

#### REPUBLIC OF KENYA



#### MINISTRY OF PUBLIC WORKS

# DETAILED DESIGN STUDY ON

# THE NAIROBI BYPASS PROJECT DETAILED CALCULATIONS FOR QUANTITIES

VOL-3

SEPTEMBER 1992

Japan International Cooperation Agency

The Permanent Secretary Ministry of Public Works P.O.Box 30260 NAIROBI The Chief Engineer (Roads) Ministry of Public Works P.O.Box 30260 NAIROBI 国際協力事業団 24827

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1.	B O X	CULV	ERT	`\$ •	٠	•	•			•		1
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2. BRIDGES • • • • • • • • 61 — 84

## BOXCULVERTS

# BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM NO.	DESCRIPTION L	MIT	Road	Footpath	Draina <i>g</i> e	TOTAL
	Excavation of fundation levels in soft materials.	<sub>1</sub> 3	5207.4	999,8	9673.0	15 880.
		3				
	the state of the s	13	1 878 8	655.3	36 <b>0</b> 9.5	6144.
		n <sup>3</sup>	13 589.1	1375.4	7707 9	22672.
		n <sup>s</sup>	976 .1	200.8	810.8	1988.
	selected granular fill for base.	n <sup>3</sup>	680 .7	821	797.5	1560.
		- '				
	at egyel ek synt og at aftat 1940 ble at Store og fladt samt god store					
	and the second s	.•				
e de la companya de l	BILL OF QUANTITIES NO. 23 PILING					·
ITEM NO.	DESCRIPTION	UNIT				
23.01	Nobilization of all the necessary plan for the piling operation setting up on					
	the position of the first pile and removal on completion of the last pile					
	Nove and set up each pile position.	No.				
23.03	3 Supply of steel pipe piles 500mm dia., 9mm thick,Grade	<u></u>				
23.04	4 Driving piles of 500mm dia. including positioning and pitching. Include for cutting pile heads to correct level.	10				

NO. DESCRIPTION	UNIT	Road	FootPath	Draina\$3	TOTAL
				i e	
BOX CULVERTS					
Concrete:	· ,				
Provide, place and compact the follow classes of concrete for insitu works	_				
specified.				•	
17.22 Class 15/40 for blinding concrete on	m³	2746	41.2	272,3	558.
all structures.	• .				
17.23 Class 25/20 for structural concrete.	т3	78216	646,2	6318.8	14787.
17.24 Provide UF2 finish to concrete surfac	e. m²	4945.3	722,7	4207.1	9875.
Formwork:	· · · · · · · · · · · · · · · · · · ·				
Provide, erect and afterwards dismant and remove the Items specified below:		:			
13 95 Mariantal Surgenty to policy of the	r:2	<u></u>	<u> </u>		
17.25 Horizontal formwork to achieve class finish.	rı <u>- 81</u>	<del>                                     </del>			
17.26 As for Item 17.25 but sloping.	m²				
17.27 As for Item 17.25 but battered.	m²			· · <u> </u>	
17.28 As for Item 17.25 but vertical.	_m²	6 336.8	1344.6	4435.8	12 1 1 7.
17.29 Horizontal formwork to achieve class	F2 m²	2 14 5.5	305.1	1549.9	40000
erio d <b>ifinish.</b> Nasara ara erio di parkeria ara dipi					
17.30 As for Item 17.29 but sloping.	w <sub>s</sub>		-		
17.31 As for Item 17.29 but battered.	m²				
17,32 As for Item 17.29 but vertical.	m <sup>2</sup>	3430.7	610.2	34122	74 53.
17.33 llorizontal formwork to achieve class finish.	F3 <u>m²</u>				
17.34 As for Item 17.33 but sloping.	m²				
17.35 As for Item 17.33 but battered.	m²				
17.36 As for Item 17.33 but vertical.	m²				
17.37 Provide and fix in position high	tonno	61.4	41.7	1117	215.
tensile steel reinforcement bars to BS 4461 of diameter equal to or less than 16mm.	Lonne				219.
17.38 hs for 11cm 17.37 but of diameter	tonne	908.6		316,3	1225.
greater than 16mm. Total	tonne	970.0	4 1.7	. 428,0	1440.

ITEM NO.	DESCRIPTION	UNIT	Road	Foot.	Drain.	TOTAL
21.0	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	70673	1344.1	_5638&	14 050.
21.0	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 mm × 203 mm × 18 mm				
21.0	3 Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 279 mm × 152 mm × 56 mm No. 279 mm × 229 mm × 37 mm No. 279 mm × 229 mm × 46 mm No. 279 mm × 229 mm × 65 mm				
21.0	4 Supply and install expansion joints as specified in the Drawings.  joint filler	m <sup>2</sup> thickneth 30 <sup>mm</sup> m <sup>2</sup> 25 m <sup>2</sup> 20	30 15	216	388,2	711.3
٠.	5 Scalant for expansion joints. 6 Provide 60mm thick asphalt concrete	m 30°°°× 50°°°° m 25 × 50°°° m³ (m²)				
21.0	surfacing on bridge and box culvert carrageways.  7 As for Item 21.05 but to 50mm thick.	<u>m³ (m²)</u>	141.5			<u> 1415(-)</u>
21.(	8 Supply and install flex beam guardealls including post, all in accordance with the Drawings.	m				
21.0	9 Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	m				
21.1	O Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	m				
1	1 Provide and install 100mm dia. drain pip through deck slabs.		<u>.                                    </u>		196	196,
	12 Provide and place 75mm dia. PVC weep holes.  15 Proveke and place 200mm dia. PVC	No.	18	12		30.
	drainage pipe. 13 Provide and place 200mm dia.	m	5225	197.0	8184	1538.
21.	perforated pipe.  4 Dowel bar Movable 20mm dia.	No.				
21.	15 Dowel bar Fixed 40mm dia.	No.				
21.	17 Water stem 200mm wide waterstops as specified in the Drawings.	Л	353.0	54.4	501,8	909.2
20.	18 Provide 500mm thickness gabion mesh.	(W <sub>3</sub> )			550. 275.	550. 275.

## Total of each boxs

### BOXCULVERT FOR ROAD (VEHICLE)

WILL OF CHANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

THM DESCRIPTION NO.	UNIT	NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	TOTAL
7.01 Excavation of fundation levels in soft materials.	in <sup>3</sup>	582.3	4510	14885	5128	447.7	5319	1143.2	<u>5207,4</u>
7.02 E.O Item 7.01 at anytocation for execution in hard materials.	in <sup>3</sup>			·—					
7.03 Backfilling with selected material for excavation.	m <sup>3</sup>	175.6	3660	4271	1802	154.7	2112	3640	1878.8
7.04 Backfilling with selected material behind abulment, wall.	. w <sub>2</sub>	1609,4	1243,1	39061	12707	12055	1148.7	32056	13589.1.
7.05 porous filter material behind adulment, wall.	m³.	124,9	99.4	2359	98.7	964	91,9	2289	976.1
7.06 selected granular fill for base.	<u>ш</u> з	1075	53.2	224.1	68.3	54.3	519	121.4	680.7

BILL OF QUANTITIES NO. 23 PILING

LILIN NO:	DESCRIPTION	UNIT				W.,
	Mobilization of all the necessary plant for the piling operation, setting up on					
	the position of the first pile and					
	ramoval on completion of the last pile.		 			
23.02	Hove and set up each pile position.	No.	 		 	 
	4.					
23.03	Supply of steel pipe piles 500mm dia.					
	9mm Hisck, Grade	m			 	 
23.84	Briving piles of 600ms dia. including					
			 	·	 	· .=
	cutting pile heads to correct level.					

# BILL OF THANFITIES No. 17 CONCRETE BORKS

# ROAD

<del>.</del>				·							
	11134 101	DESCRIPTION	UNIT	NO 1	NO 2	NO 3	NO 4	NO 5	NO 6	NO 7	TOTAL
Articles Language Control of Language Control		DOX COLVERIS							٠.		
		Concrete:									
		Provide, place and compact the follow classes of concrete for insitu works specified.									. •
	17.22	Class 15/40 for blinding concrete on all structures.	<u>n'</u>	39.0	26.6	67.9	272	272	260	60.7	274,6
	17.23	Class 25/20 for structural concrete.	n³	1158.7	6975	2455,6	793.2	6985	6704	1347.7	7821.6
		Provide UPZ finish to concrete surface Formula:	e. <u>m²</u>	725.7	499.6	1 187.2	512.8	5122	4900	1017.8	49453
	1	Provide, erect and afterwards dismut and remove the Items specified below:									
and the second s	17.25	lbrizontal forwark to achieve class finish.	F1 <u>n²</u>	<u></u>							
	17.26	As for Item 17.25 but sloping.	<b>B</b> t								
in the second	17.27	As for Item 17.25 but battered.	m²								
ag <sup>M</sup>	17. 28	As for Item 17.25 but vertical.	_ at <sup>3</sup>	951.1	7986	1476.4	783.9	784.6	2856	12566	6336.8
	17.29	Borizontal forwark to achieve class finish.	F2 <u>m²</u>	3230	2200	5050	227.0	227.0	216.8	426,7	2145.5
18 Symmetric Section 18	17.30	As for Item 17.29 but sloping.	<u> 4</u> 3								
ing the state of t	17.31	As for Item 17.29 but bottered.	- E 2					·			
	17. 32	As for Item 17.29 but vertical.	_a²	374.7	3080	<u>664,4</u>	307.1	2990	764.5	713.0	3430.7
		lkrizontal forwork to achieve class I finish.	T <u>6</u> 2								
		As for Item 17.33 but sloping.	<u>m²</u>								
and the second first the second	e" ,	As for Item 17.33 but battered. As for Item 17.33 but vertical.									
	17. 37	Provide and fix in position high tensile steel reinforcement bars to	Lonne	76	5.3	18.7	5.6	5.3	5.5	134	614
		BS 4461 of dimmeter equal to or less than 16mm.									<u></u>
	17. 38	As for Item 17.37 but of diameter preater than 16mm.	Lonue	122.0	886	271.1	89.7	84.6	824	1702	908,6
		Total	Lonne	1296	93.9	2898	95.3	899	87.9	1836	970.0

#### BILL OF CHANTITIES No. 21 MISCELLANEOUS

#### \_ROAD

FIEN DESCRIPTION NO.	UNIT		NO 1	NO 2	к Ои	NO 4	NO 5	NO 6	NO 7	TOTAL
21.01 Supply and apply, in accordance to manufacturer's instructions waterparting materials to top of bridge declarations and all structural concrete surfaces in contact with facturial prior to backfilling.	s,	. ·	1024.1	780.1	15863	787.2	771.9	741.8	1375.9	7067.3
21.02 Supply and install in position robb year bearings, fixed type as specifi in the Drawings.		×18***								
21.03 Supply and install in position rob- ped bearings, sovable type as speci in the Drawings.	Ro. 279*** ×229*** No. 279*** ×229***	×37*** ×46***				:				
21.04 Supply and install expansion joints specified in the Drawings, joint filler	m² 25 m² 20	,	32.9	21,9	95.6	22.9	22.7	22.7	82.8	3015
21.05 Scalant for expansion joints.  21.05 Provide 60cm thick asplatt concrete surfacing on bridge and box culvert carragorays.				:					· · · · · · · · · · · · · · · · · · ·	
21.07 As for Item 21.05 but to 50mm thick	r. m² (m²)		196(-)	14.7(-)	33.4(-	14.1(-)	15.0(-)	143(-)	304()	141.5()
21.08 Supply and install flex been guard including post, all in accordance with Drawings.  21.09 Provide and creek in position paragraphs.	ville ne									
hadraits to raitwaybridge as deta on the Drawings.										
21.10 Provide and erect in position para handraits to footbridges as detaile the brunings.		<del></del>							<u> </u>	
21.11 Provide and install 100m dia. dra Unrough deck slabs. 21.12 Provide and place 75m dia. PVC we	· · · · · · · · · · · · · · · · · · ·									
holes.  21.16 Proveke mil place 200am dia. PVC drainage pipe.	Ro.		22	2	4_	2	22	44_	2	18
21.13 Provide and place 200m dia. perforated pipe.	<u>m</u>		62.2	52.6	1172	51,0	51.0	486	1399	5225
21.14 Davel two Boyable 20om dia-	<u>No.</u>		<del> </del>	ļ	ļ	+	<del> </del>		<del> </del>	<del> </del>
21.15 Baxel bar Fixed 4thm dia.	No.	<del></del>	<del>                                     </del>		<del> </del>	<del> </del>			<del> </del>	<del> </del>
21.17 Whiter stem 200mm wide waterstops as specified in the Drawings.	ш		35.3	301	80.4	314	31.1	31.1	1136	353,0
20 18 Provide 500mm thickness gablen mesh.	лі <sup>2</sup> (m <sup>2</sup> )		<u> </u>			1		<u> </u>	<u> </u>	<u> </u>

#### BOXCULVERT FOR FOOTPATH (PEDESTRIAN)

DHA, OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

BILL OF QUANTITIES NO. 23

THEN DESCRIPTION NO.	TINU	NO I	NO 2	к ОИ	NO 4	TOTAL	,	
7.01 Excavation of fundation levels in soft materials.	m³	220.1	305.8	220.1	<u>253.8</u>	999.8		
7.02 E.O Itom 7.01 at anylocation for excavation in hard materials.								
7.03 Backfilling with selected material for excavation.	e <sub>m</sub>	116,0	207.3	156.0	176.0	655.3		
7.04 Backfilling with selected material behind abutment, wall.	<sub>щ</sub> з	3799	331.0	331.0	3335	1375.4		
7.05 pareus filter material behind abutment, wall.	m³	55.5	48.3	48.3	48.7	200.8		
7.06 selected granular fill for base.	m².	22.6	198	19.8	19.9	821		

PILING

THM DESCRIPTION UNIT

23.01 Mobilization of all the necessary plant L.S.

for the piling operation, setting up on the position of the first pile and resoval on completion of the last pile.

23.02 Move and set up each pile position. No.

23.03 Supply of steet pipe piles 500mm dia.,

9mm thick, Grade m

23.04 Driving piles of 500mm dia. including positioning and pilching, Include for cutting pile heads to correct level.

#### DHI. OF QUANTITIES No. 17 CONCRETE WORKS

#### FOOTPATH

KIII AD.	DESCRIPTION	WIIT	NO 1	NO 2	NO3	NO 4		TOTAL		
D0)	COLVERIS									
Cos	ocrele:				-			,		
cli	ovide, place and compact the followin usses of concrete for insity works as acified.	_								. '
	uss 15/40 for Ulinding concrete on Structures.	_n¹	11.4	99	.9.9	10.0		41.2		
17.23 C!:	uss 25/20 for structural concrete.	<u>п³</u>	175.7	156.6	156.9	157.0	ļ	6462		 
17.24 Pro	ovide UPZ finish to concrete surface.	D <sup>2</sup>	1982	1744	174.4	175.7		7227	<u> </u>	
Pro	numb: wide, erect and afterwards discontle Fromve the Hens specified below:									
	izantal formark to achieve class Fl				<del></del>					ļ 
	for Item 17.25 but sloping.	31 <sup>4</sup>								
17.27 As	for Item 17.25 but bottered.	_n³					<u> </u>			<u> </u>
17.28 As	for Itom 17.25 but vertical.	nº.	3562	3296	331.0	327.8		13446	 	
	izental forwork to achieve class F2 vish.	n,	84.0	735	73,5	74.1		3051		
17.30 As	for Item 17.29 but stoping.	a*						<u> </u>		<b></b>
17.31 As	for Item 17.29 but battered.	<b>B</b> *	<del></del>			<u> </u>	ļ	<u> </u>	<u> </u>	
17.32 As	for Item 17.23 but vertical.	n*.	1680	1470	1470	1482	<u> </u>	6105	<b> </b>	ļ ·
	rizontal formork to achieve class Fi nish.	_a*	<u> </u>	<u> </u>				<u> </u>		
17.34 As	for 11cm 17.33 but sleping.	- R <sup>2</sup>	<u> </u>	<u> </u>			<u> </u>	<u> </u>	<u> </u>	
17.35 As	for Item 17.33 but battered.	<u>a,</u>	<u></u>			<u> </u>	<u> </u>	<u> </u>	<del> </del>	<u> </u>
17.35 As	for Item 17.33 but vertical.	_n*		<u> </u>		_==	<del> </del>	<u> </u>	<del> </del>	
te		Loune	12.4	9.7	9.7	9.9	 	41.7		
Uv	4461 of diameter equal to or less on 16sm.	1			·					
17.38 As Gr	for Ites 17.37 but of dieseter eater then Hem.	Loane	<del> </del>		1	<del> </del>	<del> </del> -	<b></b>	1	<b> </b>
	Total	Lonne	12.4	9.7	9.7	9,9		4 1,7		<u> </u>

### BILL OF QUANTITIES No. 21 MISCELLANEOUS

#### ECOTPATH.

17131 180.	mzcantios	TIK	NO I	NO 2	NO 3	NO 4	TOTAL		
	Supply and apply, in accordance to movifacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	El <sup>3</sup>	365.7	325.8	3262	3264	1344.1		
	Supply and install in position rubber - ped bearings, fixed type as specified in the bearings.	Ho. 432*** ×203*** ×18***							
	Supply and install in position rubber pullbewings, executed type as specified in the Drowings.	Ro. 229*** × 162*** × 56****   Ro. 279*** × 229*** × 37****   Ro. 279*** × 229*** × 46***   Ro. 279*** × 229*** × 65***							
	Supply and install exponsion joints as specified in the Drawings. joint fitter	m² thickneth 30°°° 25 m² 20	: 54	5 <u>A</u>	5.4	5.4	2)6		
21.05	Scalint for expression joints.	m 30 mm × 50 mm m 25 × 50	- -						
	Provide 60m thick asphalt concrete surfacing on bridge and box culvert corrageways.	m <sup>3</sup> (m <sup>2</sup> )							
21.07	As for Item 21.05 but to Sümma Unick.	m² (m²)		 					
21.08	Supply and install flex bewn guardenils including post, all in accordance with the Drawings.							-	
	Provide and creek in position parapet bandrails to railwaybridge as detailed on the Gravings.	N.							
	Provide and creek in position pumper bandwils to both idges as detailed on the bravings.								
	Provide and install 180cm dis. drain pipe Durough deck stabs.					•			
21.12	Provide and place 75mm dia. PVC ween Index.	Na.		<del> </del>	<b>}</b>			· ·	<del>-</del>
21.16	Proveke and place 200ms dia. PVC drainage pipe.	No.	2_	4_	4	2	12		
21.13	Provide and place 200m dia. perforated pipe.	<u> </u>	54.4	47.4	47.4	47.8	1970		
21.14	Dowet bur Boyable 20mm dia.	No.	ļ.	+	<del> </del> -	<u> </u>		<b> </b> -	<b> </b>
21.15	Dozel fer Fixed 40am din.	No.	<del> </del>	<del> </del>	<b> </b>	}		<del> </del>	<del> </del>
21.17	Water stem 200mm wide waterstops as specified in the bravings.	Fig.	136	13.6	13,6	1	54.4	}	<del> </del>
20. 18	Provide 500om thickness radion west.	(m <sup>3</sup> )	<u>L</u>					<u> </u>	<u> </u>

#### BOXCULVERT FOR DRAINAGE (WATER)

BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

THM DESCRIPTION NO.	UNIT	NO 1	NO 2	NO 3	NO 4	NO 5	TOTAL	
7.01 Excavation of fundation levels in soft materials.	in <sup>3</sup>	403.8	1597	3240.7	_84Q.J	5028.7	96730	
7.02 E.O Itom 7.01 at anylocation for exeavation in hard materials.	m <sup>3</sup>				<b>1</b> -			
7.03 Backfilling with selected material for excavation.	. In <sup>3</sup>	1418	550	16428	357.1	1412.8	36095	· ·
7.04 Backfiffing with selected material behind abutment, wall.	e e e	1074.1	573.L	12577	758.8.	40442	77079	
7.05 perous filter material behind abutent, wall.	m²	132,5	720	1485	90.1	367.7	8108	·. ·.
7.05 selected granular fill for base.	m²					7975	797.5	

HILL OF QUANTITIES NO. 23 PILING

[1154 NO.	DESCRIPTION	URIT
23.01 Mobilization of all the necessary plant for the piling operation, setting up on		L.S.
	the position of the first pile and removal on completion of the last pile.	
23.02	Hove and set up each pile position.	No.
23.03	Supply of steel pipe piles 500mm dia., 9mm thick,Grade	<u>m</u>
23.04	Driving piles of 500ms dis. including positioning and pitching. Include for cutting pile heads to correct level.	D:

BILL OF QUANTITIES No. 17 CONCRETE NORKS

### DRAINAGE

ī .	1169 130.	MECRIPION	UNIT	NO I	NO 2	NO 3	NO 4	NO 5			TOTAL
		nox culveris									·
		Concrete:					•	i			
		Provide, place and compact the followin classes of concrete for insitu works as specified.									
٠	17.22	Class 15/40 for blinding concrete on all structures.	a <sup>3</sup>	363	142	41.7	24.7	155.4	-		272.3
	17.23	Class 25/20 for structural concrete.	m <sub>3</sub>	5068	232,2	761.8	433.3	4384.7			6318.8
	17.24	Provide IF2 finish to concrete surface.	g) <sup>2</sup>	5285	205.1	638.4	3799	24552			4207.1
		Forework:						i		•	1
		Provide, erect and afterwards dismantle and remove the Items specified below:									
	17.25	Horizontal forwark to achieve class FI	p <sup>t</sup>								
	17.26	finish. As for 11cm 17.25 but sloping.	_at								
	17.27	As for Item 17.25 but battered.	- a²				l				
	17.28	As for Item 17.25 but vertical.	m .	717.7	400.0	764.9	483.7	20695	·		4435.8
	17.23	Horizontal forwork to achieve class F2		183.0	684	2345	1400	9240			1549,9
	17.30	As for 11cm 17.29 but stoping.	_n¹							ļ <u>.</u>	
	17.31	As for Item 17, 29 but battered.	a <sup>‡</sup>	_==						<u> </u>	
	17.32	As for Item 17,29 but vertical.	n,	44 1.1	2499	4724	2888	1960.0		ļ	3412.2
	17.33	Horizontal foresork to achieve class F3 finish.	<u> </u>							ļ	
	17.34	As for 11cm 17.33 but sloping.	a <sup>2</sup>							ļ	<u></u>
	17.35	As for Item 17.33 but battered.	- 10 <sup>3</sup>				<u> </u>			ļ	
	17.36	As for Item 17.33 but vertical.	t			<u> </u>				<u> </u>	<u> </u>
1 -	17.37	Provide and fix in position high tensile steel reinforcement hars to US 461 of diameter equal to or less than 16ms.	Lonne	27,1	120	11.9	13.9	46.8			111.7
	17.38	As for Item 17.37 but of disseter	Lonne			61.3	15.9	2391	<u> </u>		316.3
		greater than 16nm. Total	Lonne	27.1	12.0	73.2	29,8	2859		<u> </u>	428.0

#### BILL OF QUANTITIES No. 21 MISCELLANEOUS

#### DRAINAGE

rhen No. Descripti	UN	UNIT	1 ОИ	NO 2	NO 3	NO 4	NO 5		TOTAL	
ing exterials to approach stabs as	structions waterproof- top of bridge decks, d all structural in contact with fill	m².	7909	3921	958.1	5785	2919.0		5638.6	
21.02 Supply and instal real tearings, fix in the browings.	I in position robber of type as specified	Ro. 432*** ×203*** ×18***								
21.03 Supply met instated bearings, earlies the Bravings.	able type as specified	100   229 max   ×152 max   ×56 max     100   279 max   ×229 max   ×37 max     100   279 max   ×229 max   ×46 max     100   279 max   ×229 max   ×65 max								
21.04 Supply and instal specified in the joint filler		m <sup>2</sup> 1hickneth 30** m <sup>2</sup> 25 m <sup>3</sup> 20	32.0	12.7	399	308	2728		3882	
21.05 Sealant for expen	sion joints.	n 25 × 50								
21.06 Provide 60mm thic surfacing on brid carrageways.	k asphatt concrete ge and box culvert	m³ (m²)	·							
21.07 As for Item 21.05	but to 50om thick.	m <sup>3</sup> (m <sup>2</sup> )	;				<u> </u>			
21.08 Supply and instal including post, a the bravings.	I flex beam guardrails II in accordance with	la l					·			
21.09 Provide and erect bundralls to rail on the Drawings.	in position parapet maybridge as detailed	а						 !		
21.10 Provide and creek bandraits to feet the browings.	in position purpet bridges as detailed on	<u>a</u>					·			
21.11 Provide and insta Unrough deck stat	11 lillen dia. drain pip s.	No.								
21.12 Provide and place holes.	75cm dia. PYC weep	Ro.	38	26	40	26	66		196	
21.16 Proveke and place drainings pipe.	: 200mm din. PVC	No.		<b> </b>						
21.13 Provide and place perforated pipe.		Tt.	1580	864	166,0	1020	3060		8184	
21.14 Dovet bar Noveblo	20m dio.	Ho.		<u> </u>	<b> </b>		<u> </u>	<b> </b> -	<del> </del>	<u> </u>
21.15 Donet but Fixed (	Omn din.	No.	-	<b> </b>	<del> </del>	<del> </del>	<b> </b>	<del> </del>	+	}
21.17 Water stow 200mm as specified in t		n .	659	! .	714	43.7	2886		5018	
20. 18 Provide 500an thi gabian mesh.	ekness	(m <sub>1</sub> )	100. 50.	90. 45.	90. 45.	80:	190. 95.	<u> </u>	550. 275.	

THM DESCRIPTION	, האנד	B1 + B2	Total quantity	
7.01 Excavation of fundation levels in soft materials.	m³	The same de alles a finished	582. 329	
7.02 E.O Item 7.01 at anylocation (excavation in hard materials.	or m³			
7.03 Backfilling with selected material for excavation. 7.04 Backfilling with selected	m <sub>3</sub>		175.648	
material behind abutment, wall.	em		1609.374	
7.05 porous filter material behind abulment, wall.	m³		124.909	
7.06 selected granular fill for base.	m <sup>3</sup>		107.463	

BILL OF QUANTITIES NO. 23

ולבורו טא.	DESCRIPTION	UNIT
	Mobilization of all the necessary plant for the piling operation, setting up on	L-S.
	the position of the first pile and removal on completion of the last pile.	
23.02	Nove and set up each pile position.	No.
	Supply of steel pipe piles 900mm dia., 9mm thick, Grade	<u>M</u>
	Driving piles of 500cm dia. including positioning and pitching, include for continuous position with broads to correct level.	IR .

I TEM NO.	· DESCRIPTION	UNIT	BI + B2	Total quantity	
Imx	CULVERIS				,
	rete:		•		
· ·					
clas	ride, place and compact the followings of concrete for insitu works a diffect.	••			٠
	s 15/40 for blinding concrete on structures.	e <sub>m</sub>		39.005	
17.23 Clas	s 25/20 for structural concrete.	_ <b>ρ</b> 3	579.735	1158.679	
17.24 Prov	ide UF2 finish to concrete surface	. m²		725. 740	V-10
Form	work:	*			
	ide, erect and afterwards dismantl remove the Items specified below:	е .			
17.25 Hori fini	zontal formwork to achieve class F	l <u>w</u> *			<del></del>
17.26 As f	or Item 17.25 but sloping.	m²			
17.27 As f	or Item 17.25 but battered.	<u> n</u> ²			
17.28 As f	or Item 17.25 but vertical.	m²	493,017 + 458.040	951. 057	
17. 29 Ilori fini	zontal forumork to achieve class F sh.	2 <u>m²</u>	161,500 X 2	323.000	
17.30 As f	or Item 17.29 but sloping.	m²			
17.31 As f	or Item 17.29 but battered.				
17.32 As fo	or Item 17.29 but vertical.	m²	187,340 X 2	374.680	
17.33 Hori: fini:	zontal formfork to achieve class Fi sh.	3 <u>m²</u>			<del></del>
17.31 As G	or Item 17.33 but sloping.	m²			
	or Item 17.33 but battered.	m²			
	or Item 17.33 but vertical.	ns <sup>‡</sup>		_	
17.37 Provi	ide and fix in position high le steel reinforcement bars to	Lonne	3180 + 3165 + 2 × 635 = 7.6	7.6	
and the second	61 of diameter equal to or less		.55 729 †58048 + 2×4 088		
17.38 As fo	or Item 17.37 but of diameter	Lonne	= 122.0	122.0	·,
great	er than 16mm. Total	Loune	129,6	129.6	

.0%	DESCRIPTION	UNIT	Total quantity
21.0	Manufacturer's instructions waterproof- ing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	1024. 142
21. (	22 Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
21.4	3 Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 279 max ×152 max ×56 max No. 279 max ×229 max ×37 max No. 279 max ×229 max ×46 max No. 279 max ×229 max ×65 max	
21.0	Of Supply and install expansion joints as specified in the Drawings.  joint filler	m² thickneth 30°22	32.860
21.1	Scalant for expansion joints.	m 30** \$0*** m 25 × 50	
21.6	16 Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	<u>n² (m²)</u>	
21.0	07 As for Item 21.05 but to 50mm thick.	m³ (m²)	19. 598 (-)
*1	OB Supply and install flex beam gnardrails including post, all in accordance with the Drawings.  OB Provide and erect in position parapet handrails to railwaybridge as detailed	TO TO	
21.	on the Drawings.  10 Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	in .	
21	II Provide and install 100mm dia, drain pip through deck slabs.	e No.	
21.	12 Provide and place 75mm dia. PVC weep holes.	No.	
21.	16 Proveke and place 200mm dia. PVC drainage pipe.	No.	2
21.	13 Provide and place 200mm dia. perforated pipe.	. п	62. 144
21.	14 Dowel bar Movable 20sm dia.	No.	
21.	16 Dowel bar Fixed 40mm dia.	No.	
21.	17 Water stem 200mm wide waterstops as specified in the Drawings.	т	35, 300
20.	18 Provide 500mm thickness gabion mesh.	(n <sup>3</sup> )	

1112M .0%	DESCRIPTION	ONIJ.	B1 + B2	Total quantity	
7.01	Excavation of fundation levels in soft materials.	m <sup>3</sup>		450. 959	
• • • • • • • • • • • • • • • • • • • •	E.O Item 7.01 at anylocation for excavation in hard materials.	m <sup>3</sup>			
	Backfilling with selected material for excavation.	w <sub>3</sub>		366.013	
	Backfilling with selected material behind abutment, wall.	m <sup>s</sup>		1243.058	
	porous filter material behind abutment, wall.	_ ii <sup>3</sup>		99. 414	
7.06	selected granular fill for base.	m <sup>8</sup>		53. 184	

### BILL OF QUANTITIES NO. 23 PILING

ITEM DESCRIPTION NO.	UNIT
23.01 Mobilization of all the necessary plant for the piling operation, setting up on	
the position of the first pile and removal on completion of the last pile.	<b>.</b>
the table of the factors and the	
23.02 Move and set up each pile position.	No.
23.03 Supply of steel pipe piles 500mm dia.,	
9mm thick, Grade	no .
23.04 Driving piles of 500cm dia. including positioning and pitching. Include for	n.
culting pile heads to correct level.	

ITEM No.	DESCRIPTION	UNIT	B <sub>1</sub> -1- B <sub>2</sub>	Total quantity
	DOX CULVENTS			
	Concrete:			·
	Provide, place and compact the followin classes of concrete for insitu works as specified.	_		
17.22	Class 15/40 for blinding concrete on all structures.	m³		26.592
17.23	Class 25/20 for structural concrete.	<i>m</i> <sup>3</sup>	348.737 X 2	697.474
17.24	Provide UF2 finish to concrete surface.	m²		499.620
4a <sup>7</sup> !	Formwork:  Provide, erect and afterwards dismantle and remove the Items specified below:	;		
17. 25	Horizontal formwork to achieve class Fl finish.	m²		
17. 26	As for Item 17.25 but sloping.	m²		
17.27	As for Item 17.25 but battered.	m²		
17.28	As for Item 17.25 but vertical.	m²	410,292 +-388,352	798.644
17. 29	llorizontal formwork to achieve class F2 finish.	m²	110,000 x 2	220.000
17.30	As for Item 17.29 but sloping.	m²		_
17.31	As for Item 17.29 but battered.	m²		_
17.32	As for Item 17.29 but vertical.	m <sub>s</sub>	154,000 X 2	308.000
	Horizontal forwark to achieve class F3 finish.	m²		
17.34	As for 11cm 17.33 but sloping.	n²		
17.35	As for Item 17.33 but battered	_m²		
	As for Item 17.33 but vertical.	m²		_
	Provide and fix in position high	t <u>onne</u>	2 X 2 1 0 9 + 2 X 5 2 1 = 5:3	5. 3
17.38	1 5 11 15 00 1	tonne	$2 \times 40431 + 2 \times 3874$ = 88.6	88.6
	2.1	tonne	939	93.9

ITEM NO.	DESCRIPTION	TINU	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	<u>m²</u>	780. 109
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mrs</sup> ×203 <sup>mrs</sup> ×18 <sup>mrs</sup>	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 min ×152 min ×56 min No. 279 min ×229 min ×37 min No. 279 min ×229 min ×46 min No. 279 min ×229 min ×65 min	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>mm</sup> m <sup>2</sup> 25 m <sup>2</sup> 20	21, 940
21.05	Sealant for expansion joints.	m 30° × 50°	
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m³ (m²)	
21.07	As for Item 21.05 but to 50am thick.	m <sup>3</sup> (m <sup>2</sup> )	14.712(-)
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>m</u> .	
21.09	Provide and erect in position paraget handrails to railwaybridge as detailed on the Drawings.	n.	
	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	<u>m</u>	
21, 11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	
100	Provide and place 75mm dia. PVC weep holes.	No.	
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.	2
	Provide and place 200mm dia. perforated pipe.	m	52,600
21.14	Dowel bar Movable 20mm dia.	No.	
21.15	Dowel bar Fixed 40mm dia.	No.	
21.17	Water stom 200mm wide waterstops as specified in the Drawings.	m	30.100
20.18	Provide 500mm thickness gabion mesh.		

THM DESCRIPTION NO.	UNIT	В١	Bs	Вз	W	Total quantity
7.01 Excavation of fundation levels in soft materials.	m³		1435,930-		52.579	1488.509
7.02 E.O Item 7.01 at anylocation for excavation in hard materials.					:	
7.03 Backfilling with selected material for excavation.	n³		4 11.302		15, 802	4 27 . 10 4
7.04 Backfilling with selected material behind abutment, wall.	m³					3906.144
7.05 perous filter material behind abutment, wall.	m³					235.872
7.06 selected granular fill for base.	m <sup>3</sup>		2 16,229-		7.888	224.118

# BILL OF QUANTITIES NO. 23 PILING

TIEM DESCRIPTION NO.	UNIT
23.01 Mobilization of all the necessary plant for the piling operation, setting up on	L.S.
the position of the first pile and removal on completion of the last pile.	
23.02 Move and set up each pile position.	No.
23.03 Supply of steel pipe piles 500mm dia., 9mm thick,Grade	m .
23.04 Driving piles of 500mm dia. including	
punitioning and pitching. Include for cutting pile heads to correct level.	m

BILL OF QUANTITIES No. 17 CONCRETE WORKS

ITEM NO.	DESCRIPTION	UNIT	Bı	Ba	Вз	W	Total quantity
			}				
	DOX CULVERIS			,			
	and the second of the second						
	Concrete:		<b> </b>				
	Provide, place and compact the following classes of concrete for insitu works as						
	specified	1 1				4.	,
7 22	Class 15/40 for blinding concrete on	m <sup>3</sup>		- 63.927 <b>-</b>		3.944	67.871
1.65	all structures.						
a aa	(1) 25 /90 for observed concepts	ធ្លាទ	772,309_	827.368	797.236	58,640	2455.553
1.23	Class 25/20 for structural concrete.	. <u>DI</u>	772,303	027.300	191.230	30,040	
7.24	Provide UF2 finish to concrete surface.	m²					1187. 160
	Formork:						
	Provide, erect and afterwards dismantle						
	and remove the Items specified below:						
7.25	Horizontal formwork to achieve class FI	D3				,	<u> </u>
	finish:					7,1	
7. 26	As for Item 17.25 but sloping.	m²				:	<u> </u>
7.27	As for Item 17.25 but battered.	m <sup>2</sup>					. —
7.28	As for Item 17.25 but vertical.	m²	427.978	400.G08	565 367	82,490	1476.443
: 7 30	Horizontal formwork to achieve class F2	,2	164.200	182.240	158,560		_505.000
1.63	finish.	' <u>""</u>	107.200	102.210	130,300		
	on talle trapia proteint (New York College) in a sure. The College of College (New York College) in the College of the College of the College of the College of the Co	•			·		
7.30	As for Item 17.29 but sloping.						
7.31	As for Item 17.29 but battered.	m²		:			<u> </u>
7 32	As for Item 17.29 but vertical.	m²	197.040	218,688	190.272	58.400	664.400
17, 33	Horizontal formwork to achieve class F	m²					_
	finish.	***					
7.34	As for Item 17.33 but sloping.	m²					
	As for Item 17.33 but battered	. m²			<u> </u>		
7.36	As for Item 17.33 but vertical.	m²					
17.37	Provide and fix in position high		4833	60.0	4,895	1070	
	tensile steel reinforcement bars to	tonne	472	(5919	975	1570	18.7
	NS 4461 of diameter equal to or less than 16mm.		88145		88957		
17.38	As for Item 17.37 but of diameter	tonne	2616	82722	7 189	1512	271.1
	greater than 16mm.	COURS					
		tonne	96.1	88.7	102.0	3.1	289.8

ITEM NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural	m <sup>2</sup>	1586. 305
	concrete surfaces in contact with fill material prior to backfilling.		
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>nm</sup> ×203 <sup>nm</sup> ×18 <sup>mm</sup>	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>mm</sup> ×152 <sup>mm</sup> ×56 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×37 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×46 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×65 <sup>mm</sup>	
21.04	Supply and install expansion joints as specified in the Drawings. joint filter	m <sup>2</sup> thickneth 30 <sup>max</sup> m <sup>2</sup> 25 (B) (W) m <sup>2</sup> 20 90.800+4.780	95, 580
21.05	Sealant for expansion joints.	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50	
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m³ (m²)	
21.07	As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	33. 352 (-)
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>m</u>	
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	n .	
21.10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	ħ	
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21.12	Provide and place 75mm dia. PVC weep holes.	No.	
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.	4
	Provide and place 200mm dia. perforated pipe.	m ·	117. 200
21.14	Dowel bar Movable 20mm dia.	No.	
21.15	Dowel bar Fixed 40mm dia.	No.	_
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	m 73.800 + 6.600	80.400
20.18	Provide 500mm thickness gabion mesh.	m <sup>2</sup> (m <sup>3</sup> )	,

ITEM DESCRI	PTION UNIT	B1 + B2	Total quantity	
7.01 Excavation of f	undation levels			
in soft materia	ls. <u>m³</u>		512.844	
7.02 E.O Item 7.01 a	t anylocation for		· .	
excavation in h	ard materials. m <sup>3</sup>			
7.03 Backfilling wit	h selected			
material for ex	cavation. m³		180. 221	
7.04 Backfilling with	selected			
material behind	abutment wall. m³		1270.681	
7.05 porous filter m	aterial			
behind abutment	wall. m³		98.662	
7.06 selected granul	ar fill for			
base.	m³	<del></del>	68. 256	

# BILL OF QUANTITIES NO. 23 PILING

ITE NO.		UNIT
23.0	Ol Mobilization of all the necessary plant for the piling operation, setting up on	L.S.
	the position of the first pile and removal on completion of the last pile.	•
23. (	2 Move and set up each pile position.	No.
23.0	3 Supply of steel pipe piles 500mm dia.,	
	9mm thick, Grade	<u>n</u>
23.0	4 Driving piles of 500mm dia. including positioning and pitching. Include for	מ
	cutting pile heads to correct level.	

17124 NO.	DESCRIPTION	UNIT	B <sub>1</sub> + B <sub>2</sub>	Total quantity	
1 1 1					
r.	DOX CULVERIS	÷			
	Concrete:				
	Provide, place and compact the followiclasses of concrete for insitu works a specified.				
17.22	Class 15/40 for blinding concrete on all structures.	in <sup>s</sup>		27. 169	
17.23	Class 25/20 for structural concrete.	pr <sup>3</sup>	396,590 X 2	793. 180	
17.24	Provide UI2 finish to concrete surface	. <u>m²</u>		512.760	
	Cormwork:				
	Provide, erect and afterwards dismantle and remove the Items specified below:	<b>c</b>			,
17.25	Horizontal formork to achieve class F	I _B2			<del></del>
	finish.				
	As for Item 17.25 but sloping.	m <sub>s</sub>			
17.27	As for Item 17.25 but battered.	n <sup>2</sup>			<del></del>
17.28	As for Item 17.25 but vertical.	m²	403,421 + 380,521	783. 942	
17. 29	llorizontal formwork to achieve class F finish.	2 _ = 2	113.475 X 2	226.950	
17.30	As for Item 17.29 but sloping.	m².		-	
17.31	As for Item 17.29 but battered.	m².			
17.32	As for Item 17.29 but vertical.	m²	153,525 X 2	307.050	
17. 33	llorizontal formork to achieve class F. finish.	3 <u>n²</u>		A.A.	
17.34	As for Item 17.33 but sloping.				
17.35	As for Item 17.33 but battered.	_ B2			
17.36	As for Item 17.33 but vertical.	m²			
4.5	Provide and fix in position high tensile steel reinforcement bars to	Lonne	2x2147+2x677	5.6	
	NS 4461 of diameter equal to or less than 16mm.				
17.38	As for Item 17.37 but of diameter greater than 16mm.	Lonne	2 x 40749 + 2 x 4093	89.7	
	Total	tonne	95.3	95.3	

	TEM VO.	DESCRIPTION	UNIT	Total quantity
	1.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	787.170
21	1.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
21		Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>mm</sup> ×152 <sup>mm</sup> ×56 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×37 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×46 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×65 <sup>mm</sup>	
21		Supply and install expansion joints as specified in the Drawings. joint filler	m²         thickneth         30 min           m²         25           m²         20	22.900
21	1.05	Scalant for expansion joints.	m 30 <sup>100-100</sup> × 50 <sup>100-100</sup> m 25 × 50	
21		Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m <sup>3</sup> (m <sup>2</sup> )	
21	1.07	As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	14.090(-)
21		Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>m</u>	
21	,	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	<u>m</u>	
21		Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	<u>m</u>	
21	.11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21		Provide and place 75mm dia. PVC weep holes.	No.	
21	. 16	Proveke and place 200mm dia. PVC drainage pipe.	No.	2
21	. 13	Provide and place 200mm dia. perforated pipe.	<u>n</u>	50. 988
21	. 14 1	Dowel bar Movable 20am dia.	No	_
21	.15	Dowel bar Fixed 40mm dia.	No.	
21	.17 \	Water stem 200mm wide waterstops as specified in the Drawings.	n	31.400
20	. 18 i	Provide 500mm thickness gabion mesh.	m <sup>2</sup> (n <sup>3</sup> )	-

NO. DESCRIPTION	TINU	Bi + B2	Total quantity	
<ul><li>7.01 Excavation of fundation levels in soft materials.</li><li>7.02 E.O Item 7.01 at anylocation for</li></ul>	m <sup>8</sup>		447.659	
excavation in hard materials.	. n3			
7.03 Backfilling with selected material for excavation.	s		154.688	
7.04 Backfilling with selected material behind abutment, wall.	m <sup>3</sup>		1205.470	
7.05 porous filter material behind abutment, wall.	m³		96.390	
7.06 selected granular fill for base.	m <sup>3</sup>	-	54. 338	

### BILL OF QUANTITIES NO. 23 PILING

ITEM NO.	DESCRIPTION	UNIT	<u>:</u>	
23.01 Nob.	ilization of all the necessary plant the piling operation, setting up on	L.S.		
	position of the first pile and oval on completion of the last pile.			
23.02 Move	e and set up each pile position.	No.	 	 <u></u> ,
	oly of steel pipe piles 500mm dia., thick,Grade	on .	· · · · · · · · · · · · · · · · · · ·	
posi	ring piles of 500mm dia. including tioning and pitching. Include for ing pile heads to correct level.	m		

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FD3 NO.	DESCRIPTION	UNIT	B1 -1- B2	Total quantity	
1					
	NOX CULVERIS  Concrete:	* *.			
	Provide, place and compact the followin classes of concrete for insitu works as specified.				
13.3	22 Class 15/40 for blinding concrete on	· m³		27. 169	
	all structures.				
17.7	23 Class 25/20 for structural concrete.	182 <sup>9</sup>	349.259 X 2	698.518	
17.2	24 Provide UF2 finish to concrete surface.	m²		512.160	
	Formsork:  Provide, erect and afterwards dismantle and remove the Items specified below:	2			
17.	25 Horizontal forework to achieve class Fl	l m²			
17	finish. 26 As for Item 17.25 but sloping.	n²			
	ev as for fees 11.25 our stoping.	<u>tu</u>			
17.	27 As for Item 17.25 but battered.	_ m²		<del>-</del>	
	28 As for Item 17.25 but vertical.	_ m²	403,620 + 380,930	784.550	
	29 Horizontal formwork to achieve class Fi finish.	2 <u>m²</u>	113.475 x 2	226.950	
17.	30 As for Item 17.29 but sloping.	m²	egr. •		
	31 As for Item 17.29 but battered.	m² .			
	32 As for Item 17.29 but vertical.	n²	149,520 X 2	299.040	
17.	33 Horizontal formwork to achieve class Finish.	3 <u>m*</u>			
17.	34 As for Item 17.33 but sloping.	ы <sup>2</sup>		-	
	35 As for Item 17.33 but battered.	m²			
	36 As for Item 17.33 but vertical.	m <sup>2</sup>			· · · · · · · · · · · · · · · · · · ·
17.	37 Provide and fix in position high tensile steel reinforcement bars to BS 4461 of diameter equal to or less	tonne	2x2170 + 2x471	5.3	
:	than 16mm.				
17.	38 As for Item 17.37 but of diameter greater than 16mm.	tonne	2 x 38513 + 2 x 3805	84,6	
	Total	Lonne	89.9	89.9	

ITEM	DESCRIPTION	UNIT	Total quantity
NO.			
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>2</sup>	771. 900
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 mm × 152 mm × 56 mm No. 279 mm × 229 mm × 37 mm No. 279 mm × 229 mm × 46 mm No. 279 mm × 229 mm × 65 mm	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>max</sup> m <sup>2</sup> 25 m <sup>2</sup> 20	22.690
21.05	Sealant for expansion joints.	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50	<u> </u>
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m³ (m²)	
21.07	As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	14. 952 (-)
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	m	
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	<u>n</u>	
21.10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	n .	
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21.12	Provide and place 75mm dia. PVC weep holes.	No.	
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.	
21.13	Provide and place 200mm dia. perforated pipe.	- Ri	51.000
21.14	Dowel bar Movable 20mm dia,	No.	_
21.15	Dowel bar Fixed 40mm dia.	No.	
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	M.	31. 100
20.18	Provide 500am thickness	m²	

ITEM DESCRIPTION NO.	UNIT	Bı + B2	Total quantity	
7.01 Excavation of fundation levels in soft materials.	m <sup>3</sup>	· · · · · · · · · · · · · · · · · · ·	581 930	
7.02 E.O Item 7.01 at anylocation for excavation in hard materials.	m³		-	
7.03 Backfilling with selected  material for excavation.	m³		211.217	
7.04 Backfilling with selected material behind abutment, wall.	m³		1148.742	
7.05 porous filter material behind abutment, wall.	m <sup>3</sup>		91. 854	
7.06 selected granular fill for base.	m <sup>a</sup>		51. 914	

## BILL OF QUANTITIES NO. 23 PILING

ITEM DESCRIPTION NO.	UNIT
23.01 Mobilization of all the necessary plant for the piling operation, setting up on	L.S.
the position of the first pile and removal on completion of the last pile.	
23,02 Move and set up each pile position.	No.
23.03 Supply of steel pipe piles 500mm dia.,	
9mm thick, Grade	m
23.04 Driving piles of 500mm dia. including positioning and pitching. Include for cutting pile heads to correct level.	tq.

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ITIM NO.	DESCRIPTION	UNIT	B1 + B2	Total quantity	
	DOX COLVELLIZ				
	Concrete:				
	garage (1905). Programme and the contract of t				
	Provide, place and compact the following classes of concrete for insitu works as specified.				
	Class 15/40 for blinding concrete on all structures.	т3		25.957	ļ
17.23	Class 25/20 for structural concrete.	_ bi <sup>3</sup>	335.205 X 2	670.410	
17.24	Provide UP2 finish to concrete surface.	m²		489. 960	
	Formork:				
	Provide, erect and afterwards dismantle and remove the Items specified below:				
	llurizontal forwork to achieve class Fl	. m²		<u>_</u>	
	finish.	•			
17.26	As for Item 17.25 but sloping.	m²	· <u></u>		i
17.27	As for Item 17.25 but battered.	w <sub>s</sub>			
17. 28	As for Item 17.25 but vertical.	Et 2	142,800 X 2	285.600	
	llerizontal forework to achieve class F2	2 m²	108,375 X 2	216.750	
	finish.			•	,
17.30	As for Item 17.29 but sloping.	n²			l
17.31	As for Item 17.29 but battered.	_ <u>m²</u>		-	] <u></u>
17.32	As for Itom 17.29 but vertical.	gı	393,579 + 370,889	764.468	}
	Herizontal fermiork to achieve class F	3 <u>n</u> *			
	finish.				}
17.34	As for Item 17.33 but sloping.	m²			
17.35	As for Item 17.33 but battered.	<u>_</u>			
17.36	As for Item 17.33 but vertical.	. W.s			
	Provide and fix in position high tensile steel reinforcement bars to	tonne	2 x 2070 + 2 x 651	5.5	
	NS 4461 of diameter equal to or less than 16mm.		v		
	As for Item 17.37 but of diameter greater than 16mm.	L <u>onne</u>	2 X 374 36 + 2 X 3 788	82.4	
	Total	Lonne	87.9	87.9	
100	and the second of the second		•		

### No.6 Box for Road

ITEM NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	741.839
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432**** ×203**** ×18*****	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>max</sup> ×152 <sup>max</sup> ×56 <sup>max</sup> No. 279 <sup>max</sup> ×229 <sup>max</sup> ×37 <sup>max</sup> No. 279 <sup>max</sup> ×229 <sup>max</sup> ×46 <sup>max</sup> No. 279 <sup>max</sup> ×229 <sup>max</sup> ×65 <sup>max</sup>	
	Supply and install expansion joints as specified in the Drawings. joint filler	m² thickneth 30 mm 25 m² 26	22, 690
21.05	Sealant for expansion joints.	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50	
	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	<u>π</u> , (ω <sub>ε</sub> )	
21.07	As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	14. 280 (-)
	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	n.	
,	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.		
	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	<u>m</u>	
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	-
21.12	Provide and place 75mm dia. PVC weep holes.	No.	
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.	4
21.13	Provide and place 200mm dia. perforated pipe.	78	48.600
21.14	Dowel bar Movable 20mm dia.	No.	
21. 15	Dowel bar Fixed 40mm dia.	No.	
21.17	Nater stem 200mm wide waterstops as specified in the Drawings.	m .	31, 100
	Provide 500mm thickness Babion mesh.	m² (m³)	

1713M NO.	DESCRIPTION	UNIT	B) = B4	B2 = B3	Wı ~ W3	Total quantity
7.01	Excavation of fundation levels in soft materials.	m <sup>3</sup>	1018	3,680	51.412 36.563 36.503 - =124.478	1143.158
7.02	E.O Itam 7.01 at anylocation for excavation in hard materials.	m³				
7.03	Rackfilling with selected material for excavation.	m <sup>3</sup>	324	1,167	19.423 14.086 6.339]= 39.848	364.015
7.04	Rackfilling with selected material behind abutment, wall.	m <sup>\$</sup>				3205. 583
, ,	porous filter material behind abutment, wall.	m <sup>3</sup>			0.004	228.885
7.06	selected granular fill for hase.	m³	101	. 870	$\begin{bmatrix} 6.664 \\ 4.704 \\ 8.134 \end{bmatrix} = 19.502$	121. 372

## BILL OF QUANTITIES NO. 23 PHING

THM DESCRIPTION NO.	UNIT							
23.01 Mobilization of all the necessary plan for the piling operation, setting up on	4 C C C C C C C C C C C C C C C C C C C		:					<del>.</del>
the position of the first pile and removal on completion of the last pile		-						
23.02 Move and set up each pile position.	No.	· ·			 		 	
23.03 Supply of steel pipe piles 500mm dia., 9mm thick,Grade	ta			:				
23.04 Driving piles of 500mm dia. including							 -	
positioning and pitching. Include for cutting pile heads to correct level.	<u>m</u>			· · · · · · · · · · · · · · · · · · ·	 	·	 · <u>······</u>	

# Ro.7 Box for Road

# BILL OF QUANTITIES No. 17 CONCRETE WORKS

CON	CIGH: NOICES					
KIT! .0%	DESCRIPTION	UNIT	B1 = B4 + B2-B3	Wı∼W3	Total quantity	
	XX COLVEIUS					
			Į į			İ
(	Concrete:					
	The world of the second					+
	rovide, place and compact the following	3				•
	classes of concrete for insitu works as					
	specified.		.		, i	
17.22.1	class 15/40 for blinding concrete on	m³.	50.935	3,332+2,352 + 4,067	60, 686	
	ill structures.	<del></del>		50.646		
			2 X 328.061+	+34.487		
17. 23 (	lass 25/20 for structural concrete.	m <sup>3</sup>	2 X 273,120	+60.162	1347.657	
17.24 1	rovide UF2 finish to concrete surface.	DI <sub>S</sub>			1017. 775	
1	orsverk:					
	rovide, creet and afterwards dismantle				'	Ĺ
	and remove the Items specified below:		]			
and the second second	forizontal formwork to achieve class Fi	B <sup>2</sup>				
1	finish.					
17.26 /	as for Item 17.25 but sloping.	an <sup>2</sup>				
and the second				<del></del>	<del></del>	
17.27	is for Item 17.25 but battered.	m*		50.676	<u> </u>	\
17 70	to fee them 17 05 but working!	o ż	2 X 321553+	+ 48:777	1250 001	
11.40 /	ls for Item 17.25 but vertical.		217.120+194.360 2 x 111.350+	+ 82.552	1256. 591	
17. 29 1	orizontal formwork to achieve class F2	E)2	2 X 102,000		426.700	<u></u> _
1	finish.	•				
12.20	on the 12 go but at the	-2	1			
11.30 1	s for Item 17.29 but sloping.	mª.			<u> </u>	l <del></del>
17.31 /	s for Item 17.29 but battered.	m²				
17.39	As for Item 17.29 but vertical.	. m²	2 X 14 8, 030 † 2 X 135, 600	+ 34.437	713.045	<u> </u>
4.0			1 EV 133'000	F 33812	113.040	
	forizontal formwork to achieve class F3	<u>m²</u>				
4	finish.		1			
17. 34 7	as for Item 17.33 but sloping.	m²				
14 1		•				
17.35 /	As for Item 17.33 but battered.		<del> </del>			l
17.36	s for Itom 17.33 but vertical.	™\$				
17 97 1	rovide and fix in position high		2x2116+759	1570		
		tonne	2 x 1926	1843 1129	13.4	}
	3S 4461 of diameter equal to or less	- 3:=		1413		
	lun 16am.		2x46648† 1602	1599		<u> </u>
17.38	is for Item 17.37 but of diameter	tome	2135633	1065	170.2	1
	greater than 16mm.					I
	Total Park 19	lonne	175,0	8,6	183.6	
				·	·	·

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NO. DESCRIPTION	UNIT	Total quantity
21.01 Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	1375.862
21.02 Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
21.03 Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 num × 152 num × 56 num  No. 279 num × 229 num × 37 num  No. 279 num × 229 num × 46 num  No. 279 num × 229 num × 65 num	
21.04 Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>mll</sup> m <sup>2</sup> 25 5,012 1 m <sup>2</sup> 20 68280 + 4.745 x 2	82.782
21.05 Sealant for expansion joints.	m 30 <sup>rous</sup> × 50 <sup>rous</sup> (B) (W)	
21.06 Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m³ (m²)	
21.07 As for Item 21.05 but to 50mm thick.	m³ (m²)	30. 371 (-)
21.08 Supply and install flex beam guardrails including post, all in accordance with the Drawings.	(f)	
21.09 Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	na .	
21.10 Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	m .	
21.11 Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21.12 Provide and place 75mm dia. PVC weep holes.	No.	
1.16 Proveke and place 200mm dia. PVC drainage pipe.	No.	2
1.13 Provide and place 200mm dia. perforated pipe.		139.900
1.14 Dowel bar Movable 20mm dia.	No.	-
1.15 Dowel bar Fixed 40mm dia.	No.	_
1.17 Water stem 200mm wide waterstops as specified in the Drawings.	m 93600 + 6.550 6.550	113.635
0.18 Provide 500mm Lhickness gabion mesh.	m <sup>2</sup> (m <sup>3</sup> )	

1715M NO.	DESCRIPTION	UNIT	BI = B2	Total quantity	
	xcavation of fundation levels				
	n soft materials.	m <sup>3</sup>		220. 081	
7.02 E	.0 Item 7.01 at anylocation for			<u> </u>	
e	xcavation in hard materials.	m <sup>3</sup>			·
7.03 B	ackfilling with selected				
fB	aterial for excavation.	m <sup>s</sup>		116.017	
7.04 Ba	ckfilling with selected				
n.	aterial behind abutment, wall.	m <sup>3</sup>		379, 937	
7.05 p	orous filter material		1 1 1 1 1		
	ehind abutment, wall.	m³		55. 488	
7.06 s	elected granular fill for	• •	the state of the s		
ix	ase.	m <sup>3</sup>		22. 560	

## BILL OF QUANTITIES NO. 23 PILING

ITEM DESCRIPTION	UNIT
23.01 Mobilization of all the necessary plant for the piling operation, setting up on	·
the position of the first pile and removal on completion of the last pile.	
23.02 Move and set up each pile position.	No.
23.03 Supply of steel pipe piles 500mm dia., 9mm thick, Grade	m
23.04 Driving piles of 500mm dia. including positioning and pitching. Include for cutting pile heads to correct level.	

# Na.1 Box for Footpath

1113/ NO.	DECEDITION	UNIT	B1 = B2	Total quantity	
	BOX CULVERIS				٠
•	Concrete:				
	Provide, place and compact the following classes of concrete for insitu works a specified.	_			
17.2	2 Class 15/40 for blinding concrete on all structures.	m <sup>3</sup>	2 X 5.673	11.346	<del></del>
17.2	3 Class 25/20 for structural concrete.	m³	2 X 87, 825	175.650	<u></u>
17.2	4 Provide UT2 finish to concrete surface	. <u>w²</u>		198.240	
	Forumork:				·  -
	Provide, erect and afterwards dismantl and remove the Items specified below:	e			
17.2	5 Horizontal forwwork to achieve class F	l m²			
	finish.				
17.2	6 As for Item 17.25 but sloping.	w²			
17.2	7 As for Item 17.25 but battered.				
17.2	8 As for Item 17.25 but vertical.	m²	180.814 + 175.374	356.188	<del></del> :
17.2	9 Horizontal formwork to achieve class F finish.	2 <u>m²</u>	2 X 42 000	84.000	· ·
17.3	O As for Item 17.29 but sloping.	m²			
	1 As for Itom 17.29 but battered.	m²			
	2 As for Item 17.29 but vertical.	_m²	2 X 84,000	168.000	
17.3	3 Horizontal formwork to achieve class F finish.	3 <u>m²</u>			
17.3	4 As for Item 17.33 but sloping.	m²			
	5 As for Item 17.33 but battered	m²			
	3 As for Item 17.33 but vertical.	m²			
17.3	Provide and fix in position high tensile steel reinforcement bars to	tonne	2 X 5380 2 X 832	12.4	
	BS 4461 of diameter equal to or less than 16mm.				
17.38	As for Item 17.37 but of diameter greater than 16mm.	tonne			
	Total	t <u>onne</u>	12,4	12.4	į Į

## No. 1 Box for Footpath

ITEM NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>3</sup>	365.707
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.  Supply and install expansion joints as	No. 229 mm × 152 mm × 56 mm  No. 279 mm × 229 mm × 37 mm  No. 279 mm × 229 mm × 46 mm  No. 279 mm × 229 mm × 46 mm	
21,04	specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>mm</sup> m <sup>2</sup> 25  m <sup>2</sup> 20	5. 440
	Sealant for expansion joints.  Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m 30 mm × 50 mm m 25 × 50 m³ (m²)	
	As for Item 21.05 but to 50mm thick.  Supply and install flex beam guardrails including post, all in accordance with the Drawings.	m³ (m²)	
	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	<u>ra</u>	
	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	<u>n</u>	
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	_No.	
٠	Provide and place 75mm dia. PVC weep holes.	No.	
	Proveke and place 200mm dia. PVC drainage pipe.	No.	2
	Provide and place 200m dia. perforated pipe. Dowel bar Movable 20mm dia.	m.	54.400
21. 15	Dowel bar Fixed 40mm dia.	No.	
20.18 [	Water stem 200mm wide waterstops as specified in the Drawings. Provide 500mm thickness gabion mesh.	m²	13.600

ITEM NO.		UNIT	Bi = B2	Total quantity	
7.01	Excavation of fundation levels			,	
	in soft materials.	m³		305. 837	
7.02	E.O Item 7.01 at anylocation for				
	excavation in hard materials.	m <sup>3</sup>			
7.03	Backfilling with selected				
	material for excavation.	m <sup>3</sup>		207. 303	
7.04	Backfilling with selected				
	material behind abutment, wall.	ns		331.048	<u> </u>
7.05	porous filter material				
	behind abutment, wall.	m³		48. 348	
7.06	selected granular fill for				
	base.	m³	<del></del>	19.760	

# BILL OF QUANTITIES NO. 23 PILING

			<del></del>			·
ITEM DESCRIPTION NO.	UNIT					
23.01 Mobilization of all the necessary plant for the piling operation, setting up on					**************************************	
the position of the first pile and removal on completion of the last pile.			10 10 00			
23.02 Move and set up each pile position.	No.	·····		 · · · · · · · · · · · · · · · · · · ·		
23.03 Supply of steel pipe piles 500mm dia., 9mm thick,Grade	m					
23.04 Driving piles of 500mm dia. including positioning and pitching. Include for	m					
cutting pile heads to correct level.				·.	<del></del>	<del></del>

NO. DESCRIPTION	UNIT	B1 = B2	Total quantity
BOX CULVERTS			
Concrete:	. (		
Provide, place and compact the following classes of concrete for insitu works as specified.			
17.22 Class 15/40 for blinding concrete on	B3	2′ X 4.972	9. 944
all structures.			
17.23 Class 25/20 for structural concrete.	B3	2 X 78 305	156. 610
17.24 Provide UF2 finish to concrete surface.	m <sub>3</sub>		174. 440
Formwork:			
Provide, erect and afterwards dismantle and remove the Items specified below:			
17.25 Horizontal forework to achieve class F1 finish.	m²		
17.26 As for Item 17.25 but sloping.	m²		
17.27 As for Item 17.25 but battered.	D <sub>S</sub>	·	
17.28 As for Item 17.25 but vertical.	<u>m</u> 2	167,514 + 162,074	329. 588
17.29 Horizontal formwork to achieve class F2 finish.	<u>m²</u>	2 X 36.750	73.500
17.30 As for Item 17.29 but sloping.	m²		
17.31 As for Item 17.29 but battered.	m²		-
17.32 As for Item 17.29 but vertical.	m²	2 X 73.500	147. 000
17.33 Horizontal formwork to achieve class F3 finish.			
17.34 As for Item 17.33 but sloping.	m²	,	
17.35 As for Item 17.33 but battered.	m²		
17.36 As for Itom 17.33 but vertical.	n)²		
	t <u>onne</u>	2 X 4 0 3 8 2 X 8 3 2	9. 7
BS 4461 of diameter equal to or less than 16mm.	long		
17.38 As for Item 17.37 but of diameter greater than 16mm.	Lonne		
Total	tonne	9.7	9. 7

## No.2 Box for Footpath

ITEM NO. DESCRIPTION	UNIT	Total quantity
21.01 Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	325.807
21.02 Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432*** ×203*** ×18***	
21.03 Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>mm</sup> ×152 <sup>mm</sup> ×56 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×37 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×46 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×65 <sup>mm</sup>	
21.04 Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>n.ma</sup> m <sup>2</sup> 25 m <sup>2</sup> 20	5. 440
21.05 Scalant for expansion joints.	m 25 × 50	
21.06 Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	$m_2 (m_5)$	
21.07 As for Item 21.05 but to 50mm thick.	<u>m³ (m²)</u>	
21.08 Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>m</u>	
21.09 Provide and creet in position parapet handrails to railwaybridge as detailed on the Drawings.	m	
21.10 Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	<u>m</u>	
21.11 Provide and install 100mm dia. drain pipe through deck slabs.	e <u>No.</u>	
21.12 Provide and place 75mm dia. PVC weep holes.	No.	
21.16 Proveke and place 200mm dia. PVC drainage pipe.	No.	4
21.13 Provide and place 200mm dia. perforated pipe.	<u>m</u>	47. 400
21.14 Dowel bar Wovable 20mm dia.	No.	
21.15 Dowel bar Fixed 40mm dia.	No.	
21.17 Water stem 200mm wide waterstops as specified in the Drawings.	in .	13.600
20.18 Provide 500mm thickness gabion mesh.	(h <sup>2</sup> )	

l'IFM NO.	DESCRIPTION	רואט	B1 = B2	Total quantity	
	Excavation of fundation levels				,
100	in soft materials.	m³		220. 133	
	E.O Item 7.01 at anylocation for excavation in hard materials.	т3			
	Backfilling with selected material for excavation.	m <sup>3</sup>		156.046	
	Dackfilling with selected material behind abutment, wall.	m³		331.048	
7.05	porous filter material behind abutment, wall.	m <sup>3</sup>		48. 348	
7.06	selected granular fill for				
	base.	m <sup>3</sup>		19.760	l

# BILL OF QUANTITIES NO. 23 PILING

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. . . . .

## No.3 Box for Footpath

ITEM NO.	DESCRIPTION	UNIT	B1 = B2	Total quantity	
	BOX CULVERTS			ppi spanish	
	Concrete:				
	Provide, place and compact the followin classes of concrete for insitu works as specified.				
17.22	Class 15/40 for blinding concrete on all structures.	_ m*	2 ½ 4,972	9. 944	
17.23	Class 25/20 for structural concrete.	B3	2 X 78,444	156. 888	
17.24	Provide UF2 finish to concrete surface.	m²		174. 360	<u> </u>
	Formwork:				
	Provide, erect and afterwards dismantle and remove the Items specified below:				
17.25	Horizontal formwork to achieve class Fl	n²	e en		:
	finish.				
	As for Item 17.25 but sloping.				
17.27	As for Item 17.25 but battered.	m² ·		***	
17.28	As for Item 17.25 but vertical.		168,222 + 162,782	331, 004	
17.29	Horizontal forework to achieve class F2 finish.	m²	2 X 36,750	73. 500	
17.30	As for Item 17.29 but sloping.	_m²	·		
17, 31	As for Item 17.29 but battered.	Ø <sub>2</sub>			<u> </u>
17.32	As for Item 17.29 but vertical.	m²	2 X 73.500	147.000	
17.33	Horizontal forumerk to achieve class F3 finish.	m <sub>\$</sub>			 
17.34	As for Item 17.33 but sloping.	D2			t 
17.35	As for Item 17.33 but battered.	<u>n²</u>			
17.36	As for Item 17.33 but vertical.	m²		-	
	Provide and fix in position high tensile steel reinforcement bars to BS 4461 of diameter equal to or less than 16mm.	t <u>onne</u>	2 X 4 0 3 8 2 X 8 3 2	9. 7	
17.38	As for Item 17.37 but of diameter greater than 16mm.	tonne			
	en de la companya de La companya de la co	t <u>onne</u>	9.7	9. 7	

NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>2</sup>	326, 160
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>mai</sup> ×152 <sup>mai</sup> ×56 <sup>mai</sup> No. 279 <sup>mai</sup> ×229 <sup>mai</sup> ×37 <sup>mai</sup> No. 279 <sup>mai</sup> ×229 <sup>mai</sup> ×46 <sup>mai</sup> No. 279 <sup>mai</sup> ×229 <sup>mai</sup> ×65 <sup>mai</sup>	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>mm</sup> m <sup>2</sup> 25  m <sup>2</sup> 20	5. 440
21.05	Sealant for expansion joints.	л 30°°°× 50°°°° m 25 × 50	
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	<u>m</u> <sup>3</sup> (m <sup>2</sup> )	
	As for Item 21.05 but to 50mm thick.  Supply and install flex beam guardrails including post, all in accordance with the Drawings.	м <sup>3</sup> (n <sup>2</sup> )	
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	m	
21, 10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	m	
	Provide and install 100mm dia. drain pipe through deck slabs.	e No.	
21.12	Provide and place 75mm dia. PVC weep holes.	No.	
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.	4
	Provide and place 200mm dia. perforated pipe.	m	47. 400
21.14	Dowel bar Movable 20mm dia.	No.	
21.15	Dowel bar Fixed 40mm dia.	No.	
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	m	13.600
20.18	Provide 500mm thickness gabion mesh.	m² (m³)	

ITEM DESCRIPTION NO.	UNIT	B1 = B2	Total quantity	
7.01 Excavation of fundation levels in soft materials.	m³ (	and the state of t	253.761	
7.02 E.O Item 7.01 at anylocation for excavation in hard materials.	e <sub>m</sub>		-	
7.03 Backfilling with selected material for excavation.	m <sup>3</sup>		176.006	
7.04 Backfilling with selected material behind abutment, wall.	m³		333.549	
7.05 porous filter material behind abutment, wall.	m³		48.713	
7.06 selected granular fill for base.	m³		19.924	

BILL OF QUANTITIES NO. 23
PILING

ITEM NO.	DESCRIPTION	TINI
23.01	Mobilization of all the necessary plant for the piling operation, setting up on	
	the position of the first pile and removal on completion of the last pile.	
23.02	Move and set up each pile position.	No.
	Supply of steel pipe piles 500mm dia., 9mm thick,Grade	as .
	Driving piles of 500mm dia. including positioning and pitching. Include for cutting pile heads to correct level.	m

## No.4 Box for Footpath

MHT1 .00	DESCRIPTION	UNIT	B <sub>1</sub> = B <sub>2</sub>	Total quantity	
-	IXX CULVERIZ				
	Concrete:				
÷.	Provide, place and compact the follow classes of concrete for insite works a specified.				
17.22	Class 15/40 for blinding concrete on all structures.	en <sup>3</sup>	2 X 5,012	10.024	
17.23	Class 25/20 for structural concrete.	_m³	2 X 78 502	157.004	
17.24	Provide UFZ finish to concrete surface	c. <u>m²</u>		175.720	
:	Forework:			- a I	
	Provide, erect and afterwards dismant and remove the Items specified below:	le ·			
17.25	Horizontal formwork to achieve class I	] <u>m²</u>			
1	finish.	•			
17. 26	As for Item 17.25 but sloping.			· <u>-</u>	
17.27	As for Item 17.25 but battered.	<u>_</u>			
17.28	As for Itom 17.25 but vertical.	m²	166,624 + 161,184	327.808	
	Horizontal formwork to achieve class I	2 <u>n²</u>	2 X 37.050	74.100	
17.30	As for Item 17.29 but sloping.	m²			\
17.31	As for Item 17.29 but battered.	193			
17.32	As for Item 17.29 but vertical.	23,5	2 X 74.100	148.200	
17.33	llorizontal formwork to achieve class finish.	F3 <u>m²</u>		<del></del>	
17.34	As for Item 17.33 but sloping.	. m²			 
17.35	As for Item 17.33 but battered.	m².			\
17.30	As for Item 17.33 but vertical.	m²			
17.37	Provide and fix in position high tensile steel reinforcement bars to	Loune	2 x 4 l 36 2 x 804	9. 9	
4	BS 4461 of diameter equal to or less than 16mm.				
17.38	As for Item 17.37 but of diameter greater than 16mm.	Lonne			
	Total	Lonne	9.9	9, 9	

## No.4 Box for Footpath

NO.	DESCRIPTION	UNIT	Total quantity
21.0	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	326. 418
21.0	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>1828</sup> ×203 <sup>1828</sup> ×18 <sup>1848</sup>	
21.00	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>mm</sup> ×152 <sup>mm</sup> ×56 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×37 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×46 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×65 <sup>mm</sup>	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m²         thickneth         30 thickneth           m²         25           m²         20	5. 440
21.0	Sealant for expansion joints.	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50	
21.00	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	<u>m³ (m²)</u>	
	As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	ni .	
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	M	
21.10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.		
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21.12	Provide and place 75mm dia. PVC weep holes.	No.	
21. 16	Proveke and place 200mm dia. PVC drainage pipe.	No.	2
21.13	Provide and place 200mm dia. perforated pipe.	m ·	47. 758
	Dowel bar Movable 20nm dia.	No.	
21.15	Dowel bar Fixed 40mm dia.	No.	_
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	n .	13.600
20.18	Provide 500mm thickness gabion mesh.	т <sup>2</sup> (m³)	

#### No.1 Box for Drainage

## BILL OF QUANTITIES No.? EXCAVATION AND FILLING FOR STRUCTURES

METT1 NO.	DESCRIPTION	UNIT	B1=B4+B2=B3	Wi ≈ W2	Total quantity
7.01	Excavation of fundation levels			!	
	in soft materials.	m <sup>3</sup>	258.420	2 X 72,705	403.830
	E.O Item 7.01 at anylocation for excavation in hard materials.	m <sup>3</sup>	<u></u>	·	-
7.03	Backfilling with selected				
	material for excavation.	គ្នាទ	1_15_640	2 X 13.089	141.818
7.04 1	lackfilling with selected				
	material behind abutment, wall.	m³			1074.145
7.05	porous filter material				
	behind abutment, wall.	m <sup>3</sup>			132.480
7.06	selected granular fill for				
•	base.				

# BILL OF QUANTITIES NO. 23 PILLING

Even a series of the series of	
NO. DESCRIPTION	UNIT
23.01 Mobilization of all the necessary plant for the piling operation setting up on	L.S.
the position of the first pile and removal on completion of the last pile.	
removal on completion of the last pile.	
23.02 Move and set up each pile position.	No.
23.03 Supply of steel pipe piles 500mm dia.,	
9nm thick, Grade	m
23.94 Driving piles of 500mm dia. including	
positioning and pitching. Include for cutting pile heads to correct level.	m

### DILL OF QUANTITIES No. 17 CONCRETE WORKS

(ASYLIC:1)	: RUINS :					
ITEM NO.	DESCRIPTION	UNIT	B1 = B4 + B2 = B3	MI = M5	Total quantity	
	在1.等 2. x					
BOX C	H.VERIS					
Concr	<b>ete:</b>					·
	le, place and compact the following as of concrete for insitu works as fied.			•		
17, 22 Class	15/40 for blinding concrete on	<b>1</b> 13	2 X 6.090 + 2 X 6.300	2X 5,777	36.334	
all s	tructures.		1			
	25/20 for structural concrete.	_m³	2 X 103.370 + 2 X 106.500	2X 43 537	506, 814	
17.24 Provi	la UF2 finish to concrete surface.	m²			528, 467	
Porme		1				
and r	de, erect and afterwards dismantle amove the Itams specified below:					
	ontal forwark to achieve class Fl	m²			<b></b>	i i
finis	he ( type )					
17.26 As fo	r Item 17.25 but sloping.	o²_	<u> </u>			
17.27 As fo	r Item 17.25 but battered.	m²			_	
	A American St.		2 X 145.801 +			
17.28 As fo	r Item 17.25 but vertical.	R*	142200 + 135,200 2 x 46,479	2 X 74.331	717.664	
	ontal forwark to achieve class f2 h.		+ 2 x 45.000		182. 958	
						}
	r 11cm 17.29 but sloping.	@ <sup>2</sup>				
17.31 As fo	r Item 17.29 but battered.	m²	2 X 87,000	<u></u>		
17.32 As fo	r Item 17.29 but vertical.	in <sup>2</sup>	+ 2 x 90.000	2 X 43.556	441.112	
17.33 Horiz finis	ontal forework to achieve class F3	m².				\ <u></u>
	r Item 17.33 but sloping.	m²				
Constant to	r Item 17.33 but battered.	: m²				
17.36 As fo	r Item 17.33 but vertical.	p²				
	de and fix in position high te steel reinforcement bars to	tonne	2 x 5728 2 x 5603	2 X 2 2 1 0	27.1	
	61 of diameter equal to or less	<del></del>				
	r Itom 17.37 but of diameter er than 15mm.	tome				
	relative in the second	Lonne	22.7	4.4	27.1	
	Attached the first of	-	•			

## No. 1 Box for Droinage

ITEM NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>2</sup>	790.863
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>th,th</sup> ×203 <sup>th,th</sup> ×18 <sup>th,th</sup>	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 mm × 152 mm × 56 mm No. 279 mm × 229 mm × 37 mm No. 279 mm × 229 mm × 46 mm No. 279 mm × 229 mm × 65 mm	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>ma</sup> m <sup>2</sup> 25 m <sup>2</sup> 20 21.00 + 2 x 5.502	32.004
21.05	Sealant for expansion joints.	m 30 suta × 50 suta m 25 × 50	
21.06	Provide 60cm thick asphalt concrete surfacing on bridge and box culvert carrageways.	$m^3 (m^2)$	
21.07	As for Item 21.05 but to 50mm thick.	m³ (m²)	
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	ib .	· <u>-</u>
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.		<u>-</u> -
21.10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	<u>m</u>	
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21.12	Provide and place 75mm dia. PVC weep holes.	No.	38
	Proveke and place 200mm dia. PVC drainage pipe.	No.	
21. 13	Provide and place 200mm dia. perforated pipe.	<u> </u>	<u>158.</u> ∞0
21.14	Dowel bar Movable 20mm dia.	No.	
21.15	Dowel bar Fixed 40mm dia.	No.	
	Water stem 200mm wide waterstops as specified in the Drawings.	m 42.000 + 2 x 11.954	65. 908
	Provide 500mm thickness gabion mesh.	m² 2 X 50 000 (m³) 2 X 25 000	100.000 50.000

#### No.2 Box for Drainage

### BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM NO.	DESCRIPTION	TINU	B1 = B2	WI = W2	Total quantity
	Excavation of fundation levels				
	in soft materials.	<u>m</u>	82.080	2 X 38.797	159.674
•	E.O Item 7.01 at anylocation for	8			_
	excavation in hard materials.	m <sup>8</sup>			
	Backfilling with selected material for excavation.	tn.³	43.092	2 X 5.948	54. 988
7.04	Backfilling with selected				
	material behind abutment, wall.	in <sup>3</sup>			573.066
7.05	porous filter material				
•	behind abulment, wall.	m³			71. 982
7.06	selected granular fill for			İ	.
	base.	m³	<u></u>	<u> </u>	ll_

### BILL OF QUANTITIES NO. 23 PILING

THEM DESCRIPTION	INIT
NO. DEJONI, TON	UNIT
23.01 Nobilization of all the necessary plant for the piling operation, setting up on	· · · · · · · · · · · · · · · · · · ·
the position of the first pile and removal on completion of the last pile.	
23.02 Move and set up each pile position.	No.
23.03 Supply of steel pipe piles 500mm dia.,	
9mm thick, Grade	70.
23.04 Driving piles of 500mm dia including positioning and pitching. Include for	ro,
culting pile heads to correct level.	

### No.2 Pox for Drainage

FIEM NO.	DESCRIPTION	UNIT	B1 = B2	WI = W2	Total quantity	
	MAY CHRADENES					
	10X CULYERIS					
	Concrete:				İ	
:	Provide, place and compact the followin	e!		•		
:. :.	classes of concrete for insitu works as specified.					
17.22	Class 15/40 for blinding concrete on	m <sup>3</sup>	2 X 5 130	2 X 1972	14.204	
	all structures.					
	Class 25/20 for structural concrete.	n <sup>3</sup>	2X 96444	2 X 19,657	232.202	
	Provide UP2 finish to concrete surface.	_m²			205. 124	
	Forework:					
	Provide, erect and afterwards dismantle	<b>!</b>				
	and remove the Items specified below:		·		e e	
	Morizontal forework to achieve class fl	_ m²			·	
4 51	finish. Mara ka dayan ya j			.1 * *		
	As for Item 17.25 but stoping.	_ B <sub>8</sub>				·
17.27	As for Item 17.25 but battered.	m²				
17.28	As for Item 17.25 but vertical.	m <sup>2</sup>	156,504 + 151,864	2 X 4 5,836	400.040	
17. 29	Horizontal foremork to achieve class F2 finish.	<u>n²</u>	2 + 34.200		68.400	
17.30	As for Item 17.29 but sloping.	m².				
17.31	As for Item 17.29 but battered.	m²				
17.32	As for Itom 17.29 but vertical.	w <sub>s</sub>	2 x 102,600	2 x 22.332	249.864	
17. 33	llorizontal formwork to achieve class F3 finish.				· <del>-</del>	
17.34	As for Item 17.33 but sloping.	m²				
100	As for Item 17.33 but battered.	in <sup>2</sup>				
17.30	As for Item 17.33 but vertical.	w <sub>s</sub>				
17.37	Provide and fix in position high tensile steel reinforcement has to US 4461 of diameter equal to or less than 16mm.	Lonne	2 x 4965	2 X 1034	12.0	
17.38		tome			_	
	greater than 16am.					
100	Total	Lonne	9.9	2.1	12.0	l

NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in centact with fill material prior to backfilling.	m <sup>2</sup>	392.070
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432**** ×203**** ×18****	<u>-</u>
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 mm × 152 mm × 56 mm No. 279 mm × 229 mm × 37 mm No. 279 mm × 229 mm × 46 mm No. 279 mm × 229 mm × 65 mm	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>max</sup> m <sup>2</sup> 25  m <sup>2</sup> 20 4,640 + 2×4,023	
21.05	Sealant for expansion joints.	m 30 × 50 × 50 (B) (W) m 25 × 50	
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m <sup>3</sup> (m <sup>2</sup> )	
21.07	As for Item 21.05 but to 50mm thick.	<u>в</u> з (m²)	
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>m</u>	
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.		
	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	TO TO THE PARTY OF	-
	Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21,12	Provide and place 75mm dia. PVC weep holes.	No.	26
	Proveke and place 200mm dia. PVC drainage pipe.	No.	
	Provide and place 200nm dia. perforated pipe.	in	86.400
21.14	Dowel bar Movable 20mm dia.	No.	
21.15	Dowel bar Fixed 40mm dia.	No.	
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	m 11.600 + 2 X10.285	32.170
20.18	Provide 500mm thickness gabion mesh.	m <sup>2</sup> 2 X 45.000 (m <sup>3</sup> ) 2 X 22.500	90.000

### No.3 Box for Drainage

### BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

THEM NO.	DESCRIPTION	UNIT	B1 = B4 + B2 = B3	W1 = W2	Total quantity
7.01 Excavati	on of fundation levels				·
in soft	materials.	m <sup>3</sup>	2837.785	402,874	3240,659
7.02 E.O Item	7.01 at anylocation for				
excavati	on in hard materials.	m <sup>3</sup>			
7.03 Backfill	ing with selected	.		1	
material	for excavation.	13 <sup>3</sup>	1482.375	160, 389	1642.764
7.04 Backfilli	ng with selected				
material	behind abutment, wall.		<u> </u>		1257.660
7.05 porous f	ilter material			} ·	
belind a	butment, wall.	m <sup>3</sup>			148. 500
7.06 selected	lgranular fill for				
base.	. 1	m <sup>3</sup>			

### BILL OF QUANTITIES NO. 23 PILING

ITEM NO.	description	TIMI
23.01	Mobilization of all the necessary plant for the piling operation, setting up on	L.S.
	the position of the first pile and removal on completion of the last pile.	
23.02	Move and set up each pile position.	No.
23.03	Supply of steel pipe piles 500mm dia., 9mm thick,Grade	<u>n</u>
23.04	Driving piles of 500mm dia. including positioning and pitching. Include for	ra .
	cutting pile heads to correct level.	

ITEM NO. DESCRIPTION	UNIT	B1 = B4 + B2=B3	Wi=W2	Total quantity	
DOX CULVERYS				]	
			į į	[	
Concrete:					
District at the full remont the following					
Provide, place and compact the followin classes of concrete for insitu works as specified.				·	
17,22 Class 15/40 for blinding concrete on	m <sup>3</sup>	2 X 9.065 2 X 7.350	2 7 4 4 4 2	41. 714	
all structures.		- 6 ^ /· 35U	2 X 4,442	41. 114	
and the state of t		2 x 179,635	a :		
17.23 Class 25/20 for structural concrete.	m <sup>3</sup>	2 X 145,650	2X55,626	761.822	
17.24 Provide UF2 finish to concrete surface.	m²			638.378	
Formork:					
Provide, erect and afterwards dismantle and remove the Items specified below:	:				
THE POINT DIE TOUR PROFITED BOTON					
17.25 Herizontal forwork to achieve class Fl	<u>m²</u>				
finish. A Discharge					
17.26 As for Item 17.25 but sloping.	p².				
17 27 to 8-y 11 12 25 but bottomed	_1			_	
17.27 As for Item 17.25 but bottered.	<u> </u>	2 X 179,282			
17.28 As for Item 17.25 but vertical.		2 x 138.710	2 X 64.474	<u>764.932</u>	
17.29 Horizontal forework to achieve class F2	) m²	2 x 64,750 2 x 52,500		234, 500	
finish.	, " <u>P1</u>				
		1			
17.30 As for Item 17.29 but sloping.	<u>m²</u>	<del> </del>	<del> </del>		
17.31 As for Item 17.29 but battered.	w <sup>2</sup>		<u> </u>		
17.32 As for Item 17.29 but vertical.	m²	2 X 111.000 2 X 90.000	2 x 35,198	472, 396	}
17.33 Horizontal formwork to achieve class E. finish.	<u> </u>		<u> </u>		
and the second of the second of the second	_		1		
17.34 As for Item 17.33 but sloping.	10,2	<u> </u>	<del> </del>		\
17.35 As for Item 17.33 but battered.	<b>13</b> 2.				
17.36 As for Item 17.33 but vertical.	g <sup>2</sup>			_	
and the second second second second					
17.37 Provide and fix in position high tensile steel reinforcement bars to	toppo	2 χ 23II 2 x 1889	2 X 1 752	11.9	1
BS 4461 of dispeter equal to or less	t <u>onne</u>	- 2 A 1009	- 1102		
than 16sm.	•	2 X 17305		)	
17.38 As for Item 17.37 but of diameter	tonne	2 x 13 349		61,3	l
greater than 16am.					
Total	Lonne	69.7	3,5	73,2	l

NO. DESCRIPTION	UNIT	Total quantity
21.01 Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	958. 144
21.02 Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
<ul><li>21.03 Supply and install in position rubber pad bearings, movable type as specified in the Drawings.</li><li>21.04 Supply and install expansion joints as specified in the Drawings.</li><li>joint filler</li></ul>	No. 229 nm × 152 mm × 56 mm  No. 279 nm × 229 nm × 37 mm  No. 279 nm × 229 nm × 46 nm  No. 279 nm × 229 nm × 65 nm  m² thickneth 30 nm  m² 25  m² 20 29.130 + 2×5.397	39.924
21.05 Sealant for expansion joints.	m 30 mm × 50 mm (B) (W) m 25 × 50	-
21.06 Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m³ (m²)	
21.07 As for Item 21.05 but to 50mm thick.	<u>m³ (m²)</u>	
21.08 Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>o</u>	
21.09 Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	<u>m</u>	
21.10 Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	m	
21.11 Provide and install 100mm dia. drain pipe through deck slabs.	No.	
21.12 Provide and place 75mm dia. PVC weep holes.	No.	40
21.16 Proveke and place 200mm dia. PVC drainage pipe.	No.	
21.13 Provide and place 200mm dia. perforated pipe.	m	166.0
21.14 Dowel bar Movable 20mm dia.	No.	
21.15 Dowel bar Fixed 40mm dia.	No.	
21.17 Water stem 200mm wide waterstops as specified in the Drawings.	m 46 500 + 2X12427	71.354
20.18 Provide 500mm Unickness gabion mesh.	$\frac{m^2}{(m^3)}$ $\frac{2 \times 45.000}{2 \times 22.500}$	90.000

### BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM DESCRIPTION NO.	UNIT	B1 = B3 + B2	WI = W2	Total quantity	
7.01 Excavation of fundation levels in soft materials.	m³	657.400	2 X 91,370	840. 140	
7.02 E.O Item 7.01 at anylocation for exervation in hard materials.	m <sup>3</sup>				
7.03 Backfilling with selected material for excavation.	m <sup>a</sup>	2 99.4 00	2 X 28.868	357. 136	_
7.04 Backfilling with selected material behind abutment, wall.	m³			758.790	<b>-</b>
7.05 porous filter material behind abutment, wall.	m³			90.090	
7.06 selected granular fill for base.	₩3				

### BILL OF QUANTITIES NO. 23 PILING

 ITEM NO.	DESCRIPTION	UNIT
	Mobilization of all the necessary plant for the piling operation, setting up on the position of the first pile and removal on completion of the last pile.	
23.02	Move and set up each pile position.	No.
23.04	Supply of steel pipe piles 500mm dia.  9mm thick, Grade  Driving piles of 500mm dia. including positioning and pitching. Include for cutting pile heads to correct level.	n n

,						
LILM ON	DESCRIPTION	רואט	B <sub>1</sub> = B <sub>3</sub> + B <sub>2</sub>	WI = W2	Total quantity	
	DOX CULVERIS					
	Concrete:					
٠.	Provide, place and compact the following classes of concrete for insitu works as specified.					
	Class 15/40 for blinding concrete on all structures.	_ <u>m</u> 3	2 X 6   25 + 7350	2 X 2549	24.698	
	Class 25/20 for structural concrete.	<u>n³</u>	2 X 121,375 + 145,650	2 X 22454	433.308	
17.2	Provide UF2 finish to concrete surface.	#s			379.874	
	Formeork:					
	Provide, erect and afterwards dismantle and remove the Items specified below:					
17.25	Norizontal formork to achieve class Fl	_m²				<del></del>
	As for Item 17.25 but sloping.	n²				
17.2	As for Item 17.25 but battered.	_Bt	0 100 200			
17. 28	As for Item 17.25 but vertical.	m²	2 X 128,208 + 129,000 2 X 4 3,750	2 X 49,127	483.670	
17. 29	Horizontal formwork to achieve class F2 finish.	w <sub>ž</sub>	+ 52.500		140.000	
17.30	As for Item 17.29 but sloping.	m²				
17. 3	As for 1tem 17.29 but battered.	m²				
17.3	As for Item 17.29 but vertical.	_m²	2 X 75.000		288.820	
	l Urizantal forework to echieve class F3 finish.	m²	+ 90000	2 X 24.410		
17.3	As for Item 17.33 but sloping.					
	As for Item 17.33 but battered.	<u>n²</u>				
17.30	As for Item 17.33 but vertical.	<u></u>				ļ
17.3	Provide and fix in position high	оние	2 x 3621 4 392	2 X 1143	13.9	
17.31	than 16cm. As for Item 17.37 but of diameter t	orme	2 X 5278 5293		15.9	
	greater than 16mm.					
	Total t	onne	27.5	2.3	29.8	l <u></u>

### No.4 Box for Dreinage

ITEM NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	EJ <sup>2</sup>	578.496
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 279 <sup>man</sup> ×152 <sup>man</sup> ×56 <sup>man</sup> No. 279 <sup>man</sup> ×229 <sup>man</sup> ×37 <sup>man</sup> No. 279 <sup>man</sup> ×229 <sup>man</sup> ×46 <sup>man</sup> No. 279 <sup>man</sup> ×229 <sup>man</sup> ×65 <sup>man</sup>	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>max</sup> m <sup>2</sup> 25 m <sup>2</sup> 20 19.420 + 2 x 5.705	30, 830
21.05	Sealant for expansion joints.	m 30 mm × 50 mm m 25 × 50	
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	es <sup>3</sup> (m <sup>2</sup> )	
21.07	As for Item 21.05 but to 50mm thick.	m³ (αι²)	-
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	to	
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	<u>m</u>	
21.10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	m .	
21.11	Provide and install 100mm dia, drain pipe through deck slabs.	No.	
21.12	Provide and place 75mm dia. PVC weep holes.	No.	26
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.	
	Provide and place 200mm dia. perforated pipe.	m	102.000
21.14	Dowel bar Wovable 20mm dia.	No.	
21.15	Dowel bar Fixed 40mm dia.	No.	
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	m 31.100 + 2X12.643	43. 743
20.18	Provide 500mm thickness gabion mesh.	m² 2 X 40.000 (m³) 2 X 20,000	80.000

#### No.5 Box for Drainage

### BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR SIRUCTURES

T TEM NO.	DESCRIPTION	UNIT	B1 = B9+B2=B8+B3~B7	W1 + W2	Total quantity	
7.01	Excavation of fundation levels in soft materials.	m <sup>3</sup>	. 2X(416.897 + 463.219) + 5X 476.719	2 X 4 4 2 <u>4 5 6</u>	5028.739	!
7.02	E.O Item 7.01 at anylocation for excavation in bard materials.	m³				
7.03	Backfilling with selected material for excavation.	m <sup>3</sup>	2 X (120,302 + 133,669) + 5 X 136.669	2 X 110.753	1412. 793	ļ
	Dackfilling with selected material behind abutment,wall.	em			4044. 210	
	porous filter material behind abutment, wall.	m³	2 X (69.525 + 77.250)		367.650	
	selected granular fill for base.	m³	+5 X 47.250	2X 133,855	797.510	

### BILL OF QUANTITIES NO. 23 PILING

ITEM DESCRIPTION NO.	UNIT
23.01 Webilization of all the necessary plant for the piling operation, setting up on	L. S.
the position of the first pile and	
removal on completion of the last pile.	
23.02 Nove and set up each pile position.	No.
23.03 Supply of steel pipe piles 500mm dia.,	
9am, thick, Grade	m .
23.04 Driving piles of 500mm dia. including positioning and pitching. Include for	rà.
cutting pile heads to correct level.	it.

17134 NO.	DESCRIPTION	UNIT	$B_1 = B_9 + B_2 = B_8 + B_3 \sim B_7$	WI= W2	Total quantity	
			02-08+03~87	441 AAS		
	DOX COTAEKLZ					
	ray cornanta					
	Concrete:				·	
			·		1	
<b>v</b> .	Provide, place and compact the followin	g				
٠,	classes of concrete for insitu works as					
	specified.		2X(13,230+14,700)	·		
17.22	Class 15/40 for blinding concrete on	m³	+ 5x 15.300	2 X 11,513	155 300	
	all structures.	<del></del>	2 X 382,050	E X 11,313	155. 386	
		_	+ 2 X 4 24 500			
17.23	Class 25/20 for structural concrete.	<u>m</u> s	+ 5 X 517.500	2 X 92043	4384.686	
17.24	Provide UF2 finish to concrete surface.	m²	· ——		2455. 187	
•	Formwork:					
	The state of the second section is			İ		
	Provide, erect and afterwards dismantle and remove the Items specified below:			: .		•
	Horizontal formwork to achieve class F1	w <sub>s</sub>			<u> </u>	<u> </u>
	finish.					
17.26	As for Item 17.25 but sloping.	m²				
					. 8	
17.27	As for Item 17.25 but battered.	w <sub>s</sub>	2(202470 (165 00))			
17.28	As for Item 17.25 but vertical.	10 <sup>2</sup>	2(209478+165cm) £246cm+4 x 2115cm	2X II4.249	2069. 454	
			2(94.500+105.000)	EV 114.542	2003. 434	
	florizontal formwork to achieve class F2	- Wg	+5 X 105,000		924.000	
	finish.		İ	,		
17.30	As for Item 17.29 but sloping.	D) 2	_			
17 21	So for law 17 30 but bettered					· <del></del>
: :	As for Item 17.29 but battered.	n) <sup>2</sup>	S(189000 + 510000)			
17.32	As for Item 17.29 but vertical.	W <sub>S</sub>	+5X210.000	2 x 55,980	1959. 960	
17.33	Marizontal forework to achieve class F3	m²		ļ		
	finish.				<del></del>	[ <del></del>
17.34	As for Item 17.33 but sloping.	m²				
				<del></del>	] <del></del>	<del></del>
17.35	As for Item 17.33 but battered.	m²				ļ
17.36	As for Item 17.33 but vertical.	m²			_	j
100			2 x 4949		<del></del>	
	Provide and fix in position high tensite steel reinforcement bars to	tonne	2 x 5464 5 x 3286	2 X 4755	40.9	
	BS 4461 of diameter equal to or less	- Annie	2 x 21410	- <del> </del>	46,8	·
	then 16cm.		2 X 19108			
17.38	As for Item 17.37 but of diameter t	Lonne	5 X 31604	<del></del>	239,0	
	greater than 16om.					<del></del>
			276,3			i e

NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	<u>m²</u>	2918.965
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>maa</sup> ×203 <sup>maa</sup> ×18 <sup>maa</sup>	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 *** × 152 *** *** × 56 ******  No. 279 *** × 229 *** *** × 37 *****  No. 279 *** × 229 *** × 46 ****  No. 279 *** × 229 *** × 46 ****  No. 279 *** × 229 *** × 55 ****	
21.04	Supply and install expansion joints as specified in the Brawings. joint filler	m <sup>2</sup> thickneth 30 <sup>mm</sup> m <sup>2</sup> 25 m <sup>2</sup> 20 251.200 + 2 x 10 785	272.770
21.05	Sealant for expansion joints.	m 30 <sup>max</sup> 50 <sup>max</sup> (B) (W)	
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	n³ (m²)	
21.07	As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	
	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	· m	
	Provide and crect in position parapet handrails to railwaybridge as detailed on the Drawings.	m	
	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	м	
21.11	Provide and install 190mm dia. drain pipe through deck slabs.	No.	
21.12	Provide and place 75mm dia. PVC weep holes.	No.	8.8
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.	
21.13	Provide and place 200mm dia. perforated pipe.	6)	306.000
21.14	Dowel bar Novable 20mm dia.	No.	
21.16 (	Dowel bar Fixed 40mm dia.	No.	
21. 17 V	Yater stem 200mm wide waterstops as specified in the Drawings.	m - 249.600+2 X 19480	288. 560
	Provide 500mm thickness abion mesh.	m² 2X 95.000 (m³) 2X 4 7.500	190.000

## BRIDGE

BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

111M DESCRIPTION UNIT		MOM.		RAIL	VEHI	CLE	PEDES.	TDIAN	
NO. DESCRIPTION UNIT		BASA	UHURU	WAY	NO 1	NO 2	NO 1	NO 2	TOTAL
7.01 Excavation of fundation levels					<u>'\\</u>	110 2	IVO	140 2	
in soft materials.		432.1	2649	າງດດ າ		20110			
7.02 E.O Item 7.01 at anylocation for		436.1	304.0	2299,3		20118	46.5	173.7	53282
excavation in hard materials. m <sup>3</sup>	.	374.8	3955		4024		ו, כייי		12001
7.03 Backfilling with selected		014.0	333,3		402.4		57,4		1230.1
material for excavation. m <sup>3</sup>	]	4489	AILO	1514.0	2720	1447.7	68,2	1292	42928
7.04 Backfilling with selected		1	<u> </u>	1014.0	<u> </u>	1476	00.2	1636	42320
material behind abutment, wall. m³		877,9	1073.7	1449.1	370,6	1210.4			4981.7
7.05 porous filter material .					0.00	1.2.10,			450
behind abutment, wail. m³		56.1	70.7	82.6	21,2	66.6			2972
7.06 selected granular fill for		W 77							
base. m³				101,0		74.3	95	99	194,5
							·	· .	1
e e e e e e e e e e e e e e e e e e e									
				1					
•	}	*.	:					]	]
and the transfer of the second second	i					٠.			
and the second of the second of the second								i I	
BILL OF QUANTITIES NO.23			- :						1
PILING									
ontary.									
TIEM DESCRIPTION U	NIT								
NO. PAGNITIVAL	,,,,,								
23.01 Mobilization of all the necessary plant L	s.					:			
for the piling operation, setting up on			:						
the position of the first pile and		<del></del>			ļ·				<del> </del>
removal on completion of the last pile.				·			ļ ·		}
Temperature of the temperature o									
23.02 Move and set up each pile position.	lo.				\ <del></del>	96			96
	<u> </u>								
23.03 Supply of steel pipe piles 500mm dia.,	. [		! ·	ļ				1	
9nm Uhick, Gradem	· [			<del></del> ,		. 772			772
									T
23.04 Driving piles of 500mm dia. including	.				·				
positioning and pitching. Include for m									
cutting pile heads to correct level.					•				···

### BRIDGE

THE DESCRIPTION	DRIT	MOM- BASA	UHURU	RAIL: WAY	VEH NO 1	ICLE NO 2	PEDES NO 1	TRIAN NO 2	TOTAL
BRHXES				<u></u>	1.10	110 2	110	NO Z	
a.i									
Concrete:							-		
Provide, place and compact the following	\$								
classes of concrete for insitu works as specified.					·				
17.01 Class 15/40 for bliding concrete on	m <sup>3</sup>	33.7	_ 32.9	50.5	inc	277	رد <u>ب</u>		1770
all structures.			2875.0	30.3	10.6	372 90.I	5 <u>.7</u>	58_ 9.3	1764
17.02 Class 25/20 for structural concrete.	m <sup>3</sup>	8317	851.0	11923	364.9	7252	38.8	505	40544
17.03 Class 30/20 for structural concrete.	m <sup>3</sup>	660.0	524.0	449,9	102,1	149.6	116.9	1208	21233
17.04 Provide UF2 finish to concrete surface.	m²	1530.3	13224	1329.2	381.2	7174	239.1	3039	5823.5
[7.85 Provide and place "dry pack mortar" as	m³	 		·					
specified.				·					
Formsork:							•		
Provide, creet and afterwards dismantle and remove the items specified below:		i ;							
17.06 Horizontal formwork to achieve class F1	m²					*	_		
(injsh.									
17.07 As for 11cm 17.06 but sloping.	_m²	264	264	5.5	27.5				85.8
17.08 hs for Item 17.06 but battered.	s				<i>*</i>				
17.09 As for Item 17.06 but vertical.	m²	621.2	6029	4 15.9	451.0	482.1	40.2	427	2656,0
17.10 Herizontal formwork to achieve class F2 finish.	. m²	10583	837.8	679.8	217.7	316.7	151,9	183,6	3445.8
17.11 As for Item 17.10 but sloping.	m²	i		·			1306	87.2	217.8
17.12 As for Item 17.10 but battered.	m²		-						
17.13 As for Item 17.10 but vertical.	m <sub>s</sub>	2473.0	2157.0	2461.0	532.7	10710	1543	192.1	90411
17.14 Horizontal formwork to achieve class F3	m <sub>s</sub>								
finish. 17.15 As for Item 17.14 but stoping.	m²						.*		
17.16 As for Item 17.14 but battered.	Ws		<del></del>						
17.17 As for Item 17.14 but vertical.	m²			-					
17.18 As for Item 17.14 but vertical and	m²		-						
curved for circular columns.									
17.19 Provide and fix in position high tensile steel reinforcement bars to	onne	52.8	45.0	50,2	128	23,9	9.2	8.4	202,
BS 4461 of diameter equal to or less than 16mm.				<del></del>		~~~			**************************************
F2 an -	onne	125,8	110,6	121.7	350	56,7	14.9	17.4	482,
greater than 16mm.									
Total	onne	178.6	155.6	171.9	4 7.8 .	80,6 <sup>†</sup>	.24,1	25.8	684.

### BRIDGE, .

THEN DESCRIPTION 1	MIT	MOM· BASA	UHURU	RAIL. WAY	NO 1		PEDES NO 1	IRIAN NO 2	TOTAL
21.04 Supply and opply, in accordance to wantecturer's instructions waterproofing waterials to top of bridge decks, approach staks and all structural concrete surfaces in contact with fill	α <sup>2</sup>	1639.6	1562.9	13644	5500	_878.8_			5995.7
material prior to backfilling.	No. 432 <sup>man</sup> ×203 <sup>man</sup> ×18 <sup>ma</sup> No. 406 X 279 X 18	18		12	3	5			37
in the Drawings.  21.03 Supply and install in position rubber pad bearings, movulde type as specified	No. 229 *** × 152*** × 56**** No. 279*** × 229*** × 37***				6		4_	4	8
in the Drawings.  21.04 Supply and install expansion joints as	No. 279 mm × 229 mm × 46 mm No. 279 mm × 229 mm × 66 mm No. 4 × 201 × 203 mm × 65 mm No. 4 × 203 × 65 mm Thickneth 30 mm		22	12 326					22 18 12 69.1
specified in the bravings. joint filter  71.05 Scalant for expansion joints.	m <sup>2</sup> 25 m <sup>2</sup> 20 m 30 hay > 50 has	62 340	56.9 3.7	13.4 31.3	92	15.6 22.7	63	<u>63</u>	81.7 58.6 65.3
21.05 Provide 6thm Unick aspkilt concrete surfacing on bridge and box culvert	m 25 × 50	(8826) 53.0	42.7 (7211) 43.3		120	200			74.7 (1603.7) 96.3
carrageways. 21.07 As for Item 21.05 but to 50mm thick.	m³ (m²)				(1803) 13.1	(2805) 245			(4608) 37.6
21.08 Supply and install flex bewa gnardrails including post, all in accordance with the branings.	ю	42.2	422		1029	56.1			243.4
21.09 Provide and creat in position pumpet handrails to railwaybridge as detailed on the brawings.				1137				<u></u>	113,7
21.10 Provide and creat in position pumped hashaifs to footbridges as detailed on the Drowings.	<u>m · · · · · · · · · · · · · · · · · · ·</u>						1398	142.0	281.8
2). 1) Provide and install 100mm dia. drain pipe through deck stabs.	No. 1	8_	6	8_	- 6	6	4	6	44
21.12 Provide and place 75cm din. PVC weep holes.	No.	10	10	20	4				62
21.16 Proveke and place 200m dia. PVC drainage pipe.  21.13 Provide and place 200m dia.	No.	34	43	_80	12	56			225
perforated pipe. 21.14 Davet tar Royabte 20mm din.	No.	36	44	24	12	20	8	8	152
21.15 Dovel har Fixed 40om dia.	No.	36	22	24	. 6	10		<u> </u>	98
21.17 Water stem 200km wide waterstops as specified in the Drawings.	DI	: 		21.7		34,6			563
20.18 Provide 500mm Urickness Rabion mesh.					i.				

### Mombusa. Ju. Bridge

### BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

NO. DESCRIPTION	UNIT	A1 = A2	P1 = P2	Total quantity	
7.01 Excavation of fundation levels					
in soft materials.	m³	2 X 128,782	2 X 87,274	432.112	
7.02 E.O Item 7.01 at anylocation for			(		
excavation in hard materials.	m³.	2X 84.714	2 X102672	374.772	
7.03 Backfilling with selected					
material for excavation.	m³	2X112,559	2 X111,881	448.880	
7.04 Backfilling with selected					
material behind abulment, wall.	m <sup>3</sup>			877. 922	
7.05 perous filter material	\$			}	ļ
behind abutment, wall.	m <sup>3</sup>			56.100	
7.06 selected granular fill for					)
base.	m³	<u>                                     </u>			<u> </u>

# BILL OF QUANTITIES NO. 23 PILING

TTEM NO.	DESCRIPTION	UNIT						
23.01 Mobilization of all the necessary plant for the piling operation, setting up on	L.S.							
• .	the position of the first pile and removal on completion of the last pile.							:
23. 02	Move and set up each pile position.	No.		····		····	·	
	3 Supply of steel pipe piles 500mm dia.,	t di				·		
	9mm thick, Grade	<u> </u>	,		<u></u>	 		<del></del>
23.0	A Driving piles of 500mm dia. including positioning and pitching. Include for	E						
	cutting pile heads to correct level.			•	•			

### Mombasa. Ju. Bridge

THA DESCRIPTION UN	IT SUPER.		SUB		Total quantity
NO.	307 ER	A1 = A2	WING(AI+A2)	P = P2	Total qualities
BRIDGES					
Concrete:					·
Provide, place and compact the following					
classes of concrete for insitu works as					
specified				: :	
7.01 Class 15/40 for bliding concrete on	n <sup>3</sup>	2X 9.620		2 x 7224	33.688
all structures.		2 X217,863	78.088		
7.02 Class 25/20 for structural concrete.	n <sup>s</sup>	† 20.400 † 3.060	+ 80 727	2 x106.847	831.695
	п³ 660.000				660, 000
i i si wasan a sa sa sa sa sa sa sa sa sa sa sa sa s	n² 1053,390	102000 + 2 X 91500	14,140 + 14,560	2 x 8(59)	1530. 272
		- 7 31,300	1 14.000	2 1000	1000.212
7.05 Provide and place "dry pack mortar" as	n <sup>3</sup>				
					•
Formwork:					
Provide, erect and afterwards dismantle				1. Th	- -
and remove the items specified below:					·.
7.06 Horizontal formwork to achieve class Fl	m*				
finish.			12,955		90 410
7.07 As for Item 17.06 but sloping.	m²	<del>  -</del>	+ 13461		26.416
7.08 As for Item 17.06 but battered.	m²	<u> </u>	227.511		
7.09 As for Item 17.06 but vertical.	m <sup>2</sup>	2X37280	+ 235,088	2 X 42,000	621.159
7.10 Horizontal formwork to achieve class F2 finish.	m² 1037,446			2 X 10,434	1058. 294
7.11 As for Item 17.10 but sloping.	m²				
	n²			:	
and the first of t	m² 1586.753	2X3I6856		2 X 126,274	2473. 013
		2.1010000			
7.14 Horizontal formwork to achieve class F3 finish.					
7.15 As for Item 17.14 but sloping.	m²		<u></u>		<del></del>
7.16 As for Item 17.14 but battered.	m <sup>2</sup>		ļ	·	<del>-</del>
7.17 As for Item 17.14 but vertical.	m <sub>s</sub>				
	m²	<u></u>			
curved for circular columns.		2X3,428	2(498+494)	2 X 3,102	
7.19 Provide and fix in position high tensile steel reinforcement bars toton	ne 37.7	<b>≈</b> 6.9	= 2.0	= 6.2	.52.8
BS 4461 of diameter equal to or less than 16mm.		2X14,221	2(2,95313118)	2X14618	
7.20 As for 1tom 17.19 but of diameter ton	ne 56.0	<b>=28.4</b>	= 12.2	=29,2	125,8
greater than 16mm.					
the contract of the contract o	ne 93.7	35.3	14.2	354	178,6

NO. DESCRIPTION L	NIT	Total quantity
21.01 Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>2</sup>	1639. 636
21.02 Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	18
pad bearings, movable type as specified in the Drawings.	No. 229 mm ×152 mm ×56 mm  No. 279 mm ×229 mm ×37 mm  No. 279 mm ×229 mm ×46 mm  No. 279 mm ×229 mm ×65 mm	- - - 18
specified in the Drawings.	m²         thickneth         30 wm           m²         25           m²         20	36. 450 - 6. 180
	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50	34.037
21.06 Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m <sub>3</sub> (m <sub>5</sub> )	52.954 (882.570)
21.07 As for Item 21.05 but to 50mm thick.	E <sub>3</sub> (U <sub>S</sub> )	
21.08 Supply and install flex beam guardrails including post, all in accordance with the Drawings.	m	42. 200
21.09 Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	<u>m</u>	
21.10 Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	_m	
21.11 Provide and install 100mm dia. drain pipe through deck slabs.	No.	8
21.12 Provide and place 75mm dia. PVC weep holes.	No.	10
21.16 Proveke and place 200mm dia. PVC drainage pipe.	No.	
21.13 Provide and place 200mm dia. perforated pipe.	m	34.000
21.14 Dowel bar Movable 20mm dia.	No.	3.6
21.15 Dowel bar Fixed 40mm dia.	No.	36
21.17 Water stem 200mm wide waterstops as specified in the Drawings.	m .	,
20.18 Provide 500mm thickness gabion mesh.	m <sup>2</sup> (m <sup>3</sup> )	

## BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

	EM DESCRIPTION O. DESCRIPTION	TIKU	A1 = A2	Р	Total quantity	
7.0	I Excavation of fundation levels					
	in soft materials.	m <sup>3</sup>	2×128.346	108.154	364.846	
7.0	2 E.O Item 7.01 at anylocation for					
41 4	excavation in hard materials.	m³	2X 133.463	128,592	395. 518	
7.0	3 Backfilling with selected					
	material for excavation.	m <sup>3</sup>	2X 136.628	138,602	411.858	
7.0	4 Backfilling with selected					
	material behind abutment, wall.	m,ş			1073.716	
7.0	5 porous filter material	, i				
	behind abutment, wall.	<u>л</u> \$			70.741	
7.0	6 selected granular fill for					
	base.	m <sup>3</sup>		<u></u>	]	<u> </u>

## BILL OF QUANTITIES NO. 23 PILING

UNIT	
L.S.	
No.	
a ·	
m	- <del></del> -
	No.

Unuru. Mo. Ju. Bridge BHL OF QUANTITIES No. 17 CONCRETE WORKS

NO. DESCRIPTION UN	NIT SUPER	$A_1 = A_2$	SUB WING(AITA)	P1 = P2	Total quantity
DRIDGES					
Concrete:	į				
Provide, place and compact the following classes of concrete for insitu works as specified.			·		
7.01 Class 15/40 for bliding concrete on all structures.	m <sup>3</sup> —	2x 11.908		9.114	32. 930
	m³	25.724 +3.858 2 x 270.227	158.815	122,131	850. 982
7.03 Class 30/20 for structural concrete.	m³ 523,959				523.959
7.04 Provide UT2 finish to concrete surface.	m² 834,900	128.621 2 x 113.500	28,700	103.191	1322.412
	m³ 0.141		<u> </u>		0.141
specified. Formwork:					
Provide, erect and afterwards dismantle and remove the items specified below:					
7.06 Horizontal formwork to achieve class Fl	W <sub>S</sub>			<u> </u>	
	m² —		26,416	·	26. 416
7.08 As for Item 17.06 but battered.	m² —				
7.09 As for Item 17.06 but vertical.	m²	2 x 44.672	462,599	51.000	602. 943
7.10 Horizontal formwork to achieve class F2 finish.	m² 824.350		<del>-</del>	13.403	837.753
7.11 As for Item 17.10 but sloping.	W <sub>5</sub>				
7.12 As for Item 17.10 but battered.	m² -		_		<u></u>
7.13 As for Item 17.10 but vertical.	m² 1242.417	2x389.645		135.278	2156. 985
7.14 Horizontal formwork to achieve class F3 _ finish.	m²			 	
17.15 As for Item 17.14 but sloping.	m²	ļ			
7.16 As for Item 17.14 but battered.	m²			· .	
7.17 As for Item 17.14 but vertical.	m²	<u> </u>			
7.18 As for Item 17.14 but vertical and curved for circular columns.	m²	274470	477		
17.19 Provide and fix in position high tensile steel reinforcement bars to	ine 30.5	2 X 4470 = 8.9 2 X 17.880	478 495 496 3090	3,6	45. O
7.20 As for Item 17.19 but of diameter ton greater than 16mm.	ine 45.4	= 35.8	2900 3102 3248	17.1	110,6
Total ton	ne 75.9	44.7	14.3	20.7	155 . 6.
foll	110   19.3	<u> </u>			1

ITEM NO.	DESCRIPTION	UNIT	Total quantity	
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	1562.867	
	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>trum</sup> ×203 <sup>trum</sup> ×18 <sup>trum</sup>	11	
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>nun</sup> ×152 <sup>nun</sup> ×56 <sup>nun</sup> No. 279 <sup>nun</sup> ×229 <sup>nun</sup> ×37 <sup>nun</sup> No. 279 <sup>nun</sup> ×229 <sup>nun</sup> ×46 <sup>nun</sup> No. 279 <sup>nun</sup> ×229 <sup>nun</sup> ×65 <sup>nun</sup>		
21.04	Supply and install expansion joints as specified in the Drawings.	$\frac{m^2}{m^2}$ thickneth $30^{mm}$ $\frac{m^2}{m^2}$ 25 $\frac{20}{m^2}$	56. 873 3. 708	
	Sealant for expansion joints.	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50	42.653	
	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m <sup>3</sup> (m <sup>2</sup> )	43.263 (721.050)	
21.07	As for Item 21.05 but to 50mm thick.	m³ (n²)		
	Supply and install flex beam guardrails including post, all in accordance with the Drawings.		42. 200	
	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	m ·		
	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	m .	<u>-</u>	
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	No.	66	
21.12	Provide and place 75mm dia. PVC weep holes.	<u>No.</u>	10	:
	Proveke and place 200mm dia. PYC drainage pipe.	No.		
21.13	Provide and place 200mm dia. perforated pipe.	<u>m</u>	42.873	
21.14	Dowel bar Movable 20mm dia.	No	44	
21.15	Dowel bar Fixed 40mm dia.	No.	22	
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	m	***	
20.18	Provide 500mm thickness gabion mesh.	m² (m³)		-

#### BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM DESCRIPTION NO.	UNIT	Αı	A2	PI= P2	Wi ∼ W3	Total quantity
7.01 Excavation of fundation levels in soft materials.	m³	792.461	623,250	2x152,694	291,945 149,670 136,546	2299.260
7.02 E.O Item 7.01 at anylocation for excavation in hard materials.	n³				. سب	
7.03 Backfilling with selected material for excavation.	m³	564,956	422.898	2x66.672	208.864 113.808 70.174	1514.044
7.04 Backfilling with selected material behind abutment, wall.	m³	···				1449. 084
7.05 porous filter material behind abutment, wall.	m³					82.630
7.06 selected granular fill for base.	m <sup>3</sup>	24.790	22.568	2x 13.348	11.918 5.508 9.558	101.038

## BILL OF QUANTITIES NO. 23 PILING

ITEM NO.	DESCRIPTION	UNIT
23.01	Mobilization of all the necessary plant for the piling operation, setting up on	
•	the position of the first pile and removal on completion of the last pile.	
	Move and set up each pile position.	No.
23. 03	Supply of steel pipe piles 500mm dia., 9mm thick,Grade	m
23.04	Driving piles of 500mm dia. including positioning and pitching. Include for	m
	cutting pile heads to correct level.	

Railway Bridge BILL OF QUANTITIES No. 17

CONCRETE WORKS FIER SUB DESCRIPTION UNIT SUPER Total quantity W. Αı A<sub>2</sub> P1 + P2 WI ~ W₃ erioges Concrete: Provide, place and compact the following classes of concrete for insitu works as specified. 5.959+2.754 17.01 Class 15/40 for bliding concrete on 12.395 11.284 m3 2 x: 6.674 50.519 4.779 14.203 14.203 all structures. 99.573+41.150 2.130 2.130 17.02 Class 25/20 for structural concrete. m³ 376.081 353.714 103.0 + 106.0+79.108 1 191. 292 449,852 17.03 Class 30/20 for structural concrete.  $\mathbf{m}_{\mathbf{3}}$ 449.852 71.015 116.350 71.015 122.262 59.065+27.500 17.64 Provide UF2 finish to concrete surface. 675.801 m² 2x70.000 46.152 1329, 160 17.05 Provide and place "dry pack mortar" as 0.116 0.116 specified. Formork: Provide, erect and afterwards dismantle and remove the items specified below: 17.06 Horizontal formwork to achieve class Fl m2 finish. 17.07 As for Item 17.06 but sloping. 5.490 m² 5.490 17.08 As for Item 17.06 but battered. m². 35.040 + 14.040 49.600 214.539 2 x 37.000 17.09 As for Itom 17.06 but vertical. E3. + 28.640 415.859 m² 2 x 1.000 679, 845 17.10 Horizontal formsork to achieve class F2. 677.845 finish. 17.11 As for Item 17.10 but sloping. 5)<sup>2</sup> 17.12 As for Item 17.10 but battered. m² 178.618+83.840 + 143.018 17.13 As for Item 17.10 but vertical. 363,700 172,000 +185,000 2461-019 926.243 108.600 m² 17.14 Horizontal forework to achieve class F3 m<sup>2</sup> finish. 17.15 As for Item 17.14 but sloping. m² 17.16 As for Item 17.14 but battered. m\* 17.17 As for Item 17.14 but vertical. W<sub>5</sub> 17.18 As for Item 17.14 but vertical and · m² 34 8 curved for circular columns. 2002 ] 1 127 4637) 512|±60 57451 十 3.490 = 49 1.109 -80 17.19 Provide and fix in position high 50.2 885 1728 tensile steel reinforcement bars to RS 4461 of diameter equal to or less = 6.9 14.592 24.4 1,08 I tonne 44871 5516 Chan 16mm. 2796 +15350 1416 8,9 121.7 17.20 As for Itom 17.19 but of diameter - 183 20.7 = 29.93016 43,9 tonne greater than 16am. 13.8 1.71.9 lotal 68.3 28,7 24.3 36.8

tonno

NO. DESCRIPTION	UNIT	Total quantity
21.01 Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m²	1364.392
21.02 Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>tum</sup> ×203 <sup>tum</sup> ×18 <sup>tum</sup> No. 406 x 279 x 18 y	12
<ul><li>21.03 Supply and install in position rubber pad bearings, movable type as specified in the Drawings.</li><li>21.04 Supply and install expansion joints as specified in the Drawings.</li></ul>	No. 229 <sup>tran</sup> ×152 <sup>tran</sup> ×56 <sup>tran</sup> No. 279 <sup>tran</sup> ×229 <sup>tran</sup> ×37 <sup>tran</sup> No. 279 <sup>tran</sup> ×229 <sup>tran</sup> ×46 <sup>tran</sup> No. 279 <sup>tran</sup> ×229 <sup>tran</sup> ×65 <sup>tran</sup> No. 432 <sup>v</sup> ×203 <sup>v</sup> ×65 <sup>tran</sup> No. 432 <sup>v</sup> ×203 <sup>v</sup> ×65 <sup>tran</sup> Thickneth 30 <sup>tran</sup> m <sup>2</sup> 25	- - - 12 32.638
joint filler 21.05 Scalant for expansion joints.	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	31.300
21.06 Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m³ (m²)	
21.07 As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	
21.08 Supply and install flex beam guardrails including post, all in accordance with the Drawings.	m ·	
21.09 Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	m	113.700
21.10 Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	. m	
21.11 Provide and install 100mm dia. drain pipe through deck slabs.	No.	8
21.12 Provide and place 75mm dia. PVC weep holes.	No.	20
21.16 Proveke and place 200mm dia. PVC drainage pipe.	No.	
21.13 Provide and place 200mm dia.	<u>m</u>	80.021
21.14 Dowel bar Movable 20mm dia.	No.	24
21.15 Dowel bar Fixed 40mm dia.	No.	24
21.17 Water stem 200mm wide waterstops as specified in the Drawings.	<u></u>	21. 700
20.18 Provide 500mm thickness gabion mesh.	m² (m²)	

#### No.1 Pedestrian Bridge

## BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM DESCRIPTION NO.	UNIT	P1+P2+P3	Psi = Ps2	Ası= Asa	Total quantity	
7.01 Excavation of fundation levels in soft materials.	m³	10.073 +10.229 + 6.629	2 X 5,189	2 X 4.610	46. 529	
7.02 E.O Item 7.01 at anylocation for excavation in hard materials.	m <sup>3</sup>	+ 7.530 +12.912	2 X 9.552	2 X 8.928	57. 402	
7.03 Backfilling with selected material for excavation.	m³	4.813 +12.129 +13.837	2 XI I. 473	2 X 7, 25B	68. 241	
7.04 Backfilling with selected material behind abutment, wall.	m³					
7.05 porous filter material behind abutment, wall.	m <sup>3</sup>		-			
7.06 selected granular fill for	3	2 V 14 O C	0.40000	0.11.070		
base.	m³	3 X 1408	2 X 0.968	2 X 1.672	9. 504	l

## BILL OF QUANTITIES NO. 23 PILING

ITEM NO.	DESCRIPTION	UNIT	
23.0	Webbilization of all the necessary plant for the piling operation, setting up on		
	the position of the first pile and removal on completion of the last pile.		
23:02	Nove and set up each pile position.	No.	
	Supply of steel pipe piles 500mm dia.,		
	9mm thick, Grade	<u>m</u>	
~ 23.04	Driving piles of 500mm dia. including		
	positioning and pitching. Include for cutting pile heads to correct level.	n ·	

No. 1 Pedestrian Oridge

DILL OF QUANTITIES No. 17 CONCRETE WORKS

III) DESCRIPTION		CII	DCD	<u></u>			
MO. DESCRIPTION	UNIT	MAIN	PER STAIR4-1	DIA D-	SUB		Total quantity
BRIDGES				PI~ P3	Psi-Psi'	ASL * ASI'	incom quality
Milones							
Concrete:					}		
	2						
Provide, place and compact the following	ng					•	
classes of concrete for insitu works as	3 .	·					
specified.							
17.01 Class 15/40 for bliding concrete on	_m3			3 X 0,864	2 X 0,484	2 <u>X1.062</u>	5,684
all structures.				8.937 + 9.307			
17.02 Class 25/20 for structural concrete.	п			+ 8.566	2 X 2467	2X 3,546	38,836
17.03 Class 30/20 for structural concrete.	m³	72.834	2X22.013	4	<u></u>	<u></u>	116,860
17.04 Provide UF2 finish to concrete surface.	m².	137,520	56.700	3 x 7,5∞	2 X 4,000	2X7200	239.120
17.05 Provide and place "dry pack mortar" as	m <sup>3</sup>						500.120
specified.							
Formsork:	. 1.1			·			
Provide, erect and afterwards dismantic	,						
and remove the items specified below:							,
17.05 Horizontal formwork to achieve class Fi	m <sup>2</sup>		:	-			
finish.							
17.07 As for Item 17.06 but sloping.	m²			į			
17.08 As for Item 17.06 but battered.	m²						
				2 V 5 000			
17.00 As for Item 17.06 but vertical.	_m*			3 X 5.000	2 X 3,200	2X 9.400	40.200
17.10 Unrigorial formwork to achieve class F2 finish.	_ m²	135,270	2X8318				151.906
17.11 As for Item 17.10 but sloping.	<u>п</u> 3		2X65,321				130.642
17.12 As for Item 17.10 but battered.	m²						Arrilge
17.13 As for Item 17.10 but vertical.	m²	55.162	2 X 2,816	26.796 + 28.710 + 24.882	2 X 6,580		154.342
17.14 Horizontal formork to achieve class Fifinish.	3 Ei 2						
17.15 As for Item 17.14 but sloping.	W <sub>s</sub>						
17.16 As for: Item 17.14 but battered.	_m²	.1 4					
17.17 As for Itom 17.14 but vertical.	m²						
17.18 As for Item 17.14 but vertical and	m²						
curved for circular columns.		-		.521 .543	2X 167	2 X 186	
17.19 Provide and fix in position high	10000		.	.543 .491	= O · 3	= 0.4	9.2
BS 4461 of diameter equal to or less	tonne	6.	3	= 1.6 1.271 1.321	≖0:3 2X227		<u>J.L</u>
Usan IGam.	- 1			1321 1221			
17.20 As for Item 17.19 but of diameter greater than 16mm.	tonne	10,	6	<b>-</b> 3.8	≖0.5		14.9
Total	tonne	17,	5	5.4	8.0	0.4	24.

### No.1 Pedestrian Bridge

ITEM NO.	DESCRIPTION	UNIT	Total quantity	
mani ing appr cond	ply and apply, in accordance to ufacturer's instructions waterproofmaterials to top of bridge decks, roach slabs and all structural crete surfaces in contact with fill erial prior to backfilling.	m²		A
pad	ply and install in position rubber bearings, fixed type as specified the Drawings.	No. 432 <sup>tum</sup> ×203 <sup>tum</sup> ×18 <sup>tum</sup>		
pad	ply and install in position rubber bearings, movable type as specified the Drawings.	No. 229 <sup>mre</sup> ×152 <sup>mre</sup> ×56 <sup>mre</sup> No. 279 <sup>mre</sup> ×229 <sup>mre</sup> ×37 <sup>mre</sup> No. 279 <sup>mre</sup> ×229 <sup>mre</sup> ×46 <sup>mre</sup> No. 279 <sup>mre</sup> ×229 <sup>mre</sup> ×65 <sup>mre</sup>	4	
spe	ply and install expansion joints as cified in the Drawings. nt filler	m <sup>2</sup> thickneth 30 <sup>mm</sup> m <sup>2</sup> 25 m <sup>2</sup> 20	6. 268	
21.05 Seal	lant for expansion joints.	m 30 <sup>may</sup> × 50 <sup>may</sup> m 25 × 50		
sur	vide 60mm thick asphalt concrete facing on bridge and box culvert rageways.	m³ (m²)		
21.07 As	for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	<u>-</u>	
inc	ply and install flex beam guardrails luding post, all in accordance with Drawings.	<u>n</u>	-	
han	vide and erect in position parapet drails to railwaybridge as detailed the Drawings.	m ·		
han	vide and erect in position parapet drails to footbridges as detailed on Drawings.	<u>n</u>	139.760	
	vide and install 100mm dia. drain pipo ough deck slabs.	? <u>No.</u>	4	· · · · · · · · · · · · · · · · · · ·
21.12 Problem	vide and place 75mm dia. PVC weep es.	No.		
	veke and place 200mm dia. PVC inage pipe.	No.		
	vide and place 200mm dia. forated pipe.	<u>m</u>	8	<del></del>
21.14 Dow	el bar Movable 20mm dia.	No.		
	el bar Fixed 40mm dia.	No.		•
21.17 Wate	er stem 200mm wide waterstops specified in the Drawings.	n		
20.18 Pro	vide 500mm thickness ion mesh.	m <sup>2</sup> (m <sup>3</sup> )		

#### BILL OF QUANTITIES No.7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM DESCRIPTION	UNIT	P1~ P4		Totaltit.	
NO. DESCRIPTION	01111	+ Ps1	ASI = AS2	Total quantity	
7.01 Excavation of fundation levels	. :	4X29,778	24.519		
in soft materials.	m <sup>3</sup>	+ 21.146	+ 8.928	173.705	:
7.02 E.O Item 7.01 at anylocation for					
excavation in hard materials.	m³		is a		
7.03 Backfilling with selected		4 x 23,703	13,155		
material for excavation.	m <sup>3</sup>	<u>+17.781</u>	+3422	129.170	
7.04 Backfilling with selected					
material behind abutment, wall.	m³ .			_	
7.05 porous filter material					
behind abutment, wall.	m³				
7.06 selected granular fill for		4 X 1.408			
base.	m <sup>3</sup>	+ 0.968	2X 1672	9. 944	

#### BILL OF QUANTITIES NO. 23 PILING

ITEM NO.	DESCRIPTION	UNIT
23.01	Mobilization of all the necessary plant for the piling operation, setting up on	L. S.
e e jud dejektori	the position of the first pile and removal on completion of the last pile.	
	Move and set up each pile position.	No.
23.03	Supply of steel pipe piles 500mm dia., 9mm thick, Grade	in .
23.04	Driving piles of 500mm dia. including positioning and pitching. Include for cutting pile heads to correct level.	m .

#### No.2 Pedestrian Bridge

BILL OF QUANTITIES No. 17 CONCRETE WORKS

CHACHETE HOURS		<del>, , , , , , , , , , , , , , , , , , , </del>		·	-		
NO. DESCRIPTION	UNIT	MAIN	PER	<u> </u>	SUB		Total quantity
		LIAIN	STAIR-1-2	PI~ P4	Psi	AS1+: AS2	total denicary
DRIDGES							
Concrete:							
•					1		
Provide, place and compact the followi							
classes of concrete for insitu works a	S						
specified.		,	}			1,062	:
01 Class 15/40 for bliding concrete on	<u>₽1<sup>3</sup> </u>			4 X 0.864	0.484	† 0.836	5,838
, all structures.				3 X 8 937		8.098	
.02 Class 25/20 for structural concrete.	_m³		21,069	+ 9.307	2.708	+ 3546	50,470
.03 Class 30/20 for structural concrete.	m <sup>a</sup>	89,454	+ 10,240 54.396				120,763.
.04 Provide UP2 finish to concrete surface	. <u>61</u> 2	174,060	54.396 + 27.036	4 X 7.500	4.000	2 X 7.200	303,892
.05 Provide and place "dry pack mortar" as	m <sup>3</sup>	i.					
specified.							
Formsork:		į			i		
Provide, erect and afterwards dismantl	,	·		• (		}	
and remove the items specified below:	٠. [			•			· ·
•	, _,						
.06 Horizontal formwork to achieve class F finish.	<u> </u>		-		<del> </del>	<del> </del>	
.07 As for Item 17.06 but sloping.	m²						
					<del></del>		<u> </u>
7.08 As for Item 17.06 but battered.	_ m²					10,096	
7.09 As for Item 17.06 but vertical.	_ m²		0.710	4 X 5,000	3,200	+ 94∞	42,696
.10 Herizontal fernwork to achieve class F	2 <u>m²</u>	171,060	8,318 + 4248				183,626
finish.			61.696 + 25.543			1 : 1	
1.11 As for Item 17.10 but sloping.			7 20,040			<del> </del>	87,239
.12 As for Item 17.10 but battered.	_m²		2,816	3 X 26.796	<del></del>	ļ	
.13 As for Item 17.10 but vertical.	_m²	69,862	+ 1920	+ 28.710	8,408		192,104
.14 Marizontal foremork to achieve class F	3 <u>m</u> *						
finish.							
.15 As for Item 17.14 but sloping.	П2	· · · · · · · · · · · · · · · · · · ·		<u> </u>		<b> </b>	
.16 As for 11cm 17.14 but battered.	n²				<del></del>	<u>                                     </u>	<u> </u>
.17 As for Item 17.14 but vertical.	m²	-			•		
7.18 As for Item 17.14 but vertical and	тэ <sup>2</sup>						<u>-</u> :
curved for circular columns.	_ <u>m</u>			3X,521		186	
.19 Provide and fix in position high	· [			+.543	_	226	
tensile steel reinforcement bars to US 4461 of diameter equal to or less	tonne	5,	.7	± 2,1 3X1271	0.2	= 0.4	8.4
Unan 16am.				+ 1321			
7.20 As for Item 17.19 but of diameter	tome	12	.0	= 5,1	0.3		17.4
greater than 16mm.						]	
			_	7.0	, e		25.8
Total	Lonne	17.		7.2	0,5	0.4	دع.۵.

#### No.2 Pedestrian Bridge

ITEN NO.	DESCRIPTION	UNIT	Total quantity	
21.01	Supply and apply, in accordance to monufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>2</sup>		
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>		<del></del>
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 mm × 152 mm × 56 mm No. 279 mm × 229 mm × 37 mm No. 279 mm × 229 mm × 46 mm No. 279 mm × 229 mm × 65 mm	4	
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>res</sup> m <sup>2</sup> 25  m <sup>2</sup> 20	6. 268	
21.05	Sealant for expansion joints.	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50		
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m <sup>3</sup> (m <sup>2</sup> )	<u> </u>	····
	As for Item 21.05 but to 50mm thick.	m³ (m²)		
21.00	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>m vii                                   </u>		<u> </u>
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	<u>u</u>		
21.10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	<u>ra</u>	142.000	<b></b>
21.11	Provide and install 100mm dia. drain pipe through deck slabs.	e No.	6	
21.12	Provide and place 75mm dia. PVC weep holes.	No.		<del>- w</del>
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No.		·
21.13	Provide and place 200mm dia. perforated pipe.	<u>m</u>		<del></del>
21.14	Dowel bar Movable 20mm dia.	No,	8	
21.15	Dowel bar Fixed 40mm dia.	No		
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	<u>m</u>		
20.18	Provide 500mm thickness gabion mesh.	m² (m³)		

#### BILL OF QUANTITIES No. 7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM DESCRIPTION	UNIT	AI = A2	Р	Total quantity	
7.01 Excavation of fundation levels					* <del>***********************************</del>
in soft materials.	m <sup>a</sup>			_	
7.02 E.O Item 7.01 at anylocation for					
excavation in hard materials.	n <sup>3</sup>	2X 172460	57.522	402.442	
7.03 Backfilling with selected					
material for excavation.	m <sup>3</sup>	2 X 120,804	31,328	272. 936	
7.04 Backfilling with selected					
material behind abutment, wall.	m <sup>3</sup>			_370.598	
7.05 porous filter material					
behind abutment, wall.	m³			21. 240	
7.06 selected granular fill for			<del></del>		· <del></del>
base.	ខាន				

## BILL OF QUANTITIES NO. 23 PILING

ITEM NO.	DESCRIPTION	UNIT
	Mobilization of all the necessary plant for the piling operation, setting up on	L.S.
	the position of the first pile and removal on completion of the last pile.	
23.02	Move and set up each pile position.	No.
	Supply of steel pipe piles 500mm dia.,	
	9mm thick, Grade	m
23.04	Driving piles of 500mm dia. including positioning and pitching. Include for cutting pile heads to correct level.	初

### No.1 Vehicle Bridge

BILL OF QUANTITIES No. 17 CONCRETE WORKS

TIEM DESCRIPTION	UNIT	SUPER		Sub		Total quantity
NO. DESCRIPTION	0.111		A1	P1	A 2	total quality
DRIDGES					<i>;</i>	
en en en en en en en en en en en en en e						
Concrete:			ĺ			
Provide, place and compact the following	± .					
classes of concrete for insitu works as						
specified.				44		
.01 Class 15/40 for bliding concrete on	m <sup>3</sup>		3.848	2.914	3.848	10.610
all structures.			7.200 + 1.080 6 4. 348	·	7 3, 403	
.02 Class 25/20 for structural concrete.	m <sup>3</sup>		+ 91.422	37.064	+91.422	364.939
.03 Class 30/20 for structural concrete.	m <sup>3</sup>	102.111				102.111
.04 Provide UF2 finish to concrete surface.	_m²	216.360	13,860 + 36,000 + 36,000	27.750	15.260 +36.000	381. 230
.05 Provide and place "dry pack mortar" as	m <sup>3</sup>	0.048	_			0. 048
specified.					·	: - ·
Formsork:			,	:		
Provide, erect and afterwards dismantle						
and remove the items specified below:					•	
.06 Morizontal formwork to achieve class F1	192				<u> </u>	
finish.					:	
.07 As for Item 17.06 but sloping.	m²		12.903	<u>.                                    </u>	14.623	27. 526
7.08 As for Item 17.06 but battered.	Ws		   19.520		19.520	
7.09 As for Item 17.06 but vertical.	m²		+ 188.785	9.600	+213.567	450.992
7.10 Norizontal forowork to achieve class F2 finish.	_m²	216.961		0.750		217.711
.11 As for Item 17.10 but sloping.	m²					
.11 As for Item 17.10 but battered.	m <sub>s</sub>					
		178.665	143.200	67.647	143.200	532. 712
7.13 As for Item 17.10 but vertical.	m²	110.003	143.200	01.047	7.5.200	
7.14 Horizontal formwork to achieve class F3 finish.						
7.15 As for Item 17.14 but sloping.	m²	·				
.16 As for Item 17.14 but battered.	m²					
.17 As for Item 17.14 but vertical.	m²					
7.18 As for Item 17.14 but vertical and	m²					
curved for circular columns.			1,611 2X ,507		1611 2X .562	٠.
19 Provide and fix in position high	tonne	6.4	= 2.6	[3]	= 2.7	12.8
BS 4461 of diameter equal to or less	roung	1	5363		5363	
than 16mm.			2X2388	4.7	2X 3.670 = 12.7	35 • 0
.20 As for Item 17.19 but of diameter greater than 16mm,	tonne	7.8	= 10.2	4.3	1	35 (0.
on the confidence of the state				]		1
	tonre	14.2	12.8	5,4	15.4	47.8

ITEM NO.	DESCRIPTION	UNIT	Total quantity	
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>2</sup>	550.009	
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mm</sup> ×203 <sup>mm</sup> ×18 <sup>mm</sup>	3	: :
21.03	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.	No. 229 <sup>mm</sup> ×152 <sup>mm</sup> ×56 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×37 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×46 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×65 <sup>mm</sup>		
21.04	Supply and install expansion joints as specified in the Drawings. joint filler	m <sup>2</sup> thickneth 30 <sup>m/m</sup> m <sup>2</sup> 25  m <sup>2</sup> 20	9. 210	
21.05	Sealant for expansion joints.	m 30 <sup>nara</sup> × 50 <sup>mara</sup> m 25 × 50	12.000	
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrage*ays.	<u>m</u> <sup>3</sup> (m <sup>2</sup> )		Production of the Control of the Con
21.07	As for Item 21.05 but to 50mm thick.	m <sup>3</sup> (m <sup>2</sup> )	13.071 (180.300)	
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.		102. 900	
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.	an .		<del></del>
21.10	Provide and erect in position parapet handralls to footbridges as detailed on the Drawings.	<u>n</u>		
21.11	Provide and install 100mm dia. drain pip through deck slabs.	e <u>No.</u>	6	
21.12	Provide and place 75mm dia. PVC weep holes.	_No.	4	
21.16	Proveke and place 200mm dia. PVC drainage pipe.	No. 1 1 1		
21.13	Provide and place 200mm dia. perforated pipe.		12.000	
21.14	Dowel bar Movable 20mm dia.	No.	12	
21.15	Dowel bar Fixed 40mm dia.	No.	66	
21.17	Water stem 200mm wide waterstops as specified in the Drawings.	_m		
20.18	Provide 500mm thickness gabion mesh.	m² (m²)		

#### No.2 Vehicle Bridge

#### BILL OF QUANTITIES No.7 EXCAVATION AND FILLING FOR STRUCTURES

ITEM NO.	DESCRIPTION	UNIT	AI = A2	Р	WI∼ W4	Total quantity	
7.01	Excavation of fundation levels in soft materials.	m³	2 X 323,446	95,484	4 X 317.356	2011. 800	
	E.O Item 7.01 at anylocation for excavation in hard materials.	m <sup>3</sup>					
7.03	Backfilling with selected material for excavation.	m³	2 X 226.926	49,578	4 X 236.076	1447. 734	
	Backfilling with selected material behind abutment,wall.	m³			·	1210. 407	
7.05	porous filter material behind abutment, wall.	m <sup>3</sup>				66. 552	
7.06	selected granular fill for base.	m³	2 X 11.856	7.708	4 X 10.730	74. 340	

## BILL OF QUANTITIES NO. 23 PILING

UNIT	A1=A2	Р.	WI ~ W4	Total quantity
LiS.	• • •			
		•		
	(8.0 <sup>M</sup> /no)	(8.5Mno)		
No.	2 X 20	8	4 X 12	96
m	320.0	68.0	384.0	. 772.0
ស				
	I.S.	1.s. (8.0 <sup>M</sup> /no) No. 2 x 20  m 320.0	1.s. (8.0 m/no) (8.5 m/no) No. 2 x 20 8  m 320.0 68.0	1.s. (8.0 %ho) (8.5 %ho) (8.0 %ho) No. 2 x 20 8 4 x 12  m 320.0 68.0 384.0

No.2 Vehicle Bridge

BILL OF QUANTITIES No. 17 CONCRETE WORKS

IDA DESCRIPTION				SUB		T
NO. DESCRIPTION	UNIT	SUPER	A1 = A2	P	WI ∼ W4	Total quantity
BRIDGES						
Concrete:						
Provide, place and compact the followin	g					
classes of concrete for insitu works as						
specified.						
17.01 Class 15/40 for bliding concrete on	m3		2 x 5.928	3.854	4 X 5.365	37, 170
all structures.			12,000+1,800			
17.02 Class 25/20 for structural concrete.	m3		+2X146.550	54,140	4 X 91,048	725, 232
17.03 Class 30/20 for structural concrete.	m³	149,579	60,00			149.579
17.04 Provide UF2 finish to concrete surface.	m²	314,160	+ 2X56.000	38.000	4 X 48,300	717. 360
17.05 Provide and place "dry pack mortar" as	m <sup>3</sup>		11			
specified.					·	
Foruwork:						
Provide, crect and afterwards dismantle						
and remove the items specified below:						e distribution
17.06 Horizontal formwork to achieve class Fl	Ws					<u> </u>
finish.					-	
17.07 As for Item 17.06 but sloping.	_ m²					<del>-</del>
17.08 As for Item 17.06 but battered.	m²			-		
17.09 As for Item 17.06 but vertical.	m²		2X 29 160	22500	4 X 100 332	482.148
17.10 Horizontal formwork to achieve class F2 finish.	m <sub>s</sub>	314.721		2,000		316.721
17.11 As for Item 17.10 but sloping.	m²			·		
17.12 As for Item 17.10 but battered.	m²					
17.13 As for Item 17.10 but vertical.	m²	271,985	2X2I0.340	92,664	4X71412	1070. 977
17.14 Horizontal formwork to achieve class F3	л²					
finish.						
17.15 As for Item 17.14 but sloping.				<del> </del>	<u> </u>	<del>_</del>
17.16 As for Item 17.14 but battered.	m²					<del>-</del>
17.17 As for Item 17.14 but vertical.	m <sup>2</sup>		·		:	
17.18 As for Item 17.14 but vertical and curved for circular columns.	. m²		2 X 2,851	<u> </u>	4 X 1595	<del>-</del>
7.19 Provide and fix in position high		, , , ,		: A	= 6,4	07.0
BS 4461 of diameter equal to or less	tonne	10,4	= 5.7 2×8.828	1,4	4 X 4.715	23.9
than 16mm.						
7 90 1 0	tonne	12.3	= 17.7	7.8	= 18.9	56 .7
	onne	22,7	23,4	9,2	25.3	80.6

ITEM NO.	DESCRIPTION	UNIT	Total quantity
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m <sup>2</sup>	878. 790
21.02	Supply and install in position rubber pad bearings, fixed type as specified in the Drawings.	No. 432 <sup>mra</sup> ×203 <sup>mra</sup> ×18 <sup>mra</sup>	<u> </u>
	Supply and install in position rubber pad bearings, movable type as specified in the Drawings.  Supply and install expansion joints as specified in the Drawings. joint filler	No. 229 <sup>mm</sup> ×152 <sup>mm</sup> ×556 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×37 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×46 <sup>mm</sup> No. 279 <sup>mm</sup> ×229 <sup>mm</sup> ×65 <sup>mm</sup> m² thickneth 30 <sup>mm</sup> m² 25  m² 20	10 
21.05	Sealant for expansion joints.	m 30 <sup>mm</sup> × 50 <sup>mm</sup> m 25 × 50	20.000
21.06	Provide 60mm thick asphalt concrete surfacing on bridge and box culvert carrageways.	m <sup>3</sup> (m <sup>2</sup> )	
21.07	As for Item 21.05 but to 50mm thick.	<u>м³ (м²)</u>	24.543(280.500)
21.08	Supply and install flex beam guardrails including post, all in accordance with the Drawings.	<u>m</u>	56. 100
21.09	Provide and erect in position parapet handrails to railwaybridge as detailed on the Drawings.		
21.10	Provide and erect in position parapet handrails to footbridges as detailed on the Drawings.	in .	
21.11	Provide and install 100mm dia. drain pip through deck slabs.	e <u>No.</u>	6
21.12	Provide and place 75mm dia. PVC weep holes.	No.	18
21. 16	Proveke and place 200mm dia. PVC drainage pipe.	No.	
21.13	Provide and place 200mm dia. perforated pipe.	m .	55. 200
21.14	Dowel bar Novable 20mm dia.	No.	20
21.15	Dowel bar Fixed 40mm dia.	No.	10
	Water stem 200mm wide waterstops as specified in the Drawings.	m	34.600
	Provide 500mm thickness gabion mesh.	m² (m³)	

- II. DETAILED DESCRIPTIONS
  - 1. BRIDGES ON THE MAIN ROADS
    - 2. OVERBRIDGES
    - 3. BOX CULVERTS

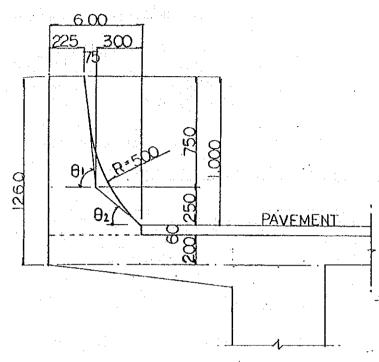
# BILL OF QUANTITIES BRIDGES FOR MAIN ROAD

MOMBAS	A ROAD J	UNCTION B	RIDGE — 1	
Agenta de				
UHURU	MONUMENT	JUNCTION	BR I DG E — 13	
4.				
RAILWA	Y BRIDGE	·····	24	-47

```
MOMBASA-JU-BRIDGE
   Super structure
() Concrete, (Grade=30)
   Girder slab and parapet
                    V = 3.10,981 \times 56,940
                                                                                                                      625.259m<sup>3</sup>
   cross girder = 1.325 \times 0.95 \times (0.60 \times 4 + 0.35 \times 3) \times 8
                                                                                                                        34.741m<sup>3</sup>
                                                                                                                      660.000m<sup>3</sup>
   total
    Of UF<sub>2</sub>: A = 56.940 \times (17.0+15.0)
                                                                                                                  = 1053, 390 m<sup>2</sup>
2) form work
                     A = 56.940 (\sqrt{1.10^2+0.15^2} \times 2+0.600 \times 9+1.325 \times 8)
                                                                                                                  = 1037.446 m<sup>2</sup>
   horizontal
                     A = 56.940 \times (0.20+0.95+1.10 \times 8+1.06 \times 2+0.86) \times 2
   Vertical
                     + 0.950 \times 1.325 \times 8 \times 12
                        - (0.95 \times 0.60 \times 4 + 0.95 \times 0.35 \times 3) \times 2
                                                                                                                  = 1586.753 m<sup>2</sup>
                   V = \{(0.95+1.10) \times 1.10+1.10 \times 1.325 \times 8\} \times 56.940
3) Support
                        + 5.80 \times 18.20 \times (56.940-0.800 \times 4)
                                                                                                                  = 6465.115m^3
                     V = (18.20+1.00) \times 56.940
                                                                                                                  = 1093.248 \text{m}^3
4) Scaffold
5) Joint filler (t=30mm) \cdot\cdot\cdot\cdot expansion 2: =17.00 \times 2 \times 1.0011
                                                                                                                        34.037m
                     A = \{(0.20+0.35) \times 1.10+1.10 \times 16.00\} \times 2 \times 1.0011
                                                                                                                        36.450 m
                                                                                                                        52.954m<sup>3</sup>
6)Asphalt
                     V = 0.06 \times (17.00 - 1.50) \times 56.940
                                                                                                                      (882.570 m²)
7) Joint filler (t=20mm) — Parapet for verse and central reserve.
                     A = (0.352 \times 2 + 0.532) \times 5
                                                                                                                          6.180 m<sup>2</sup>
8) Guard rail (Abut) Q := (10.40+10.70) \times 2
                                                                                                                        42, 200m
                 * section of superstructure.
                     A = 0.352 \times 2 + 0.532 + (0.20 + 0.35) \times 1.10 + (1.30 \times 16.0 - 1.10 \times 1.325 \times 8) =
                                                                                                                         10.981 m
```

#### SHAPE OF PARAPET OF MAIN ROAD

#### FOR VERGE



Section arer

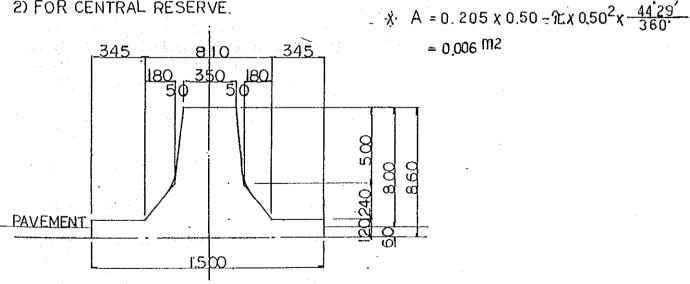
$$A = 0.60 \times 1.06 - \frac{1}{2} \times 0.075 \times 0.75$$
$$- \frac{0.75 + 1.00}{2} \times 0.30 + 0.006$$
$$= 0.352 \text{ m}^2$$

$$\theta_1 = \tan^{-1} \frac{0.750}{0.075} = 84^{\circ} 17^{'} 22^{''}$$

$$- |\theta_2 = \tan^{-1} \frac{0.250}{0.300} = 39^{\circ} 48^{'} 20^{''}$$

$$\theta = \frac{44^{\circ} 29^{'}}{2} = 0.205^{\circ}$$
TL=R·tan  $\frac{\theta}{2} = 0.205^{\circ}$ 

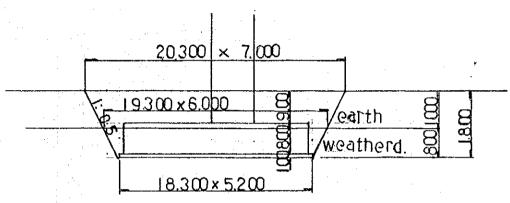
2) FOR CENTRAL RESERVE.



Section aren

$$A = \frac{0.35 \pm 0.45}{2} \times 0.50 + \frac{0.45 \pm 0.81}{2} \times 0.24 + 1.50 \times 0.12$$
$$= 0.532 \,\text{m}^2$$

```
MOMBASA JU BRIDGE
   Sub structure: A<sub>1</sub>=A<sub>2</sub>(Main)
() Concrete
                 V = 0.26 \times 0.60 \times 0.30 \times 2
                      + 18.30(1.40\times0.30+1.10\times6.80+5.00\times0.80)
                                                                                                                    217.863m<sup>3</sup>
     Of UF<sub>2</sub>: A = 18.30 \{ (5.00-1.10) + 0.30 + 0.80 \}
                                                                                                                      91.500 m²
2)form work.
                    A = (0.30+0.60) \times 0.26 \times 2 \times 2 + (0.30+18.30) \times 1.40 \times 2
  Vartical
                      + (1.10+18.30) \times 6.80 \times 2
                                                                                                                    316, 856 m²
          (footing)
                              A = (5.00+18.30) \times 0.80 \times 2
                                                                                                                     37. 280 m²
3)Scaffold
                              V = 1.20 \{(1.10+2.00)+(18.30+2.00)\} \times 8.20
                                                                                                                    230, 256m<sup>3</sup>
4)base concrete
                              V = 5.20 \times 18,50 \times 0.10
                                                                                                                       9.620m3
                              A = (5, 20+18, 50) \times 0, 10 \times 2
                                                                                                                       4.740 m
```



```
5) excavation earth V = 1.00/6 \{6.00 \times 19.30 + 7.00 \times 20.30 + (6.00 + 7.00) (19.30 + 20.30) = 128.782 m^3 weatherd V = 0.80/6 \{5.20 \times 18.50 + 6.00 \times 19.30 + (5.20 + 6.00) (18.50 + 19.30)\} = 84.714 m^3 remain V = 9.620 + 18.30 \times 5.00 \times 0.80 + 18.30 \times 1.10 \times 0.90 = 100.937 m<sup>3</sup> back fill V = 128.782 + 84.714 - 100.937
```

```
A<sub>1</sub> - wing

1) concrete. V = 1/2(8.455+8.413) \times 2.40+1/2(8.413+0.817) \times 7.70} \times 0.70 \times 2

= \{55.777\} \times 0.70 \times 2

OT. UF<sub>2</sub>: A = 10.10 \times 0.70 \times 2

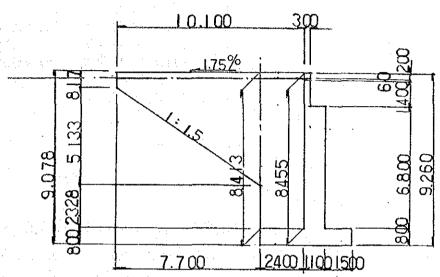
2) form work.

F<sub>1</sub> (vertical) V = \frac{355.777 \times 2 \times 2 + 2 \times 0.70}{5.133^2 + 7.70^2 \times 0.70 \times 2}

= 27.511 \text{ m}^2

F<sub>1</sub> (Sloping) A = \sqrt{5.133^2 + 7.70^2 \times 0.70 \times 2}

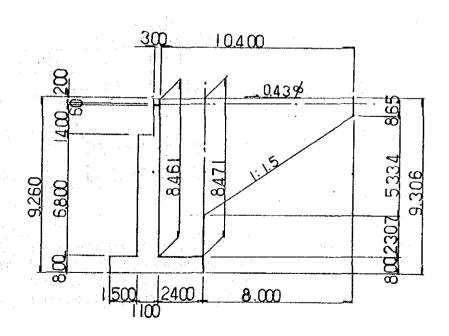
= 12.955 \text{ m}^2
```



A 2 - wing

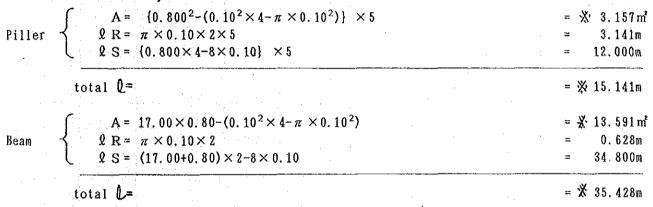
1) concrete  $V = 1/2 \{8.461+8.471\} \times 2.40+1/2 (8.471+0.865) \times 8.00\} \times 0.70 \times 2$   $= \{57.662\} \times 0.70 \times 2$   $= \{57.662\} \times 0.70 \times 2$   $= 80.727m^{3}$ Of. UF<sub>2</sub>: A = 10.40×0.70×2  $= 14.560 \text{ m}^{2}$ 2) Form work.

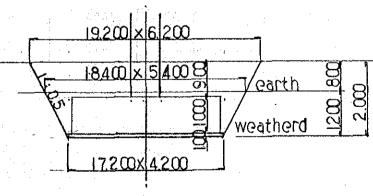
F<sub>1</sub>: (vertical) A =  $\frac{1}{2}$ 57.662×2×2+(0.865+2.307)×0.70×2  $= 235.088 \text{ m}^{2}$ F<sub>1</sub>: (Sloping) A =  $\sqrt{5.334^{2}+8.00^{2}} \times 0.70 \times 2$   $= 13.461 \text{ m}^{2}$ 



#### MOMBASA-JU-BRIDGE Sub structure : P1=P2···Pier ()Concrete : $V = X13.591 \times 1.00$ beam 13.591m<sup>3</sup> $V = 3.157 \times 8.00$ Pillar 25, 256m<sup>3</sup> $V = 17.00 \times 4.00 \times 1.00$ Footing 68.000m<sup>3</sup> total 106.847m<sup>3</sup> Of. UF<sub>2</sub>: $A = 17.00 \times 4.00 + 13.591$ 81.591 m 2) form work. A = 3.591-3.157horizontal 10.434 m Vartical $A = 35.428 \times 1.00 + 15.141 \times 0.600$ 126. 274 m (footing) $A = (17, 00+4, 00) \times 1.00 \times 2$ 42.000 m 3)base conorete $V = 17.20 \times 4.20 \times 0.10$ . $7.224m^3$ " formwork $A = (17, 20+4, 20) \times 0.10 \times 2$ 4. 280 m<sup>2</sup> $V = \% (13.591-3.157) \times (6.00-0.10)$ 61.560m<sup>3</sup> 4)Support 5) Scaffold. $V = 1.20 \{(0.80+2.00)+(17.00+2.00)\} \times 7.00 \times 2$ 366.240m<sup>3</sup>

#### \* where: quantity of unit-len8th





```
6) excavation earth V = 0.80/6 \{18.40 \times 5.40 + 19.20 \times 6.20 + (18.40 + 19.20) (5.40 + 6.20)\} = 87.274 \text{m}^3 weatherd V = 1.20/6 \{17.20 \times 4.20 + 18.40 \times 5.40 + (17.20 + 18.40) (4.20 + 5.40)\} = 102.672 \text{m}^3 remain V = 7.224 + 68.000 + 3.157 \times 0.900 = 78.065 \text{m}^3 back fill V = 87.274 + 102.672 + 78.065
```

## LIST OF REINFORCED BAR --- MOMBASA Br

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
	SUPFRS	STRUCTUR	F	· · · · · · · · · · · · · · · · · · ·			
S 1-1	Y 1 6	10000	3 4 4	1.579	15.79	5432	
- 2	,,	8690	344	"	13.72	4720	_ <del></del>
2 - 1	Y 1 2	10000	344	0.888	8.88	3055	
2 - 2	"	6280	3 4 4	<i>"</i>	5.58	1920	
3 - 1	Y 2 0	10000	.14	2.466	24.66	3 4 5	
3 – 2	"	8830	14	" ·	21.77	305	
4 - 1	Y 1 6	10000	14	1.579	15.79	221	
4 - 2	11_	6420	14	"	10.14	142	
5	<i>II</i> .	2300	44	"	3.63	160	
6	11 11 11	1720	382	,,	2.72	1039	
7-1	Y 1 2	10000	384	0.888	8.88	3410	
7 - 2	"	8000	96	"	7.10	682	
7 - 3	"	8890	96 -	"	7.89	757	
						22188	k g
			ı <del></del>		<u></u>	·	
<u>K 1</u>	Y 1 2	1380	388	0.888	1.23	477	
<u> </u>		1340	388		1.19	462	
3	"	1360	388	"	1.21	469	
1	n . :	510	388	,,	0.45	175	
6	<i>"</i>	1150	388	".	1.02	396	
7		1040	388	,,	0.92	357	
8	"	1880	194	"	1.67	324	
9	<i>"</i>	640	194	"	0.57	111	
10-1		10000	96		8.88	852	
10-2	"	8000	24_	. "	7.10	170	
10-3	"	8890	24	"	7.89	189	
	<u>- ' .                                  </u>		·		<u> </u>	3982	k g
			<del></del>			<del></del>	
<u> </u>	-	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·				
	· · · · · · · · · · · · · · · · · · ·	<u> </u>	<del></del> _				
				·	:		
<u></u>	<u> </u>		· · · · · · · · · · · · · · · · · · ·	:: '.		·	
·			·			•	

LIST OF REINFORCED BAR --- MOMBASA BE

	Ι	···		r	MOMBAS		
<del></del>	DIAMETER	<u> </u>	<u> L</u>	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
	SUPER:	STRUCTUR	<u> </u>	·		·	
B 1-1	Y 3 2	10000	147	6.313	63.13	9280	·
1 - 2		9750	98		61.55	6032	
1-3		8160	98		51.51	5048	
2	Y 3 2	10000	90	"	63.13	5682	
3-1	"	00001	225		63.13	14204	
3-2		8360	90	"	52.78	4750	
4		12000	45	3.854	46.25	2081	
5-1	Y 2 5	5800	90		22.35	2012	
5-2		8000	90_	"	30.83	2775	
6-1	YIZ	10000	180	0.888	8.88	1598	
6-2	1	5000	36		4.44	160	
6-3		4310	36		3.83	138_	
80 1-1		3380	792	1.579	5.34	4229	
1-2	1	960	792		1.52	1204	· · · · · · · · · · · · · · · · · · ·
2-1		3250	846	0.888	2.89	2445	
2-2		840	846		0.75	635	
3	<u>L"</u>	690	816		0,61	516	
			<del></del> -			62 789	kg
C 1-1	Vac	10000			20 51		
C 1-1 1-2		10000	16	3.854	38.54	617	
2-1	1	6780 10000	16	"	26, 13	418	<u></u>
2-2		8860	16		38.54	517	
3-1	1	10000	16		34.15	546	
3-2	1	6270	16	0.888	8.88 5.57	89	
		2870	160	,,		108	
CO 1-1 1-2		840	160		2.55 0.75	120	
	1	1 040	100	l"	0.13	2957	L
	· · · · · · · · · · · · · · · · · · ·	· . · · · · · · · · · · · · · · · · · ·	<del> </del>			2331	kgk
C 4-1	Y 25	10000	9	3.854	38.54	347	1
<u>√ 9-1</u> {-2		6780	9	3.001	26.13	235	<b> </b>
5-1		10000	,	,,,	38.54	347	
5 - 2	1	8860	9	,,	34.15	307	
<u> </u>	Y12	10000	12	0.888	8.88	107	
6 - 2	1	6270	12	<u> </u>	5. 57	67	
CO 3-1		2490	120	,,	2. 21	265	-
3 - 2	1	600	120	"	0.53	64	
	·		1		<u></u>	1739	J
		g Fight Control					
	- :	Y32		44.996		•	
:		Y25		10302			. •
		Y20		650			
		Y16		17147			:
		Y12		20560			
				93,655	S B		
-							

LIST OF REINFORCED BAR --- MOMBASA -- A1= A2

MARK	DIAMETER	LENGTH	XAGMUN	OUTTAKETORT	PIECEWEIGHT	MEIGHT	REMARK
					,		
P 1	Y12	2000	240	0.888	1.78	427	
2	"	540	123	11	0.48	59	
3		18580	10	11	16.50	165	
4	<u>"</u>	400	27	4.1	0.36	10	
<u> </u>		<u> </u>	<del> </del>		-	661	kg
<del></del>		· · · · · · · · · · · · · · · · · · ·			<del></del>		i
A 1	7 .	5000	59	6.313	31.57	1863	
2	1	6000	58	**	37.88	2197	·
3	]	4030	59	3.854	15.53	916	
4		3030	58		11.68	677	
5	!!!	7800	62	"	30.06	1864	
6	1	1450	123	1.579	2.29	282	
<u> </u>		18720	5	0	29.56	148	
8		18860	22	2.466	46.51	1023	
9		19040	22	3.854	73.38	1614	
10		1210	135	0.888	1.07	144	
11	Y16	7720	4	1.579	12.19	49	
<del></del>	<u> </u>		<del> </del>			10777	kg
<u> </u>	<u> </u>	· · · · · · · · · · · · · · · · · · ·	*	· · · · · · · · · · · · · · · · · · ·	·		
<u>E 1</u>	1 1	1140	56	0.888	1.01	57	
2	( <u> </u>	17180	2	. "	15.26	31	
		<del></del>		· · · · · · · · · · · · · · · · · · ·		88	kg
: :		: -			· · · · · · · · · I		
F 1	Y25	3660	117	3.854	14.11	1651	
2	100	2770	62	2,466	6.83	423	
3		3050	117	3.854	11.75	1375	
4	Y20	4040	62	2.466	9.96	618	
<u>. Š</u>		18720	33	1.579	29.56	975	
6	. 23	19240	4	11	30.38	122	
7		5390	4	"	8.51	34	
8		1030	8	0.888	0.91	7	
9	<u>"</u>	1950	139	''	1.73	240	L
· · · · <del>· ·</del> ·		:				5445	kg
S 1	Y16	2880	112	1.579	4.55	510	
2		17200	112	0.888		168	
2	112	1/200	11	V.000	10,21	678	kø
					·		
	<del></del>	Van		4060 }		·	
	<del> </del>	Y32 Y25		8097			
				2064 l			<del></del>
		Y20	<del>,</del>				
······································		Y16		2120 l 1308 l			
		Y12		17649 F		<del></del>	

LIST OF REINFORCED BAR --- MOMBASA-A --- WING

XARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	. ЖЕІСНТ	REMARK
					. :	1	
W 1	Y16	11070	2	1.579	17.48	35	
2	Y32	11710	4	6.313	73.93	296	i
3	11	7350	15	11	46.40	696	
4	11	3850	8	11	24.31	194	
5	Y20	3670	23	2.466	9.05	208	
6	,, .	11100	4	11	27.37	109	
7	ıı .	7170	15	11	17.68	265	
8		3670	8	11	9.05	72	-
9	11	9150	. 8	11	22.56	180	
10		3360	25	U	8.29	207	
11	,,	4500	5	"	11.10	55	
12	Y16	9090	8	1.579	14.35	115	
13	19 11	3300	25	*11	5.21	130	:
14	11	11060	2	11	17.46	35	
15	Y12	1480	36	0.888	1.31	47	
16	Y16	1040	34	1.579	1.64	56	
17	11	1040	27	11	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	44	<u>-</u>
18	Y32	2740	4	6.313	17.30	69	
19	,,	3880	22	H	24.49	539	
20	"	2500	4	***	15.78	_63	
21	Y12	800	50	0.888	0.71	36	
		· · · · · · · · · · · · · · · · · · ·	-			3451 k	g
1		Y32		1857	\g		
		Y20		1096 }			:
		Y16		415			
		Y12		83 }	·-		
	<del></del>	<del> </del>		3451 }	•		

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LIST OF REINFORCED BAR --- MOMBASA -- A2---WING

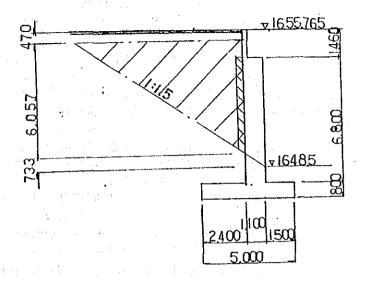
- ·

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	YEIGHT .	REMAR
<u>W 1</u>	Y16	11370	2	1.579	17.95	36	
2	Y32	11820	6	6.313	74.62	448	
3		7190	14	11	45.39	635	
4	11	3850	8	11	24.31	194	<u></u> .
5	Y20	3670	24	2.466	9.05	217	
6	••	11220	6	.,	27.67	166	
7	19	7010	14	. 11	17.29	242	
8	,,,	3670	8	"	9.05	72	
9	1)	9180	8	n	22.64	181	
10		3420	26	"	8.43	219	
11	"	4500	5	++	11.10	55	• • • •
12	Y16	9120	8	1.579	14.40	115	
13	11	3360	26	17	5.31	138	
14		11300	2	,,	17.84	36	
15	Y12	840	37	0.888	0.75	28	
16	Y16	1040	35	1.579	1.64	57	
17	11	1040	28	11	11	46	<del> </del>
18	Y32	2740	5	6.313	17.30	87	
19	"	3880	22	13	24.49	539	
20	71	2500	4	11	15.78	. 63	
21	Y12	800	54	0.888	0.71	38	
			<del></del>			3612 k	g
						:	
<u></u>		Y32		1966 1	g		<del></del>
		Y20		1152 }	g		
	<del></del>	Y16		428 }	(g	<del></del>	
		Y12		66 1	g		

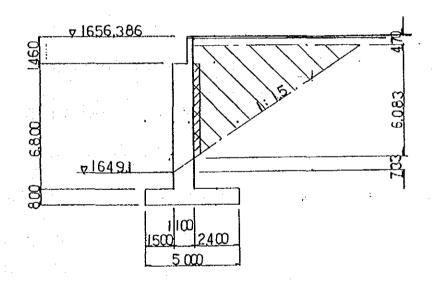
LIST OF REINFORCED BAR --- MOMBASA - PIER

					_			
MAR	ĸ	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	. gemark
	P	) = (P2)						<u> </u>
В	1	Y25	19410	12	3.854	74.81	898	
	_2	11	17730	12	ti.	68.33	820	
	3	Y20	18910	6	2.466	46.63	280	
<del>, ,, -, -, -, -</del>	4	Y16	2650	111	1.579	4.18	464	
	5	1)	890	111	''	1.41	157	
	6	Y12	890	58	0.888	0.79	46	
				·		<u></u>	2665	kg
:		· · · · · · · · · · · · · · · · · · ·		·····				
C	_1	Y32	8050	140	6.313	50.82	7115	
	2	Y16	3270	205	1.579	5.16	1058	
	3	Y12	890	110	0.888	0.79	87	
			<u></u>			<del></del>	8260	kg
·		,		·	¥			·
F_	1	Y20	5580	113	2.460	13.76	1555	
	2	Y16	4320	59	1.579	6.82	402	
	_3	Y25	19480	27	3.854	75.08	2027	
	_4		18480	27	11	71.22	1923	
	5	Y16	17900	6-	1.579	28.26	170	
	6	ti I	4360	10	11	6.88	69	
	- 7		2340	176	1	3.69	649	· .
· 	·						6795	kg
· ·		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·			·		·
			Y32		7115	kg		
	- 1		Y25		5668	kg		
			Y20	·	1835	kg .		· · · · · · · · · · · · · · · · · · ·
			Y16		2969	kg		
			Y12		133	kg		
:					17720	kg		
	<u>.</u>							

## MOMBASA -ABUTMENT AL --BACKFILL



### A2 --- BACK FILL



**BACK-FILL** 

A1: 
$$V = \frac{1}{2} \times 6.057^2 \times 1.5 \times (18.30 - 0.70 \times 2) = 465.0^{\text{m}^3}$$
  
A2:  $V = \frac{1}{2} \times 6.083^2 \times 1.5 \times ($  " ) = 469.0 " = 934.0 "

#### UNURU MONUMENT BRIDGE Super structure 1) Concrete (Grade=30) Girder slab $V = \times 12.993 \times 37.950$ 493.084m<sup>3</sup> cross girder $V = 0.950 \times (0.60 \times 3 + 0.35 \times 2) \times 1.30 \times 10$ 30.875m<sup>3</sup> total 523, 959m<sup>3</sup> Of UF<sub>2</sub>: $A = 37.95 \times (20.50 + 1.50)$ 834.900 m² 2) form work . $A = 37.95 \times (\sqrt{0.15^2+1.05^2} \times 2+0.60 \times 11+1.30 \times 10)$ horizontal 824.350 m² Vartical $A = 37.95 \times (0.20+0.95+1.10 \times 10+1.06 \times 2+0.86) \times 2$ + 0.95 $\times$ 1.30 $\times$ 10 $\times$ 8 $-(0.95\times0.60\times3+0.95\times0.35\times2)\times2$ $= 1242.417 \,\mathrm{m}^2$ 3) Support $V = 37.95 \times \{(0.95+1.10) \times 1.05+1.30 \times 1.10 \times 10\}$ $+ 5.50 \times 21.70 \times \{38.000 - (1.00 \times 2 + 0.80) \times 1.0403\}$ $= 4812.024 \text{m}^3$ 4) Scaffold $V = (21.70+1.00) \times 37.95$ 861.465m<sup>3</sup> $= 20.50 \times 1.0403 \times 2$ 42.653m 5) expansion expansion filler (1=30MM) $A = \{(0, 20+0.35) \times 1.05+1.10 \times 19.60\} \times 1.0403 \times 2$ 56.873 m<sup>2</sup> 6) Joint filler (t=20mm) $A = (0.352 \times 2 + 0.532) \times 3$ 3.708 m² (Parapet) 43.263m<sup>3</sup> 7) Asphalt (t=60mm) $A = 0.06 \times (20.50 - 1.50) \times 37.95$ (721, 050 m²)

#### \* section of superstructure.

 $= (10.40+10.70) \times 2$ 

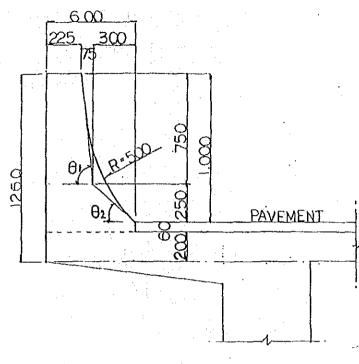
8)Guard rail(Abut)

 $A = \{(0.20 \times 0.35) \times 1.05 + 1.30 \times 19.60 - 1.10 \times 1.300 \times 10\} + 0.352 \times 2 + 0.532 = 12.993 \text{ m}^2$ 

42.200m

#### SHAPE OF PARAPET OF MAIN ROAD

#### ) FOR VERGE



Section arer

$$A = 0.60 \times 1.06 - \frac{1}{2} \times 0.075 \times 0.75$$
$$- \frac{0.75 + 1.00}{2} \times 0.30 + 0.006$$
$$= 0.352 \text{ m}^2$$

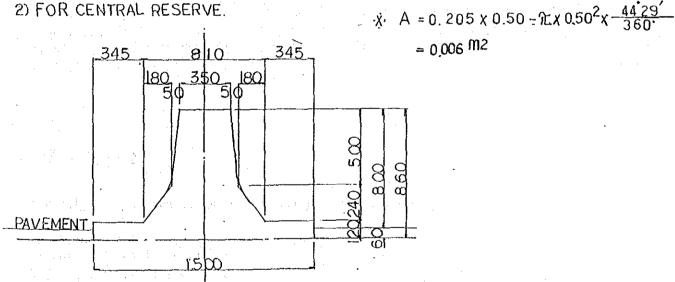
$$\theta_1 = \tan^{1} \frac{0.750}{0.075} = 84^{\circ} 17'22''$$

$$- |\theta_2 = \tan^{1} \frac{0.250}{0.300} = 39^{\circ} 48'20''$$

$$\theta = \pm 44^{\circ} 29'.$$

$$TL = R \cdot \tan \frac{\theta}{2} = 0.205^{\circ}$$

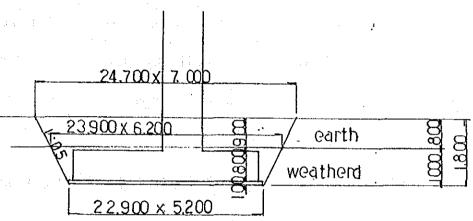
2) FOR CENTRAL RESERVE.



Section arer

$$A = \frac{0.35 + 0.45}{2} \times 0.50 + \frac{0.45 + 0.81}{2} \times 0.24 + 1.50 \times 0.12$$
$$= 0.532 \, \text{m}^2$$

```
UNUNRU NONUMENT JU BRIDGE
   Sub structure : A_1 = A_2 (Main)
1) Concrete
                     V = 0.16 \times 0.626 \times 0.30 \times 2
                       + 22.70(1.40\times0.30+11.00\times6.80+5.00\times0.80)
                                                                                                                   270, 227m<sup>3</sup>
          UF<sub>2</sub>: A = 22.70 \{ (5.00-1.10) + 0.30 + 0.80 \}
                                                                                                                   113, 500 m<sup>2</sup>
2) formwork.
                     A = \{(0.30+0.60) \times 0.26 \times 2 \times 2 + (0.30+21.70) \times 1.40 \times 2
   Vartical
                       + (1.10+21.70) \times 6.80 \times 2 \times 1.0457
                                                                                                                   389.645 m
                              A = (5.00+21.70) \times 0.80 \times 2 \times 1.0457
              (footing)
                                                                                                                    44.672 m2
3) Scaffold
                              V = 1.20 \{(1.10+2.00)+(21.70+2.00)\} \times 8.20 \times 1.0457
                                                                                                                   275.763m<sup>3</sup>
A) base concrete
                              V = 5.20 \times 21.90 \times 0.10 \times 1.0457
                                                                                                                    11.908m<sup>3</sup>
                              A = (5.20+21.90) \times 0.10 \times 2 \times 1.0457
                                                                                                                     5.667 m
```



#### 5) excavation

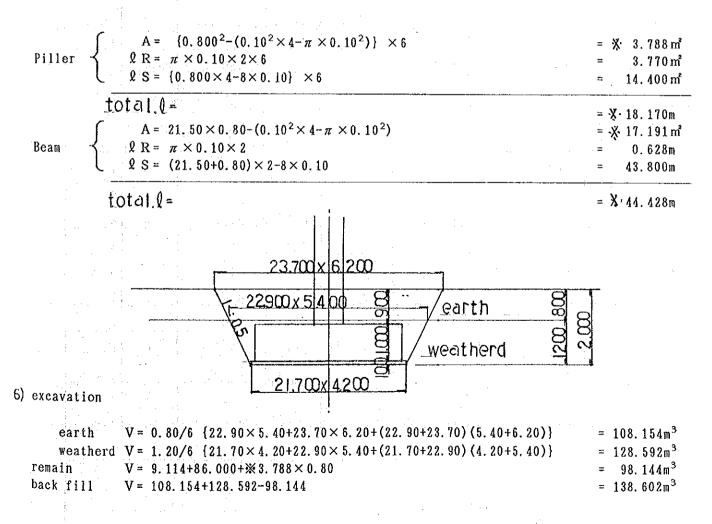
```
\begin{array}{lll} & \text{earth} & V = 0.\ 80/6 \ \{6.\ 20 \times 23.\ 90+7.\ 00 \times 24.\ 70+(6.\ 20+7.\ 00)\ (23.\ 90+24.\ 70)\} & = 128.\ 346\text{m}^3 \\ & \text{weatherd} & V = 1.\ 00/6 \ \{5.\ 20 \times 22.\ 90+6.\ 20 \times 23.\ 90+(5.\ 20+6.\ 20)\ (22.\ 90+23.\ 90)\} & = 133.\ 463\text{m}^3 \\ & \text{remain} & V = 11.\ 908+22.\ 70 \times 5.\ 00 \times 0.\ 80+22.\ 70 \times 1.\ 10 \times 0.\ 90 & = 125.\ 181\text{m}^3 \\ & \text{back fill} & V = 128.\ 346+133.\ 463-125.\ 181 & = 136.\ 628\text{m}^3 \end{array}
```

#### wins : A1 = A2

Material of this wing is apply quantity of mombasa wing

```
UNURU MONUMENT JU BRIDGE
   Sub structure P<sub>1</sub>: Pier
1) Concrete
   beam
                     V = \%17.191 \times 1.00
                                                                                                                   17.191m<sup>3</sup>
                     V = 3.788 \times 5.00
   Pillar
                                                                                                                   18.940m<sup>3</sup>
                    V = 21.50 \times 4.00 \times 1.00
   footing
                                                                                                                   86.000m<sup>3</sup>
   total
                                                                                                                  122.131m<sup>3</sup>
            UF<sub>2</sub>: A = 21.50 \times 4.00 + 17.191
                                                                                                                  103.191 m
2) form work.
   horizontal A = %17.191-%3.788
                                                                                                                   13.403 m²
                    A = \frac{1}{4}4.428 \times 1.00 + 18.170 \times 5.00
                                                                                                                  135. 278 m²
       " (footing) A = (21.50+4.00) \times 1.00 \times 2
                                                                                                                   51,000 m<sup>2</sup>
3) base concrete
                              V = 21.70 \times 4.20 \times 0.10
                                                                                                                    9.114m<sup>3</sup>
                            A = (21.70+4.20) \times 0.10 \times 2
       " formwork
                                                                                                                    5.180 m<sup>2</sup>
                             V = \%(17.191-3.788) \times (6.10-0.10)
                                                                                                                   80.418m<sup>3</sup>
                             V = 1.20 \{(0.80+2.00)+(21.50+2.00)\} \times 6.00 \times 2
5) Scaffold
                                                                                                                  378, 720m<sup>3</sup>
```

#### \_X where quantity of unit-lensth



LIST OF REINFORCED BAR --- UHURU-Br

WARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
	SUPERS	STRUCTURE			<u> </u>		į
s 1-1		10000	222	1.579	15.79	3505	
1-1		5500	222	"	8 68	1972	
1-:		8130	222	"	12.84	2850	
2 -		6090	222	0.888	5.41	1201	
2-		6500	222	"	5.77	1281	
2 - 3	_	8500	222	"	7.55	1676	
3 - 1	Y 2 0	10000	14	2.466	24.66	345	
3 - 7		5500	14	"	13.56	. 190	***************************************
3-3	"	8410	14	. "	20.74	290	
4	Y 1 6	6370	14	1.579	10.06	141	
4-2	2 "	8500	14	"	13.42	188	- 1
4-3	3 "	8410	14	"	13.28	186	
5	"	2900	3 4	,, ,	4.58	156	
6	"	1730	250	"	2.73	683	
7-	Y 1 2	10000	348	0.888	8.88	3 0 9 0	
7-1	2 "	5000	116	"	4.44	515	
7-3	3 "	4070	116	"	3.61	418	·
	111 111		_ <del>.</del>		· · · · · · · · · · · · · · · · · · ·	18687	kg
		·				,	<u> </u>
<u>K</u>	Y 1 2	1380	250	0.888	1.23	308	.]
	2 "	1340	250	"	1.19	298	
	3 "	1360	250	,,	1.21	304	
	. "	510	250	,,	0.45	113	
	, "	1150	250	"	1.02	255	ļ
	1 "	1040	250	"	0.92	230	
1	3 "	1880	125	" ·	1.67	209	<u> </u>
<u> </u>	) "	640	125	. ,,	0.57	71	ļ
10-	<u>"</u>	10000	72	"	8.88	639	
10-	) "	5000	24	"	4.44	106	<u> </u>
10-	"	4070	24	"	3.61	86	<u> </u>
-			·			2619	kg
1		<u></u>					
		· · · · · · · · · · · · · · · · · · ·					

LIST OF REINFORCED BAR --- UHURU-Br

******		1				UHURU ·	RL	
М	ARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	MEIGHT	REMARK
		SUPER:	STRUCTUR	E				:
<u> </u>	1-1	Y 3 2	10000	177	6 313	63.13	11174	
	1-2	."	7300	118	,,	46.08	5437	
	2		10000	5.5		63.13	3472	
	3-1	"	10000	165		63.13	10416	
	3-2	<i>"</i>	6620	110		41.79	4597	
	4-1	Y 25	10000	110	3.854	38.54	4239	
	4 - 2		4800	110		18.50	2035	
	5-1	Y 1 2	10000	1 32	0.888	8.88	1172	
	5-2	//	4740	8.8	"	4.21	370	
	· · · ·	T	<del></del>	<del></del>	· · · · · · · · · · · · · · · · · · ·	<u> </u>		
30	1-1	Y 1 6	3800	638	1.579	5.34	3407	
	1 - 2		460	638		1.52	970	
	2-1	Y12	3250	682	0.888	2.89	1971	<b></b>
	2-2	"	840	682		0.75	512	ļ
	3		690	682		0.61	416	<u> </u>
		· · ·			· <del></del>	<u></u>	50188	
	<del></del>	· · ·			·		<del></del>	·
		<del>,</del> 1		<del>                                     </del>	·			·
<u> </u>	1-1	Y 25	10000	12	3.854	38, 54	462	
	1-2		6350	24		24.47	587	
	2-1		10000	12		35.84	462	
	2-2		6980	24		26.90	646	
	3 – 1	Y12	10000	12	0.888	8.88	107	
	3-2	}	5520	24		4.90	118	
0	_1_		2870	150		2.55	383	
<del></del>	2	l	840	150		0.75	. 113	
	<del></del>						2878	kg
					<u> </u>			
C	4-1		10000	6	3.854	38.54	231	<del></del>
_	4-2		6350	12		24.47	294	
_	5-1	"	10000	8	"	38.54	231	
	5-2	<i>"</i>	6980	12		26.90	323	
-	6-1	Y 1 2	10000	8	0.888	8.88	71	
·	6-2		5520	16		4, 90	78	
0	3	"	2630	100	"	2.34	234	<del></del>
0	4		600	100		0.53	53	L <u>·</u>
:	1 × 5						1515	kg
	<del>-</del>	<del></del> -	<del></del>			<del></del>		<del></del>
_	~					2500c ba		
·			Y32	<del></del>		35096 kg		*
			Y25		•	9510 kg		<del></del>
	7	* 1.7	Y20		<u> </u>	825 kg		
_	<del></del> -		Y16	<del></del>		4 058 kg		
	· · ·		Y12	· · · · ·		6398 kg		
						15887 kg	······································	<del></del>
				·····		····		

MAR	≀ĸ	RETERALD	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	MEIGHT	REMARK
•				.:				1
>	1	Y12	2000	300	0.888	1.78	534	
	2	1,	670	147	"	0.59	87	
	3	.,	23390	10	"	20.77	208	
	_4		410	35		0.36	13	
							842	kg
	: 	·	:	<u>-</u>	· · · · · · · · · · · · · · · · · · ·			
<u>\</u>		Y32	5000	75	6.313	31.57	2368	
	2		6000	72	te .	37.88	2727	
	3	Y25	4080	75	3.854	15.72	1179	
	4		3080	7.2		11.87	855	
	5	11	7850	<u>77</u>	 	30.25	2329	
	6	Y16	7720	4_	1.579	12.19	49	-
	-7	11	1490	153		2.35	360	
	8		23670	5		37.37	187	
	9	Y25	24300	22	3.854	93.65	2060	<u></u>
	10	<u> Y16</u>	23670	22	1.579	37.37	822	ļ
	11	Y12	1250	175	0.888	1.11	194	
				<del></del>			13130	kg
 ?		V12	1100	21	0.000	1 05		<u> </u>
<u> </u>	_1 2	Y12	1180 22150	· 71	0.888	1.05	75 39	
	1		00133	<del>ا ـ . ـ . د</del> ـ	L	13.07	114	k o
			·	:				NB
	1	Y25	3750	147	3.854	14.45	2124	
	2	Y20	2880	77	2.466	7.10	547	
	3	Y25	3110	153	3.854	11.99	1834	
	4	Y20	4180	77	2.466	10.31	794	
	5	.,	23950	18	,,	59.06	1063	
	6	Y16	23670	15	1.579	37.37	561	
	7		24150	4	"	38.13	153	
	8	.,	6	4	.,	0.01	0	
	9	10	1150	8		1.82	15	
	10	Y12	1960	176	0.888	1.74	306	<u> </u>
		·					7397	kg
							<u> </u>	
3	1	Y16	2880	143	1.579	4.55	651	<del> </del>
<u>-</u>	2	Y12	22150	11	0.888	19.67	216	L
			<u> </u>				867	kg ,
				·	: 1 			
			Y32	./s	5095 k		·····	
	<u>:</u> _	<del></del>	Y25		10381 k			<del> </del>
		.a	Y20	-	2404 k		·	·
			Y16		2798 k			
	· ·	·	Y12		1672 k	<u>g</u>		

	XXXX	DIAMETE	LENGTH	NUMBAR	UNITACICAL	PIECEWEIGHT	REIGHT	REMARK	
1	DIC	3HT		L	L	<u> </u>	······································	<u> </u>	
ソ	1416	ו ויוכ	τ		r	r			
	<u>W 1</u>	Y16	11150	2	1.579	17.61	35		
- 1	2	Y32	11700	6	6.313	73.86	443		
٠,	3		7130	14	н	45.01	630		
	4	.,	3980	8	"	25.13	201		
	5	Y20	3800	23	2,466	9.37	216		
	6		11250	6	11	27.74	166		
- ]	7	,	7100	14	11	-		<del></del>	
	8	17	3800	8	. ,1	17.51	245	······································	
ĺ	9	"	9140	8	11	9,37	75		
	10	,,	4500	5	11.	22.54	180	·	
	11				11	11.10	55		
			3470	25		8.56	214		
	12	Y16	9080	8	1.579	14.34	115		
- 1	13		3450	26	- 11	5.45	142		
	14		11230	2_		17,73	35		
	15	Y12	840	37	0.888	0.75	2.8	·	
- 1	16	Y16	1040	54	1.579	1.64	89		
	17		1060	8_		1.67	13		
إ	18	Y32	2690	5	6.313	16.98	85		
	19	п	3580	22	- 1	22.60	497		
- {	20	-11	3000	5	0	18.94	95		
	21	Y12	800	5 4	0.888	0.71	38		
ı			·	. <u></u>	V. 000	V. //I	3597	l	
. :			<del></del>				3331	<u> </u>	
	1		Y32		1051				
					1951				
- 1	<del></del>		Y20		1151 kg				
-:			YIG		429 ]	<u> </u>			
			Y12		66 )	-			
			YI2		3597 I	-			
						-			
)	LE	FT				-			
)	LE * 1	FT 116		2		-	36.		
)		·	St.	2 6	3597 1	· 8	36 449		
)	W 1	Y16	11300		1.579	17.84	· · · · · · · · · · · · · · · · · · ·		
)	W 1	Y16 Y32	11300 11850 7290	6_	1.579	17.84 74.81 46.02	449 644		
	W 1 2 3	Y16 Y32 "	11300 11860 7290 3980	6 14 8	1.579 6.313	17.84 74.81 46.02 25.13	449 644 201		
	W 1 2 3 4 5	Y16 Y32	11300 11850 7290 3980 3800	6 14 8 23	3597 I	17.84 74.81 46.02 25.13 9.37	449 644 201 216		
	W 1 2 3 4 5	Y16 Y32 " " Y20	11300 11850 7290 3980 3800	6 14 8 23 6	1.579 6.313 "	17.84 74.81 46.02 25.13 9.37	449 644 201 216		
)	W 1 2 3 4 5 6 7	Y16 Y32 " " Y20	11300 11850 7290 3980 3800 11250 7100	6 14 8 23 6	1.579 6.313 " 2.466	17.84 74.81 46.02 25.13 9.37 27.74	449 644 201 216 166 245		
	W 1 2 3 4 5 6 7 8	Y16 Y32 " " Y20	11300 11860 7290 3980 3800 11250 7100 3800	6 14 8 23 6 14 8	3597 }  1.579 6.313 " 2.466 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51	449 644 201 216 166 245 75		
	¥ 1 2 3 3 4 5 6 6 7 8 8 9	Y16 Y32 " " Y20 " "	11300 11850 7290 3980 3800 11250 7100 3800 9140	6 14 8 23 6 14 8	3597   1.579 6.313 " 2.466 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54	449 644 201 216 166 245 75		
	W 1 2 3 4 5 6 7 8	Y16 Y32 " " Y20 "	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500	6 14 8 23 6 14 8 8	3597 1 1.579 6.313 " 2.466	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54	449 644 201 216 166 245 75 180		
	¥ 1 2 3 3 4 5 6 6 7 8 8 9	Y16 Y32 " " Y20 " "	11300 11850 7290 3980 3800 11250 7100 3800 9140	6 14 8 23 6 14 8	3597   1.579 6.313 " 2.466 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54	449 644 201 216 166 245 75		
	W 1 2 3 4 4 5 6 6 7 2 8 9 1 0	Y16 Y32 " " Y20 "	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500	6 14 8 23 6 14 8 8	3597 1 1.579 6.313 " 2.466	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54	449 644 201 216 166 245 75 180		
	# 1 2 3 4 5 6 7 8 9 1 0 1 1	Y16 Y32 " " Y20 " " " "	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500	6 14 8 23 6 14 8 8 5	3597 1 1.579 6.313 " 2.466 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26	449 644 201 216 166 245 75 180 55		
	# 1 2 3 4 5 6 6 7 8 8 9 10 11 12	Y16 Y32 " " Y20 " " " " " Y16	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350	6 14 8 23 6 14 8 8 5 25	3597   1.579 6.313  2.466  	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26	449 644 201 216 166 245 75 180 55 206		
	# 1 2 3 4 5 6 6 7 7 8 9 10 11 12 13 14	Y16 Y32 " Y20 " " " " " Y46 "	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450	6 14 8 23 6 14 8 8 5 25 8 26	1.579 6.313  2.466  	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34	449 644 201 216 166 245 75 180 55 206 115		
	# 1 2 3 4 4 5 6 6 7 7 8 9 10 11 12 13 14 15	Y16 Y32 " " Y20 " " " " " Y16 " Y16	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230	6 14 8 23 6 14 8 3 5 25 8 26 2	3597 1  1.579 6.313 " 2.466 " " 1.579 " 1.579 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75	449 644 201 216 166 245 75 180 55 206 115 142 36		
	# 1 2 3 4 5 6 6 7 8 8 9 10 11 12 13 14 15 16	Y16 Y32 " Y20 " " " " " Y16 " " Y16 " Y12	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840	6 14 8 23 6 14 8 8 5 25 8 26 2 2	3597 1  1.579 6.313 " 2.466 " " 1.579 " 0.888 1.579	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64	449 644 201 216 166 245 75 180 55 206 115 142 36 28		
	# 1 2 3 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17	Y16 Y32 " " Y20 " " " " Y16 " Y16 " Y12 Y16	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040	6 14 8 23 6 14 8 8 5 25 8 26 2 2 37 54 8	3597 1  1.579 6.313 " 2.466 " " 1.579 " 0.888 1.579	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67	449 644 201 216 166 245 75 180 55 206 115 142 36 28		
	# 1 2 3 4 5 6 6 7 8 8 9 10 11 12 13 14 15 16 17 18	Y16 Y32 " " Y20 " " " " Y16 " Y16 " Y12 Y16 " Y32	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8	3597 1  1.579 6.313 " " 2.466 " " 1.579 " 0.888 1.579 " 6.313	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89		
	# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	1.579 6.313 2.466 1.579 1.579 9.888 1.579	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89 13		
	# 1 2 3 4 5 6 6 7 8 8 9 10 11 12 13 14 15 16 17 18	Y16 Y32 " " Y20 " " " " Y16 " Y16 " Y12 Y16 " Y32	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220 4420 3000	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	3597 1  1.579 6.313 " 2.466 " 1.579 " 0.888 1.579 " 6.313 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90 18.94	449 644 201 216 166 245 75 180 55 206 115 142 38 89 13 102 614		
	# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	1.579 6.313 2.466 1.579 1.579 9.888 1.579	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89 13		
	# 1 2: 3 4 5: 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32 "	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220 4420 3000	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	3597 1  1.579 6.313 " 2.466 " 1.579 " 0.888 1.579 " 6.313 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90 18.94	449 644 201 216 166 245 75 180 55 206 115 142 38 89 13 102 614	kg	
	# 1 2: 3 4 5: 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32 "	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220 4420 3000	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	3597 1  1.579 6.313 " 2.466 " 1.579 " 0.888 1.579 " 6.313 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90 18.94	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89 13 102 614 95	kg	
	# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32 "	11300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220 4420 3000	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	3597 1  1.579 6.313 " 2.466 " 1.579 " 0.888 1.579 " 6.313 "	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90 18.94 0.71	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89 13 102 614 95	kg	
	# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32 "	\$\frac{1}{1}300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220 4420 3000 800	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	3597   1.579 6.313 2.466 1.579 9.888 1.579 6.313 0.8888	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90 18.94 0.71	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89 13 102 614 95	kg	
	# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32 "	\$\frac{1}{1}300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220 4420 3000 800	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	3597   1.579 6.313 2.466 1.579 0.888 1.579 6.313 0.888	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.76 1.64 1.67 20.33 27.90 18.94 0.71	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89 13 102 614 95	kg	
	# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16 " Y32 "	\$\frac{1}{1}300 11850 7290 3980 3800 11250 7100 3800 9140 4500 3350 9080 3450 11230 840 1040 1060 3220 4420 3000 800	6 14 8 23 6 14 8 8 5 25 8 26 2 37 54 8 5	3597   1.579 6.313 2.466 1.579 9.888 1.579 6.313 0.8888	17.84 74.81 46.02 25.13 9.37 27.74 17.51 9.37 22.54 11.10 8.26 14.34 5.45 17.73 0.75 1.64 1.67 20.33 27.90 18.94 0.71	449 644 201 216 166 245 75 180 55 206 115 142 36 28 89 13 102 614 95	kg	

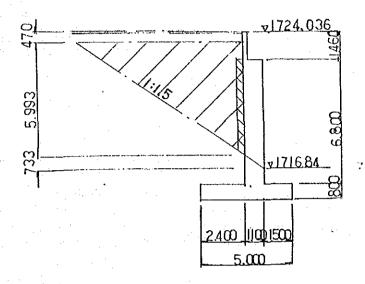
ŀ	MARK	DIAMETE	R LENGTH	HUMBAR	THOISYTIKU	PIECENEICHT	#E1CH1	REMAR
	RI	GHI	-			<del></del>	·	
	w 1	Y16	10860	2	1.579	12 (1		i
L	2	Y32	11760	6	6.313	17.15 74.24	34	
_	3		7290	13	"	46.02	445	
_	1		4000	7	"	25.25	598 177	<u> </u>
-	5	450	3820	23	2.466	9.42	217	<del></del>
-	6		11120	5	13	27.42	137	
` -			7150	14		17.63	247	
-	8	-"-	3820	8	"	9.42	75	
-	9		9110	. 8	31	22,47	180	
}-	10	- 11	4500	. 5	- "	11.10	5.5	
-	11		3180	25		8.58	214	<u> </u>
<b>-</b>	12	Y16	9050	8	1.579	14.29	114	
-	13 14		3420 11090	25		5.40	135	<del></del>
1	16	Y12	740	36	<del></del>	17.51	35	
	16	Y16	1040	53	0.888 1.579	0.56	24	
	17	.,	1060	7	1.079	1.64	87	
	18	Y32	3220	5	6.313	20.33	102	
	19	19	4420	21		27.90	586	
Ŀ	20		3000	3	,	18.94	57	
_	21	Y12	800	50	0.888	0.71	36	
-		100 4 15					3567	kg
-		<del></del>					······································	· <del></del>
-		<del></del>	Y32		1965 k	g	<del></del>	
-			Y20		1125 k	g		·
-			Y16		417 k			
			Y12		60 k			
	<del></del> -						<del></del>	
-					3567 k			
-							-	·
_	LE	FT					-	
-		FT 	11030	2			35	
1				2 6	3567 k	β	35 433	
1	1	Y16	11030		3567 k	17.42		
1	!! 2	Y16 Y32	11030	6	3567 k	17.42 72.16	433	
1	1 1 2 3	Y16 Y32	11030 11430 6960	6 13	1.579 6.313	17.42 72.16 43.94	433 571	
1	2 3 4 5 6	Y16 Y32 " " Y20	11030 11430 6960 4000 3820 11120	6 13 7	3567 k	17.42 72.16 43.94 25.25 9.42 27.42	433 571 177 217 137	
1	1 2 3 4 5 6 7	Y16 Y32 " " Y20	11030 11430 6960 4000 3820 11120 7100	6 13 7 23 5	3567 k	17.42 72.16 43.94 25.25 9.42 27.42 17.51	433 571 177 217 137 245	
1	1 2 3 4 5 6 7 8	Y16 Y32 " " Y20	11030 11430 6960 4000 3820 11120 7100 3820	6 13 7 23 5 14 8	1.579 6.313 " 2.466	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42	433 571 177 217 137 245 75	
1	1 2 3 4 5 6 7 8 9	Y16 Y32 " " Y20 "	11030 11430 6960 4000 3820 11120 7100 3820 9110	6 13 7 23 5 14 8	1.579 6.313  2.456 	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47	433 571 177 217 137 245 75	
1	3 3 4 5 6 7 8 9	Y16 Y32 " " " Y20 "	11030 11430 6960 4000 3820 11120 7100 3820 9110	6 13 7 23 5 14 8 8	3567 k	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47	433 571 177 217 137 245 75 180	
1	2 3 4 5 6 7 8 9	Y16 Y32 " " Y20 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500	6 13 7 23 5 14 8 8 5	3567 k	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34	433 571 177 217 137 245 75 180 55 200	
1	7 1 2 3 4 5 6 7 8 9 10 11	Y16 Y32 " " Y20 " " " "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380	6 13 7 23 5 14 8 8 5 24 8	3567 k  1.579 6.313 2.456 1.579	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29	433 571 177 217 137 245 75 180 55 200	
1	1 2 3 4 5 6 7 8 9 10 11 12 13	Y16 Y32 " " Y20 " " " " " "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050	6 13 7 23 5 14 8 8 5 24 8 25	3567 k	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40	433 571 177 217 137 245 75 180 55 200 114 135	
1	1 2 3 4 5 6 6 7 8 9 10 11 12 13 14	Y16 Y32 " " Y20 " " " " Y16	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420	6 13 7 23 5 14 8 8 5 24 8 25 2	3567 k  1.579 6.313 2.466	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40	433 571 177 217 137 245 75 180 55 200 114 135 35	
1	1 2 3 4 5 6 6 7 8 9 10 11 12 13 14 15	Y16 Y32 " " Y20 " " " " Y16 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740	6 13 7 23 5 14 8 8 5 24 8 25 2 2 36	3567 k  1.579 6.313 2.456 1.579 0.888	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51	433 571 177 217 137 245 75 180 55 200 114 135	
1	1 2 3 4 5 6 6 7 8 9 10 11 12 13 14	Y16 Y32 " " Y20 " " " " Y16	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420	6 13 7 23 5 14 8 8 5 24 8 25 2	3567 k  1.579 6.313 2.466	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40	433 571 177 217 137 245 75 180 55 200 114 135 35	
1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Y16 Y32 " " Y20 " " " " Y16 " Y12 Y16	31030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53	1.579 6.313  2.456   1.579 	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66	433 571 177 217 137 245 75 180 55 200 114 135 35 24	
1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	Y16 Y32 " " Y20 " " " " Y16 " Y16 " Y16 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1040	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53	3567 k  1.579 6.313 2.456 1.579 0.888 1.579	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64	433 571 177 217 137 245 75 180 55 200 114 135 35 24 87	
1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	Y16 Y32 " " Y20 " " " " Y16 " Y16 " Y16 " Y17 Y17 Y17 Y17	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1040 1060 2580	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53 7 7 5	3567 k  1.579 6.313 2.456 1.579 0.888 1.579 6.313	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64 1.67	433 571 177 217 137 245 75 180 55 200 114 135 35 24 87 12	
1	1 2 3 4 5 6 6 7 8 9 10 11 12 13 14 15 16 17 18 19	Y16 Y32 " " Y20 " " " " Y16 " Y16 " Y17 Y17 Y17 Y17 Y17	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1060 2680 3560	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53 7 5 21	3567 k  1.579 6.313 2.456 1.579 0.888 1.579 6.313	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64 1.67 16.29	433 571 177 217 137 245 75 180 55 200 114 135 36 24 87 12 81	
1	1 2 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Y16 Y32 " "Y20 " " " Y16 " Y12 Y16 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1040 1060 2580 3560	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53 7 5 21 3	1.579 6.313 2.466 1.579 0.888 1.579 6.313 1.579	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64 1.67 16.29 22.47 18.94	433 571 177 217 137 245 75 180 55 200 114 135 35 24 87 12 81 472 57	kg
1	1 2 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Y16 Y32 " "Y20 " " " Y16 " Y12 Y16 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1040 1060 2580 3560 3000	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53 7 5 21 3	1.579 6.313 2.466 1.579 0.888 1.579 6.313 1.579	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64 1.67 16.29 22.47 18.94	433 571 177 217 137 245 75 180 55 200 114 135 35 24 87 12 81 472 57	kg
1	1 2 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20	Y16 Y32 " "Y20 " " " Y16 " Y12 Y16 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1040 1060 2580 3560 3000	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53 7 5 21 3	1.579 6.313 2.466 1.579 0.888 1.579 6.313 1.579	# 17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64 1.67 16.29 22.47 18.94 0.71	433 571 177 217 137 245 75 180 55 200 114 135 35 24 87 12 81 472 57	kg
1	1 2 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Y16 Y32 " "Y20 " " " Y16 " Y12 Y16 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1060 2580 3560 3000 800	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53 7 5 21 3	3567 k  1.579 6.313 2.466 1.579 0.888 1.579 6.313 0.888	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64 1.67 16.29 22.47 18.94 0.71	433 571 177 217 137 245 75 180 55 200 114 135 35 24 87 12 81 472 57	kg
1	1 2 3 4 5 6 6 7 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	Y16 Y32 " "Y20 " " " Y16 " Y12 Y16 "	11030 11430 6960 4000 3820 11120 7100 3820 9110 4500 3380 9050 3420 11090 740 1040 1060 2580 3560 3000 800	6 13 7 23 5 14 8 8 5 24 8 25 2 36 53 7 5 21 3	3567 k  1.579 6.313 2.456 1.579 0.888 1.579 6.313 0.888	17.42 72.16 43.94 25.25 9.42 27.42 17.51 9.42 22.47 11.10 8.34 14.29 5.40 17.51 0.66 1.64 1.67 16.29 22.47 18.94 0.71	433 571 177 217 137 245 75 180 55 200 114 135 35 24 87 12 81 472 57	kg

LIST OF REINFORCED BAR --- UHURU-PIER

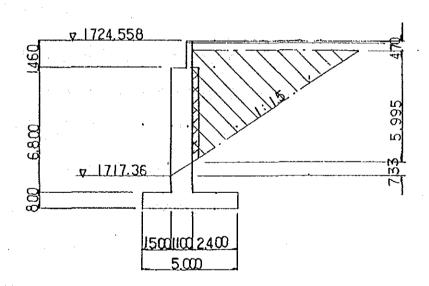
MA	RK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
<u>B</u>	1	Y25	24790	12	3.854	95.54	1146	
	2	17	23110	12	11	89.07	1069	
	3	Y20	24110	6	2.466	59.46	357	
	4	Y16	2650	141	1.579	4.18	589	
	5	11	890	141	11	1.41	199	
	6	Y12	890	70	0.888	0.79	5.5	
			:				3415	kg
				· · · · · · · · · · · · · · · · · · ·	<del></del>			
C_	1	Y32	7050	168	6.313	44.51	7478	
	2	Y16	3270	204	1.579	5.16	1053	
	3	Y12	890	108	0.888	0.79	_85	
							8616	kg
		<u></u>	· · · · · · · · · · · · · · · · · · ·		· ·			,
F	1	Y20	5580	143	2.466	13.76	1968	
	_2	Y16	4320	73	1.579	6.82	498	
	3	Y25	24850	27	3.854	95.77	2586	
	4	н	23860	27	11	91.96	2483	•
	5	Y16_	22960	6/	1,579	36.25	218	
	6	11	4360	10	11	6.88	69	. <u>.                                   </u>
	7	,,	2340	220	"	3.69	812	
							8634	kg
	<b>-</b>	:			<u> </u>			<u> </u>
		1.7	Y32		7478 k	g		
			Y25	·	7284 k	(g		
			Y20		2325 k	g	·.	
	·		Y16	<u></u>	3438 k	g		·
			Y12		140 k	(g	·	
				-	20665 k	g		

## UHURU-ABUTMENT

## AI --- BACK-FILL



## A2---BACK-FILL



## BACK FILL

A1 : 
$$V = \frac{1}{2} \times 5.993^2 \times 1.5 \times (22.70 - 0.732 \times 2) = 572.0 \text{ m}^3$$
  
A2 :  $V = \frac{1}{2} \times 5.995^2 \times 1.5 \times (22.70 - 0.727 \times 2) = 572.5$ 

$$= 1144.5$$

#### 电二二基 医皮肤 医超过电池 医二 RAILWWAY BRIDGE Super structure 1)Concrete (Grade=30) Girder slab $V = \times 7.439 \times 56.790$ 422.460m<sup>3</sup> cross girder V = 1.050 × (0.60 × 4+0.35 × 3) × 1.15 × 5 × 1.3151 27.392m<sup>3</sup> total 449.852m<sup>3</sup> Of UF<sub>2</sub>: $V = 11.90 \times 56.79$ 675.801 m<sup>2</sup> 2) form work. A = $56.79 \times (\sqrt{0.20^2+1.125^2} \times 2+0.65 \times 6+1.15 \times 5)$ horizontal 677.845 m² Vartical $A = 56.79 \times (0.20+1.20 \times 6) \times 2$ $+ 1.15 \times 1.05 \times 5 \times 12 \times 1.3151$ - $(1.05 \times 0.60 \times 4 + 1.05 \times 0.35 \times 3) \times 2 \times 1.3151$ 926. 243 m $V = 56.79 \times \{(1.40+1.20) \times 1.125+1.15 \times 1.20 \times 5\}$ 3) Support + 5. 80 × 11. 90 {56. 850 - (1. 00 × 2+0. 50) × 2 × 1. 3151} $= 4027.907m^3$ 4) Scaffold $V = (11.90+1.00) \times 56.790$ 732.591m3 5) expansion $= 11.90 \times 1.3151 \times 2$ 31.300m expansion filler(t=30mm) $A = \{2 \times 0.20 \times 1.51 + 0.20 \times 1.125 + 9.65 \times 1.20\} \times 1.3151 \times 2$ 32.638 m<sup>8</sup> 6) Handrail $= 56.850 \times 2$ 113.700m

### \* section of superstructure.

 $A = \{0.20 \times 1.51 \times 2 + 0.20 \times 1.125 + 9.65 \times 1.40 - 1.20 \times 1.15 \times 5\} = 7.439 \,\text{m}^2$ 

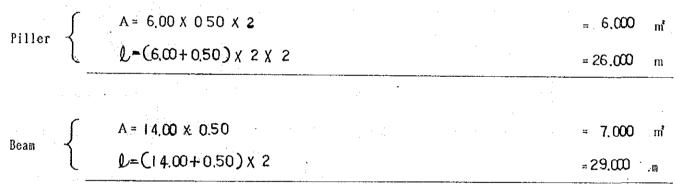
```
RAILWAY BRIDGE
   Sub structure - A 1 ABUT
 1) Concrete.
                   V = 0.50 \times 3.20 \times 1.0353 \times 2 \times 10.50
   wing
                                                                                                         = 34.786 \, \text{m}^3
                   V = (0.30 \times 1.50 + 1.30 \times 9.00 + 6.50 \times 1.00) \times 18.30
   main
                                                                                                         = 341.295 \, \text{m}^3
   total
                                                                                                         =.376.081 \text{ m}^3
      Of UF<sub>2</sub>: A = (6.50-1.30+1.00+0.30) \times 18.30 + (0.50 \times 3.20 \times 1.0353) \times 2
                                                                                                         = 122.262 m
2)form work.
     F_1(V)
             A = (6.50 + 18.30) \times 1.00 \times 2
                                                                                                         = 49600 nt
                   A = \{(0.30+18.30) \times 1.50+(1.30+18.30) \times 9.00\} \times 2
     F_2(v)
                                                                                                        =408,600 m2
3)base concrete
                            V = 6.70 \times 18.50 \times 0.10
                                                                                                         ± 12.395 m³
 A) " (crusherran)
                            V = 6.70 \times 18.50 \times 0.20
                                                                                                            24,790 m
                                     22.800 x 11.000
                                                                                earth
                                      18500 x 6.700
5) excavation
                  V = 4.30/6 \{18.50 \times 650 + 22.80 \times 11.00 + (18.50 + 22.80) (6.70 + 11.00)\}
      earth
                                                                                                        =792461 \text{ m}^3
                  V = 12395 + 24790 + 18.30 \times 6.50 \times 1.00 + 1.30 \times 3.00 \times 18.30
  remain
                                                                                                        = 227,505 m<sup>3</sup>
```

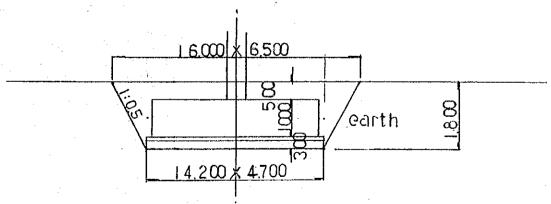
 $= 564.956 \text{ m}^3$ 

V = 792461 - 227505

```
RAILWAY
                       BRIGDE
   Sub structure
                         P_1 (P_2): Pier
1) Concrete.
                   V = X \cdot 7.00 \times 1.00
  beam-
                                                                                           = 7.000⋅
                  V = \% 6.00 \times 5.50(6.00)
  Pillar
                                                                                           -33,000(36,000)
                   V = 14.00 \times 4.50 \times 1.00
   footing
                                                                                                                  .m.3
                                                                                            = 63000
  total
                                                                                           =103,000(106,000)
                                                                                                                  .<sub>m</sub> 3
      Of. UF<sub>2</sub>: A = [4.00 \times 4.50 + 7.000]
                                                                                           <del>-</del> 70.000
                                                                                                                  m
2) form work.
                  A = 2.00 \times 0.50
  horizontal
                                                                                              1.000
                                                                                                                  กใ
                  A = \% 29.000 \times 1.00 + \% 26.000 \times 550 (6.00)
  Vertical
                                                                                           -172,000(185,000)
                                                                                                                  m²
      " (footing) A = (14.00+4.50) \times 1.00 \times 2
                                                                                                     ≈ 37,000
                                                                                                                  m^2
3)base concrete
                           V = [14.20 \times 4.70 \times 0.10]
                                                                                                                  m<sup>3</sup>
                                                                                                     _= 6,674
      # formwork
                           A = (1420 \pm 4.70) \times 0.10 \times 2
                                                                                                         3.780
                                                                                                                  រាវិ
4)base(Crusherran) V = 1420x470 x 020
                                                                                                                 m³
                                                                                                     .= 13,348
5) Support
                           V = 2.00 \times 0.50 \times (6.00 - 0.10)
                                                                                                                 mЗ
                                                                                                     = 5900
6) Scaffold
                           V = .1.20((0.50 + 2.00) + (14.00 + 2.00)) \times 6.00 \times 2
                                                                                                     = 266.400
```

## \* where quantity of unit len9th

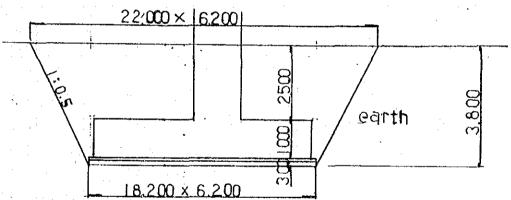




7) excavation earth  $V = 1.80/6 \{14.20 \times 4.70 + 16.00 \times 6.50 + (14.20 + 16.00) (4.70 + 6.50)\}$  =  $152.694 \text{ m}^3$  remain  $V = 63.000 + 6674 + 13.348 + \frac{13.348}{4.000} + \frac{13.348}{4.$ 

# RAILWAY BRIDGE Sub structure A2 - ABUT 1) concrete.

 $V = (0.30 \times 1.50 + 1.30 \times 8.00 + 6.00 \times 1.00) \times 18.000$ main  $\pm 303.300 \text{ m}^3$  $V = (2.70 \times 9.70) \times 0.50$ wing +  $\{1/2(9.70+9.43) \times 2.70+1/2(6.564+0.967) \times 7.30\} \times 0.70$ wing  $+(26.190)\times0.50+\{53.313\}\times0.70$ 50.414m<sup>3</sup> total \_# 353.714 m<sup>3</sup> Of. UF<sub>2</sub>:  $A = 18.00(600 - 1.30 + 1.00 + 0.30) + 2.70 \times 0.50 + 10.00 \times 0.70$ = 116,350 m² 2) form work.  $A = (0.30+18.00) \times 1.50 \times 2 + (1.30+18.00) \times 8.00 \times 2$  $F_2(Y)$ 363. 700 m²  $A = (6.00 + 18.00) \times 1.00 \times 2 + 26.190 \times 2 + 53.313 \times 2$  $+ 0.50 \times 9.70 + 0.70 (0.967 + 2.866)$  $= .214.539 \, \mathrm{m}^2$ F<sub>1</sub> (sloping)  $A = 0.70 \times \sqrt{7.30^2 + 2.866^2}$ 5.490m<sup>3</sup> 3) base concrete  $V = 6.20 \times 18.20 \times 0.10$ 11.283m3 4) base(curusherran)  $V = 6.20 \times 18.20 \times 0.20$ 22,568 m<sup>3</sup>



5) excavation

earth  $V = 3.80/6 \{18.20 \times 620 + 22.00 \times 1000 + (18.20 + 22.00) (620 + 1000)\}$ 

remain  $V = 11.283 + 22.568 + 6.00 \times 18.00 \times 1.00$ 

 $+1.30 \times 18.00 \times 2.50$ 

backfill V=623.250-200,352

=200.352 in<sup>3</sup>

= 623,250 m<sup>3</sup>

=42**2**.898 m³

LIST OF REINFORCED BAR --- RAILWAY Br

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
(	SUPERS	TRUCTUR	6		homewar war war war angewer and a second	<u>, , , , , , , , , , , , , , , , , , , </u>	: :
1	Y16	10000	311	1,579	15.79	4911	ediculus dimensis (Parchy III per menyer) me
2	Y 1 2	9500	323	0.888	8.44	2726	-
3	716	6720	114	1.579	10.61	1210	
4		5570	102		8.80	906	
5	"	2500	20	"	3.95	7 9	
6		1790	368		2.83	1041	
7		2370	18	"	3.74	67	
8 - 1	Y 1 2	10000	280	0.888	8.88	2486	
8 - 2	<i>"</i>	9350	140	" .	9.30	1302	
		·			·.	14728	kg
							<u> </u>
1-1	Y 3 2	10000	180	6.313	63.13	11363	
1 - 2	"	7940	72		50.13	3609	
2	<i>w</i> -	10000	72	"	63.13	4545	· ,
3-1	Y 3 2	10000	180	"	63.13	11363	
3 – 2	,,	7160	72	"	45.20	3254	
4-1	"	10000	72	"	63.13	4545	
4 - 2	"	5210	72	"	32.89	2368	
5-1	Y12	10000	180	0.888	8.88	1598	ļ
5-2	. "	4580	7 2	"	4.07	293	ļ
0 1-1	Y 1 6	3630	636	1.579	5.73	3644	-
1-2	"	1010	636	"	1.59	1011	ļ
2-1	Y12	3500	420	0.888	3.11	1306	
2 – 2	"	890	420		0.79	3 3 2	
	"	690	468	"	0.61	285	
0 3							

LIST OF REINFORCED BAR --- RAILWAY Br

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
	SUPERS	STRUCTUR	Œ			<u></u>	
c 1-1	Y 2 5	10000	16	3.854	38.54	617	
1 - 2	"	4170	16	"	16.07	257	
2-1	"	10000	16		38.54	617	
2-2	"	5880	16	"	22.66	363	
3-1	Y 1 2	10000	24	0.888	8.88	213	
3 - 2	,,	2960	2.4	"	2.63	6 3	
C0 1	Y 1 2	3070	120	"	2.73	328	
2	"	840	120	"	0.75	90	
			***			2548	kg
· · · · · · · · · · · · · · · · · · ·							
C 4-1	Y 25	10000	9	3.854	38.54	347	
4-2	"	4170	9	"	16.07	145	
5-1	"	10000	9	,, '	38.54	347	
5-2	"	5880	9	"	22.66	204	
6-1	Y12	10000	18	0.888	8.88	160	
6 - 2	"	2960	18	"	2,63	47	
CO 3	Y 1 2	2830	90	"	2, 51	226	:
4	11	600	90	"	0.53	48	<u> </u>
	<u> </u>		···		· · · · · · · · · · · · · · · · · · ·	1524	kg
	<u> </u>						
· .		Y 3 2	<u>.</u>	41047	kg		
		Y 2 5		2897	kg		
·		Y16		12869	kg		
	<u>.</u>	Y 1 2	. <u></u>	11503	kg		
		·	<del></del>	68316	kg		
		: 		······································			
i.							
	· · · · · · · · · · · · · · · · · · ·		<del></del>			<del></del>	
			·	· · · · · · · · · · · · · · · · · · ·			
			·				
							•
	*						
					•		

LIST OF REINFORCED BAR---RAILWAY-A

	ARX	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PLECEMEIGHT	WEIGHT	REMARK
P	1	Y12	2000	284	0.888	1.78	506	
	2	*1	550	143	11	0.49	70	
	3	*1	18590	12	in .	16.51	198	
	4	"	410	33	"	Ò.36	12	
	<u> </u>	· · · · · · · · · · · · · · · · · · ·					786	kg
		· · · ·	·		·			
A_	1	Y32	5000	73	6.313	31.57	2305	·· · · · · · · · · · · · · · · · · · ·
	2	*1	6000	68		37.88	2576	
	3	Y25	6420	73	3.854	24.74	1806	
	4	"	5420	68	"	20.89	1421	
	5		11070	75		42.66	3199	· · · · · · · · · · · · · · · · · · ·
,	6		10620	6	1.579	16.77	101	
-:	7	!	1690	143		2.67	382	
_	. 8		18730	36	"	29.57	1065	
	9	Y25	19050	36	3.854	73.42	2643	· · · · · · · · · · · · · · · · · · ·
_	10	Y16	18730	4	1.579	29.57	118	
	11	Y12	1410	281	0.888	1.25	351	
-					·		15967	kg
	. 1	V10	1120	107	0 000	, ,,		
E	1	Y12	1170	137	0.888	1.04	142	
	2	Li	18590	2		16.51	33	l
		<u>:</u>			<del></del>	**	175	кg
F	1	Y25	5390	141	3.854	20.77	2929	
<u>.                                    </u>	2	Y20	3580	75	2.466	8.83	662	<u> </u>
	3	Y25	4150	143	3.854	15.99	2287	
	4		4820	75	2.466	11.89	892	
	- 5	Y16	18730	50	1.579	29.57	1479	
	6	"	1310	14	"	2.07	29	
	7		19210	6	11	30.33	182	
	8	'n	6890	6		10.88	65	
	9	Y12	2550	136	0.888	2.26	307	
				100	0.0001		8832	ke -
	<u> </u>	:						
 S	1	Y16	2880	115	1.579	4.55	523	1
s	1	Y16	2880 18590	115	1.579	16.51	523 182	
S	1 2	Y16 Y12	2880 18590	115	1.579 0.888	16.51	523 182 705	kg
S							182	kg
3			18590			16.51	182	kg
3					0.888	16,51	182	kg
5			18590 Y32		0.888	16.51	182	kg
\$			18590 Y32 Y25		0.888 4881 } 14285 }	16.51	182	kg
3			18590 Y32 Y25 Y20		0.888 4881 } 14285 } 1554 }	16,51	182	kg

LIST OF REINFORCED BAR---RAILWAY-AI---WING

MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REWARK
RIG	HT			A AMERICAN CONTRACTOR OF THE PARTY OF THE PA	*		
W 1	Y16.	3740	6	1.579	5.91	25	
2	1)	4770		11			
3	: 11	3740		11			
4	11	4770	30	tr		i	<del></del>
5	t+	12380	11	ŧ,			
6	Y12	12180	11	0.888	: "		•
7	<u>Y</u> 16	860	1.0				····
8	11	870	35	11			
9	11	1240	5	i i			· · · · · · · · · · · · · · · · · · ·
10	I†	3020	29	11			
11		2500	5	11			
12	Y12	610	43	0.888			
						· — · · · · · · · · · · · · · · · · · ·	kg
		Y16		967 k	g		
		Y12		142 k	g	_	
		計		1109 k	(g		
			<u> </u>				
LEF	7						
W 1	Y16	3740	6	1.579	5.91	35	
2							
	. 11	4770	30	. 6		226	· · · · · · · · · · · · · · · · · · ·
3	)† )†		30 6	11	7.53		
		3740	6		7.53 5.91	226	
3	<b>)</b> 1	3740 4770	6 30	21	7.53 5.91 7.53	226 35 226	
3	9F	3740	6	31	7.53 5.91	226 35	
3 4 5	97 11	3740 4770 12380	6 30 11	31 33	7.53 5.91 7.53 19.55	226 35 226 215	
3 4 5 6 7	" " Y12	3740 4770 12380 12180 860	6 30 11 11	" " " " " " " " " " " " " " " " " " " "	7.53 5.91 7.53 19.55 10.82 1.36	226 35 226 215 119	
3 4 5 6 7	" " " " " " " " " " " " " " " " " " "	3740 4770 12380 12180 860 870	6 30 11 11 10 35	" " 0.888 1.579	7.53 5.91 7.53 19.55 10.82 1.36	226 35 226 215 119	
3 4 5 6 7 8 9	" " " " " " " " " " " " " " " " " " "	3740 4770 12380 12180 860 870 1190	6 30 11 11 10 35	" " 0.888 1.579	7.53 5.91 7.53 19.55 10.82 1.36	226 35 226 215 119 14 48	
3 4 5 6 7 8 9 10	" " " " " " " " " " " " " " " " " " "	3740 4770 12380 12180 860 870 1190 2430	6 30 11 11 10 35 5 29	"	7.53 5.91 7.53 19.55 10.82 1.36 1.37	226 35 226 215 119 14 48	
3 4 5 6 7 8 9 10 11	" Y12 Y16 " "	3740 4770 12380 12180 860 870 1190 2430 2500	6 30 11 11 10 35 5 29	" " " " " " " " " " " " " " " " " " "	7.53 5.91 7.53 19.55 10.82 1.36 1.37 1.88 3.84 3.95	226 35 226 215 119 14 48 9 111 20	
3 4 5 6 7 8 9 10	" " " " " " " " " "	3740 4770 12380 12180 860 870 1190 2430	6 30 11 11 10 35 5 29	" 0.888 1.579 " "	7.53 5.91 7.53 19.55 10.82 1.36 1.37 1.88	226 35 226 215 119 14 48 9 111 20 23	kg
3 4 5 6 7 8 9 10 11	" Y12 Y16 " "	3740 4770 12380 12180 860 870 1190 2430 2500	6 30 11 11 10 35 5 29	" " " " " " " " " " " " " " " " " " "	7.53 5.91 7.53 19.55 10.82 1.36 1.37 1.88 3.84 3.95	226 35 226 215 119 14 48 9 111 20	kg
3 4 5 6 7 8 9 10 11	" Y12 Y16 " "	3740 4770 12380 12180 860 870 1190 2430 2500 610	6 30 11 11 10 35 5 29	" 0.888 1.579 " " " 0.888	7.53 5.91 7.53 19.55 10.82 1.36 1.37 1.88 3.84 3.95 0.54	226 35 226 215 119 14 48 9 111 20 23	kg
3 4 5 6 7 8 9 10 11	" Y12 Y16 " "	3740 4770 12380 12180 860 870 1190 2430 2500 610	6 30 11 11 10 35 5 29	" 0.888 1.579 " " 0.888	7.53 5.91 7.53 19.55 10.82 1.36 1.37 1.88 3.84 3.95 0.54	226 35 226 215 119 14 48 9 111 20 23	kg
3 4 5 6 7 8 9 10 11	" Y12 Y16 " "	3740 4770 12380 12180 860 870 1190 2430 2500 610	6 30 11 11 10 35 5 29	" 0.888 1.579 " " " 0.888	7.53 5.91 7.53 19.55 10.82 1.36 1.37 1.88 3.84 3.95 0.54	226 35 226 215 119 14 48 9 111 20 23	kg
	RIG W 1 2 3 4 5 6 7 8 9 10 11 12	RIGHT  W 1 Y16 2 " 3 " 4 " 5 " 6 Y12 7 Y16 8 " 9 " 10 " 11 " 12 Y12	RIGHT  W 1 Y16 3740 2 " 4770 3 " 3740 4 " 4770 5 " 12380 6 Y12 12180 7 Y16 860 8 " 870 9 " 1240 10 " 3020 11 " 2500 12 Y12 610  LEFT	RIGHT  W 1 Y16 3740 6 2 " 4770 30 3 " 3740 6 4 " 4770 30 5 " 12380 11 6 Y12 12180 11 7 Y16 860 10 8 " 870 35 9 " 1240 5 10 " 3020 29 11 " 2500 5 12 Y12 610 43  LEFT	RIGHT  W 1 Y16 3740 6 1.579 2 " 4770 30 " 3 " 3740 6 " 4 " 4770 30 " 5 " 12380 11 " 6 Y12 12180 11 0.888 7 Y16 860 10 1.579 8 " 870 35 " 9 " 1240 5 " 10 " 3020 29 " 11 " 2500 5 " 12 Y12 610 43 0.888   Y16 967 F  Y12 142 F	RIGHT  W 1 Y16 3740 6 1.579 5.91 2 " 4770 30 " 7.53 3 " 3740 6 " 5.91 4 " 4770 30 " 7.53 5 " 12380 11 " 19.55 6 Y12 12180 11 0.888 10.82 7 Y16 860 10 1.579 1.36 8 " 870 35 " 1.37 9 " 1240 5 " 1.96 10 " 3020 29 " 4.77 11 " 2500 5 " 3.95 12 Y12 610 43 0.888 0.54   LEFT	RIGHT  W 1 Y16 3740 6 1.579 5.91 35 2 " 4770 30 " 7.53 226 3 " 3740 6 " 5.91 35 4 " 4770 30 " 7.53 226 5 " 12380 11 " 19.55 215 6 Y12 12180 11 0.888 10.82 119 7 Y16 860 10 1.579 1.36 14 8 " 870 35 " 1.37 48 9 " 1240 5 " 1.96 10 10 " 3020 29 " 4.77 138 11 " 2500 5 " 3.95 20 12 Y12 610 43 0.888 0.54 23   Y16 967 kg  Y12 142 kg 5 1109 kg

LIST OF REINFORCED BAR---RAILWAY-PIER

MAR	K	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PLECEWEIGHT	WEIGHT	REMARK
		(P)						
В	1	Y25	16350	4	3.854	63.01	252	
	2	"	6000	4	ft	23.12	92	
	3	Y20	15150	6	2.466	37.36	224	
	4	Y16	2360	31	1.579	3.73	116	
	5	11	600	31	, ti	0.95	' 29	· ·
	6	4	880	12	п	1.39	17	
,			<u></u>				730	kg
3	1	Y32	7650	240	6.313	48.29	11590	
	2	Y16	6860	96	1.579	10.83	1040	
	3	11	1540	240	11	2.43	583	
					<del>-</del> 1		13213	kg
F	1	Y25	6100	71	3.854	23.51	1669	
	2	Y16	4820	71	1.579	7.61	540	
···	3	Y20	16320	19	2.466	40.25	765	
·	4	Y12	14640	19	0.888	13.00	247	
	5	Y16	14950	4	1.579	23.61	94	
	6	13	4860	6	11	7.67	46	
	7	11	2280	196_	11	3.60	706	
1		**		: · · · · · · · · · · · · · · · ·			4067	kg
• •			Y32		11590	ζg		
			Y25		2013	rg		
		·	Y20		989	κg		
100			Y16		3171	rg		
			. Y12		247 1	₹g		-
	·		•		18010 1	₹g		
		1.554				<del> </del>		

LIST. OF REINFORCED BAR --- RAILWAY-PIER

MA	RK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMARK
e,		®	AND THE PERSON NAMED OF TH			<del></del>	. <del></del>	
В	1	Y25	16350	4	3.854	63.01	252	
	2	11	6000	4	" .	23.12	92	
	3	Y20	15150	6	2.466	37.36	224	
	4	Y16	2360	31	1.579	3.73	116	
	5	11	600	31	n	0.95	29	
	6	11	880	12	11	1.39	17	
							730	kg
С	1	Y32	8150	240	6.313	51.45	12348	
	2	Y16	6860	100	1.579	10.83	1083	
	3	.,	1540	252	"	2.43	612	
	·····		·			·	14043	kg
					<b>_</b>	······		
F	1	Y25	6100	71	3.854	23.51	1669	
	2	Y16	4820	71	1.579	7.61	5.40	
	3	Y20	16320	19	2.466	40.25	765	
	4	Y12	14640	19	0.888	13.00	247	
	5	Y16	14950	4	1.579	23.61	94	
	6	)1	4860	6	11	7.67	46	
	7	"	2280	196		3.60	706	
	·		· · ·				4067	kg
				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		· · · · · · · · · · · · · · · · · · ·		
	· · · · · · · · · · · · · · · · · · ·		Y32		12348	kg		
			Y25		2013	kg		
			Y20	Waliofali waliowan white chalande www.d	989	kg		
· · · · · · · · · · · · · · · · · · ·			Y16		3243	kg		
	·		Y12		247	kg		
			•		18840	kg		

LIST OF REINFORCED BAR --- RAILWAY -- A2

	1		THE RESIDENCE AND ADDRESS OF THE PARTY NAMED IN COLUMN		·			
•	MARK	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PIECEWEIGHT	MEIGHT	REMARK
-			·					
	<u> </u>							
	P 1	1	2000	236	0.888	1.78	420	
	2	7	550	115	н	0.49	56	
	3	"	18290	2	"	16.24	32	
	4		410	28	<u> </u>	0.36	10	
•	<del></del> -	·	<del></del>			:	518	kg
		11		· · · · · · · · · · · · · · · · · · ·	,i	· · · · · · · · · · · · · · · · · · ·		· .
	<u> </u>	Y32	5000	60	6.313	31.57	1894	
	2	11	6000	57	n	37.88	2159	
	3	Y25	5430	60	3.854	20.93	1256	
	4	"	4430	57	- 11	17.07	973	
	5	"	9210	62	11	35.50	2201	
	6	Y16	9070	6	1.579	14.32	86	
	7		1690	119	11	2.67	318	
	8		18430	27	11	29.10	786	
	9		18750	27	3.854	72.26	1951	
	10	1.	18430	4	1.579	29.10	116	
	11		1410	182	0.888	1.25	228	
••	<del></del>			102		<u>1.60</u> _	11968	lr or
							11300	ng
	E 1	Y12	1170	56	0.888	1.04	58	
	2	ĺ	18290	2	"	16.24	32	
			10230		L1	10.24	90	le et
							90	ng
	F 1	Y25	1200	117	2 054	16.88	1975	
	1		4380	117	3.854			
	2	]	3580 4150	62	2.466	8.83	547	
			4150					
	3	1		119	3.854	15.99	1903	
	4	Y20	4300	62	2.466	10.60	657	
	4 5	Y20 Y16	4300 18430	62 39	2.466 1.579	10.60	657 1135	
	4 5 6	Y20 Y16 "	4300 18430 1350	62 39 12	2.466 1.579	10.60 29.10 2.13	657 1135 26	
	4 5 6	Y20 Y16 "	4300 18430 1350 18910	62 39 12 6	2.466 1.579 "	10.60 29.10 2.13 29.86	657 1135 26 179	
	4 5 6 7 8	Y20 Y16 "	4300 18430 1350 18910 6390	62 39 12 6	2.466 1.579 "	10.60 29.10 2.13 29.86 10.09	657 1135 26 179 61	
	4 5 6	Y20 Y16 "	4300 18430 1350 18910	62 39 12 6	2.466 1.579 "	10.60 29.10 2.13 29.86	657 1135 26 179 61 405	
	4 5 6 7 8	Y20 Y16 "	4300 18430 1350 18910 6390	62 39 12 6	2.466 1.579 "	10.60 29.10 2.13 29.86 10.09	657 1135 26 179 61	kg
	4 5 6 7 8	Y20 Y16 "	4300 18430 1350 18910 6390	62 39 12 6	2.466 1.579 "	10.60 29.10 2.13 29.86 10.09	657 1135 26 179 61 405	kg
	4 5 6 7 8	Y20 Y16 ""	4300 18430 1350 18910 6390	62 39 12 6	2.466 1.579 "	10.60 29.10 2.13 29.86 10.09 2.10	657 1135 26 179 61 405	kg
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360	62 39 12 6 6	2.466 1.579 " " " 0.888	10.60 29.10 2.13 29.86 10.09 2.10	657 1135 26 179 61 405 6888	kg
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360	62 39 12 6 6 193	2.466 1.579 " " 0.888	10.60 29.10 2.13 29.86 10.09 2.10	657 1135 26 179 61 405 6888	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360	62 39 12 6 6 193	2.466 1.579 " " 0.888	10.60 29.10 2.13 29.86 10.09 2.10	657 1135 26 179 61 405 6888 510 179	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360	62 39 12 6 6 193	2.466 1.579 " " 0.888	10.60 29.10 2.13 29.86 10.09 2.10 4.55 16.24	657 1135 26 179 61 405 6888 510 179	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360 2880 18290	62 39 12 6 6 193	2.466 1.579 " " 0.888 1.579 0.888	10.60 29.10 2.13 29.86 10.09 2.10 4.55 16.24	657 1135 26 179 61 405 6888 510 179	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360 2880 18290	62 39 12 6 6 193	2.466 1.579 " " 0.888 1.579 0.888	10.60 29.10 2.13 29.86 10.09 2.10 4.55 16.24	657 1135 26 179 61 405 6888 510 179	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360 2880 18290 Y32 Y25 Y20	62 39 12 6 6 193	2.466 1.579 " " 0.888 1.579 0.888 4053	10.60 29.10 2.13 29.86 10.09 2.10 4.55 16.24	657 1135 26 179 61 405 6888 510 179	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360  2880 18290  Y32 Y25 Y20 Y16	62 39 12 6 6 193	2.466 1.579 " " 0.888 1.579 0.888 4053 1 10259 1 1204 1	10.60 29.10 2.13 29.86 10.09 2.10 4.55 16.24	657 1135 26 179 61 405 6888 510 179	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360  2880 18290  Y32 Y25 Y20 Y16 Y12	62 39 12 6 6 193	2.466 1.579 " " 0.888  1.579 0.888  4053 10259 1204 3217 1420	10.60 29.10 2.13 29.86 10.09 2.10 4.55 16.24	657 1135 26 179 61 405 6888 510 179	
	4 5 6 7 8 9	Y20 Y16 " " Y12	4300 18430 1350 18910 6390 2360  2880 18290  Y32 Y25 Y20 Y16	62 39 12 6 6 193	2.466 1.579 " " 0.888 1.579 0.888 4053 1 10259 1 1204 1	10.60 29.10 2.13 29.86 10.09 2.10 4.55 16.24	657 1135 26 179 61 405 6888 510 179	

LIST OF REINFORCED BAR --- RAILWAY -- A2 --- WING

		the second	DIAMETER		T	UNITWEIGHT	PLECEMEIGHT	HEIGHT	ING Remark
A	)	RIC	HT		1				
		W 1	1	10960	2	1 650			
		2	!	11420	9	1.579 3.854	17.31	35	· <del>-</del> ····
4 .		. 3	!	7140	12	"	27.52	396	
		:4	Y20	4310	9	2.466	10.63	330	
	Ì	5		4390	24	3.854	16.92	96	
4			!!!	11320	9	2.466	27.92	406 251	
		7		7220	12	"	17.80		
		8		4310	9	11	10.63	214	<del></del>
		9	1	11380	10		28.06	96 281	···
÷		10	",	5000	5	0.	12.33	62	
		11	!	3920	22		9.67	213	
		12		11190	10	1.579	17.67	177	
	•	13	1	3960	23	"	6.25	144	<u> </u>
•		14		10000	2	"	15.79	32	<u> </u>
	: ,. }	15		1090	22	.,	1.72	38	
		16	,	1050	20	"	1.66	33	
	.	17	1	1070	10		1.69	17	
		18	1 1	2500	4	3.854	9.64	39	
		19		3650	26	"	14.07	366	
		20	3	3000	4	"	11.56	46	
	1	21		810	50	0.888	0.72	36	
;			,	· .		I		3308 1	CE.
						:		:	
				Y25		1583 k	g		
				Y20		1213 k			
				Y16		476 k			
	.			Y12		36 k			
	•	1.1	1.	-:		3308 k			, , , , , , , , , , , , , , , , , , , ,
		: f :							
8,	1(1	LEF	T			31 °	-		
		W 1	Y16	3240	2	1.579	5.12	10	
		2	"	3220	10	11	5.08	51	
		3		4260	52	",	6.73	350	
		<u>×</u>	11	11230	9	,,	17.73	160	
		5	Y12	11030	. 9	0.888	9.79	88	
		6	Y16	860	8	1.579	1.36	11	·
	.	7	1.0	1400	5	. "	2.21	11	
		8	,,	3020	26	"	4.77	124	
		9	"	2500	5	"	3.95	20	
	f	10		870	32	,,	1.37	44	
		11	Y12	610	30	0.888	0.54	16	
			116	VIV_				885	kg
				<del></del>					
• ,			<del></del>	Y16		781 k	e .		
				Y12		104 k			<del></del>
	-			116		885 k			
						000 11	<del></del>		
	1.							***********	

LIST OF REINFORCED BAR -- RAILWAY- (WALL (1)

MAR		DIAMETER		·	T	··RAILWAY-		(1)
MAK	, A	DIAMETER	LENGTH	NUMBAR	UNITWEIGHT	PLECEMETOHT	WEIGHT	XRAMER
		· · · · · · · · · · · · · · · · · · ·		r				
W	_1	Y25	5430	66	3.854	20.93	1381	
	2	. 11	4750	33	н.	18.31	604	
	3	) t	8660	1_	H	33.38	33	
	4	Y20	5490	69	2.466	13.54	934	
	5	Y16	850	68	1.579	1.34	91	
	6	11	1000	1	"	1.58	2	
	7		830	3	11	1.31	4	
	8	. 0	1090	25	"	1.72	43	
	9	- 16 ,	21030	7	и	33.21	232	
	10		15310	9	) i	24.17	218	
- :	11	.,	5750	10	н	9.08	91	
	12	Y12	21120	7	0.888	18.75	131	
	13	jed g <sup>ir</sup> s	15750	9	н	13.99	126	
	14		6000	10	.,	5.33	53	
	15		700	107		0.62	66	
<u></u>	· -	· · · · · · · · · · · · · · · · · · ·		·			4009	kg
- 4		· · ·	· · · · · · · · · · · · · · · · · · ·					<del></del>
	_!	Y20	3250	58	2.466	8.01	465	
	2	11	2870	24	ni - ·	7.08	170	
	3	••	3790	58	11	9.35	542	
	4		1780	24		4.39	105	
	5	17	2850	10	*11 -	7.03	70	
	6	11	2460	5	11	6.07	30	<del></del>
	7	- 11	5050	1	u	12.45	12	·
	8		3120	10	"	7,69	77	
	9	ti .	1770	2	11	4.36	9	
	10	11	2500	4	0	6.17	25	
	11	Y16	21500	2	1.579	33.95	68	
	12	.16	12500	2	11	19.74	39	
	13	15	20950	10	n	33.08	331	
	14	11	13940	6	. "	22.01	132	
	15	19	5590	. 4	17	8.83	35	
· .	16	. "	17890	2	и .	28.25	57	
	17	Y20	1630	2	2.466	4.02	8	
· !	18	••	4460	2	- ,,	11.00	22	
:	19	Y16	1010	13	1.579	1.59	21	
	20	Y12	1750	70	0.888	1.55	109	<u> </u>
			·			·	2327	kg
			· · · · · · · · · · · · · · · · · · ·	_ <del></del>	*	· · · · · · · · · · · · · · · · · · ·		
	1	Y12	3100	29	0.888	2.75	80	
•	2		3120	9		2.77	25	
_	3	- 11	10800	4		9.59	. 38	<u> </u>
<del></del> -	4	اا	2850	4		2.53	10	<u></u>
							153	kg
		<del></del> ;	· · · · · · · · · · · · · · · · · · ·					
			Y25		2018 }		<del></del>	
		<del>-</del> -	Y20		2469 1			
		···	Y16		1364			
			Y12		638 1			
					6489	v.R		
					36			

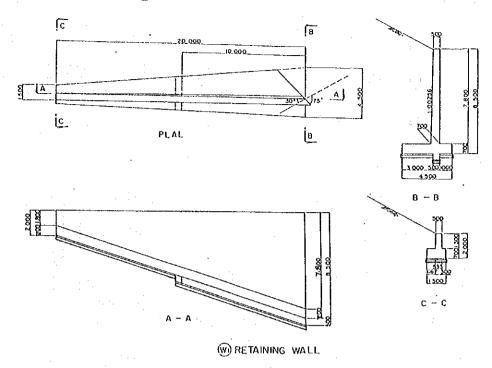
LIST OF REINFORCED BAR -- RAILWAY - (RETAINING-WALL(2)

	MARK	DIAMETER	LENGTH	RABAUN	UNITWEIGHT	PIECEWEIGHT	WEIGHT	REMAR
				4				·
	W 1	Y20	4880	34	2.466	12.03	409	
	2	",	3200	17	,,	7.89	134	
	3	Y16	4820	34	1.579	7.61	259	
	4		860	34	,	1.36	46	
	; 5		11820	2	.11	18.66	37	
	6	Y20	9880	4	2.466	24.36	97	
	7		5170	18		12.75	230	
	8	Y12	9870	4	0.888	8.76	35	
	9	ļ	5170	18	11	4.59	83	
	10	Y16_	930	22	1.579	1.47	32	
	11		850	4		1.34	5	
	12	Y12	710	46	0.888	0.63	29	
			:				1396	kg
,					r			
	<u>F 1</u>	Y20	2600	51	2.466	6.41	327	ļ <u> </u>
	2	Y16	1390	34	1.579	2.19	74	
	3	Y20	1740	51	2.466	4.29	219	
	4	Y16	2220	34	1.579	3.51	119	
	5	1	9880	6	" :	15.60	94	
	6	1	4800	5_	11	7.58	38	
	7		10000	1	11.	15.79	16	
	8		5660	<u>i</u> _		8.94	9	
	9	"	9900	1		15.63	16	
	10	Y12	9880	5	0.888	8.77	44	
	11	<u> </u>	4300	- 5		3.82	19	
	12		10000	1_	. 11	8.88	9	
	13		5660	1	. n	5.03	5	
	14	• •	9900	1	11	8.79	9	
1	15	Y16	930	12	1.579	1.47	18	
	16	Y12	1550	43	0.888	1.38	59	
			<u> </u>				1075	kg
i	<u> </u>	<del>,                                    </del>			ا نخست	Т		
	<u>K 1</u>	1	3670	17	0.888	3.26	55	<del>-</del> -
	2	<u> </u>	4870	4	н	4.32	. 17	
		<del>-                                    </del>				,	72	kg
	ļ. <del> </del>		<del></del>			· · · · · · · · · · · · · · · · · · ·	<u> </u>	
	<u> </u>	. · <del></del>	Y20		1416 }	Kg		
	<u> </u>		716		763 3	kg		
	: '	<u> </u>	Y12		364 1	(g		
	15				2543 }	(g		

LIST OF REINFORCED BAR.--RAILWAY- (WALL (3)

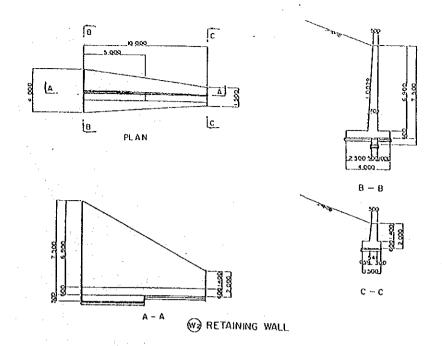
- 1					I		( WALL	···
	MARK	DIAMETER	LENGTH	NUHBAR	UN114E1CH1	PIECEWEIGHT	WEIGHT	REMARK
				<del>T</del>	r <del></del>			
İ	₩ 1	Y25	5380	54	3.854	20.73	1119	
	2	11	3500	27		13.49	364	· · · · · · · · · · · · · · · · · · ·
,	3	Y20	5360	54	2.466		714	
	· 4	Y16	860	53	1.579	1.36	72	
	5	"	870	11_	17	1.'37	1	
	6	13	17830	2	11	28.15	56	
			16400	4		25.90	104	
	8		13360	8	1)	21.10	169	
	9	"	5040	13	n	7.96	103	
	10	Y12	16420	4	0.888	i	58	
	11	"	13410	8	ti .	11.91	95	
	12		5230	13	11	4.64	60	
	13	Y16	830	4	1.579	1.31	5	
	14		920	25	11	1.45	36	
	15	Y12	720	84	0.888	0.64	54	
					·		3010 1	⟨g
		<del> </del>						·
	F 1	Y20	2240	75	2.466	5.52	414	
	2	Y16	1280	51	1.579	2.02	103	
	3	Y20	1680	75	2.466	4.14	310	
	4	Y16	1760	51	1.579	2.78	142	
	5	Y20	3480	. 6	2.466	8.58	51	
	6	Y16	1890	4	1.579	2.98	12	
	7	¥20	2250	8	2.466	5.55	44	
	8	Y16	3140	3	1.579	4.96	15	
: .	9	.,	16440	6	"	25.96	156	
	10	.,	12310	2	<b>H</b> -	19.44	39	
	11	.,,	5710	2	111	9.02	18	
	12	'n	15900	1	17	25.11	25	
	13		9350	1	.,	14.76	15	
	14		16850	l	1)	26.61	27	
	15		16300	5	0.888	14.47	72	
	16		9350	i	11	8.30	8	
Ì	17	"	16710	1	1)	14.84	15	
ı	18	11	12170	2	1)	10.81	22	
	19	"	5710	2	.,	5.07	10	
	20	.,	15760	1	и	13.99	14	
	21	Y16	1030	12	1.579	1.63	20	
	22	Y12	1750	67	0.888	1.55	104	
-					· · · · · · · · · · · · · · · · · · ·		1636	kg
		1						
	K 1	Y12	2900	27	0.888	2.58	70	
	2	.,	7880	4	17	7.00	28	
		<u>'</u> 1	_,, <u></u>	<u></u> u-			98	kg
	***************************************	. '						
İ			Y25		1483	Sg		
		····	Y20		1533 J			
ļ			Y16		1118			
l			Y12		610 }			
Ì			<del></del>		4744 1			
- 1								

## RAILWAY BRIDGE WRETAINING WALL



() concrete		
$V = 1/2 \{1/2(0.50+0.70) \times 7.80+1/2(0.50+0.533) \times 1.30\} \times 20.00$		
$+ 1/2(4.50+1.50) \times 0.70 \times 20.00+0.50^2 \times (10.00+3.00)$	=	99.573m <sup>3</sup>
UF <sub>2</sub> $A = \{1/2(4.50+1.50) - 1/2(0.70+0.533) + 0.50\} \times 20.00$		
+ 0.50 (10.00 + 3.00)	=	59. 065 m²
2) form work.		
$F_1$ (V) $A = (20.00 \times 2 + 1.50 + 2.80) \times 0.70$	=	35. 040 m²
$F_2$ (Y) $A = 1/2(7.80+1.30) \times 20.000 \times 2+1/2(0.50+0.533) \times 1.20$	=	178. 618 m
3) base concrete $V = 1/2(4.50+1.70) \times 20.20 \times 0.10$	=	5.959m <sup>3</sup>
4) base(curusherran) $V = 1/2(4.50+1.70) \times 20.20 \times 0.20$	=	11.918m³
5) joint filler $V = 1/2(0.50+0.70) \times 7.80$	=	4. 620 m²
6) water stop $Q =$	=	7.500 m

#### (W2) RETAINING WALL



I) concrete. 
$$V = 1/2 \left\{ (6.90+1.40) \times 0.56 + (4.00+1.50) \times 0.60 \right\} \times 10.00$$

$$+ 0.50^{2} \times 5.00$$

$$UP_{2} \quad A = \left\{ 1/2 (4.00+1.50) - 0.62 + 0.50 \right\} \times 10.00 + 0.50 \times 5.00$$

$$= 41.150m^{3}$$

$$= 27.500 \text{ nf}^{2}$$
2) form work.
$$P_{1} \quad (V) \quad A = (10.000 \times 2+1.50+2.30) \times 0.60$$

$$F_{2} \quad (V) \quad A = 1/2 (6.90+1.40) \times 10.00 \times 2+0.52 \times 1.40$$

$$= 83.840 \text{ nf}^{2}$$
3) base concrete
$$V = 1/2 (4.20+1.70) \times 10.20 \times 0.10$$

$$= 2.754m^{3}$$
4) base(curusherran)
$$V = 1/2 (4.20+1.70) \times 10.20 \times 0.20$$

$$= 5.508m^{3}$$
5) joint filler
$$A = 0.60 \times 6.90$$

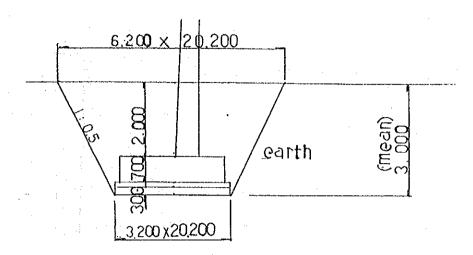
$$= 4.140 \text{ nf}^{2}$$

$$= 6.600 \text{ m}^{2}$$

where 
$$. * \frac{1}{2} \left( \frac{050 + 070}{2} + \frac{050 + 0541}{2} \right) = 0.560^{\text{M}}$$

#### RAILWAY BRIDGE - (W1) and (w2)





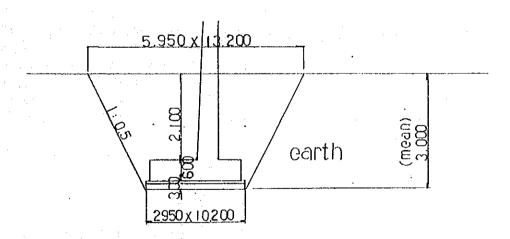
7) excavation

earth  $V = 3.00/6 \{3.20 \times 20.20 + 6.20 \times 23.20 + (3.20 + 6.20)(20.20 + 23.20)\}$  = 291.945m<sup>3</sup>

remain  $V = 5.959+11.918+1/2(4.50+1.50) \times 20.00 \times 0.70+0.558 \times 2.00 \times 20.00 = 83.081 \text{m}^3$ 

backfill V = 291.945-83.081 = 208.864 $m^3$ 

 $(y_2)$ 



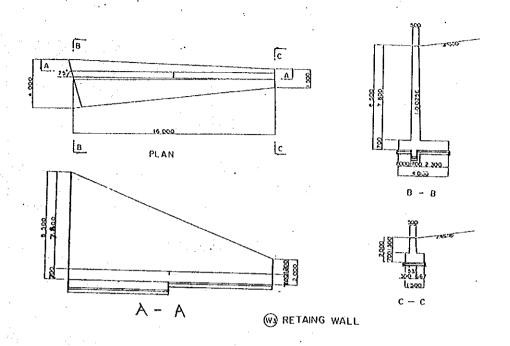
7) excavation

earth  $V = 3.00/6 \{2.95 \times 10.20 + 5.95 \times 13.20 + (2.95 + 5.95)(10.20 + 13.20)\}$  = 149.670m<sup>3</sup>

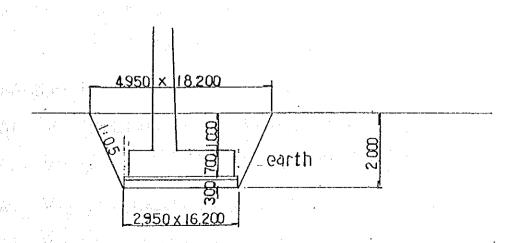
remain  $V = 2.754+5.508+ 1/2(4.00+1.50) \times 10.00 \times 0.60+0.60 \times 2.10 \times 10.00 = 35.862 m^3$ 

backfill V = 149.670-35.862 = 113.808 $m^3$ 

#### (W3) RETAING WALL

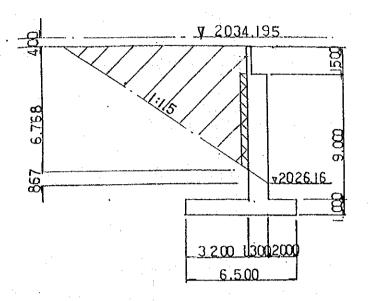


() concrete.  $V = 1/2 \{(0.50+0.70) \times 7.80/2 + (0.50+0.531) \times 1.30/2\} \times 16.00$  $+ 1/2(4.00+1.50) \times 0.70 \times 16.00+0.50^2 \times 8.00$  $79.108m^3$ UF<sub>2</sub>:  $\Lambda = \{1/2(4.00+1.50)-1/2(0.70+0.531)+0.50\} \times 16.00+0.50 \times 8.00$ 46.152 ni 2) form work.  $F_1$  (Y) $\Lambda = (16.00 \times 2+1, 50+2, 30) \times 0.70$ 28.640 m F2: (V)  $\Lambda = 1/2(7.80+1.30) \times 16.00 \times 2+1/2(0.50+0.531) \times 1.20$ 143.018 m² 3) base concrete  $V = 1/2(4.20+1.70) \times 16.20 \times 0.10$ 4.779 m 4) base (curusherran)  $V = 1/2(4.20+1.70) \times 16.20 \times 0.20$ 9.558 m² 5) joint filler  $\Lambda = 1/2(0.50+0.70) \times 7.80$ 4.620 m² 6) water stop 7.500m

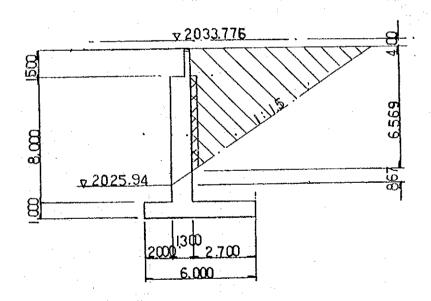


### 7) exeavation earth $V = 2.00/6 \{2.95 \times 16.20 + 4.95 \times 18.20 + (2.95 + 4.95) (16.20 + 18.20)\}$ = $136.546 \text{m}^3$ remain $V = 4.779 + 9.558 + 1/2 (4.00 + 1.50) \times 16.00 \times 0.700 + 0.558 \times 1.00 \times 16.00$ = $66.372 \text{m}^3$ backfill V = 136.546 - 66.372 = $70.174 \text{m}^3$

# RAILWAY - ABUTMENT AI --- BACKFILL.



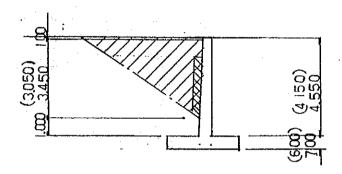
## A2---BACK-FILL



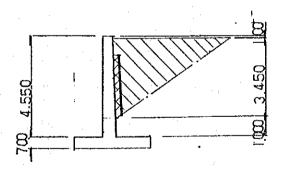
#### BACK-FILL

A1: 
$$V = \frac{1}{2} \times 6.768^2 \times 1.5 \times (18.30 - 0.517 \times 2) = 593.2^{\text{m}^3}$$
  
A2:  $V = \frac{1}{2} \times 6.569^2 \times 1.5 \times (18.00 - 0.517 - 0.724) = 542.4^{''}$   
W1:  $V = \frac{1}{2} \times 3.450^2 \times 1.5 \times 20.00 = 178.6^{''}$   
W2:  $V = \frac{1}{2} \times 3.050^2 \times 1.5 \times 10.00 = 74.4$   
W3:  $V = \frac{1}{2} \times 3.450^2 \times 1.5 \times 16.00 = 142.9$   
= 1531.5

RAILWAY - ABUTMENT
RETAINING --- BACK-FILL
'WI (W2)



 $W_3$ 



```
= 187.000 \text{ m}^2 56.100 \text{m}^3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 = 275.432 \text{ m}^2 82.630 \text{m}^3
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     = 80.021 m
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       A = (6.77 - 1.50 - 0.30) \times 17.264 + (6.57 - 1.50 - 0.30) \times 16.757
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        drain pipe (\phi75mm)N = (17.264/5.00+1)+(16.757/5.00+1)+(20.00/5.00+1)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               +2.45 \times 20.00 + 2.15 \times 10.00 + 2.45 \times 16.00 (\times 0.300)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  perforated pipe L = 17.264 + 16.757 + 20.00 + 10.00 + 16.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (10.00 \times 5.00 + 1) + (16.000 \times 5.00 + 1)
                                                                                                                                                                                                                                                                                                                                       porous drainage A = 20.50 \times 1.0457 \times 5.50 \times 2(\times 0.300)
                                                                                                                                                                                                                                                                                                                                                                                                                                                   drain pipe(\phi75mm)N = (20.50×1.0457/5.00+1)×2
                                                   porous drainage A = 17.00 \times 5.50 \times 2(\times 0.300)
                                                                                                                                                                 drain pipe (\phi.75 \text{mm})N = (17.00 / 5.00 + 1) \times 2
                                                                                                                                                                                                                                                                                                                                                                                             perforated pipe L = 20.50 \times 1.0457 \times 2
                                                                                                        perforated pipe L = 17.00 \times 2
                                                                                                                                                                                                                                                                                 UHURU MONUMENT, Ju, BRIDGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 porous drainage
MOMBUSA, Ju. BRIDGE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Railway bridge
```

#### B. Q 21.01 Waterproofing materials

total

```
Mombasa, Ju. bridge
super structure: A = 56.940 \times 17.00 + 17.00 \times 3.00 \times 2 \times 2
                                                                                                 = 1171, 980 m<sup>2</sup>
                A1: A = (18.30 - 2 \times 0.70) \times 8.20
                           +(8.455+8.413)\times 2.40+(8.413-2.328+0.817)\times 7.70
                                                                                                 = 232, 208 "
                A2: A = (18.30 - 2 \times 0.70) \times 8.20
                             +(8.461+8.471)\times 2.40+(8.471-2.307+0.865)\times 8.00
                                                                                                   = 235.448 "
                   total
                                                                                                 = 1639.636 m²
llhuru momument Ju. bridge
super structure: A = 37.95 × 20.50 + 20.50 × 3.00 × 2 × 2
                                                                                                 = 1023.975 m<sup>2</sup>
sub " A1: A = (22.70-2\times0.70\times1.0403)\times8.20
                           + (8.455 + 8.413) \times 2.40 + (8.413 + 2.328 + 0.817) \times 7.70
                                                                                                 = 267.826 "
                A2: A = (22.70 - 2 \times 0.70 \times 1.0403) \times 8.20
                             +(8.461+8.471)\times 2.40+(8.471-2.307+0.865)\times 8.00
                                                                                                 = 271.066 "
                   total
                                                                                                 = 1562.867 m
Rail way bridge
super structure: A = 56.790 \times 11.90 + 9.00 \times 1.3151 \times 3.00 \times 2 \times 2
                                                                                                 = 817.832 m²
sub " A1: A = (18.30-2\times0.50\times1.03528)\times10.50
                            +0.50\times10.5\times3.20\times1.03528\times2
                                                                                                 = 216.068 "
              A2: A = \{18.00 - (0.50 + 0.70) \times 1.03528\} \times 9.50 + 2.70 \times 9.50 \times 0.50 \times 1.03528
                          +\frac{1}{2} (9.70+9.43) × 2.70+ \frac{1}{2} (6.564+0.967) × 7.30
                                                                                                 = 225.792 "
           W1 \sim W3: A = \frac{1}{2} (7.70+1.20)×16.00+ \frac{1}{2} (1.20+7.70)×20.00
                                                          +\frac{1}{2} (1. 20 + 7. 70) × 10. 00
                                                                                                  = 204.70 "
```

 $= 1364.392 \text{ m}^2$ 

Mombasa, Ju, brid	ge		
approach slab			
	$V = 3.00 \times 0.20 \times 17.00 \times 2$		$= 20.400 \text{ m}^3$
	$\Lambda = 3.00 \times 17.00 \times 2$		= 102.00 m²
joint, filler	$A = 0.20 \times 17.00 \times 2$		$= 6.800 \text{ m}^2$
		4	
Sub, structure		•	
	$Y = 0.30 \times 0.30 \times 17.00 \times 2$		$= 3.060 \text{ m}^3$
form work	$\Lambda = (0.30 + 0.30) \times 17.00 \times 2$		= 20.400 m <sup>2</sup>
Uhuru moment Ju	bridge		
approach slab			•
concrete:	$Y = 3,00 \times 0,20 \times 20,50 \times 1,0457 \times 2$		$= 25.725 \text{ m}^3$
UF2	$\Lambda = 3.00 \times 20.50 \times 1.0457 \times 2$		= 128.621 m
joint filler	$A = 0.200 \times 20.50 \times 1.0457 \times 2$		= 8.574 m <sup>2</sup>
Sub, structure			4
concrete:	$V = 0.30 \times 0.30 \times 20.50 \times 1.0457 \times 2$		$= 3.858 \text{ m}^3$
form worle	$\Lambda = (0.30 \pm 0.30) \times 20.50 \times 1.0457 \times 2$		= 25.724 m²
		•	
Railway bridge			•
approach slab	A CARAGO TANGO NECESSARIA NO PERSONAL DE LA CARAGO DE LA CARAGO DE LA CARAGO DE LA CARAGO DE LA CARAGO DE LA C		11.000.3
	$V = 3.00 \times 0.20 \times 9.00 \times 1.3151 \times 2$		$= 14.203 \text{ m}^3$
and the second of the second	$\Lambda = 3.00 \times 9.00 \times 1.3151 \times 2$		= 71.015 m
joint filler	$\Lambda = 0.20 \times 9.00 \times 1.3151 \times 2$		= 4.734 m
Sub, structure			
concrete:	$y = 0.30 \times 0.30 \times 9.00 \times 1.3151 \times 2$		$= 2.130 \text{ m}^3$
	$\Lambda = (0.30 + 0.30) \times 9.00 \times 1.3151 \times 2$		= 14.203 m²
The second secon			

MORTAR OF SHOE --- THE CALCULATION BE ABRIDGE TO A LITTLE.