 13	Calculation,	Calculation		24/22

## 3.3.3 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.

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

A' = B' x L'

B' = B - 2 eB = 4,779 m

L' = 1. + 2 eL = 5,258 m

A' 25,126 m²

 $\alpha$  1,3
 $\beta$  0,6
k 1+0.3x Dt/3' Dt' = 2,000 m

1,126
q = g Df g1 = 1,7 t/m

3,4

C = N/1 = 5/11 = 0,455 (for soit clay, N < 10)
 $\phi$  = 15 + (15 'N') ^0.5 = 23,660 degree

Nc 18,000

Nq 9,000

Nq 9,000

Nq 9,000

Nq 5,000

Qu = 1.472,390 ton

The Ultimate Bearing capacity qu = Qu/A' = 53,592 toa'm2

From the stability analysis qu max = 14.016 t/m2'

The safety factor SF = qu / qu max = 4.181 3

The Bearing Capacity as all right.

### BEARING CAPACITY ANALYSIS AT SEISMIC CONDITION

The Bearing Capacity its all right:

Name of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	
			<u> </u>		- 1

# DESIGN CALCULATION REPORT

RAILWAY BRIDGE BH - 13
PART 2

STABILITY ANALISYS OF RAISING ABUTMENT

Name of Structure	Railway Bridge BH - 13	Category of Calculation	Structure Calculation	Page	1/5/	
		<u> </u>			<u> </u>	

### PART 2

# STABILITY ANALISIS OF RAISING ABUTMENT RAILWAY BRIDGE BH. 13 ( STEEL BRIDGE 8.00 M )

#### Table content

- 1. DESIGN CONDITION
  - 1,1 Existing Super Structure
  - 1,2 Track Condition
  - 1,3 Regulation reference
  - 1,4 Material Quality
    - 1,5 Loading
- 2. DIMENTION OF EXISTING ABUTMENT
- 3. STABILITY ANALISYS OF RAISING ABUTMENT
  - 3,1 Dimension of Raising Abutment
  - 3,2 Loading
    - 3.2.1 Vertical Force
    - 3.2.2 Longitudinal Horizontal Force
    - 3.2.3 Tranversal Horizontal Force
  - 3,3 Stability Analysis
    - 3.3.1. Weight of Abutment
    - 3.3.2 Load Combination
    - 3,3.3 Reinforcing Analysis
  - 3,4 Bearing Capacity of Pile Temporary Support (Coonut Pile)

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Nan	ne Of	Railwy Bridge	Category of	Structure	Page	2/-1
Stru	icture	BH - 13	Calculation	Calculation		/51

### 1. DESIGN CONDITION

### 1.1 EXISTING CONDITION

#### a. Superstructure

- Type : Steel Girder
- Total weight : 10,03 tf
- Effective Span (c.t.c) : 8,80 m
- Total Lenght of girder : 9,60 m
- Center to center of main Girder : 3,00 m
- Distance between top of rail up to top of : 0,90 m
Concrete Bearing

- Material of Bearing Shoe

Steel Bearing

#### b. Substructure

Material : concrete K 225
Type : cantilever
Visual Condition : good
Crack on Structure : nothing
Displesement : nothing
Fondation : concrete slab

### 1,2 TRACK CONDITION

- Track Plan : Straigt

- Track Elevation : 0,0044 gradien

### 1,3 REGULATION REFERENCE

- Spesifikation of Perumka Railway Bridge Design (AVBP 1932)
- PD-10
- Indonesian Concrete Code
- Elastic Analysis of concrete section ( Departement PU)

### 1,4 MATERIAL QUALITY

- Concrete K 225
- Plain / Lean Concrete K-125
- Reinforced Steel bar U-32 (Deform steel)

### 1,5 LOADINGS

Name Of	Railwy Bridge	Category of	Structure	Page	3/51
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### 1,5 LOADINGS

- Train Load

- Impact

- Longitudinal Load due to Long Rails

- Break Load

- Lateral Load

- Wind Load

- Eart Pressure

- Stream Flow

- Seismic Load

: based on 100 % Load Scheme 1921

: [0.2 + 25/(L + 50)] x Train Load

: 1.00 tf/m (per one track) max. 200 tf

: 1/6 Locomotive + 1/10 Wagon

: 1/10 train Load

0.10 tf/m²

: bassed on Collomb teory

: based on the equivalent static force and design

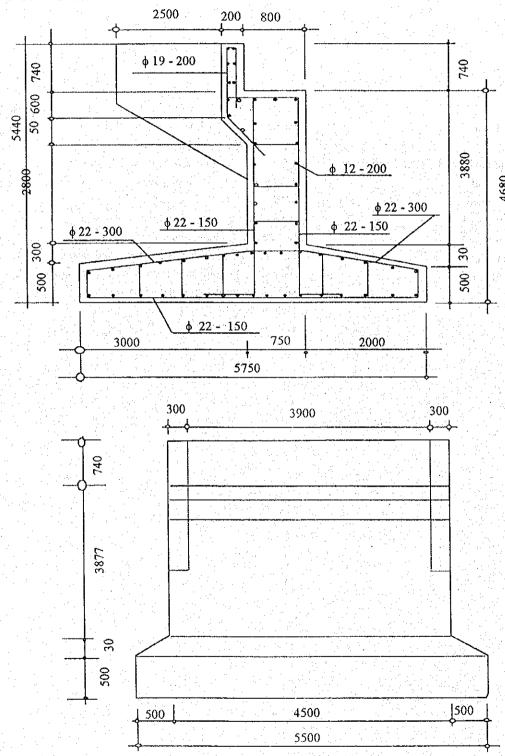
: bassed on the equivalent static force and design

seismic intensity expressed as followings:

KH = 0.18

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

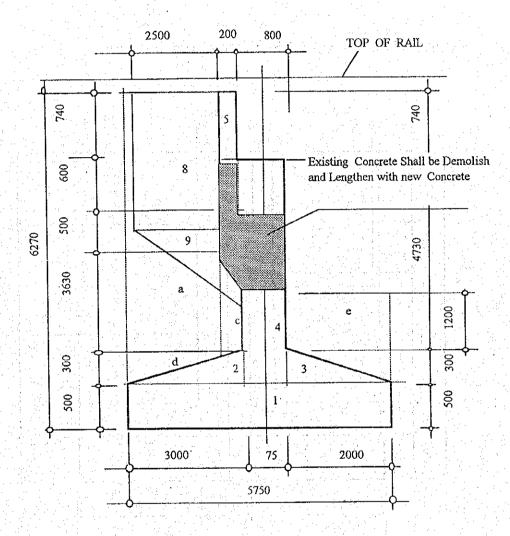
### 2 DIMENSION OF EXISTING ABUTMENT



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

# BASIC CONCEP OF RAISING ABUTMENT

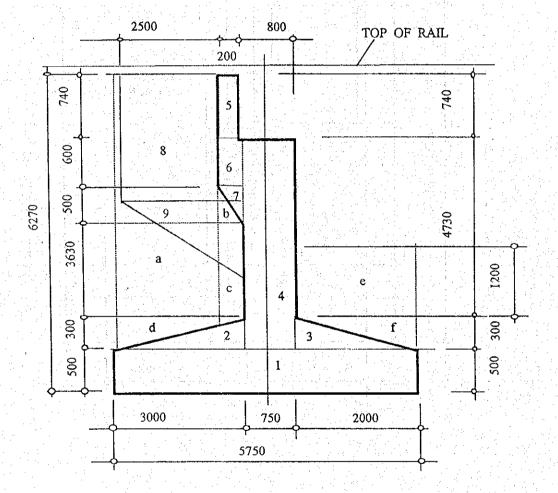
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	í					l.
	Name Of	Railwy Bridge	Category of	Structure	Page	6/51
1	Structure	BH - 13	Calculation	Calculation		

# 3. STABILITY ANALYSIS OF RAISING ABUTMENT

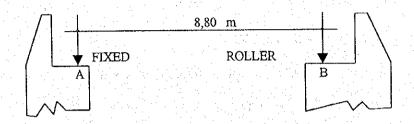
## 3,1 DIMENSION OF NEW ABUTMENT( AFTER RAISSING )



	Name Of Structure	Railwy Bridge BH - 13	Category of Calculation	Structure Calculation	Page	7/51
L	Ottucturo	1311 13	<u> </u>	<u></u>		

### 3,2 LOADING

### 3.2.1 VERTICAL FORCE



c. Impact Load

Impact Coefficient

$$I = 0.200 + 25/(8.00 + 50.00) = 0.631$$
  
 $Va = V$  52.50 x 0.631 = 33,128

d. Train Load for Seismic

$$q = 15.00 / 2.4 = 6,250 ext{ tf/m}$$
 $Va = 6.250 ext{ x } 8.8 ext{ x } 0.5 = 27,500 ext{ tf}$ 
 $Vb = 6.250 ext{ x } 8.8 ext{ x } 0.5 = 27,500 ext{ tf}$ 

### SUMMARY OF VERTICAL FORCE

ITEM	Support A ( ton - f )	Support B ( ton - f)
Dead load ( DL )	5,015	5,015
Train Load (LL)	52,500	52,500
Impact Load (I)	33,128	33,128
Train for Seismic (LL)	27,500	27,500

	<del></del>				
Name Of Structure		Bridge - 13	Category of Calculation	Structure Calculation	Page
	3.2.2.	LONGITUDINA	HORIZONTA	L FORCE	***************************************
				S PORCE	
		a. DEAD LOAD	+ LONG RAIL	LOAD	
$\frac{1}{r} = q^{r} = \frac{1}{r}$		TOTAL HOR	IZONTAL FOR	<b>~</b> ₽	
			$9.6 \times 1.00 =$		
				ina manghalan an an Antara mangharan	and the second second
		HORIZONTAI	FORCE ON S	UPPORT	
			I - 1/2 x μ x Vb - 0.5 x 0.10 x 9.6	<b>A</b>	
The second second				$> 1/2 \times 9.6 = 4.8$	tf
		therefore			
		Ha =	9,12	tf	
		VERTICAL	FORCE		
					n yang sahir sa Maraja Barasa
		Va = 9	.6 x 0.9 / 8.8	3 = / 0,982	tf
		b. LONG RAIL I	OAD + BRAKE	LOAD	
				新华·西南北南东	
			ZONTAL FORC	E ) + 7 x 15 x 0.1667 +	
			27,1035		r <b>9.</b> 6
		HORIZONTAL	FORCE ON SI		
			- 1/2 x μ x Vb	JPPORT	
		= 27.103	$35 - 0.5 \times 0.10 \times$	(10.03+52.50)	
		therefore		$> 1/2 \times 27.1035 =$	13.5518 tf
		Ha = 23.			
		VERTICAL FO	)RCE		
			.977 x 0.9 / 8.8	= 2,452	tf
		c. TRAIN LOAD	+LONG RAIL	LOAD	
		TOTAL HORL	ZONTAL FORCE		
	and the second	$\Sigma H = 9$	6 x 1.00	= 9,600	tf
		HORIZONTAL	FORCE ON SU	TOOGO	
			- 1/2 x μ x Vb	JFFOR1	
		the contract of the contract o	$0.5 \times 0.10 \times (10)$		
		= therefore	6,474 tf	$> 1/2 \times 9.600 = 4.$	80 tf
		the state of the s	74 lf		
		VERTICAL FO			
		va = 9.0	5 x 0.9 / 8.8	= 0,982	tf

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Name Of Structure	Railwy Bridge BH -13	Category of Calculation	Structure Calculation	Page	9/51
		<u> </u>			

### d. DEAD LOAD FOR SEISMICC

TOTAL HORIZONTAL FORCE  

$$\Sigma H = 10.03 \times 2 \times 0.18 = 3,611$$
 tf

### HORIZONTAL FORCE ON SUPPORT

Ha =  $\Sigma$ H - 1/2 x μ x Vb = 3.611 - 0.5 x 0.10 x 10.03 = 3,110 tf > 1/2 x 3.611 = 1.805 tf therefore Ha = 3.110 tf

### VERTICAL FORCE

 $Va = 3.110 \times 0.9 / 8.8 = 0.318$  tf

### e. TRAIN LOAD FOR SEISMICC

TOTAL HORIZONTAL FORCE  $\Sigma H = (10.03 + 27.50) \times 2 \times 0.18 \quad 13,511 \quad tf$ 

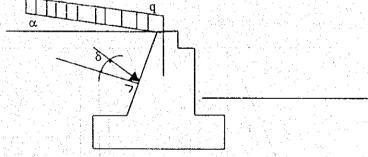
### HORIZONTAL FORCE ON SUPPORT

Ha =  $\Sigma$ H - 1/2 x  $\mu$  x Vb = 13.511 - 0.5 x 0.10 x (10.03 + 27.500) = 11,635 tf > 1/2 x 13.511 = 6.755 tf therefore Ha = 11.635 tf

### VERTICAL FORCE

 $Va = 11.635 \times 0.9 / 8.8 = 1,190 \text{ tf}$ 

### f. EART PRESSURE



## 1) NORMAL CONDITION

COEFFICIENT OF EARTH PRESSURE

$$Ka = \frac{\cos^2(\phi - \theta)}{\sin(\phi + \delta)\sin(\phi - \alpha)}$$

$$Cos^2\theta \cos(\theta + \delta)[1 + \sqrt{\frac{\sin(\phi + \delta)\sin(\phi - \alpha)}{\cos(\theta + \delta)\cos(\theta - \alpha)}}]$$

 $\cos^2(\phi+\theta)$ 

	Name Of Structure	Railwy Bridge BH - 13		Category of Calculation	Structure Calculation		Page	10/51
Kn =			Kn ≕			74.CM B. T.M.F.		

 $\cos^2\theta \, \cos(\theta + \delta) [1 + \sqrt{ }$ 

Fill material

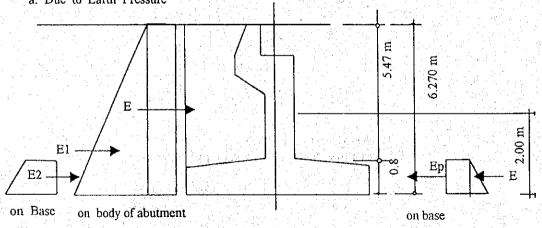
Soil (Assumsion same with BH 10)

### Active Earth Pressure

$$Ka = \frac{0.8660 \times 0.8660}{1,000 \times 0.9398 \times [1.4]} \frac{0.7660 \times 0.5000}{0.9397 \times 1.000}$$

$$= 0,2973$$

### a. Due to Earth Pressure



### Active Earth Pressure

E1 =  $0.5 \times 2.00 \times 6.270 \times 6.270 \times 0.2973$  11,688 tf/m E2 =  $0.8 \times 2.00 \times 6.270 \times 0.2973$  2,983 tf/m

	1.0							
Name Of Structure	Railwy BH		Category of Calculation	Structure Calculation		Page	11/51	
		E2 h = E2 Co E1 v = E1 Sir	$\delta \delta = 11.688 \times 10^{-1} \times$	0.9397 2 x 0.342 3	),983 ,803 ,997 ,020	tf/m tf/m tf/m tf/m		
		Total force per a	butment					
		E1h = 10.983 E2h = 2.803		49,423 tf 12,612 tf 62,035 tf	yl = y2 = y =	2,093 0,400 1,247	m m m	
		Elv = 3.997 > E2v = 1.02 x		17,987 tf 4,590 tf √ 22,577 tf	x1 x2 x	2,875 2,875 2,875	m m m	
		Passive Earth Pr	ressure					
				0.0006 0.009				
		Ka =		0.9986 x 0.998		672 x 0.0523		
			1.000 x 0.99	994 x [1+		994 x 1.000	····	
			= 1,1477					
		$E_{p1} = 2.00$	c 1.60 x 1.14	77	3,673	tf/m²		
		- Web - Table 1 / 1 / 1 / 1	. 1.60 x 1.147	the first control of the first	5,142	tf/m²		
		Ep1 = 0.80 Ep2 = 0.5 x			2,938 2,057	tf/m tf/m		
		Ep2 h = E2 $Ep1 v = E1$	Cos $\delta = 2.938$ Cos $\delta = 2.057$ Sin $\delta = 2.938$ Sin $\delta = 2.057$	x 0.9994 x 0.0349	2,936 2,056 0,103 0,072	tf/m tf/m tf/m tf/m		
				X 0.0547	0,072	Will		
		Total force per	abutment					
		Ep1h = 2.9 Ep2h = 2.0	36 x 4.50 = 56 x 4.50 = _	13,212 tf 9,252 tf ✓ 22,464 tf	yl = y2 = y =	= 0,267	m m m	
		Eplv = 0.1	03 x 4.50 =	0,464 tf	хl	2,875	m	
		Ep2v = 0.0	72 x 4.50 =	0,324 tf 0,788 tf	x2 x	2,875 2,875	m m	
		b). Do to live	Load					
		Total force per	Abutment x 0.2973 x 6.2	51	16,311	tf		

Name Of Structure	Railwy Bridge BH - 13	Category of Calculation	Structure Calculation	Page	12/51
	2), EARTQUA	KE CONDITION			
		Specification of the second se			
	COEFFICII	ENT OF EARTH I	PRESSURE		
			$\cos^2(\phi-\theta\phi-\theta)$		
	Kea = -		Jos (φ-σσ-σ)		
	NGd		jirja e e e e 🖊 🏗	$Sin(\phi + \delta) Sin($	$\frac{1}{\phi - \alpha - \theta \circ}$
	$C_{-}^{2}$	) - Cas O Cas ( 0 o 1 0	11221	Sin ( φ + δ ) Sin (	12
	Cos e	0ο Cos θ Cos (θο+θ	)+0)[1' V	$Cos(\theta + \theta o + \delta)$	$Cos(\theta - \alpha)$
				Cos (01 00 10)	000(0 00)
			$\cos^2(\phi-\theta\phi+\theta)$		
			Cos ( $\phi$ - $\theta$ O $+$ $\theta$		
	Kea =		<i></i>	$Sin(\phi - \delta)Sin$	$(\phi + \alpha - \theta \alpha)$
	2.2		2. 22.11		•
, i j	Cos C	θο Cos θ Cos (θο-θ	7+0)[1+ V	Cos (θ – θo +δ)	
				Cos (0 - 00 + 0)	, cos ( o – a )
	T2:11	material	Soil (	Assumsion same	with BH 10 )
	θο	10.00	5011 (	$\theta_0 =$	10,20
	θ.	= 10,20 $= 0,00$		θ =	0,00
		= 30,00		φ =	3,00
		= 0,00		δ =	0,00
	α			α =	0,00
		Application of the control of the co	0,9408	$\cos (\phi - \theta \circ$	terral and the second second second
			0,9408	Cos (φ – θο	
	Cos		0,9842	Cos θο	= 0,9842
	Cos		1,0000	Cos θ	= 1,0000
	Cos	$(\theta + \theta + \delta) =$	0,9842	Cos (θ +θο-	
	Cos	$(\theta + \theta o + \delta) =$	0,9842	Cos (θ +θο-	$+\delta$ ) = 0,9842
	Sin	$(\phi + \delta) =$	0,5002	Sin (φ+	
			0,3389	Sin (φ +δ- θ	
			0,5002	Sin ( <b>4</b> –	
			0,3386	Sin (φ +α- (	
	Cos	$(\theta - \alpha) =$	1,0000	Cos (θ –	$\alpha) = 1,0000$
	Active	Earth pressure	0.0040	0,9408	
	<b>17.00</b>		0,9842	0,9408	<u>*</u>
	Kea =		, in the first of	0.5000 x 0.338	$\overline{j}$
		0040 1000 1000	100000		12
	<b>U</b>	.9842 x 1.000x1.000	T 0.9042 [ 1 T]	0.9842 x 1.00	J 10
		0,4566	<b>"</b>	0.7042 X 1.00	<b>Y</b>
		0,4300			
2.0	a) Dua to l	Earth Pressure			
	a). Duc to 1	Latti 11030010			
	<b>E1</b>	$= 0.500 \times 1.9$	90 x 6.270 x 6.2	270 x 0.4566 =	17,080 tf/n
	E2		$90 \times 6.270 \times 90$		4,352 tf/n
	102	0.000 A 1.			
			At March 1984 A Section 1984 A Secti		
	<b>FII</b>	$n = E \cos \delta$	= 17.08	30 x 1.000 =	17,080 tf/1

Name Of Structure	Railwy BH	Bridge - 13			Category of Calculation		Structure Calculation	1	Page		13/	51
							-					
		. 4	Elv	<b>==</b> ]	E Sin δ =		17.08	80 x 0.0	000 =	0,00	)0 tf/	m
			E2v		E Sin $\delta =$			2 x 0,00		0,00		' m
4				. :	Oliman ya	:	1		•			
	•		Total	forc	e per abutment							
				. :								4
			Elh	==	17.080 x 4.50	=	Programme	76,860 t	if yl=	= 2,09	90 m	
		1999 138	E2h	• =	4.351 x 4.50	=	<u> </u>	19,582 (	<u>tf</u> y2 =	= 0,40	00 m	
			· . · ·			·. :		96,442 t	tfy:	= 1,24	45 m	
				1,410		11.7	40000					- 1
			Elv		$0.000 \times 4.50 =$			0,000 (				
			E2v	<b>=</b>	0.000 x 4.50	<u></u>		0,000 t				
								0,000 t	tf x	= 2,8	75 m	
				Laru	n pressure 0	,94(	)8	x	0,940	08		
		Ke						0.05	523 x - 0.	1253		
			0.9	842	x 1.000x1.000 +	0.9	842 [1	0.98	342 x 1	.000	]2	
				. = .	not possible							

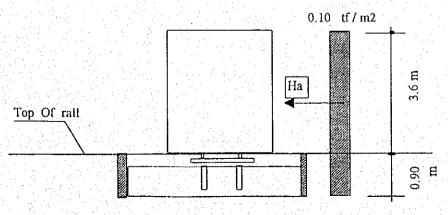
### SUMMARY DUE TO LONGITUDINAL HORIZONTAL FORCE

	FORCE ON SUPPORT			
ITEM	На	Va		
Long Rail (DL)	9,120	0,982		
Long (DL) + Brake (B)	23,977	2,452		
Long Rail ( LL )	6,474	0,982		
Seismic (DL)	3,110	0,318		
Seismic ( LL )	11,635	1,190		

### 3.3.3. TRANVERSAL HORIZONTAL FORCE

a. LATERAL LOAD Ha =  $0.5 \times 0.1 \times 7 \times 15 = 5,25$  tf

### b. WIND LOAD



Name Of Structure	Railwy Bridge BH - 13	Category of Calculation	Structure Calculation	Page	14/51
		Ha = 0.10 x	4.50 x 8.8 x 0.50	1,98	tf
	c. DEAL		SEISMIC LOAD 10.03 x 0.18	1,8054	<b>tf</b>
	d. LIVE	and the second s	SEISMIC LOAD		
		Ea = 23	.977 x 0.18 =	4,31586	tf

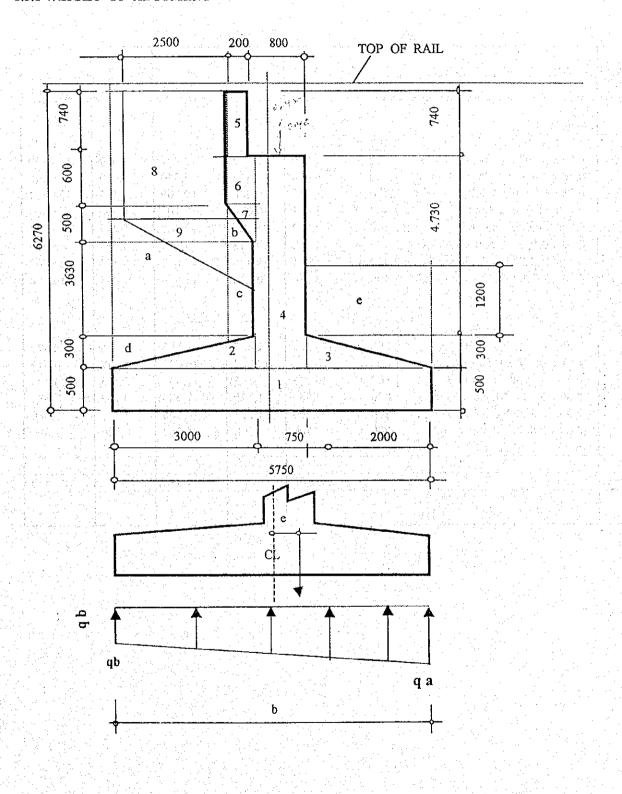
# SUMMARY DUE TO TRANVERSAL HORIZONTAL FORCE

	FORCE ON SUPPORT			
ITEM	H ( ton - f )	Y ( m )		
Lateral Load (Lr)	5,250	1,225		
Wind Load (W)	1,980	2,575		
Seismic (DL)	1,805	1,225		
Seismic ( LL )	4,316	1,225		

Name Of	Railway Bridge	Category of	Structure	Page	15/51
Structure	BH - 13	Calculation	Calculation		

# 3.3 STABILITY ANALYSIS

## 3.3.1 WEIGHT OF ABUTMENT



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the second second			and the second second second second	and the second of	the Athan Hotel to the Control
Name Of	Railway Bridge	Category of	Structure	Page	16/51
Structure	BH - 13	Calculation	Calculation		
	<u> </u>			L	L

×00753. 4	TATION OF LINE OF AND IN						
ITEM	WIGHT OF ABUTMENT		(11)	X	Mx	Y	My
					( tf-m )	( m )	(tf-m)
	CONCRETE						
1	5.750 x 0.500 x 5.500 x	2.400 =	37,950		4 <u>5</u> 1	0,250	9,48
2	$0.50 \times 3.000 \times 0.500 \times 5.000 \times$	2.400 =	9,000	(0,875)	(7,875)	0,600	5,40
3	$0.50 \times 2.000 \times 0.500 \times 5.000 \times$	2.400 =	6,000	1,542	9,250	0,600	3,60
4	0.750 x 4.730 x 4.500 x	2.400 =	38,418	0,500	19,209	3,165	121,59
5	0.200 x 0.740 x 4.000 x	2.400 =	1,421	(0,075)	(0,107)	5,900	8,38
6	0.500 x 0.600 x 4.000 x	2.400 =	2,880	(0,125)	(0,360)	5,230	15,06
7	$0.50 \times 0.500 \times 0.500 \times 4.000 \times$	2.400 =	1,200	(0,042)	(0,050)	4,763	5,71
8	$2.900 \times 1.570 \times 0.250 \times 2.0 \times$	2.400 =	<b>5</b> ,464	(1,475)	(8,059)	5,485	29,96
9	$0.50 \times 2.700 \times 2.00 \times 0.25 \times 2.0$	2.400 =	3,240	(0,875)	(2,835)	4,033	13,06
	SOIL						
a	2.500 x 5.470 x 5.500 x	1.800 =	135,383	(1,625)	(219,997)	3,535	478,57
b	$0.50 \times 0.500 \times 0.500 \times 0.500 \times$	1.800 =	0,113	(0,208)	(0,023)	4,597	0,51
С	0.500 x 2.80 x 5.000 x	1.800 =	16,785	(0,175)	(2,937)	2,615	43,89
d	$0.50 \times 3.000 \times 0.300 \times 5.000 \times$	1.800 =	4,050	(1,875)	(7,594)	0,700	2,83
e	2.000 x 1.200 x 5.000 x	1.800 =	21,600	1,875	40,500	2,300	49,68
f	0.50 x 2.000 x 0.300 x 5.000 x	1.800 =	2,700	2,208	5,963	0,700	1,89
			286,203		(174,915)		789,67
	X = (0.611)						
	Y = 2,759						