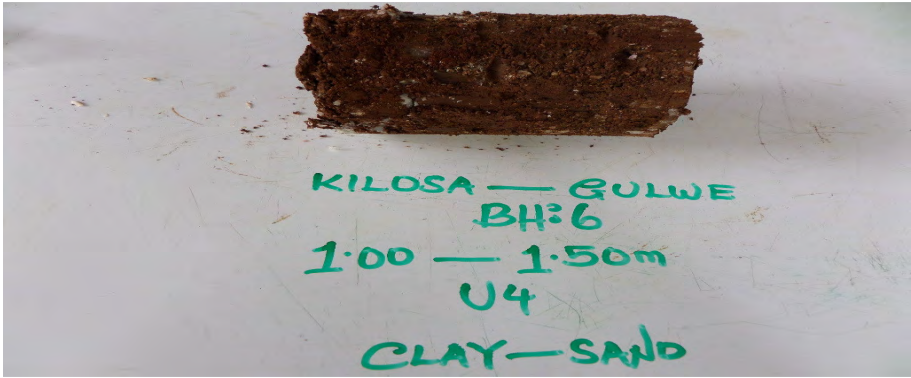









## PHOTOS BH6





0.00m-1.95m	
1.95m-3.95m	
3.95m-4.90m	
4.90m-6.70m	

## PHOTOS BH6





6.70m-7.00m	
7.00m-8.00m	
8.00m-8.50m	
8.50m-9.90m	



## PHOTOS BH6





9.90m-10.50m	
10.50m-11.90m	
11.90m-12.70m	
12.70m-13.50m	

## PHOTOS BH6

13.50m-14.00m	
14.70m-15.50m	
15.50m-17.00m	
17.00m-18.00m	



## PHOTOS BH6


18.00m-19.00m	
19.00m-20.00m	
20.00m-21.00m	
21.00m-22.00m	

## BOREHOLE 6 PICS

Depth	Observations	Picture
6.7 – 7.0m	<ul style="list-style-type: none"> <li>• Part translucent part white Quartzite</li> <li>• Medium to coarse grained</li> <li>• Hard</li> <li>• Distinctly different from dark grey rock below it.</li> </ul>	
8.0 – 12.7m	<ul style="list-style-type: none"> <li>• Dark grey lineated rock, steeply dipping 30 - 60 deg.</li> <li>• Mylonitic tendency at some depths.</li> <li>• <b>Amphibolite</b> facies.</li> <li>• Fine to medium grained gneiss</li> <li>• Occasional Quartz lenses 20 to 40mm thick</li> <li>• High mica concentration</li> </ul>	
13.5 – 14.0m	<ul style="list-style-type: none"> <li>• Grey medium grained rock</li> <li>• Less obviously foliated, more quartz / feldspar</li> </ul>	



## BOREHOLE 6 PICS

Depth	Observations	Picture
14.7 – 22.0m	<ul style="list-style-type: none"> <li>• Similar to rock formation 8-12.7m deep.</li> <li>• Dark grey banded and lineated rock steeply dipping upto 70 deg.</li> <li>• Fine to medium grained.</li> <li>• <b>Mylonitic</b> tendency.</li> <li>• <b>Amphibolite</b> facies</li> <li>• Occasional Quartz lenses 20 to 40mm thick</li> <li>• High mica concentration.</li> <li>• Some widely spaced filled joints crossing the foliation.</li> </ul>	



**DRILLING METHOD:** Rotary Drilling

**B/HOLE NO:** BH07

**PROJECT NO:** S0820

**BORE DATE:** 18 - 20Mar/15

**FIELD SUPERVISOR:** V.S

**NORTHING:** 9276 368.3

**SURFACE ELEVATION:** 736

**EASTING:** 232 655.0

**CHECKED BY:** J.N

ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS
736	0.0				(0.0 to 0.5) Stiff Reddish brown silty organic soil			
735	1.0	U4	SC G.S.F = 01.82.17 PI = 9		(0.5 to 3.0) Reddish brown sandy CLAY	16,17,14		Relatively dry upto 4.5m depth
734	2.0							
733	3.0				(3.0 to 4.5) Reddish brown SILT	12,25,30		
732	4.0							
731	5.0	U4	SW-SC G.S.F = 21.70.10 PI = 22		(4.5 to 12.0) Reddish brown Silty SAND	11,15,16		Drilling stopped at 5m. Resumed 19/03
730	6.0							
729	7.0					12,14,18		
728	8.0							
727	9.0					9,8,14		
726	10.0							
725	11.0					12,14,14		Drilling stopped at 11m. Resumed 20/03
724	12.0				(12.0 to 13.0) Weathered Rock			
723	13.0				(13.0 to 18.0) Intact Rock			
722	14.0							
721	15.0							





**LOCATION:** BH07

**CLIENT:** PADECO Co. Ltd

**DRILLING METHOD:** Rotary Drilling

**B/HOLE NO:** BH07

**PROJECT NO:** S0820

**BORE DATE:** 18 - 20Mar/15

**FIELD SUPERVISOR:** V.S

**NORTHING:** 9276 368.3

**SURFACE ELEVATION:** 736

**EASTING:** 232 655.0

**CHECKED BY:** J.N

ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS
720	16.0			[Pattern]			0      50	
719	17.0							
718	18.0							

**Project** PREP. SURVEY ON FLOOD PROTECTION FOR CENTRAL RAILWAY

**Client** PADECO Co. Ltd  
**Location** KILOSA GULWE  
**Coordinates** 9276368.3N  
 232655E

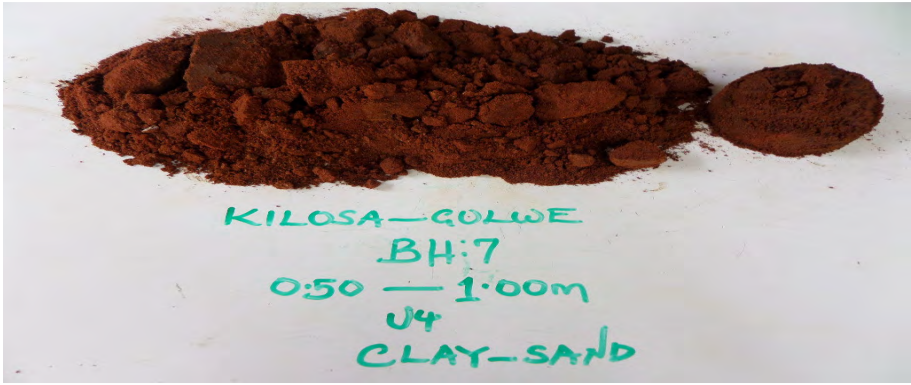



**B/Hole No.** BH 07  
**Elevation** 736m  
**Date** 02 Mar 2015  
**Logged By** VS





Down Hole Depth (m)	Elevation	Lithology	LITHOLOGIC DESCRIPTION	Degree of Weathering	Strength Data			Discontinuity Data			Core Run depth, m	TCR %	SCR %	RQD %
					UCS MPa	Is (50)	Hardness	Dip Angles		Type				
13	723		(13 - 18) Ortho Gneiss	IV		19	R2				14	99	23	23
14	722			III			R3				15	99	81	82
15	721			II			R4				16	99	77	76
16	720			II			R3				17	99	73	73
17	719			II			R4				18	99	80	80
18	718													

Hardness: R0 = Extremely weak, R1 = Very weak, R2 = Weak, R3 = Medium Strong, R4 = Strong, R5 = Very Strong, R6 = Extremely Strong  
 Weathering: I = Fresh, II = Slightly, III = Moderately, IV = Highly, V = Completely, VI = Residual  
 TCR = Total Core Recovery, SCR = Solid core recovery, RQD = Rock Quality Designation,  
 UCS = Unconfined compressive Strength, Is(50) = Adjusted Point Load Strength



0.00m-8.50m	 <p>KILOSA-GOLWE BH:7 0.50 — 1.00m U4 CLAY-SAND</p>
13.00m-14.00m	 <p>BOREHOLE 7 ROCK 13.00M-14.00M</p>
14.00m-15.00m	 <p>BOREHOLE 7 ROCK 14.00M-15.00M</p>
15.00m-16.00m	 <p>BOREHOLE 7 ROCK 15.00M-16.00M</p>

<p>16.00m-17.00m</p>	
<p>17.00m-18.00m</p>	

## BOREHOLE 7 PICS

Depth	Observations	Picture
13.0 – 15.0m	<ul style="list-style-type: none"> <li>• Distinctly banded <b>gneiss</b> predominantly dark grey or black. Orthogneiss, granulite.</li> <li>• Medium to coarse grained</li> <li>• Foliations dipping more than 20 to 60 deg.</li> <li>• Mica present</li> <li>• Some Quartzite intrusions.</li> </ul>	
15.0 – 18.0m	<ul style="list-style-type: none"> <li>• As above</li> </ul>	





**DRILLING METHOD:** Rotary Drilling

**B/HOLE NO:** BH08

**PROJECT NO:** 303713

**BORE DATE:** 12 - 15Mar/15

**FIELD SUPERVISOR:** V.S

**NORTHING:** 9282.245.6

**SURFACE ELEVATION:** 770

**EASTING:** 222 325.4

**CHECKED BY:** J.N

ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS
770	0.0				(0.0 to 12.5) Very erodible silty SANDS. Deep riverine sediments			
769	1.0	U4	SM G.S.F = 00.53.47 PI = NP			5,5,6		Relatively dry borehole
768	2.0							
767	3.0					5,9,9		
766	4.0							
765	5.0	U4	CL G.S.F = 00.45.55 PI = 9			8,11,12		
764	6.0							
763	7.0					4,6,7		
762	8.0							Drilling stopped at 7.5m. Resumed 13/03
761	9.0	U4	SM G.S.F = 01.75.25 PI = NP			8,12,11		Perched water table 7.5m to 11m. Water seeping from nearby river.
760	10.0							
759	11.0					10,9,8		
758	12.0							
757	13.0	U4	SC G.S.F = 02.60.38 PI = 14		(12.5 to 15.7) Brown SAND with quartz	11,14,17		
756	14.0							
755	15.0					12,16,14		Drilling stopped at 15m. Resumed 14/03



LOCATION: BH08

CLIENT: PADECO Co. Ltd

DRILLING METHOD: Rotary Drilling

B/HOLE NO: BH08

PROJECT NO: 303713

BORE DATE: 12 - 15Mar/15

FIELD SUPERVISOR: V.S

NORTHING: 9282.245.6

SURFACE ELEVATION: 770

EASTING: 222 325.4

CHECKED BY: J.N

ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS
754	16.0				(15.7 to 20.0) Weak rock formations interbedded with stiff clayey SANDS		0 50	
753	17.0							
752	18.0					35/4cm		SPT refusal (>50 blows)
751	19.0							
750	20.0				(20.0 to 26.8) Intact Rock. Gneiss	40/6cm		SPT refusal (> 50 blows)
749	21.0						0 50	
748	22.0							
747	23.0							Drilling stopped at 23m. Resumed 15/03
746	24.0							
745	25.0							
744	26.0						0 50	

**Project** PREP. SURVEY ON FLOOD PROTECTION FOR CENTRAL RAILWAY

**Client** PADECO Co. Ltd  
**Location** KILOSA GULWE  
**Coordinates** 9282245.6N  
 222325.4E

**B/Hole No.** BH 08  
**Elevation** 770m  
**Date** 15 Mar 2015  
**Logged By** VS


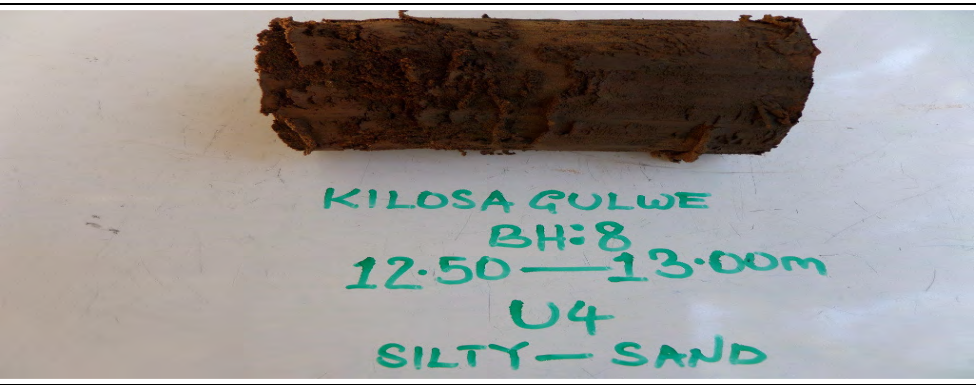


Down Hole Depth (m)	Elevation	Lithology	LITHOLOGIC DESCRIPTION	Degree of Weathering	Strength Data			Discontinuity Data			Core Run depth, m	TCR %	SCR %	RQD %			
					UCS MPa	Is (50)	Hardness	Dip Angles		Type					Spacing (cm)		
18	752		(18 - 20) Weathered														
19	751			IV		24	R2					20	15	0			
20	750		(20 - 25) Wide banded Orthogneiss														
21	749			III			R4					21	99	86	84		
22	748			III			R4					22	99	61	54		
23	747			III			R4					23	99	84	80		
24	746			III			R4					24	99	87	87		
25	745			III			R4					25	99	95	95		





Hardness: R0 = Extremely weak, R1 = Very weak, R2 = Weak, R3 = Medium Strong, R4 = Strong, R5 = Very Strong, R6 = Extremely Strong  
 Weathering: I = Fresh, II = Slightly, III = Moderately, IV = Highly, V = Completely, VI = Residual  
 TCR = Total Core Recovery, SCR = Solid core recovery, RQD = Rock Quality Designation,  
 UCS = Unconfined compressive Strength, Is(50) = Adjusted Point Load Strength



## PHOTOS BH8

0.00m	 <p>KILOSA GULWE BH:8 1.00 — 1.50m U4</p> <p>KILOSA - GULWE BH:8 4.50 — 5.00m U4 SILTY</p> <p>KILOSA GULWA BH:8 8.50 — 9.00m U4 SAND SILTY</p>
11.45m-13.45m	 <p>KILOSA GULWE BH:8 12.50 — 13.00m U4 SILTY — SAND</p>

## PHOTOS BH8




18.00m-20.00m	
20.00m-21.00m	
21.00m-22.00m	
22.00m-23.00m	

PHOTOS BH8

<p>23.00m-24.00m</p>	
<p>24.00m-25.00m</p>	



## BOREHOLE 8 PICS

Depth	Observations	Picture
18.0 – 20.0m	<ul style="list-style-type: none"> <li>• Quartzite layers + some pink metamorphosed sandstone.</li> <li>• Light grey layers</li> <li>• Fine to medium grained</li> <li>• Rocks are initially relatively porous</li> </ul>	
20.0 – 23.0m	<ul style="list-style-type: none"> <li>• Wide bands/layers (20 to 50mm) of very dark grey / black rock and white rock upto about 22 m depth</li> <li>• Appears as layers of dolerite and microgranite.</li> <li>• <b>Ortho Gneiss</b></li> <li>• Medium to coarse grains</li> </ul>	
23.0 – 25.0m	<ul style="list-style-type: none"> <li>• As above but less obviously foliated.</li> <li>• Dark bands predominate. Looks like Dolerite interbedded with light grey rocks similar to microgranite.</li> <li>• Black and white mica visible</li> <li>• Medium to coarse grained.</li> </ul>	



ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS
774	0.0				(0.0 to 0.5) Brown silty CLAY. Organic soil			
773	1.0	U4	SC G.S.F = 13.60.28 PI = 26		(0.5 to 5.5) Brown clayey SAND	3,4,3		
772	2.0							
771	3.0					4,5,6		
770	4.0							
769	5.0	U4	SC G.S.F = 01.54.45 PI = 23			7,5,8		
768	6.0				(5.5 to 9.4) Grey or dark grey SAND			
767	7.0					10/0cm		SPT refusal (N>50)
766	8.0							
765	9.0					20/1cm		SPT refusal (N>50)
764	10.0				(9.4 to 23.5) Grey and dark grey SAND and cobbles. Weak or heavily wethered rock formation probably broken up by rotary action of the drilling bit.			
763	11.0							
762	12.0							Drilling stopped at 11.5m. Resumed 13/03
761	13.0					42/5cm		SPT refusal (N>50)
760	14.0							
759	15.0					40/3cm		SPT refusal (N>50)



**DRILLING METHOD: Rotary Drilling**

**B/HOLE NO: BH09**

**PROJECT NO: S0820**

**BORE DATE: 12 - 15Mar/15**

**FIELD SUPERVISOR: V.S**

**NORTHING: 9284.422**

**SURFACE ELEVATION: 774**

**EASTING: 217 353.6**

**CHECKED BY: J.N**

ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS	
758	16.0						0	50	
757	17.0					40/3cm			SPT refusal (N>50)
756	18.0								
755	19.0					40/2cm			SPT refusal (N>50). No sample Drilling stopped at 19.5m. Resumed 14/03
754	20.0								
753	21.0					12,18,24	0	50	No SPT Sample
752	22.0								
751	23.0					40/2cm			SPT refusal (N>50)
750	24.0					(23.5 to 28.0) Weathered rock			
749	25.0					40/3cm			SPT refusal (N>50) Drilling stopped at 25.3m. Resumed 15/03
748	26.0					0	50		
747	27.0								
746	28.0				(28.0 to 33.0) Intact rock. Gneiss				
745	29.0								
744	30.0								
743	31.0								





**DRILLING METHOD:** Rotary Drilling

**B/HOLE NO:** BH09

**PROJECT NO:** S0820

**BORE DATE:** 12 - 15Mar/15

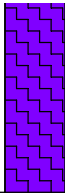
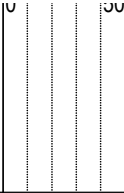
**FIELD SUPERVISOR:** V.S

**NORTHING:** 9284.422

**SURFACE ELEVATION:** 774

**EASTING:** 217 353.6

**CHECKED BY:** J.N

ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS
742	32.0							
741	33.0							

**Project** PREP. SURVEY ON FLOOD PROTECTION FOR CENTRAL RAILWAY

**Client** PADECO Co. Ltd  
**Location** KILOSA GULWE  
**Coordinates** 9284422.9N  
 217353.6E

**B/Hole No.** BH 09  
**Elevation** 774m  
**Date** 14 Mar 2015  
**Logged By** VS



Down Hole Depth (m)	Elevation	Lithology	LITHOLOGIC DESCRIPTION	Degree of Weathering	Strength Data			Discontinuity Data			Core Run depth, m	TCR %	SCR %	RQD %	
					UCS MPa	Is (50)	Hardness	Dip Angles		Type					Spacing (cm)
					50			30	60						
10	764	(9 - 15) Weathered Paragneiss. Sandstone and quartzites		V		18					13.0		7	7	0
11	763														
12	762														
13	761														
14	760														
15	759	(15 - 27) Feldspar		IV		17					15.5		60	60	0
16	758														
17	757														
18	756														
19	755														
20	754														
21	753														
22	752														

Hardness: R0 = Extremely weak, R1 = Very weak, R2 = Weak, R3 = Medium Strong, R4 = Strong, R5 = Very Strong, R6 = Extremely Strong  
 Weathering: I = Fresh, II = Slightly, III = Moderately, IV = Highly, V = Completely, VI = Residual  
 TCR = Total Core Recovery, SCR = Solid core recovery, RQD = Rock Quality Designation,  
 UCS = Unconfined compressive Strength, Is(50) = Adjusted Point Load Strength

**Project** PREP. SURVEY ON FLOOD PROTECTION FOR CENTRAL RAILWAY

**Client** PADECO Co. Ltd  
**Location** KILOSA GULWE  
**Coordinates** 9284422.9N  
 217353.6E




**B/Hole No.** BH 09  
**Elevation** 774m  
**Date** 14 Mar 2015  
**Logged By** VS



Down Hole Depth (m)	Elevation	Lithology	LITHOLOGIC DESCRIPTION	Degree of Weathering	Strength Data			Discontinuity Data			Core Run depth, m	TCR %	SCR %	RQD %
					UCS MPa	Is (50)	Hardness	Dip Angles		Type				
					50			30	60					
23	751										23			
24	750													
25	749													
26	748			III		16	R3				25.3	45	43	13
27	747		(27 - 33) Ortho Gneiss								27.0			
28	746			II			R4					80	53	53
29	745										29.4			
30	744			II			R5					99	66	66
31	743			II			R4					99	75	75
32	742			II			R4					99	80	80
33	741			II			R5					99	60	60





Hardness: R0 = Extremely weak, R1 = Very weak, R2 = Weak, R3 = Medium Strong, R4 = Strong, R5 = Very Strong, R6 = Extremely Strong  
 Weathering: I = Fresh, II = Slightly, III = Moderately, IV = Highly, V = Completely, VI = Residual  
 TCR = Total Core Recovery, SCR = Solid core recovery, RQD = Rock Quality Designation,  
 UCS = Unconfined compressive Strength, Is(50) = Adjusted Point Load Strength

## PHOTOS BH9



0.00m          5.45m	 <p>KILOSA GULWE BH:9 0.50 — 1.00M U4 SAND CLAY</p> <p>KILOSA GULWE BH:9 4.50 — 5.00M U4 CLAY SAND</p>
9.45m-11.00m	 <p>BORE HOLE 9 ROCK 9.450M — 11.00M</p>
13.00m-13.50m	 <p>BORE HOLE 9 ROCK 13.00M — 13.50M</p>



## PHOTOS BH9

15.45m-16.70m	
25.30m-26.30m	
27.00m-28.00m	
29.00m-30.40m	

## PHOTOS BH9

30.40m-31.40m	
31.40m-32.40m	
32.40m-33.00m	

## BOREHOLE 9 PICS

Depth	Observations	Picture
9.45 – 26.3m	<ul style="list-style-type: none"> <li>• Light Grey and pink and brown minerals.</li> <li>• No foliation</li> <li>• Medium to coarse grained</li> <li>• Weathering in the joints.</li> <li>• <b>Paragneiss.</b> Quartzite and other Metasediments</li> <li>• <b>Sandstone</b></li> <li>• Mica present</li> </ul>	
27.0 – 28.0m	<ul style="list-style-type: none"> <li>• Light grey</li> <li>• Layered</li> <li>• Distinct weathering in the joints</li> <li>• Light colored mica present</li> <li>• <b>Paragneiss.</b></li> </ul>	
28.0 – 32.4	<ul style="list-style-type: none"> <li>• Predominantly dark grey rock with fine lineation 2-5mm thick.</li> <li>• Finer elongated minerals. Mylonitic tendency at some depths</li> <li>• <b>Gneiss</b></li> <li>• Fine to medium grained</li> <li>• With quartzite intrusions</li> </ul>	





ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS
785	0.0				(0.0 to 1.0) Disturbed brown SAND deposits			
784	1.0	U4	SW G.S.F = 15.81.04 PI = NP		(1.0 to 3.5) Brown Transported riverine SAND sediment.	8,12,17		
783	2.0							
782	3.0	U4	SW G.S.F = 59.37.05 PI = NP		(3.5 to 7.0) Brown silty SAND. Transported riverine sediments	2,4,12		
781	4.0							
780	5.0	U4	Not tested					
779	6.0					11,12,9		
778	7.0	U4	GC G.S.F = 54.23.23 PI = 12		(7.0 to 8.0) Reddish brown very silty SAND	5,10,17		Drilling stopped at 7.0m. Resumed 06/03
777	8.0							
776	9.0	U4	SC G.S.F = 39.17.44 PI = 32		(8.0 to 12.0) Residual brown clayey / silty SAND	5,5,10		
775	10.0							
774	11.0	U4	SM G.S.F = 32.36.32 PI = 11			9,12,17		
773	12.0				(12.0 to 23.7) Weathered rock formation			Drilling stopped at 12.0m. Resumed 7/03
772	13.0					40/3cm		SPT refusal (N>50)
771	14.0							High rate of percolation of drilling fluid in weathered rock zone 14.5 to 24m
770	15.0							





**LOCATION: BH10**

**CLIENT: PADECO Co. Ltd**

**DRILLING METHOD: Rotary Drilling**

**B/HOLE NO: BH10**

**PROJECT NO: S0820**

**BORE DATE: 05 - 08Mar/15**

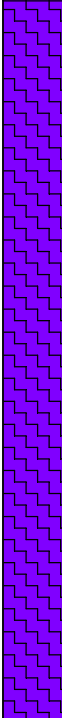
**FIELD SUPERVISOR: V.S**

**NORTHING: 9286 420.2**

**SURFACE ELEVATION: 785**

**EASTING: 213 838.6**

**CHECKED BY: J.N**

ELEV. (M.)	DRILL DEPTH	SAMPLE TYPE AND NO.	USCS	PROFILE	DESCRIPTION	SPT BLOWS	SPT PLOT	REMARKS	
769	16.0					40/4cm	0	50	SPT refusal (N>50)
768	17.0								
767	18.0								
766	19.0								
765	20.0								Drilling stopped at 20.5m. Resumed 8/03
764	21.0					40/3cm	0	50	SPT refusal (N>50)
763	22.0					40/3cm			SPT refusal (N>50)
762	23.0								
761	24.0				(23.7 to 30.8) Intact rock. Gneiss				Moderate rate of percolation of drilling fluid in intact rock zone below 24m
760	25.0								
759	26.0						0	50	
758	27.0								
757	28.0								
756	29.0								
755	30.0								

**Project** PREP. SURVEY ON FLOOD PROTECTION FOR CENTRAL RAILWAY

**Client** PADECO Co. Ltd  
**Location** KILOSA GULWE  
**Coordinates** 9286420.2N  
 213838.6E


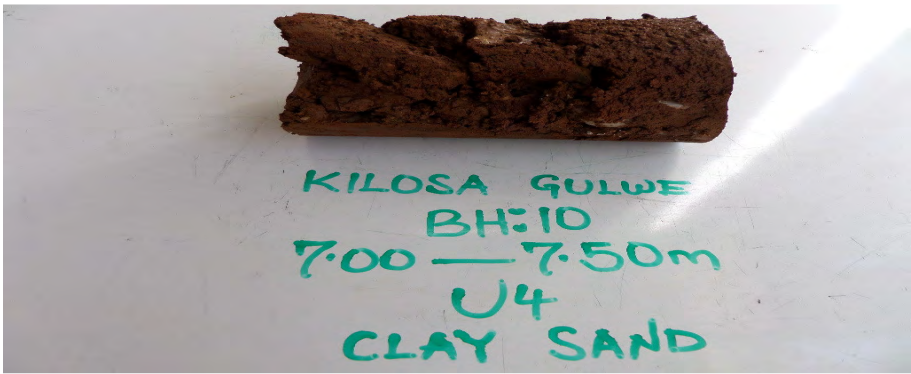

**B/Hole No.** BH 10  
**Elevation** 785m  
**Date** 06 Mar 2015  
**Logged By** VS







Down Hole Depth (m)	Elevation	Lithology	LITHOLOGIC DESCRIPTION	Degree of Weathering	Strength Data			Discontinuity Data			Core Run depth, m	TCR %	SCR %	RQD %
					UCS MPa	Is (50)	Hardness	Dip Angles		Type				
26	759		(26 - 31) Ortho Gneiss	II			R3				26.8	99	82	78
27	758			II			R3				27.8	95	63	52
28	757			II			R3				28.8	87	84	82
29	756			II			R3				29.8	85	81	78
30	755			II			R4				30.8	95	93	92

Hardness: R0 = Extremely weak, R1 = Very weak, R2 = Weak, R3 = Medium Strong, R4 = Strong, R5 = Very Strong, R6 = Extremely Strong  
 Weathering: I = Fresh, II = Slightly, III = Moderately, IV = Highly, V = Completely, VI = Residual  
 TCR = Total Core Recovery, SCR = Solid core recovery, RQD = Rock Quality Designation,  
 UCS = Unconfined compressive Strength, Is(50) = Adjusted Point Load Strength

## PHOTOS BH10

0.00m-3.50m	 <p>KILOSA-GULWE BH:10 3.00 — 3.50m U4 SAND</p>
3.50m-7.95m	 <p>KILOSA GULWE BH:10 7.00 — 7.50m U4 CLAY SAND</p>
7.95m	 <p>KILOSA-GULWE BH:10 9.00 — 9.50m U4 CLAY SAND</p> <p>KILOSA GULWE BH:10 11.00 — 11.50m U4 CLAY SILTY</p>
11.95m	

## PHOTOS BH10




25.80m-26.80m	
26.80m-27.80m	
27.80m-28.80m	
28.80m-29.80m	



PHOTOS BH10



## BOREHOLE 10 PICS

Depth	Observations	Picture
25.8 – 26.8m	<ul style="list-style-type: none"> <li>• Very dark rock</li> <li>• Medium grained</li> <li>• Some quartzite bands</li> <li>• Banded 10-20mm</li> <li>• <b>Gneiss</b></li> </ul>	
26.8 – 28.8	<ul style="list-style-type: none"> <li>• Dark grey and pink bands</li> <li>• Bands 5-10mm</li> <li>• Mica present and white spots. speckled</li> </ul>	
28.0 – 32.4	<ul style="list-style-type: none"> <li>• Thin light colored bands or veins &lt; 5mm vs wider dark bands dipped 0 – 15 degrees.</li> <li>• Some of the dark bands are lineated, mylonitic at some depths. while others are not.</li> <li>• Medium grained.</li> <li>• <b>Gneiss</b></li> <li>• High concentration of mica.</li> </ul>	



CENTRAL RAILWAY JICA STUDY  
KILOSA - GULWE SECTION



LABORATORY TEST RESULTS SUMMARY

CLIENT: PADECO COMPANY LIMITED

MAY ,2015

Job No.	Sample No.	SOURCE Depth (Elevation)	Date Sampled	LL	PL	PI	LS	GRAVE L %	SAND %	FINES %	CLAY %	nmc %	LI	Act	P (g/cc)	SOIL DESCRIPTION - BSCS	BSCS SYMBOL	USCS SYMBOL	Shear test	C	Ø	Cc	Cr	Pc	OCR	Eoed	
S0820	6017	BH № 1 [U4] 0.50 - 1.00	Apr-15	34	20	14	7	42	36	22	-	15.0	-0.4	-	1.972	Very clayey SAND and GRAVEL	GC(L)	GC									
S0820	6018	BH № 1 [U4] 3.00 - 3.50	Apr-15	24	NP	NP	0	30	68	3	-	13.1	-	-	1.661	very gravelly SAND	SP	SW	DS	26	41.8						
S0820	6019	BH № 1 [U4] 5.00 - 5.50	Apr-15	71	31	40	20	40	18	43	22	64.9	0.8	1.8	1.607	Slightly sandy Gravelly CLAY of very high	CG(V)	SC	UU	22.4		0.250	0.039	90	1	2.12	
S0820	6020	BH № 1 [U4] 7.00 - 7.50	Apr-15	55	30	25	12	0	0	100	66	72.7	1.7	0.4	1.503	SILT of high plasticity	M(H)	MH	UU	10		0.390	0.056	85	0.7	1.86	
S0820	6021	BH № 1 [U4] 9.00 - 9.50	Apr-15	41	15	26	13	18	18	64	-	21.1	0.2	-	1.570	Slightly sandy CLAY of intermediate plastic	CS(I)	CL									
S0820	6022	BH № 1 [U4] 11.00 - 11.50	Apr-15	26	13	13	6	5	69	26	-	18.3	0.4	-	1.988	Very clayey SAND	SC(L)	SC				0.230	0.037	65	0.3	3.12	
S0820	6023	BH № 1 [U4] 15.00 - 15.50	Apr-15	34	20	14	7	7	58	35	-	24.6	0.3	-	1.373	Very clayey gravelly SAND	SC(L)	SC				0.162	0.010	95	0.3	6.25	
S0820	6024	BH № 1 [U4] 18.50 - 19.00	Apr-15	33	15	18	9	10	53	37	23	29.7	0.8	0.8	1.953	Very clayey gravelly SAND	SC(L)	SC				0.173	0.016	45	0.1	5.85	
S0820	6025	BH № 1 [U4] 22.50 - 23.00	Apr-15	45	21	24	12	6	54	40	8	23.4	0.1	3.0	1.805	Sandy CLAY of intermediate plasticity	CS(I)	SC				0.082	0.008	105	0.2	15.94	
S0820	6026	BH № 1 [U4] 26.50 - 27.00	Apr-15	42	19	23	12	2	48	50	20	24.3	0.2	1.2	1.828	Sandy CLAY of intermediate plasticity	CS(I)	CL	UU	94.3		0.233	0.038	190	0.4	8.08	
S0820	6027	BH № 2 [U4] 1.00 - 1.50	Apr-15	23	NP	NP	0	52	39	9	-	28.7	-	-	2.269	Silty SAND and GRAVEL	G-M	SW-SM									
S0820	6028	BH № 2 [U4] 5.00 - 5.50	Apr-15	24	NP	NP	1	42	51	7	-	9.1	-	-	2.119	Silty SAND and GRAVEL	S-M	SW-SM									
S0820	6029	BH № 2 [U4] 9.00 - 9.50	Apr-15	44	19	25	13	20	21	59	-	12.1	-0.3	-	1.981	Slightly sandy Slightly gravelly CLAY of int	CS(I)	CL									
S0820	6030	BH № 2 [U4] 17.00 - 17.50	Apr-15	25	NP	NP	0	73	24	3	-	13.1	-	-	1.722	very sandy GRAVEL	GP	SW	DS	59	41.2						
S0820	6031	BH № 2 [U4] 21.00 - 21.50	Apr-15	24	NP	NP	0	22	72	7	-	12.1	-	-	1.725	Silty very gravelly SAND	S-M	SW-SM	DS	83	36						
S0820	6032	BH № 2 [U4] 25.00 - 25.50	Apr-15	23	NP	NP	0	30	61	9	-	12.5	-	-	1.948	Silty SAND and GRAVEL	S-M	SW-SM	DS	67	39.5						
S0792	6033	BH № 3 [U4] 1.00 - 1.50	Apr-15	27	NP	NP	1	66	25	9	-	7.6	-	-	2.115	Silty very sandy GRAVEL	G-M	GW-GM				0.058	0.012	95	3.8	5.58	
S0820	6034	BH № 4 [U4] 1.00 - 1.50	Feb-15	33	17	16	8	26	53	21	-	18.0	0.1	-	1.996	Clayey very gravelly SAND	SC(L)	SC									
S0820	6035	BH № 5 [U4] 0.50 - 1.00	Mar-15	64	25	39	20	0	2	98	58	30.0	0.1	0.7	1.634	CLAY of high plasticity	C(H)	CH	UU	55.4		0.159	0.043	140	12.6	6.12	
S0820	6036	BH № 5 [U4] 4.50 - 5.00	Mar-15	79	27	52	26	0	0	100	61	29.6	0.1	0.8	1.660	CLAY of very high plasticity	C(V)	CH	UU	24.8		0.183	0.047	165	1.9	5.23	
S0820	6037	BH № 5 [U4] 8.50 - 9.00	Mar-15	55	30	25	13	2	9	89	49	45.5	0.6	0.5	1.745	SILT of high plasticity	M(H)	MH	UU	89.4		0.212	0.059	85	0.6	2.93	
S0820	6038	BH № 5 [U4] 12.50 - 13.00	Mar-15	56	35	21	10	3	10	86	54	24.1	-0.5	0.4	1.357	SILT of high plasticity	M(H)	MH				0.214	0.043	70	6.5	1.9	

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CENTRAL RAILWAY JICA STUDY  
KILOSA - GULWE SECTION



LABORATORY TEST RESULTS SUMMARY

CLIENT: PADECO COMPANY LIMITED

MAY ,2015

Job No.	Sample No.	SOURCE Depth (Elevation)	Date Sampled	LL	PL	PI	LS	GRAVE L %	SAND %	FINES %	CLAY %	nmc %	LI	Act	P (g/cc)	SOIL DESCRIPTION - BSCS	BSCS SYMBOL	USCS SYMBOL	Shear test	C	Ø	Cc	Cr	Pc	OCR	Eoed
S0820	6039	BH № 6 [U4] 1.00 - 1.50	Mar-15	43	21	22	11	2	27	71	20	26.1	0.2	1.1	1.771	CLAY of intermediate plasticity	C(I)	CL				0.101	0.016	100	5.1	6.2
S0820	6040	BH № 6 [U4] 3.00 - 3.50	Mar-15	26	NP	NP	0	23	62	14	-	7.3	-	-	1.496	Silty very gravelly SAND	S-M	SM								
S0820	6041	BH № 7 [U4] 0.50 - 1.00	Mar-15	25	16	9	4	1	82	17	9	5.0	-1.2	1.0	1.698	Clayey SAND	SC(L)	SC								
S0820	6042	BH № 7 [U4] 4.50 - 5.00	Mar-15	35	13	22	11	21	70	10	-	8.4	-0.2	-	2.024	Clayey very gravelly SAND	S-C	SW-SC								
S0820	5915	BH № 8 [U4] 1.00 - 1.50	Mar-15	24	NP	NP	0	0	53	47	-	5.9	-	-	1.819	Sandy SILT of low plasticity	MS(L)	SM								
S0820	5916	BH № 8 [U4] 4.50 - 5.00	Mar-15	23	14	9	5	0	45	55	-	1.6	-1.4	-	1.571	Sandy CLAY of low plasticity	CS(L)	CL								
S0820	5917	BH № 8 [U4] 8.50 - 9.00	Mar-15	24	NP	NP	1	1	75	25	-	13.5	-	-	2.271	Very silty SAND	SM(L)	SM								
S0820	5918	BH № 8 [U4] 12.50 - 13.00	Mar-15	26	12	14	7	2	60	38	-	24.3	0.9	-	1.966	Sandy CLAY of low plasticity	CS(L)	SC				0.105	0.023	110	0.4	9.4
S0820	5919	BH № 9 [U4] 0.50 - 1.00	Mar-15	45	19	26	13	13	60	28	9	16.9	-0.1	3.0	2.059	Very clayey gravelly SAND	SC(I)	SC	UU	0	21.1	0.083	0.010	165	12.5	7.26
S0820	5920	BH № 9 [U4] 4.50 - 5.00	Mar-15	44	21	23	11	1	54	45	23	15.9	-0.2	1.0	1.806	Sandy CLAY of intermediate plasticity	CS(I)	SC	UU	132.6		0.120	0.016	100	2	8.46
S0820	5921	BH № 10 [U4] 1.00 - 1.50	Mar-15	24	NP	NP	1	15	81	4	-	17.8	-	-	1.624	gravelly SAND	SP	SW	DS	47	41.3					
S0820	5922	BH № 10 [U4] 3.00 - 3.50	Mar-15	23	NP	NP	0	59	37	5	-	13.3	-	-	1.566	SAND and GRAVEL	GW	SW	DS	68	38.1					
S0820	5924	BH № 10 [U4] 7.00 - 7.50	Mar-15	29	17	12	6	54	23	23	9	12.7	-0.4	1.4	1.668	Very clayey very sandy GRAVEL	GC(L)	GC				0.066	0.008	120	0.8	9.4
S0820	5925	BH № 10 [U4] 9.00 - 9.50	Mar-15	60	28	32	16	39	17	44	14	23.4	-0.1	2.3	1.890	Slightly sandy Gravelly CLAY of high plasticity	CG(H)	SC				0.100	0.013	155	0.8	10.1
S0820	5926	BH № 10 [U4] 11.00 - 11.50	Mar-15	36	25	11	6	32	36	32	-	22.4	-0.2	-	1.952	Very silty SAND and GRAVEL	SM(I)	SM	UU	0	29	0.093	0.016	210	1.2	13.5

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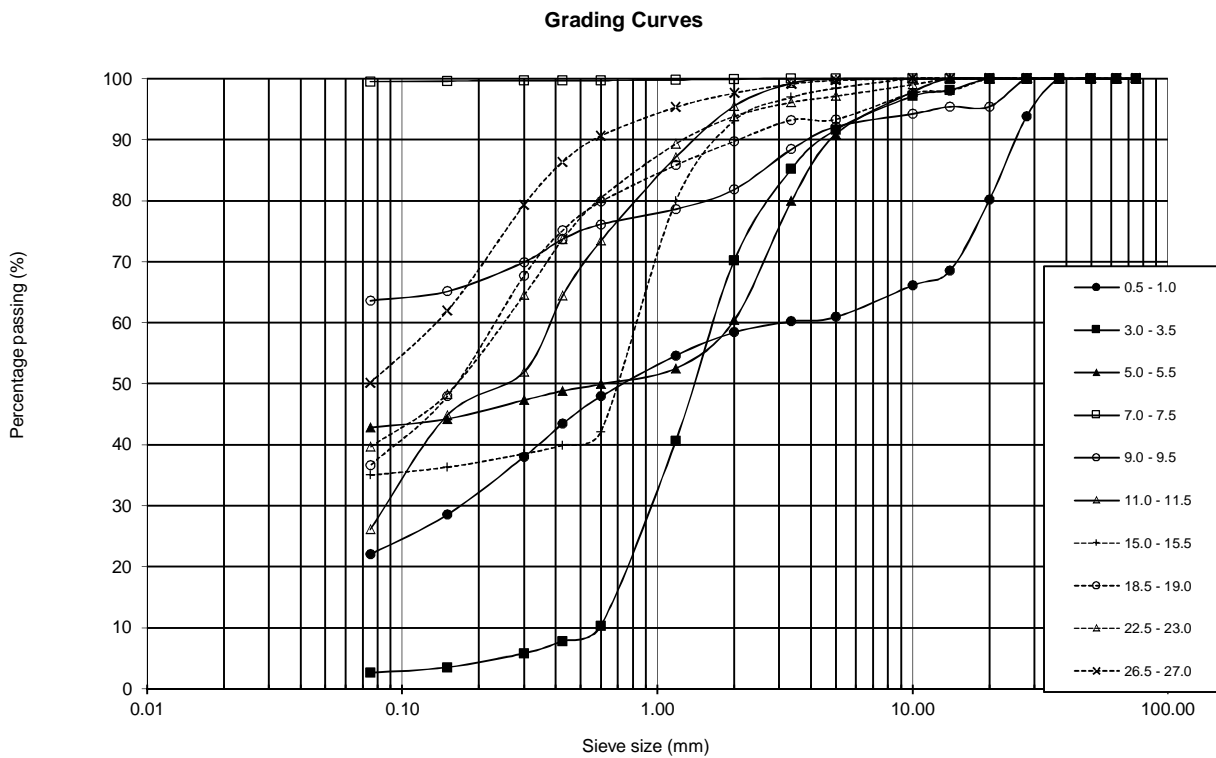
**CLASSIFICATION - BH1**  
CENTRAL RAILWAY STUDY. KILOSA GULWE SECTION

CLIENT: **PADECO CO. LTD** Date: **May 2015**

**GRAIN SIZE DISTRIBUTION**

Sample No	6017	6018	6019	6020	6021	6022	6023	6024	6025	6026
Depth, m	0.5 - 1.0	3.0 - 3.5	5.0 - 5.5	7.0 - 7.5	9.0 - 9.5	11.0 - 11.5	15.0 - 15.5	18.5 - 19.0	22.5 - 23.0	26.5 - 27.0
Sieve Size:(mm)	%Passing.									
75	100	100	100	100	100	100	100	100	100	100
63	100	100	100	100	100	100	100	100	100	100
50	100	100	100	100	100	100	100	100	100	100
37.5	100	100	100	100	100	100	100	100	100	100
28	94	100	100	100	100	100	100	100	100	100
20	80	100	100	100	95	100	100	100	100	100
14	69	98	100	100	95	100	100	98	100	100
10	66	97	98	100	94	100	100	98	99	100
5	61	92	91	100	92	100	98	93	97	100
3.35	60	85	80	100	88	99	97	93	96	99
2.00	58	70	60	100	82	96	93	90	94	98
1.18	55	41	53	100	79	87	80	86	89	95
0.600	48	10	50	100	76	73	42	80	80	91
0.425	43	8	49	100	74	64	40	75	74	86
0.300	38	6	47	100	70	52	39	68	65	79
0.150	29	4	44	100	65	45	36	48	48	62
0.075	22	3	43	100	64	26	35	37	40	50

USCS CLASS	GC	SW	SM	CH	ML	SC	SC	SC	SC	CL
% Gravels(100-Pass 2mm)	42	30	40	0	18	5	7	10	6	2
% Sand (0.075 - 2.0mm)	36	68	18	0	18	69	58	53	54	48
% Fines (< 0.075mm)	22	3	43	100	64	26	35	37	40	50
LL (%)	34	24	71	55	41	26	34	33	45	42
PI (%)	20	NP	31	30	15	13	20	15	21	19
LS (%)	14.0	NP	40.0	25.0	26.0	13.0	14.0	18.0	24.0	23.0



Checked by : .....

Approved by : .....



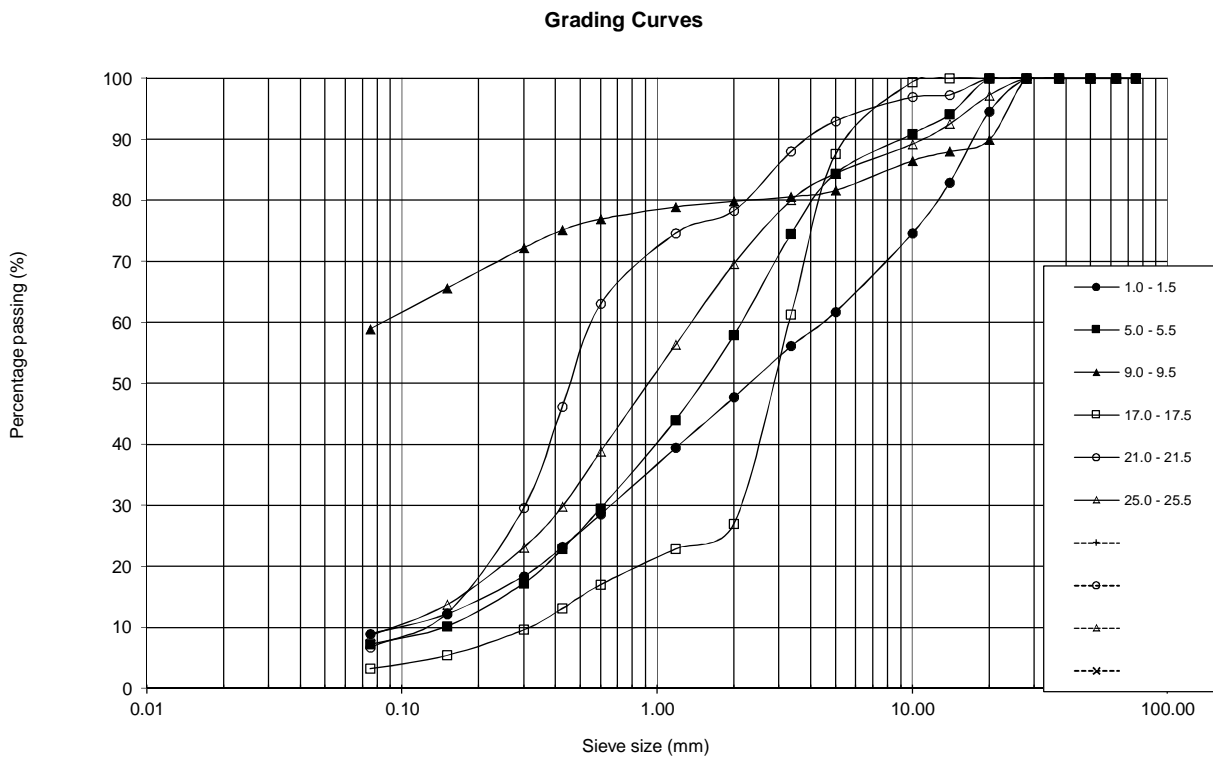
**CLASSIFICATION - BH2**  
CENTRAL RAILWAY STUDY. KILOSA GULWE SECTION

CLIENT: **PADECO CO. LTD** Date: May 2015

**GRAIN SIZE DISTRIBUTION**

Sample No	6027	6028	6029	6030	6031	6032			
Depth, m	1.0 - 1.5	5.0 - 5.5	9.0 - 9.5	17.0 - 17.5	21.0 - 21.5	25.0 - 25.5			
Sieve Size:(mm)	%Passing.								
75	100	100	100	100	100	100			
63	100	100	100	100	100	100			
50	100	100	100	100	100	100			
37.5	100	100	100	100	100	100			
28	100	100	100	100	100	100			
20	95	100	90	100	100	97			
14	83	94	88	100	97	93			
10	75	91	87	99	97	89			
5	62	84	82	88	93	84			
3.35	56	75	81	61	88	80			
2.00	48	58	80	27	78	70			
1.18	39	44	79	23	75	56			
0.600	29	30	77	17	63	39			
0.425	23	23	75	13	46	30			
0.300	18	17	72	10	30	23			
0.150	12	10	66	5	12	14			
0.075	9	7	59	3	7	9			

USCS CLASS	SW-SM	SW-SM	CL	SW	SW-SM	SW-SM			
% Gravels(100-Pass 2mm)	52	42	20	73	22	30			
% Sand (0.075 - 2.0mm)	39	51	21	24	72	61			
% Fines (< 0.075mm)	9	7	59	3	7	9			
LL (%)	23	24	44	25	24	23			
PI (%)	NP	NP	19	NP	NP	NP			
LS (%)	NP	NP	25.0	NP	NP	NP			



Checked by : .....

Approved by : .....



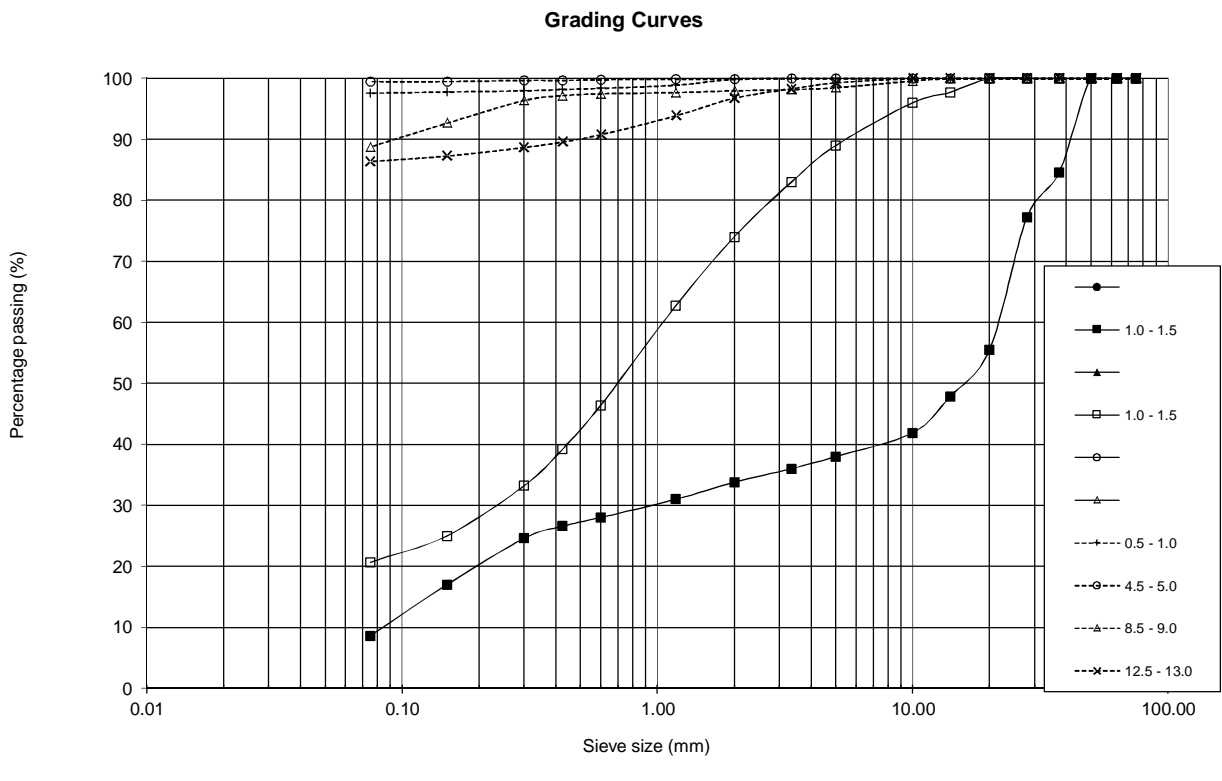
## CLASSIFICATION - BH3,4 & 5

CENTRAL RAILWAY STUDY. KILOSA GULWE SECTION

CLIENT: PADECO CO. LTD Date: May 2015

GRAIN SIZE DISTRIBUTION									
Sample No	6033	6034	6035	6036	6037	6038			
Depth, m	1.0 - 1.5	1.0 - 1.5	0.5 - 1.0	4.5 - 5.0	8.5 - 9.0	12.5 - 13.0			
Sieve Size:(mm)	BH3	BH4	BH5						
75	100	100	100	100	100	100			
63	100	100	100	100	100	100			
50	100	100	100	100	100	100			
37.5	85	100	100	100	100	100			
28	77	100	100	100	100	100			
20	56	100	100	100	100	100			
14	48	98	100	100	100	100			
10	42	96	100	100	100	100			
5	38	89	100	100	99	99			
3.35	36	83	100	100	98	98			
2.00	34	74	100	100	98	97			
1.18	31	63	99	100	98	94			
0.600	28	46	98	100	98	91			
0.425	27	39	98	100	97	90			
0.300	25	33	98	100	96	89			
0.150	17	25	98	100	93	87			
0.075	9	21	98	100	89	86			

USCS CLASS	GW-GM	SC	MH	MH	CH	CH
% Gravels(100-Pass 2mm)	66	26	0	0	2	3
% Sand (0.075 - 2.0mm)	25	53	2	0	9	10
% Fines (< 0.075mm)	9	21	98	100	89	86
LL (%)	27	33	64	79	55	56
PI (%)	NP	17	25	27	30	35
LS (%)	NP	16.0	39.0	52.0	25.0	21.0



Checked by : .....

Approved by : .....



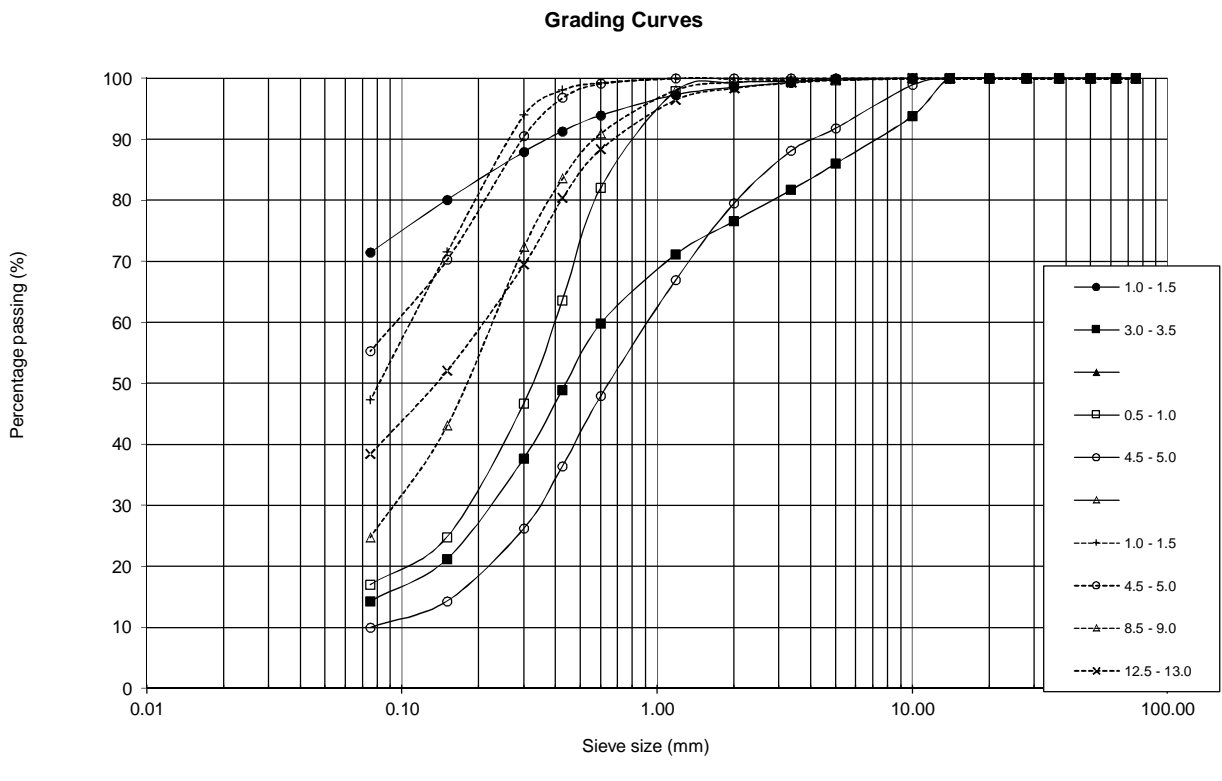
## CLASSIFICATION - BH6, 7 & 8

CENTRAL RAILWAY STUDY. KILOSA GULWE SECTION

CLIENT: **PADECO CO. LTD** Date: May 2015

GRAIN SIZE DISTRIBUTION									
Sample No	6039	6040	6041	6042	5915	5916	5917	5918	
Depth, m	1.0 - 1.5	3.0 - 3.5	0.5 - 1.0	4.5 - 5.0	1.0 - 1.5	4.5 - 5.0	8.5 - 9.0	12.5 - 13.0	
Sieve Size:(mm)	BH6		BH7		BH8				
75	100	100	100	100	100	100	100	100	100
63	100	100	100	100	100	100	100	100	100
50	100	100	100	100	100	100	100	100	100
37.5	100	100	100	100	100	100	100	100	100
28	100	100	100	100	100	100	100	100	100
20	100	100	100	100	100	100	100	100	100
14	100	100	100	100	100	100	100	100	100
10	100	94	100	99	100	100	100	100	100
5	100	86	100	92	100	100	100	100	100
3.35	99	82	100	88	100	100	100	99	99
2.00	99	77	99	80	100	100	99	98	98
1.18	97	71	98	67	100	100	98	97	97
0.600	94	60	82	48	99	99	91	88	88
0.425	91	49	64	36	98	97	84	80	80
0.300	88	38	47	26	94	91	72	70	70
0.150	80	21	25	14	72	70	43	52	52
0.075	71	14	17	10	47	55	25	38	38

USCS CLASS	CL	SM	SC	SW-SC	SM	CL	SM	SC
% Gravels(100-Pass 2mm)	2	23	1	21	0	0	1	2
% Sand (0.075 - 2.0mm)	27	62	82	70	53	45	75	60
% Fines (< 0.075mm)	71	14	17	10	47	55	25	38
LL (%)	43	26	25	35	24	23	24	26
PI (%)	21	NP	16	13	NP	14	NP	12
LS (%)	22.0	NP	9.0	22.0	NP	9.0	NP	14.0



Checked by : .....

Approved by : .....



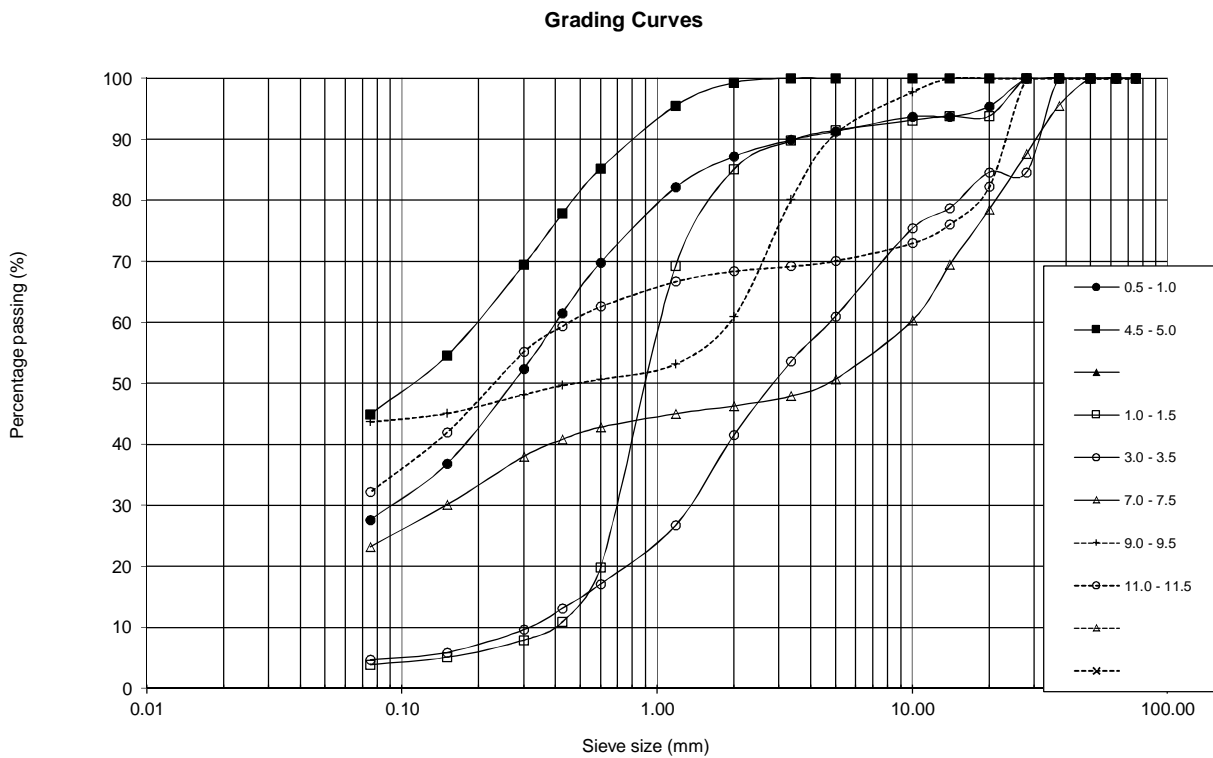


**CLASSIFICATION - BH9 & BH10**  
CENTRAL RAILWAY STUDY. KILOSA GULWE SECTION

CLIENT: **PADECO CO. LTD** Date: **May 2015**

GRAIN SIZE DISTRIBUTION									
Sample No	5919	5920	5921	5922	5924	5925	5926		
Depth, m	0.5 - 1.0	4.5 - 5.0	1.0 - 1.5	3.0 - 3.5	7.0 - 7.5	9.0 - 9.5	11.0 - 11.5		
Sieve Size:(mm)	BH9		BH10						
75	100	100	100	100	100	100	100		
63	100	100	100	100	100	100	100		
50	100	100	100	100	100	100	100		
37.5	100	100	100	100	96	100	100		
28	100	100	100	85	88	100	100		
20	95	100	94	85	79	100	82		
14	94	100	94	79	69	100	76		
10	94	100	93	75	60	98	73		
5	91	100	92	61	51	91	70		
3.35	90	100	90	54	48	80	69		
2.00	87	99	85	42	46	61	68		
1.18	82	96	69	27	45	53	67		
0.600	70	85	20	17	43	51	63		
0.425	62	78	11	13	41	50	59		
0.300	52	69	8	10	38	48	55		
0.150	37	55	5	6	30	45	42		
0.075	28	45	4	5	23	44	32		

USCS CLASS	SC	SC	SW	SW	GC	SM	SC
% Gravels(100-Pass 2mm)	13	1	15	59	54	39	32
% Sand (0.075 - 2.0mm)	60	54	81	37	23	17	36
% Fines (< 0.075mm)	28	45	4	5	23	44	32
LL (%)	45	44	24	23	29	60	36
PI (%)	19	21	NP	NP	17	28	25
LS (%)	26.0	23.0	NP	NP	12.0	32.0	11.0



Checked by : .....

Approved by : .....



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**Triaxial Unconsolidated Undrained (UU) Test**

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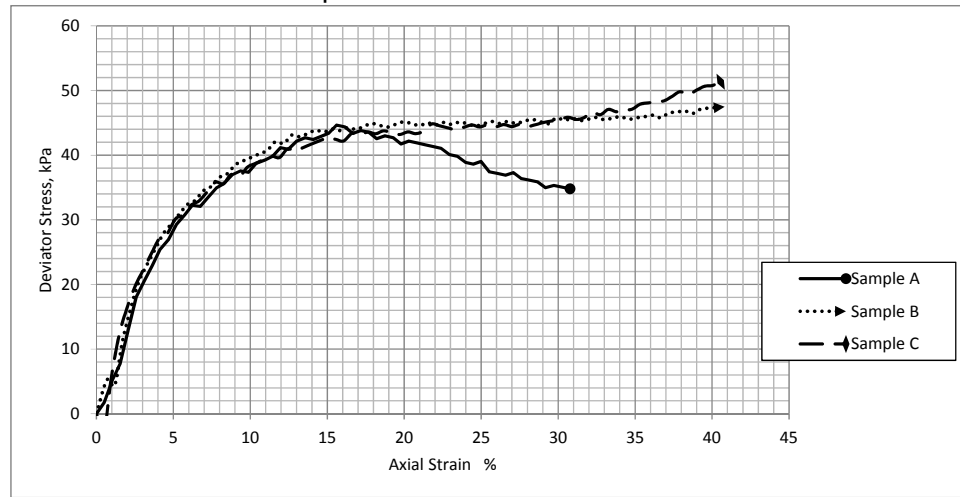
<b>PROJECT:</b>	CENTRAL RAILWAY STUDY: KILOSA GULWE			TESTED BY	Law / Rose
<b>CLIENT:</b>	PADECO CO. LTD			DATE	12/5/2015
<b>SOURCE/ LOCATION</b>	BH 01 : 5.00 - 5.50m	<b>SMPLE NO</b>	6019	CHECKED BY	Jotham
<b>Type of Specimen</b>	Undisturbed			DATE	12/5/2015

Specimen Details		Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134	1134
Length	Lo (mm)	76	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193	86193
Mass	g	141.77	141.56	145.05
Moisture Content	%	64.9	64.9	64.9
Bulk Density	Mg/m <sup>3</sup>	1.645	1.642	1.683
Dry Density	Mg/m <sup>3</sup>	0.997	0.996	1.021
Specific Gravity		2.311	2.311	2.311
Void Ratio		1.32	1.32	1.26
Initial Degree of Saturation		114%	114%	89%

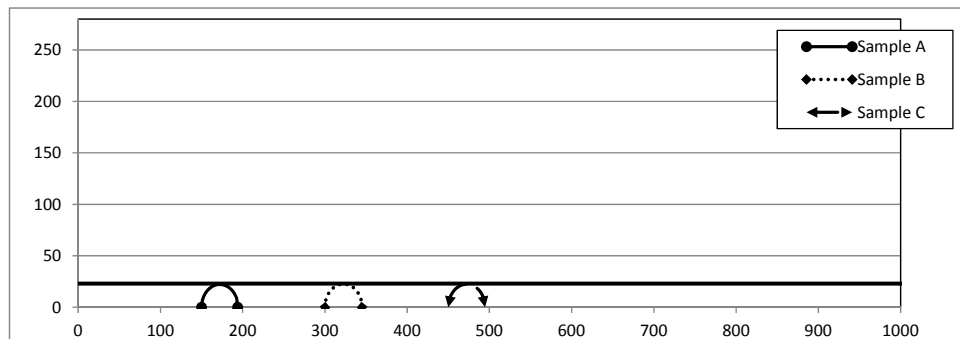
**TESTING DETAILS**

Mode of Failure:		Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8	0.8
Cell Pressure, P1	kPa	150	300	450
Max Deviator Stress	kPa	44.4	45.1	44.7
Major Principal Stress P3,	kPa	194.4	345.1	494.7
Axial Strain at failure	%	16.1%	23.6%	25.4%
Undrained Strength, Su	kPa	22.2	22.6	22.4
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>22.4</b>		
E <sub>50</sub> secant modulus,	kPa	729	891	912
E <sub>50</sub> strain	%	3.6	3.3	3.5
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>844</b>		
Cohesion , C	kPa	23.0		
Angle of internal Friction,	φ	0.0		

**Stress Strain Graphs**



**Undrained Shear Strength**      **22.4 kPa at 22% strain**  
**E<sub>50</sub> secant modulus**            **0.8 Mpa at 3.5% strain**





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**Triaxial Unconsolidated Undrained (UU) Test**

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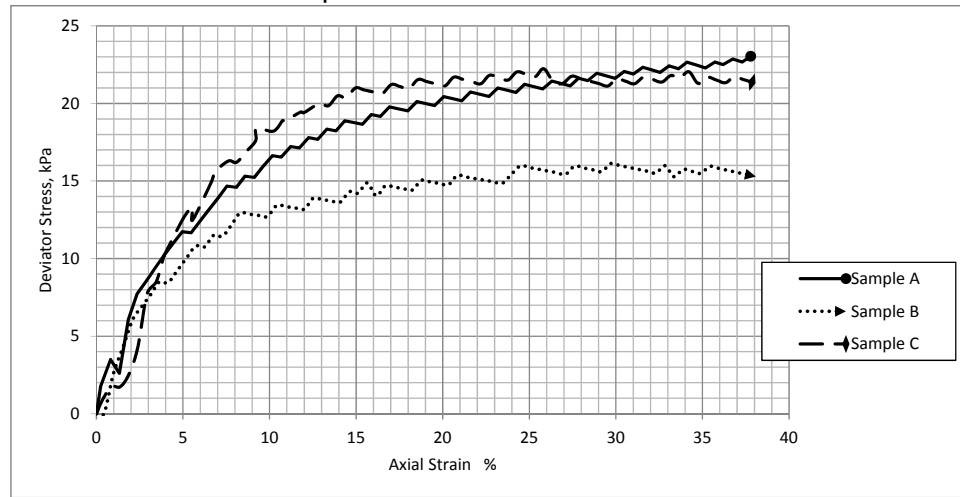
<b>PROJECT:</b>	CENTRAL RAILWAY STUDY: KILOSA GULWE			TESTED BY	Law / Rose
<b>CLIENT:</b>	PADECO CO. LTD			DATE	5/5/2015
<b>SOURCE/ LOCATION</b>	BH 01 : 7.00 - 7.50m	<b>SMPLE NO</b>	6020	CHECKED BY	Jotham
<b>Type of Specimen</b>	Undisturbed			DATE	12/5/2015

Specimen Details		Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134	1134
Length	Lo (mm)	76	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193	86193
Mass	g	140.8	139.86	143.09
Moisture Content	%	72.7	72.7	72.7
Bulk Density	Mg/m <sup>3</sup>	1.634	1.623	1.660
Dry Density	Mg/m <sup>3</sup>	0.946	0.940	0.961
Specific Gravity		2.386	2.386	2.386
Void Ratio		1.52	1.54	1.48
Initial Degree of Saturation		114%	113%	89%

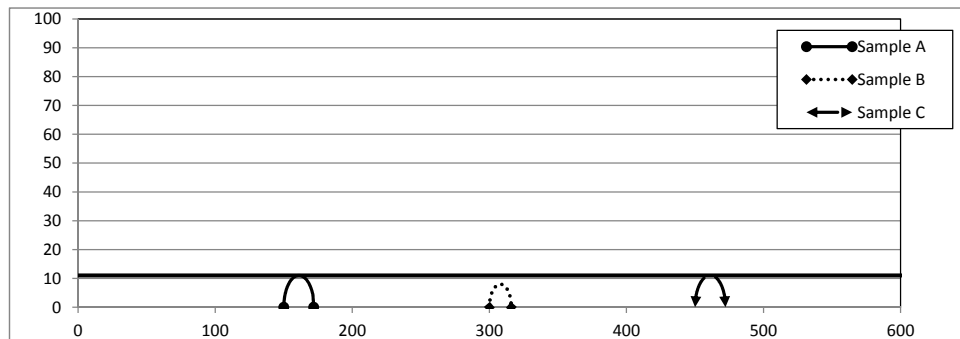
**TESTING DETAILS**

Mode of Failure:		Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8	0.8
Cell Pressure, P1	kPa	150	300	450
Max Deviator Stress	kPa	22.1	16.0	22.2
Major Principal Stress P3,	kPa	172.1	316.0	472.2
Axial Strain at failure	%	30.5%	30.2%	25.8%
Undrained Strength, Su	kPa	11.0	8.0	11.1
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>10.0</b>		
E <sub>50</sub> secant modulus,	kPa	251	266	321
E <sub>50</sub> strain	%	5.0	3.6	5.0
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>279</b>		
Cohesion , C	kPa	11.0		
Angle of internal Friction,	φ	0.0		



**Stress Strain Graphs**



**Undrained Shear Strength**      10 kPa at 29% strain  
**E<sub>50</sub> secant modulus**            0.3 Mpa at 4.5% strain



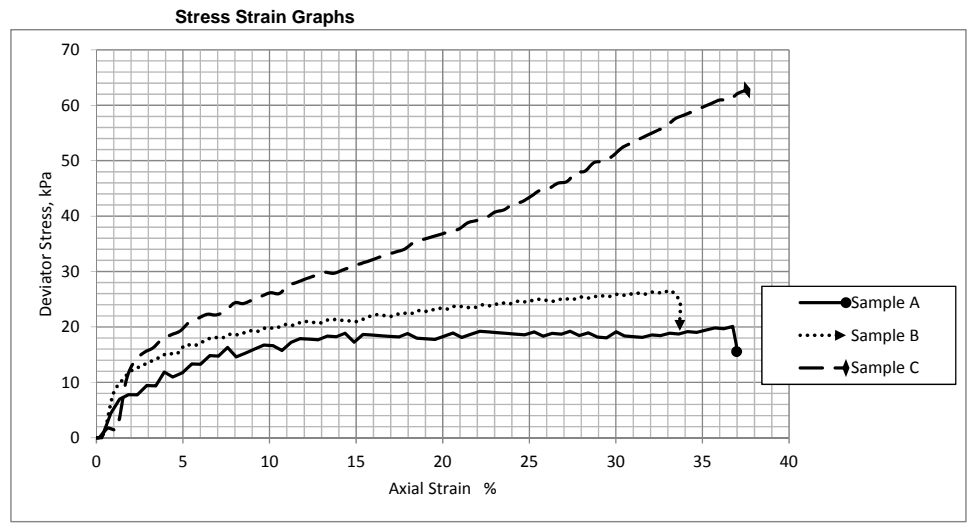
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		BS 1377 Part 7

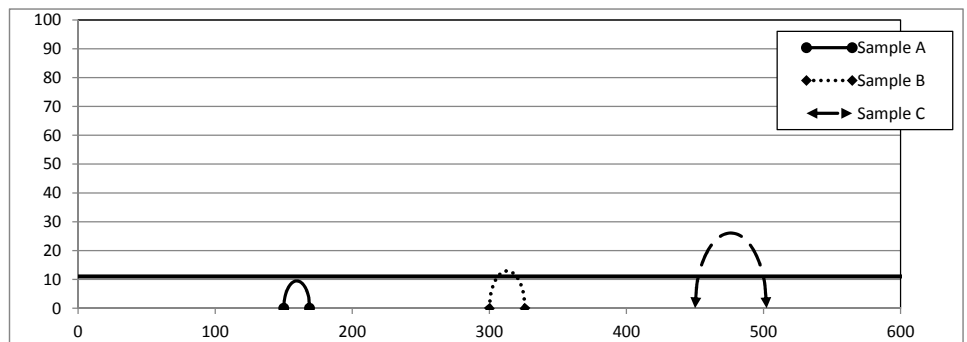
PROJECT:	CENTRAL RAILWAY STUDY: KILOSA GULWE	TESTED BY	Law / Rose
CLIENT:	PADECO CO. LTD	DATE	12/6/2015
SOURCE/ LOCATION	BH 01 : 18.50 - 19.00m	SMPLE NO	6020
Type of Specimen	Undisturbed	CHECKED BY	Jotham
		DATE	12/5/2015

Specimen Details	Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134
Length	Lo (mm)	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193
Mass	g	155.65	165.27
Moisture Content	%	29.7	29.7
Bulk Density	Mg/m <sup>3</sup>	1.806	1.917
Dry Density	Mg/m <sup>3</sup>	1.392	1.478
Specific Gravity		2.497	2.497
Void Ratio		0.79	0.69
Initial Degree of Saturation		93%	108%
		89%	

TESTING DETAILS			
Mode of Failure:	Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8
Cell Pressure, P1	kPa	150	300
Max Deviator Stress	kPa	19.0	25.9
Major Principal Stress P3,	kPa	169.0	325.9
Axial Strain at failure	%	23.2%	30.1%
Undrained Strength, Su	kPa	9.5	12.9
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>16.2</b>	
E <sub>50</sub> secant modulus,	kPa	329	488
E <sub>50</sub> strain	%	3.9	3.1
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>364</b>	
Cohesion , C	kPa	11.0	
Angle of internal Friction,	φ	0.0	



**Undrained Shear Strength**      11.2 kPa at 27% strain  
**E<sub>50</sub> secant modulus**            0.4 Mpa at 3.5% strain



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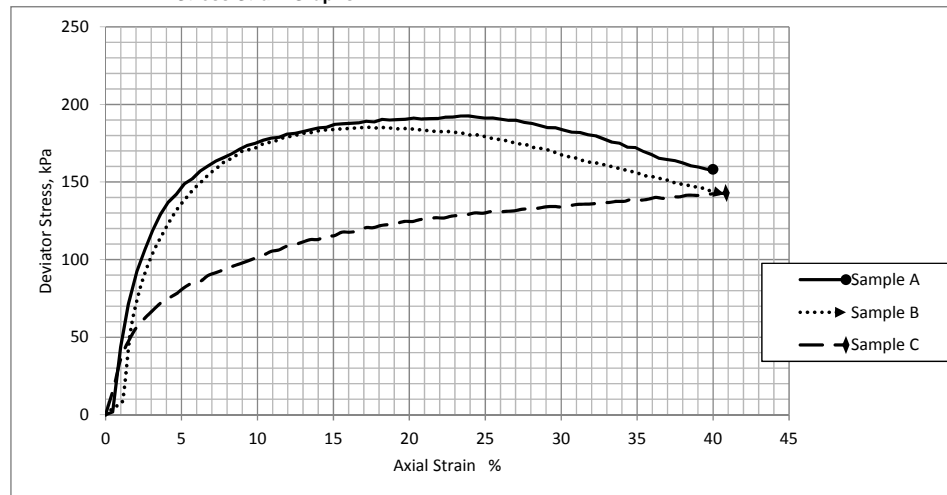
<b>PROJECT:</b>	CENTRAL RAILWAY STUDY: KILOSA GULWE			TESTED BY	Law / Rose
<b>CLIENT:</b>	PADECO CO. LTD			DATE	7/5/2015
<b>SOURCE/ LOCATION</b>	BH 01 : 26.50 - 27.00m	<b>SMPLE NO</b>	6026	CHECKED BY	Jotham
<b>Type of Specimen</b>	Undisturbed			DATE	12/5/2015

Specimen Details		Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134	1134
Length	Lo (mm)	76	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193	86193
Mass	g	164.25	164.21	165.64
Moisture Content	%	24.3	24.3	24.3
Bulk Density	Mg/m <sup>3</sup>	1.906	1.905	1.922
Dry Density	Mg/m <sup>3</sup>	1.533	1.533	1.546
Specific Gravity		2.489	2.489	2.489
Void Ratio		0.62	0.62	0.61
Initial Degree of Saturation		97%	97%	89%

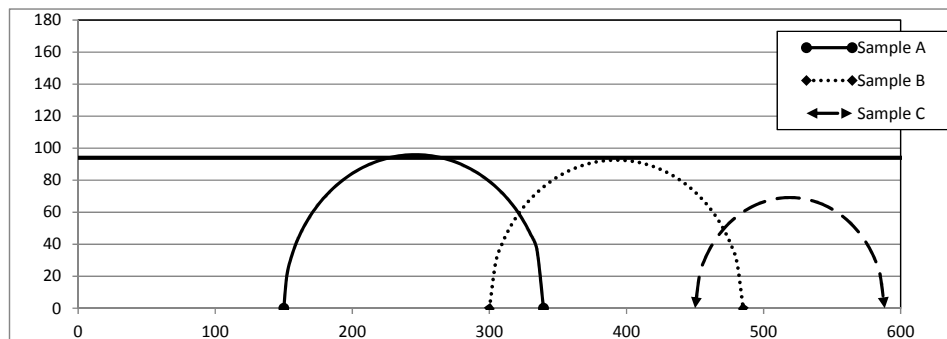
**TESTING DETAILS**

Mode of Failure:		Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8	0.8
Cell Pressure, P1	kPa	150	300	450
Max Deviator Stress	kPa	191.9	185.1	138.3
Major Principal Stress P3,	kPa	341.9	485.1	588.3
Axial Strain at failure	%	24.4%	18.3%	35.2%
Undrained Strength, Su	kPa	95.9	92.6	69.2
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>85.9</b>		
E <sub>50</sub> secant modulus,	kPa	4926	5494	1979
E <sub>50</sub> strain	%	2.6	2.6	3.6
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>4133</b>		
Cohesion , C	kPa	94.0		
Angle of internal Friction,	φ	0.0		



**Stress Strain Graphs**



**Undrained Shear Strength**      **94.3 kPa at 21% strain**  
**E<sub>50</sub> secant modulus**              **5.2 Mpa at 2.6% strain**



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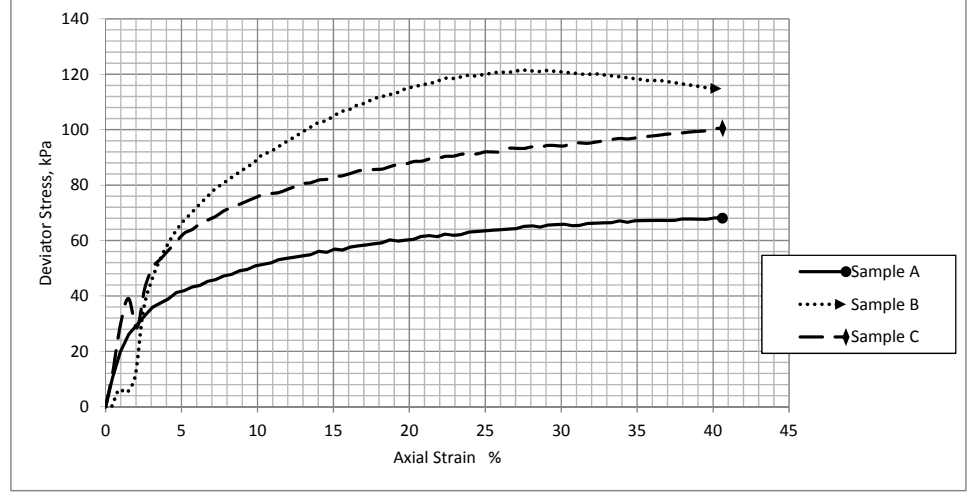
PROJECT:	CENTRAL RAILWAY STUDY: KILOSA GULWE	TESTED BY	Law / Rose
CLIENT:	PADECO CO. LTD	DATE	9/5/2015
SOURCE/ LOCATION	BH 05 : 0.50 - 1.00m	SMPLE NO	6035
Type of Specimen	Undisturbed	CHECKED BY	Jotham
		DATE	12/5/2015

Specimen Details	Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134
Length	Lo (mm)	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193
Mass	g	157.7	153.37
Moisture Content	%	30.0	30.0
Bulk Density	Mg/m <sup>3</sup>	1.830	1.779
Dry Density	Mg/m <sup>3</sup>	1.407	1.369
Specific Gravity		2.358	2.358
Void Ratio		0.68	0.72
Initial Degree of Saturation		105%	98%
		89%	

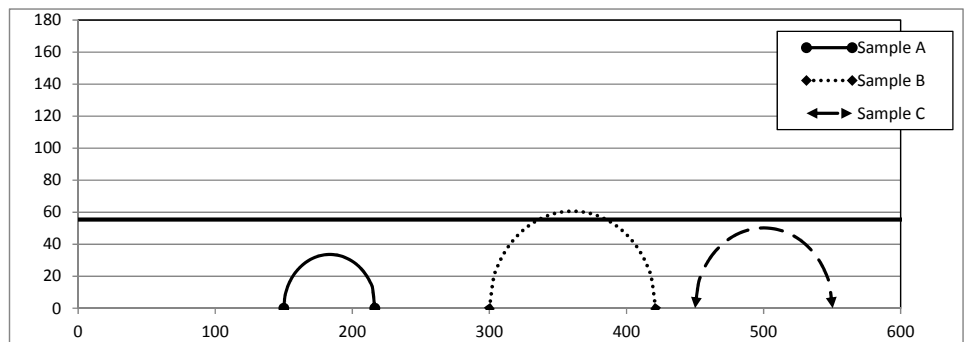
**TESTING DETAILS**

Mode of Failure:	Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8
Cell Pressure, P1	kPa	150	300
Max Deviator Stress	kPa	67.2	121.2
Major Principal Stress P3,	kPa	217.2	421.2
Axial Strain at failure	%	35.4%	28.0%
Undrained Strength, Su	kPa	33.6	60.6
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>48.1</b>	
E <sub>50</sub> secant modulus,	kPa	1164	1975
E <sub>50</sub> strain	%	3.1	4.6
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>1731</b>	
Cohesion , C	kPa	55.4	
Angle of internal Friction,	φ	0.0	



**Stress Strain Graphs**



Undrained Shear Strength    **55.4 kPa at 34% strain**  
 E<sub>50</sub> secant modulus        **2 Mpa at 3.9% strain**



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		BS 1377 Part 7

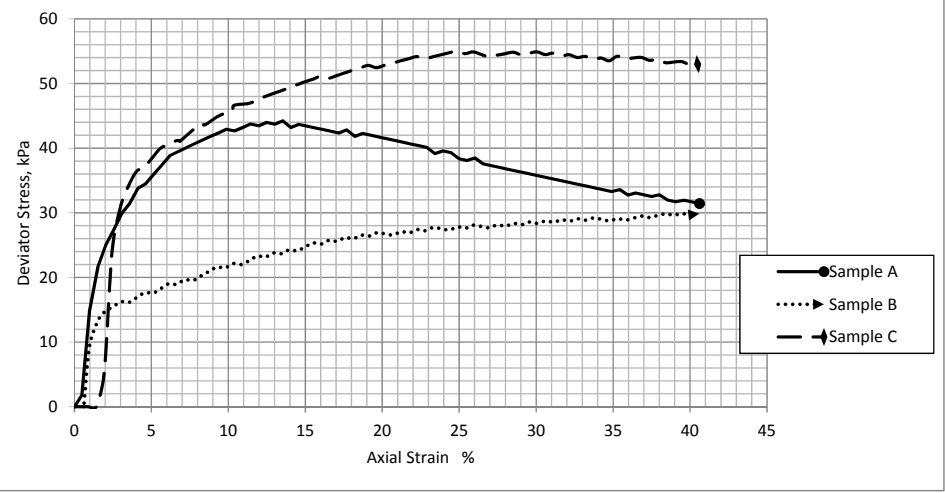
PROJECT:	CENTRAL RAILWAY STUDY: KILOSA GULWE	TESTED BY	Law / Rose
CLIENT:	PADECO CO. LTD	DATE	2/5/2015
SOURCE/ LOCATION	BH 05 : 4.50 - 5.00m	SMPLE NO	6036
Type of Specimen	Undisturbed	CHECKED BY	Jotham
		DATE	12/5/2015

Specimen Details	Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134
Length	Lo (mm)	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193
Mass	g	152.95	148.77
Moisture Content	%	29.6	29.6
Bulk Density	Mg/m <sup>3</sup>	1.775	1.726
Dry Density	Mg/m <sup>3</sup>	1.369	1.332
Specific Gravity		2.318	2.318
Void Ratio		0.69	0.74
Initial Degree of Saturation		99%	93%
		89%	

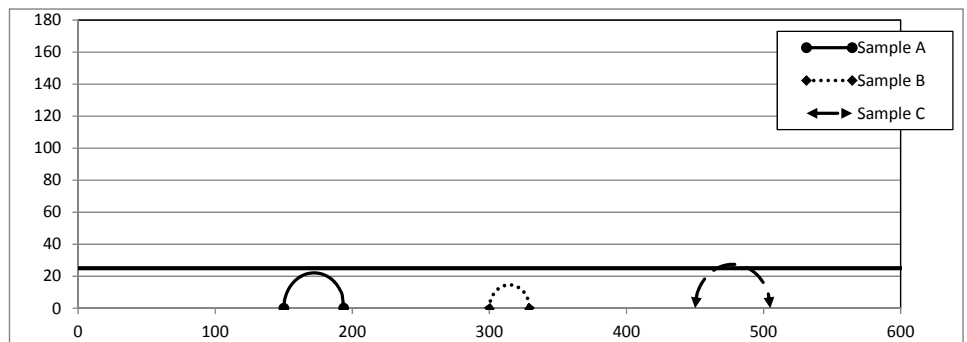
**TESTING DETAILS**

<b>Mode of Failure:</b>		Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8	0.8
Cell Pressure, P1	kPa	150	300	450
Max Deviator Stress	kPa	44.2	29.2	54.9
Major Principal Stress P3,	kPa	194.2	329.2	504.9
Axial Strain at failure	%	13.5%	33.7%	25.9%
Undrained Strength, Su	kPa	22.1	14.6	27.4
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>21.4</b>		
E <sub>50</sub> secant modulus,	kPa	1490	1222	2439
E <sub>50</sub> strain	%	2.0	2.0	3.0
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>1717</b>		
Cohesion , C	kPa	25.0		
Angle of internal Friction,	φ	0.0		



**Stress Strain Graphs**



**Undrained Shear Strength      24.8 kPa at 20% strain**  
**E<sub>50</sub> secant modulus            2 Mpa at 2.5% strain**



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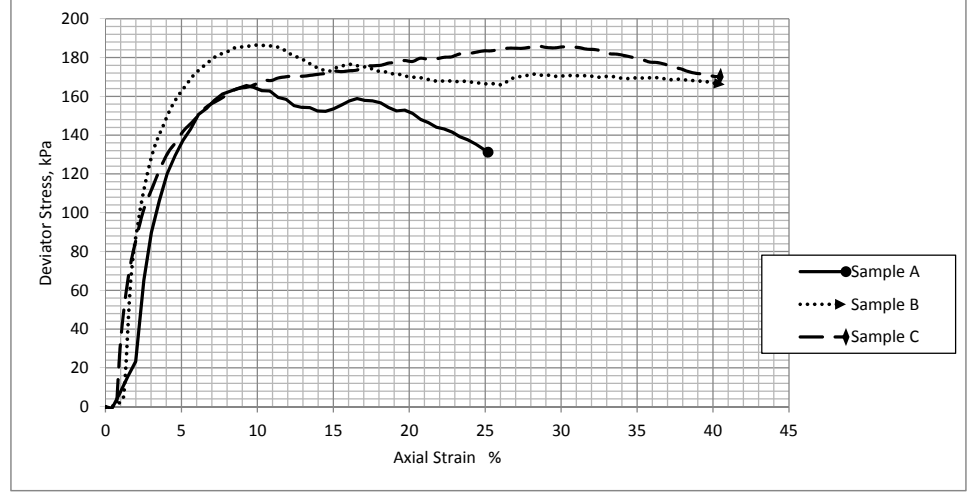
PROJECT:	CENTRAL RAILWAY STUDY: KILOSA GULWE	TESTED BY	Law / Rose
CLIENT:	PADECO CO. LTD	DATE	11/5/2015
SOURCE/ LOCATION	BH 05 : 8.50 - 9.00m	SMPLE NO	6037
Type of Specimen	Undisturbed	CHECKED BY	Jotham
		DATE	12/5/2015

Specimen Details	Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134
Length	Lo (mm)	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193
Mass	g	158.87	158.27
Moisture Content	%	45.5	45.5
Bulk Density	Mg/m <sup>3</sup>	1.843	1.836
Dry Density	Mg/m <sup>3</sup>	1.267	1.262
Specific Gravity		2.385	2.385
Void Ratio		0.88	0.89
Initial Degree of Saturation		123%	122%
		89%	

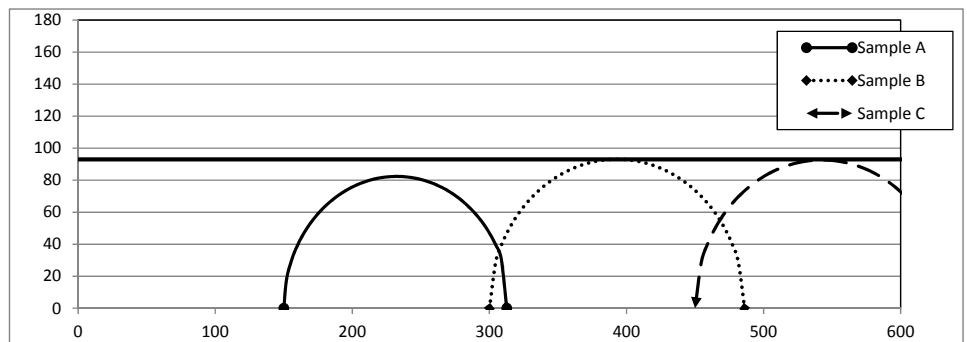
**TESTING DETAILS**

<b>Mode of Failure:</b>		Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8	0.8
Cell Pressure, P1	kPa	150	300	450
Max Deviator Stress	kPa	164.7	186.2	185.2
Major Principal Stress P3,	kPa	314.7	486.2	635.2
Axial Strain at failure	%	9.8%	10.5%	29.0%
Undrained Strength, Su	kPa	82.4	93.1	92.6
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>89.4</b>		
E <sub>50</sub> secant modulus,	kPa	6467	9045	6140
E <sub>50</sub> strain	%	3.0	2.2	2.5
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>7217</b>		
Cohesion , C	kPa	93.0		
Angle of internal Friction,	φ	0.0		

**Stress Strain Graphs**





**Undrained Shear Strength      89.4 kPa at 16% strain**  
**E<sub>50</sub> secant modulus              7.2 Mpa at 2.6% strain**



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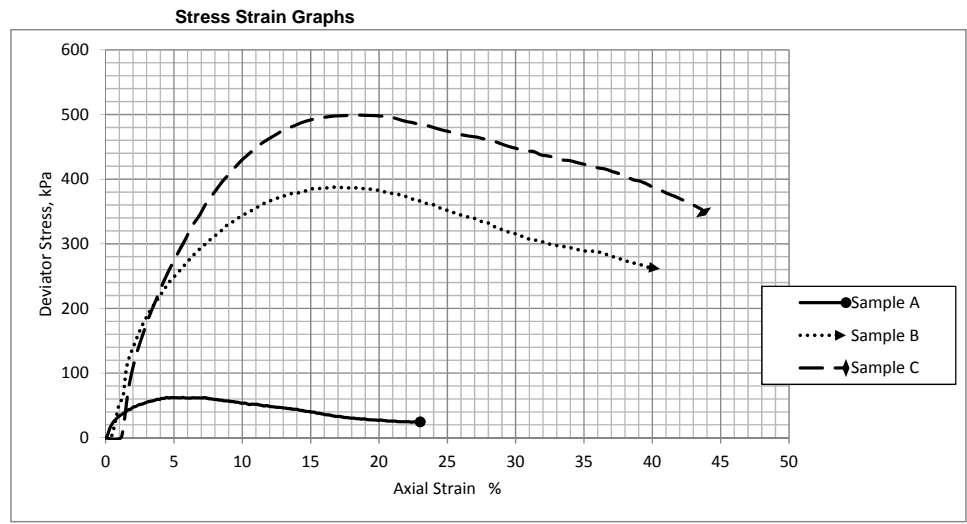


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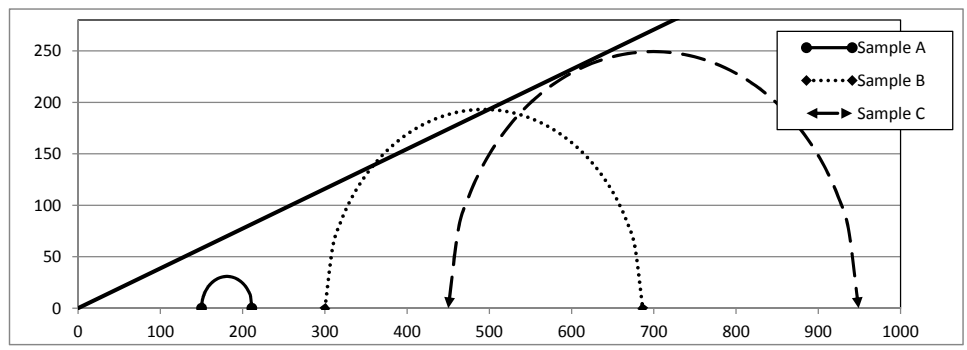
PROJECT:	CENTRAL RAILWAY STUDY: KILOSA GULWE	TESTED BY	Law / Rose
CLIENT:	PADECO CO. LTD	DATE	4/5/2015
SOURCE/ LOCATION	BH 09 : 0.50 - 1.00m	SMPLE NO	5919
Type of Specimen	Undisturbed	CHECKED BY	Jotham
		DATE	12/5/2015

Specimen Details	Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134
Length	Lo (mm)	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193
Mass	g	180.75	177.67
Moisture Content	%	16.9	16.9
Bulk Density	Mg/m <sup>3</sup>	2.097	1.945
Dry Density	Mg/m <sup>3</sup>	1.794	1.664
Specific Gravity		2.303	2.303
Void Ratio		0.28	0.31
Initial Degree of Saturation		137%	101%
		89%	

TESTING DETAILS			
Mode of Failure:	Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8
Cell Pressure, P1	kPa	150	300
Max Deviator Stress	kPa	61.9	386.4
Major Principal Stress P3,	kPa	211.9	686.4
Axial Strain at failure	%	5.2%	17.6%
Undrained Strength, Su	kPa	30.9	193.2
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>157.8</b>	
E <sub>50</sub> secant modulus,	kPa	3570	6431
E <sub>50</sub> strain	%	1.0	3.7
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>5756</b>	
App Cohesion , C	kPa	0.0	
App Angle of internal Fricti	φ	21.1	



Undrained Shear Strength      **221.3 kPa at 18% strain**  
 E<sub>50</sub> secant modulus              **6.8 Mpa at 4.2% strain**



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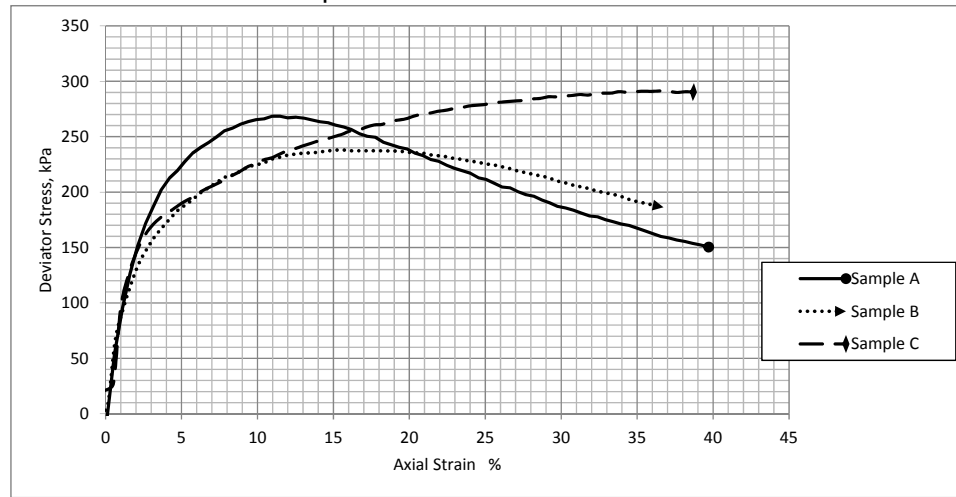
<b>PROJECT:</b>	CENTRAL RAILWAY STUDY: KILOSA GULWE			TESTED BY	Law / Rose
<b>CLIENT:</b>	PADECO CO. LTD			DATE	13/5/2015
<b>SOURCE/ LOCATION</b>	BH 09 : 4.00 - 4.50m	<b>SMPLE NO</b>	5920	CHECKED BY	Jotham
<b>Type of Specimen</b>	Undisturbed			DATE	13/5/2015

Specimen Details		Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134	1134
Length	Lo (mm)	76	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193	86193
Mass	g	174.45	156.72	160.45
Moisture Content	%	15.9	15.9	15.9
Bulk Density	Mg/m <sup>3</sup>	2.024	1.818	1.862
Dry Density	Mg/m <sup>3</sup>	1.746	1.569	1.606
Specific Gravity		2.546	2.546	2.546
Void Ratio		0.46	0.62	0.59
Initial Degree of Saturation		88%	65%	89%

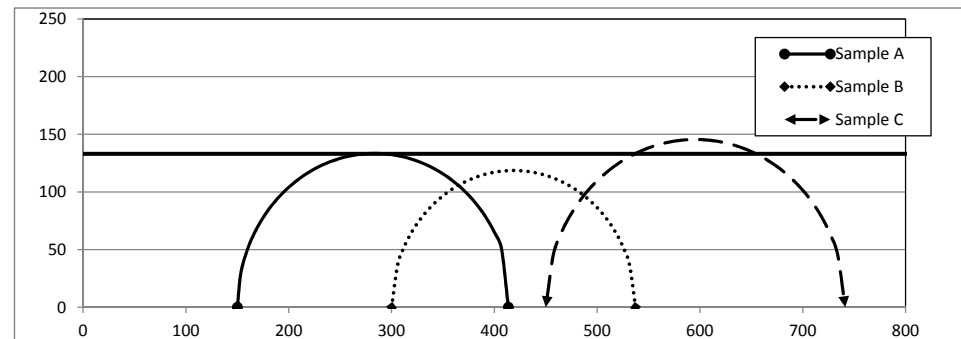
**TESTING DETAILS**

Mode of Failure:		Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8	0.8
Cell Pressure, P1	kPa	150	300	450
Max Deviator Stress	kPa	266.9	237.3	291.2
Major Principal Stress P3,	kPa	416.9	537.3	741.2
Axial Strain at failure	%	12.3%	18.3%	39.6%
Undrained Strength, Su	kPa	133.5	118.6	145.6
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>132.6</b>		
E <sub>50</sub> secant modulus,	kPa	7734	6277	6030
E <sub>50</sub> strain	%	2.1	2.2	2.0
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>6680</b>		
Cohesion , C	kPa	133.0		
Angle of internal Friction,	φ	0.0		



**Stress Strain Graphs**



**Undrained Shear Strength**      132.6 kPa at 23% strain  
**E<sub>50</sub> secant modulus**            6.7 Mpa at 2.1% strain



Z-107

	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	
Triaxial Unconsolidated Undrained (UU) Test		
		BS 1377 Part 7

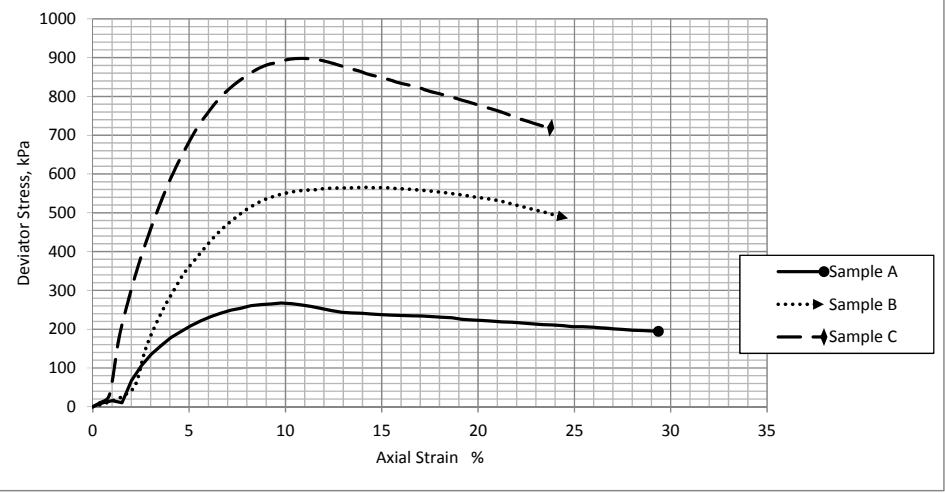
PROJECT:	CENTRAL RAILWAY STUDY: KILOSA GULWE	TESTED BY	Law / Rose
CLIENT:	PADECO CO. LTD	DATE	14/5/2015
SOURCE/ LOCATION	BH 10 : 11.00 - 11.50m	SMPLE NO	5926
Type of Specimen	Undisturbed	CHECKED BY	Jotham
		DATE	14/5/2015

Specimen Details	Sample A	Sample B	Sample C
Diameter	Do (mm)	38	38
Area	Ao (mm <sup>2</sup> )	1134	1134
Length	Lo (mm)	76	76
Volume	Vo (mm <sup>3</sup> )	86193	86193
Mass	g	153.58	153.17
Moisture Content	%	22.4	22.4
Bulk Density	Mg/m <sup>3</sup>	1.782	1.777
Dry Density	Mg/m <sup>3</sup>	1.456	1.468
Specific Gravity		2.645	2.645
Void Ratio		0.82	0.80
Initial Degree of Saturation		73%	72%
		89%	

**TESTING DETAILS**

<b>Mode of Failure:</b>		Maximum Deviator Stress		
Rate of strain	mm/min	0.8	0.8	0.8
Cell Pressure, P1	kPa	150	300	450
Max Deviator Stress	kPa	265.7	564.9	897.5
Major Principal Stress P3,	kPa	415.7	864.9	1347.5
Axial Strain at failure	%	10.3%	15.1%	11.2%
Undrained Strength, Su	kPa	132.9	282.5	448.7
<b>Av. Undrained Strength,</b>	<b>kPa</b>	<b>288.0</b>		
E <sub>50</sub> secant modulus,	kPa	8210	12190	18891
E <sub>50</sub> strain	%	3.0	4.2	3.4
<b>E<sub>50</sub> Av. secant modulus</b>	<b>kPa</b>	<b>13097</b>		
Cohesion , C	kPa	0.0		
Angle of internal Friction,	φ	29.0		

**Stress Strain Graphs**

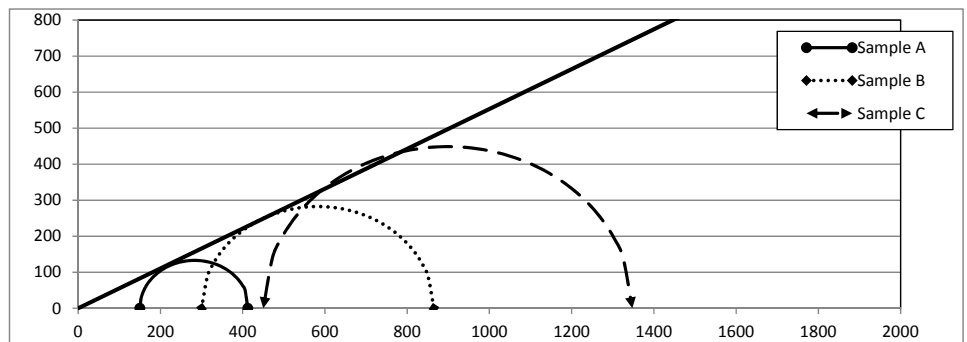


**Undrained Shear Strength**



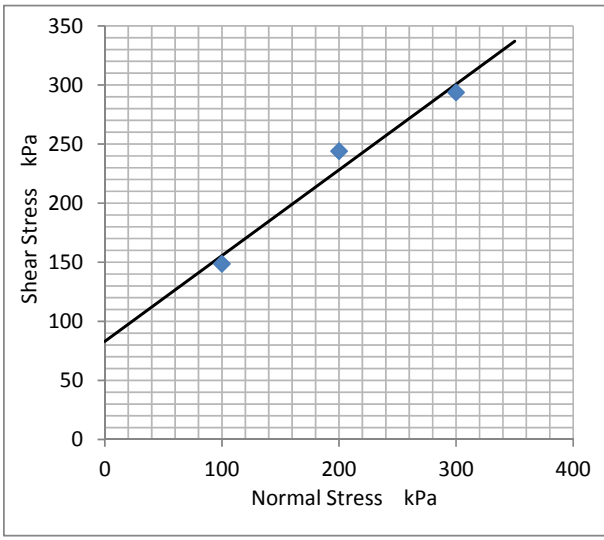
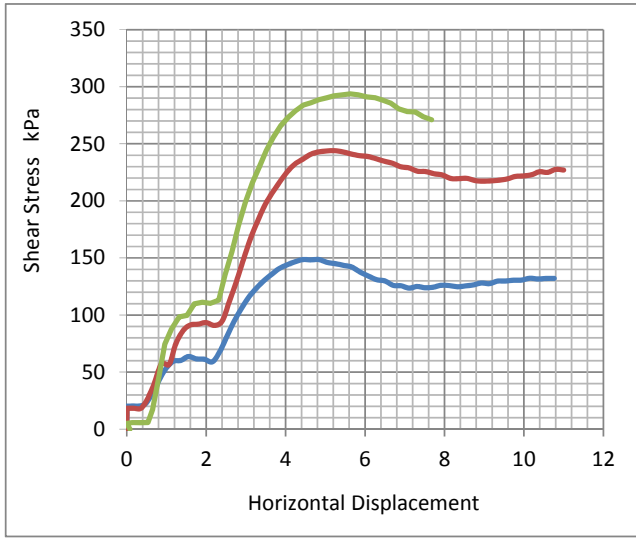
E<sub>50</sub> secant modulus      13.1 Mpa at 3.6% strain

**Remarks**



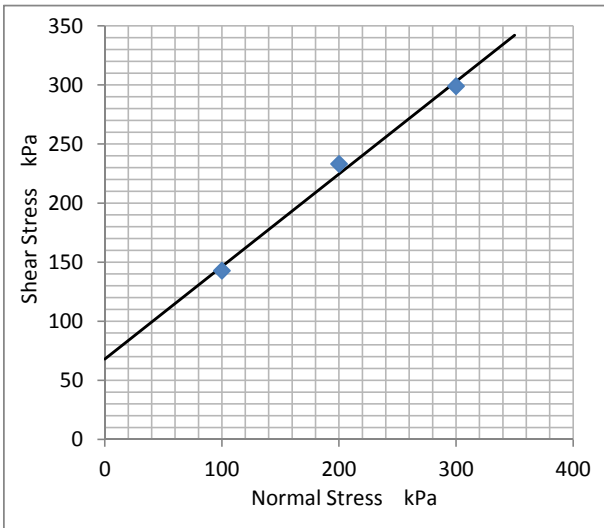
Sample not saturated. Undrained test behaving as a total stress test with c and phi



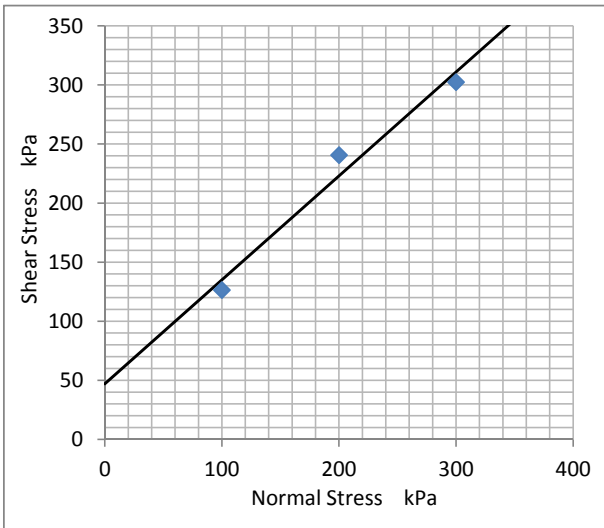
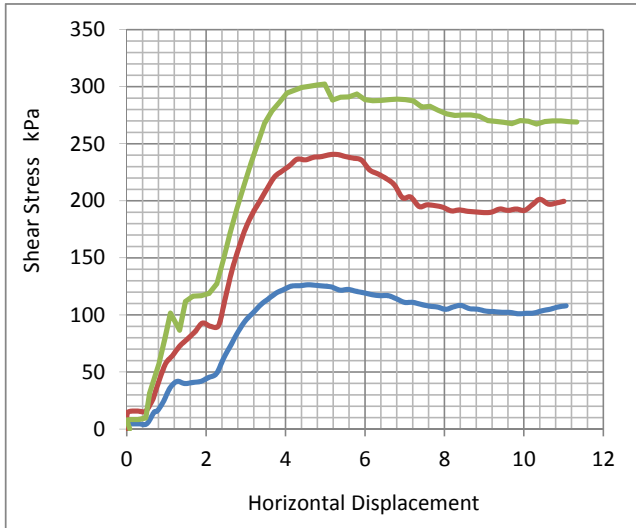


801-Z

		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA																																																																			
<b>Direct Shear Test</b>																																																																					
FORM No		S0820 - 6031		BS 1377: Part 7: 1990																																																																	
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Cohesion		C	83.0																																																																		
Angle of internal Friction,		$\phi$	36.0																																																																		
Signed by ( Materials Engineer/ Manager)				Received by:																																																																	
Z-109																																																																					



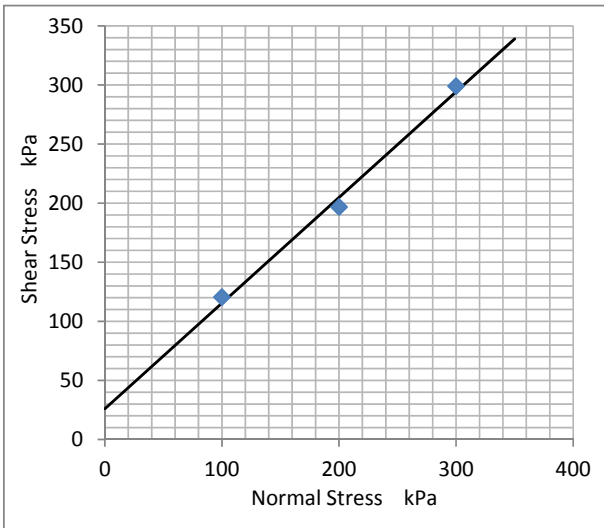
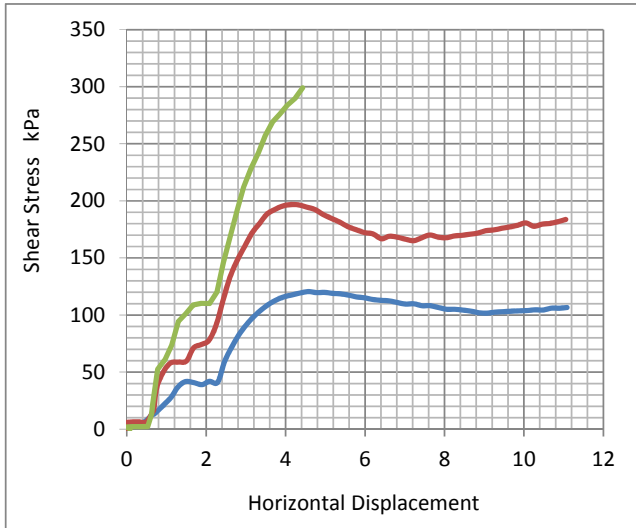


		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA			
<b>Direct Shear Test</b>					
FORM No		S0820 - 5922		BS 1377: Part 7: 1990	
PROJECT		KILOSA GULWE		CHECKED	Jotham
SOURCE/ LOCATION		BH10 3.00 - 3.50m		DATE	18-May-15
TESTED BY		LAWRANCE /ROSE CLIENT:		APPROVED	
DATE OF SAMPLING		TESTING DATE		30-Apr-2015	
<b>Type of Specimen</b>		Disturbed		<b>Material Description</b>	
		<b>Initially</b>		<b>Test 1</b>	
		<b>Test 2</b>		<b>Test 3</b>	
Specific gravity		2.751		Normal Stress (kPa)	
				<b>100</b>	
Mosture Content %		13.03		Mass of specimen (g)	
				121.97	
Area (mm <sup>2</sup> )		3600		Initial vertical reading (mm)	
				0	
Height of specimen (mm)		20		V. reading at End of Consolid.(mm)	
				1.022	
Volume (mm <sup>3</sup> )		72000		Bulk Density (Mg/m <sup>3</sup> )	
				1.785	
Av. Bulk density (Mg/m <sup>3</sup> )		1.694		Dry Density (Mg/m <sup>3</sup> )	
				1.579	
				Intial Void Ratio	
				0.84	
				Void ratio at end of consolidation	
				0.74	
<b>Test Conditions</b>		Rate of Displacement (mm/min)		1.00	
		Peak Shear Stress (kPa)		<b>142.8</b>	
				<b>233.2</b>	
				<b>299.0</b>	
<b>Plot of Results</b>					
<b>Shear Stress Vs Normal Stress</b>			<b>Shear Stress Vs Displacement</b>		
					
<b>Shear Strength Parameters at Failure</b>					
Cohesion		C		68.0	
Angle of internal Friction,		$\phi$		38.1	
Signed by ( Materials Engineer/ Manager)				Received by:	
Z-110					

		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA			
<b>Direct Shear Test</b>					
FORM №		S0820 - 5921		BS 1377: Part 7: 1990	
PROJECT		KILOSA GULWE		CHECKED	Jotham
SOURCE/ LOCATION		BH10 1.00 - 1.50m		DATE	18-May-15
TESTED BY		LAWRANCE /ROSE CLIENT:		APPROVED	
DATE OF SAMPLING		TESTING DATE		4-May-2015	
<b>Type of Specimen</b>		Disturbed		<b>Material Description</b>	
	<b>Initially</b>		<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>
Specific gravity	2.689	Normal Stress (kPa)	100	200	300
Moisture Content %	19.03	Mass of specimen (g)	144.91	144.94	144.95
Area (mm <sup>2</sup> )	3600	Initial vertical reading (mm)	0	0	0
Height of specimen (mm)	20	V. reading at End of Consolid.(mm)	1.363	1.819	1.84
Volume (mm <sup>3</sup> )	72000	Bulk Density (Mg/m <sup>3</sup> )	2.160	2.214	2.561
Av. Bulk density (Mg/m <sup>3</sup> )	2.013	Dry Density (Mg/m <sup>3</sup> )	1.815	1.860	2.152
		Initial Void Ratio	0.59	0.59	0.59
		Void ratio at end of consolidation	0.48	0.45	0.25
<b>Test Conditions</b>		Rate of Displacement (mm/min)	1.00	1.00	1.00
		Peak Shear Stress (kPa)	126.4	240.6	302.4
<b>Plot of Results</b>					
<b>Shear Stress Vs Normal Stress</b>			<b>Shear Stress Vs Displacement</b>		
					
<b>Shear Strength Parameters at Failure</b>					
<b>Cohesion</b>		<b>C</b>	47.0		
<b>Angle of internal Friction,</b>		<b>φ</b>	41.3		
Signed by ( Materials Engineer/ Manager)			Z-111		Received by:

CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA		C.Labs(Tz) Draw, Build, Test	
<b>Direct Shear Test</b>			
FORM No	S0820 - 6032	BS 1377: Part 7: 1990	
PROJECT	KILOSA GULWE	CHECKED	Jotham
SOURCE/ LOCATION	BH2 25.00 - 25.50m	DATE	18-May-15
TESTED BY	LAWRANCE /ROSE CLIENT:	APPROVED	
DATE OF SAMPLING	TESTING DATE	4-May-2015	
<b>Type of Specimen</b>	Disturbed	<b>Material Description</b>	
	<b>Initially</b>	<b>Test 1</b>	<b>Test 2</b>
			<b>Test 3</b>
Specific gravity	2.775	Normal Stress (kPa)	<b>100</b>
			<b>200</b>
			<b>300</b>
Mosture Content %	12.05	Mass of specimen (g)	156.27
			156.29
			156.31
Area (mm <sup>2</sup> )	3600	Initial vertical reading (mm)	0
			0
			0
Height of specimen (mm)	20	V. reading at End of Consolid.(mm)	1.663
			1.886
			1.793
Volume (mm <sup>3</sup> )	72000	Bulk Density (Mg/m <sup>3</sup> )	2.367
			2.397
			2.561
Av. Bulk density (Mg/m <sup>3</sup> )	2.171	Dry Density (Mg/m <sup>3</sup> )	2.113
			2.139
			2.286
		Intial Void Ratio	0.43
			0.43
		Void ratio at end of consolidation	0.31
			0.30
			0.21
<b>Test Conditions</b>		Rate of Displacement (mm/min)	1.00
			1.00
		Peak Shear Stress (kPa)	<b>137.0</b>
			<b>259.3</b>
			<b>302.4</b>
<b>Plot of Results</b>			
<b>Shear Stress Vs Normal Stress</b>		<b>Shear Stress Vs Displacement</b>	
<b>Shear Strength Parameters at Failure</b>			
<b>Cohesion</b>	<b>C</b>	<b>67.0</b>	
<b>Angle of internal Friction,</b>	<b>φ</b>	<b>39.5</b>	
Signed by ( Materials Engineer/ Manager)		Received by:	
Z-112			

C.Labs(Tz) Draw, Build, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA		C.Labs(Tz) Draw, Build, Test	
<b>Direct Shear Test</b>					
FORM №	S0820 - 6030			BS 1377: Part 7: 1990	
PROJECT	KILOSA GULWE			CHECKED	Jotham
SOURCE/ LOCATION	BH2 17.00 - 17.50m U4			DATE	18-May-15
TESTED BY	LAWRANCE /ROSE CLIENT:			APPROVED	
DATE OF SAMPLING	TESTING DATE 19/4/2015			DATE	
<b>Type of Specimen</b>	Disturbed		<b>Material Description</b>		
	<b>Initially</b>		<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>
Specific gravity	2.76	Normal Stress (kPa)	100	200	300
Moisture Content %	13.01	Mass of specimen (g)	169.92	169.95	169.98
Area (mm <sup>2</sup> )	3600	Initial vertical reading (mm)	0	0	0
Height of specimen (mm)	20	V. reading at End of Consolid.(mm)	1.419	1.691	2.358
Volume (mm <sup>3</sup> )	72000	Bulk Density (Mg/m <sup>3</sup> )	2.540	2.578	2.561
Av. Bulk density (Mg/m <sup>3</sup> )	2.360	Dry Density (Mg/m <sup>3</sup> )	2.248	2.282	2.266
		Initial Void Ratio	0.32	0.32	0.32
		Void ratio at end of consolidation	0.23	0.21	0.22
<b>Test Conditions</b>		Rate of Displacement (mm/min)	1.00	1.00	1.00
		Peak Shear Stress (kPa)	134.7	259.7	310.8
<b>Plot of Results</b>					
<b>Shear Stress Vs Normal Stress</b>			<b>Shear Stress Vs Displacement</b>		
<b>Shear Strength Parameters at Failure</b>					
<b>Cohesion</b>	<b>C</b>	59.0			
<b>Angle of internal Friction,</b>	<b>φ</b>	41.2			
Signed by ( Materials Engineer/ Manager)			Received by:		
Z-113					

		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA			
<b>Direct Shear Test</b>					
FORM No		S0820 - 6018		BS 1377: Part 7: 1990	
PROJECT		KILOSA GULWE		CHECKED	Jotham
SOURCE/ LOCATION		BH1 3.00 - 3.50m		DATE	18-May-15
TESTED BY		LAWRANCE /ROSE CLIENT:		APPROVED	
DATE OF SAMPLING		TESTING DATE		24/4/2015	
DATE					
<b>Type of Specimen</b>		Disturbed		<b>Material Description</b>	
	<b>Initially</b>		<b>Test 1</b>	<b>Test 2</b>	<b>Test 3</b>
Specific gravity	2.773	Normal Stress (kPa)	100	200	300
Moisture Content %	13.11	Mass of specimen (g)	137.87	137.88	137.9
Area (mm <sup>2</sup> )	3600	Initial vertical reading (mm)	0	0	0
Height of specimen (mm)	20	V. reading at End of Consolid.(mm)	1.593	1.883	1.81
Volume (mm <sup>3</sup> )	72000	Bulk Density (Mg/m <sup>3</sup> )	2.081	2.114	2.561
Av. Bulk density (Mg/m <sup>3</sup> )	1.915	Dry Density (Mg/m <sup>3</sup> )	1.839	1.869	2.264
		Initial Void Ratio	0.64	0.64	0.64
		Void ratio at end of consolidation	0.51	0.48	0.22
<b>Test Conditions</b>		Rate of Displacement (mm/min)	1.00	1.00	1.00
		Peak Shear Stress (kPa)	120.5	196.7	299.1
<b>Plot of Results</b>					
<b>Shear Stress Vs Normal Stress</b>			<b>Shear Stress Vs Displacement</b>		
					
<b>Shear Strength Parameters at Failure</b>					
Cohesion		C	26.0		
Angle of internal Friction,		$\phi$	41.8		
Signed by ( Materials Engineer/ Manager)		Z-114		Received by:	



### One Dimension Consolidation test

Form №			BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD		DATE: 6-May to 15-May-2015
<b>LOCATION</b>	BH 1 : Depth 5.00 - 5.50m	<b>SAMPLE NO.</b> 6028	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b>	DATE:

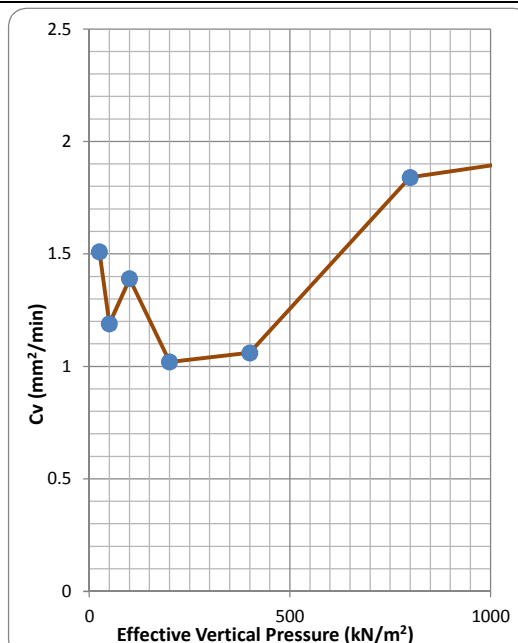
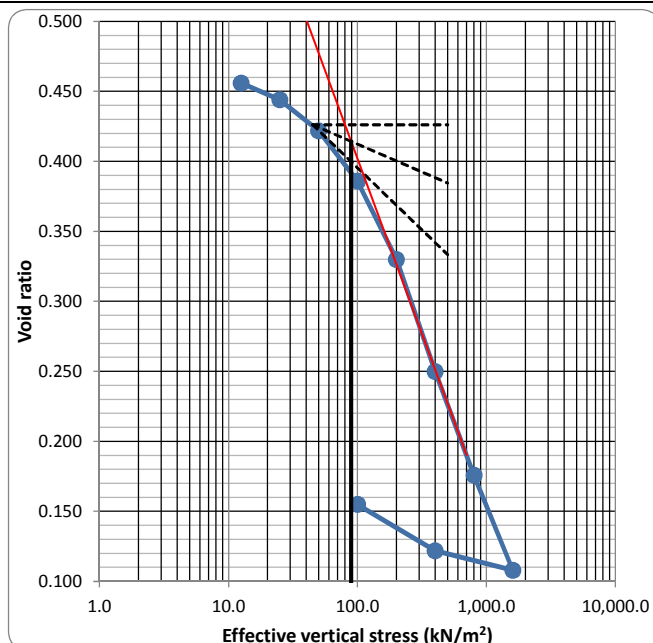
**SPECIMEN DETAIL**

Diameter (mm)	50	Initial Moisture Content (%)	9.1
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	43.93
Height (mm)	20.14	Initial Void ratio	0.48
Volume (mm <sup>3</sup> )	39545	Final Moisture Content (%)	36.4
Specific gravity	2.312	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	13.61	Unit weight of Soil (kN/m <sup>3</sup> )	16.72

**TEST RESULTS**

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.456				
12 - 25	0.444	13.22	1.51	0.66	0.016
25 - 50	0.422	16.74	1.19	0.61	0.012
50 - 100	0.386	14.38	1.39	0.51	0.012
100 - 200	0.330	19.57	1.02	0.40	0.007
200 - 400	0.250	18.76	1.06	0.30	0.005
400 - 799	0.176	10.84	1.84	0.15	0.004
799 - 1599	0.108	9.73	2.05	0.07	0.002
1,599 - 400	0.122				
400 - 100	0.155				

**GRAPHS**



Compression Index (Loading)	0.250	OCR > 1 , Over Consolidated OCR <=1, Normal Consolidation Eoed at 100kN = 2.12mN/m2
Compression Index (Unloading)	0.039	
Preconsolidation Pressure (kN/m <sup>2</sup> )	89.3	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	85.3	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	1.0	
Signed by (Materials Engineer/Manager)		
		Received by;

**One Dimension Consolidation test**

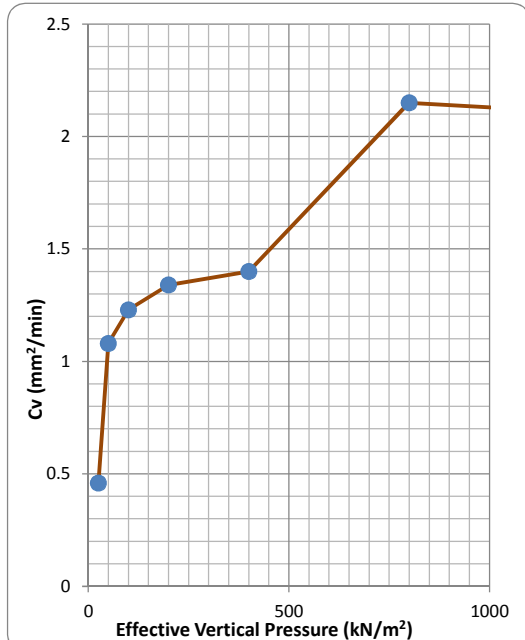
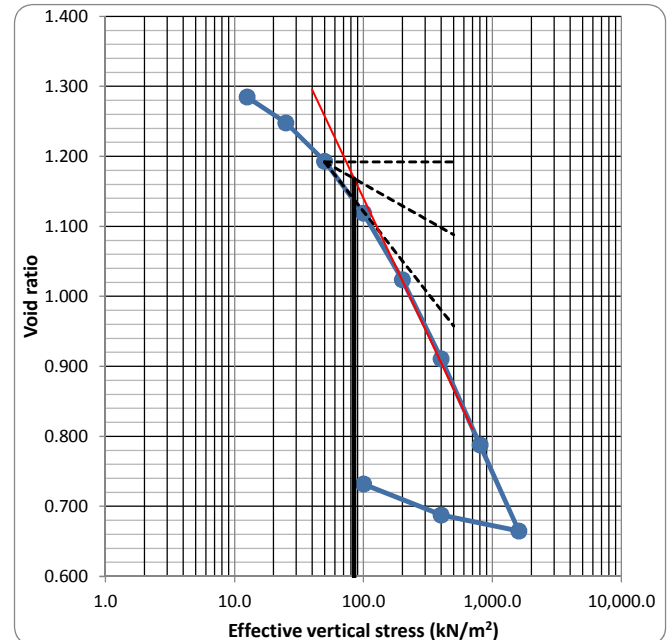
Form No		BS 1377 Part 5
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<b>PROJECT</b>	CENTRAL RAILWAY STUDY. KILOSA GULWE	TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD	DATE: 28-May to 6-Jun-2015
<b>LOCATION</b>	BH 1 : Depth 7.00 - 7.50m	<b>SAMPLE NO.</b> 6020
<b>DATE: SAMPLING</b>	--	<b>TESTING</b> 28-May
		CHECKED BY: Jotham
		DATE:

SPECIMEN DETAIL			
Diameter (mm)	50	Initial Moisture Content (%)	72.7
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	122.31
Height (mm)	20.13	Initial Void ratio	1.36
Volume (mm <sup>3</sup> )	39525	Final Moisture Content (%)	36.9
Specific gravity	2.296	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	8.51	Unit weight of Soil (kN/m <sup>3</sup> )	16.45

TEST RESULTS							
Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)		
0 - 12	1.285						
12 - 25	1.248	43.33	0.46	1.30	0.010		
25 - 50	1.193	18.41	1.08	0.98	0.017		
50 - 100	1.119	16.16	1.23	0.68	0.014		
100 - 200	1.024	14.94	1.34	0.45	0.010		
200 - 400	0.911	14.28	1.40	0.28	0.006		
400 - 799	0.788	9.26	2.15	0.16	0.006		
799 - 1599	0.665	9.63	2.07	0.09	0.003		
1,599 - 400	0.688						
400 - 100	0.732						

**GRAPHS**



Compression Index (Loading)	0.390	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 120kN = 1.86mN/m2
Compression Index (Unloading)	0.056	
Preconsolidation Pressure (kN/m <sup>2</sup> )	84.7	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	116.8	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.7	
Signed by (Materials Engineer/Manager)		Received by;

### One Dimension Consolidation test

Form №		BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>	TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD	DATE: 25-Apr to 4-May-2015
<b>LOCATION</b>	BH 1 : Depth 11.00 - 11.50m <b>SAMPLE NO.</b> 6022	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	-- <b>TESTING</b> 25-Apr	DATE:

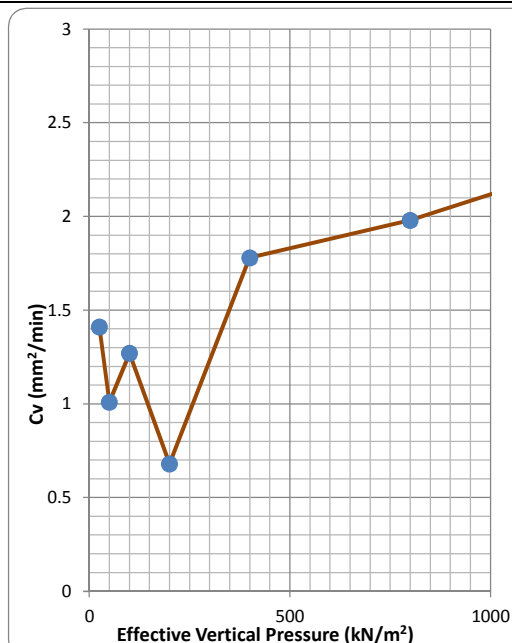
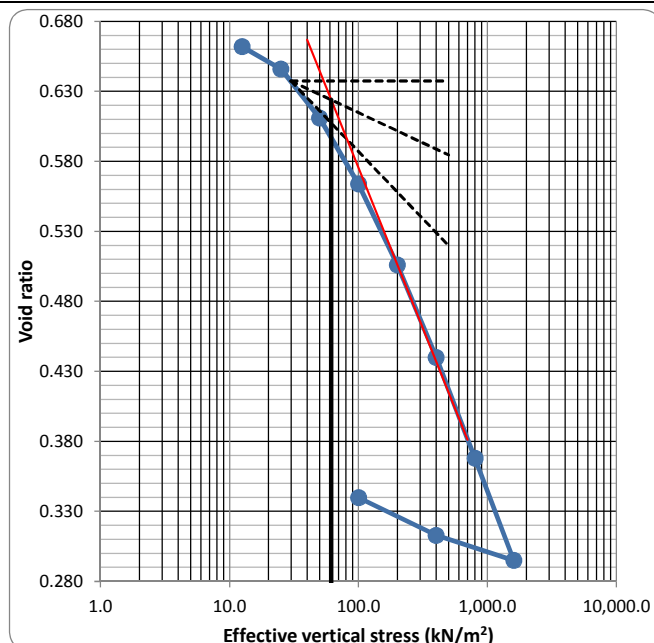
#### SPECIMEN DETAIL

Diameter (mm)	50	Initial Moisture Content (%)	18.3
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	67.75
Height (mm)	20.14	Initial Void ratio	0.72
Volume (mm <sup>3</sup> )	39545	Final Moisture Content (%)	29.7
Specific gravity	2.653	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	11.73	Unit weight of Soil (kN/m <sup>3</sup> )	17.94

#### TEST RESULTS

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)	
0 - 12	0.662					
12 - 25	0.646	14.14	1.41	0.77	0.018	
25 - 50	0.611	19.71	1.01	0.85	0.014	
50 - 100	0.564	15.70	1.27	0.58	0.012	
100 - 200	0.506	29.17	0.68	0.37	0.004	
200 - 400	0.440	11.20	1.78	0.22	0.006	
400 - 799	0.368	10.10	1.98	0.13	0.004	
799 - 1599	0.295	7.91	2.53	0.07	0.003	
1,599 - 400	0.313					
400 - 100	0.340					

#### GRAPHS



Compression Index (Loading)	0.230	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 200kN = 3.12mN/m2
Compression Index (Unloading)	0.037	
Preconsolidation Pressure (kN/m <sup>2</sup> )	61.5	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	199.1	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.3	
Signed by (Materials Engineer/Manager)		Received by;

### One Dimension Consolidation test

Form №			BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD		DATE: 25-Apr to 4-May-2015
<b>LOCATION</b>	BH 1 : Depth 15.00 - 15.50m	<b>SAMPLE NO.</b> 6023	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b> 25-Apr	DATE:

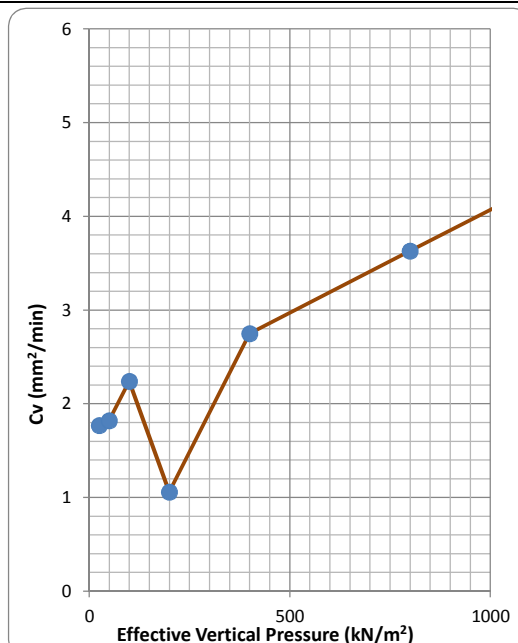
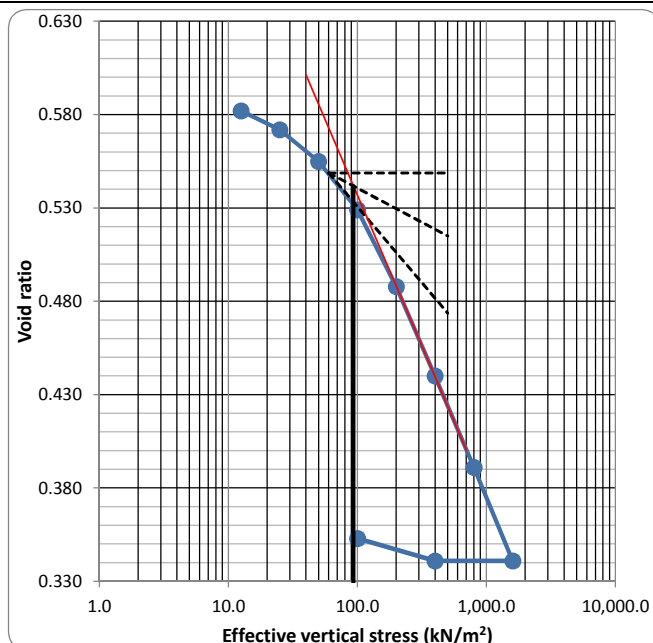
**SPECIMEN DETAIL**

Diameter (mm)	50	Initial Moisture Content (%)	24.6
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	106.65
Height (mm)	20.15	Initial Void ratio	0.61
Volume (mm <sup>3</sup> )	39564	Final Moisture Content (%)	19.7
Specific gravity	2.656	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	12.50	Unit weight of Soil (kN/m <sup>3</sup> )	20.13

**TEST RESULTS**

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.582				
12 - 25	0.572	11.29	1.77	0.51	0.015
25 - 50	0.555	11.02	1.82	0.43	0.013
50 - 100	0.529	8.93	2.24	0.33	0.012
100 - 200	0.488	18.85	1.06	0.27	0.005
200 - 400	0.440	7.27	2.75	0.16	0.007
400 - 799	0.391	5.51	3.63	0.09	0.005
799 - 1599	0.341	3.72	5.38	0.04	0.004
1,599 - 400	0.341				
400 - 100	0.353				

**GRAPHS**



Compression Index (Loading)	0.162	OCR > 1 , Over Consolidated OCR <=1, Normal Consolidation Eoed at 305kN = 6.25mN/m2
Compression Index (Unloading)	0.010	
Preconsolidation Pressure (kN/m <sup>2</sup> )	93.3	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	304.0	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.3	
Signed by (Materials Engineer/Manager)		Received by;

### One Dimension Consolidation test

Form №			BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD		DATE: 6-May to 15-May-2015
<b>LOCATION</b>	BH 1 : Depth 18.5 - 19.0m	<b>SAMPLE NO.</b> 6024	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b>	DATE:

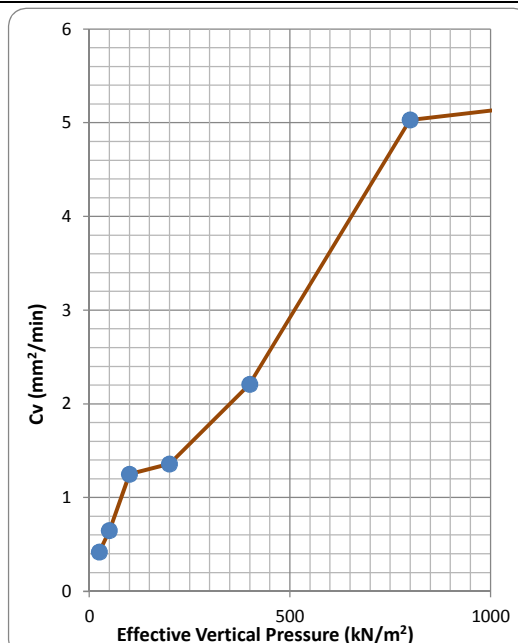
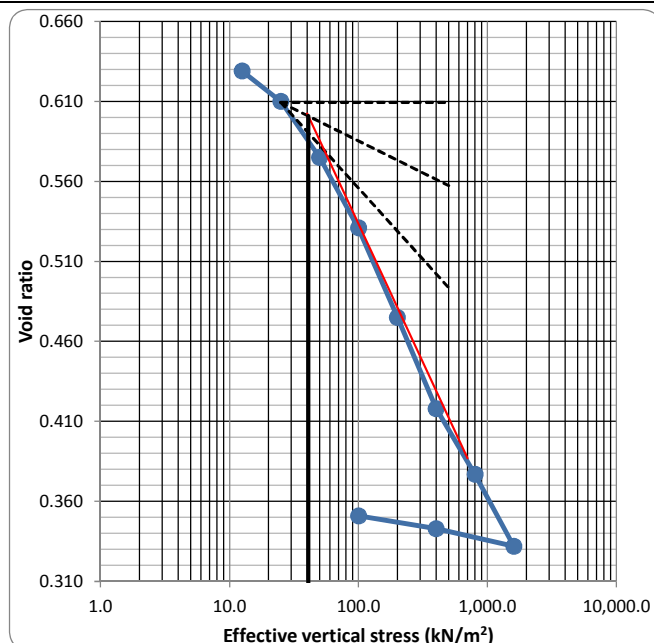
**SPECIMEN DETAIL**

Diameter (mm)	50	Initial Moisture Content (%)	29.7
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	109.36
Height (mm)	20.24	Initial Void ratio	0.68
Volume (mm <sup>3</sup> )	39741	Final Moisture Content (%)	18.3
Specific gravity	2.497	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	12.07	Unit weight of Soil (kN/m <sup>3</sup> )	18.94

**TEST RESULTS**

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.629				
12 - 25	0.610	48.03	0.42	0.93	0.006
25 - 50	0.575	31.14	0.65	0.87	0.009
50 - 100	0.531	16.10	1.25	0.56	0.011
100 - 200	0.475	14.82	1.36	0.37	0.008
200 - 400	0.418	9.11	2.21	0.19	0.007
400 - 799	0.377	4.01	5.03	0.07	0.006
799 - 1599	0.332	3.72	5.43	0.04	0.004
1,599 - 400	0.343				
400 - 100	0.351				

**GRAPHS**



Compression Index (Loading)	0.173	OCR > 1 , Over Consolidated OCR <=1, Normal Consolidation Eoed at 355kN = 5.85mN/m2
Compression Index (Unloading)	0.016	
Preconsolidation Pressure (kN/m <sup>2</sup> )	40.8	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	352.2	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.1	
Signed by (Materials Engineer/Manager)		Received by;



### One Dimension Consolidation test

Form No		BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>	TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD	DATE: 9-Jun to 22-May-2015
<b>LOCATION</b>	BH 1 : Depth 22.50 - 23.00m <b>SAMPLE NO.</b> 6025	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	-- <b>TESTING</b> 9-Jun	DATE:

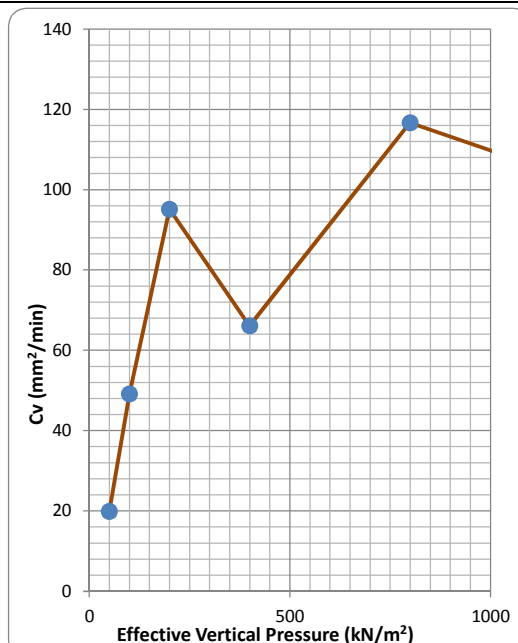
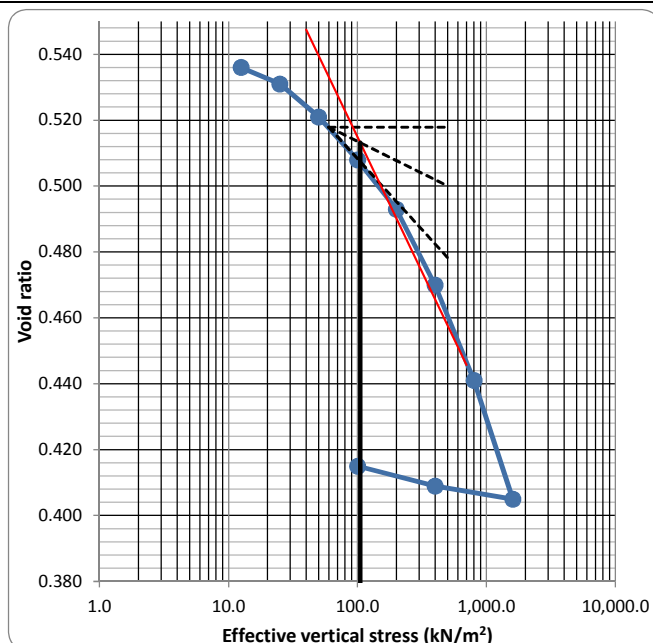
#### SPECIMEN DETAIL

Diameter (mm)	50	Initial Moisture Content (%)	23.4
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	111.14
Height (mm)	20.31	Initial Void ratio	0.54
Volume (mm <sup>3</sup> )	39879	Final Moisture Content (%)	17.7
Specific gravity	2.557	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	13.20	Unit weight of Soil (kN/m <sup>3</sup> )	20.12



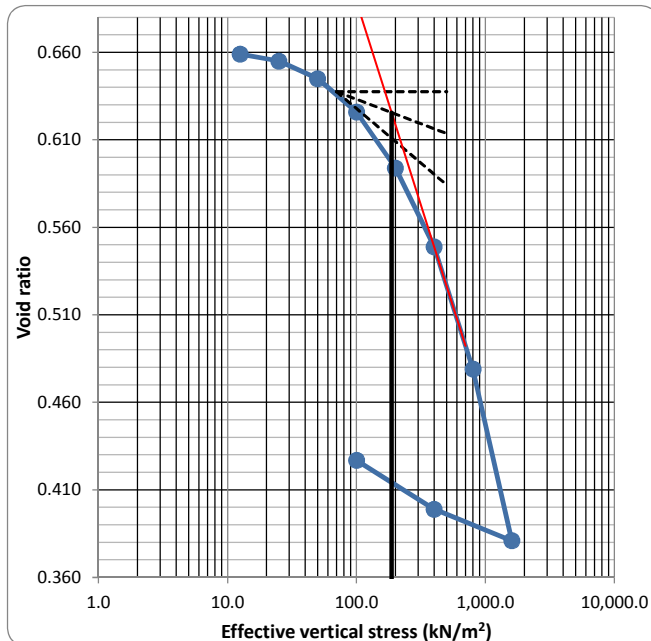
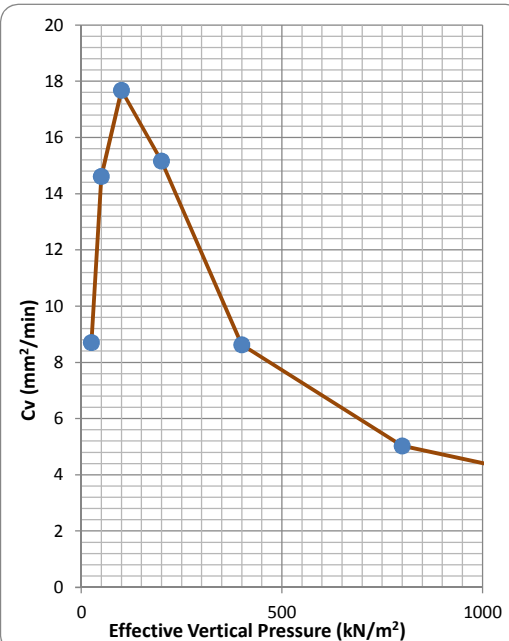
#### TEST RESULTS



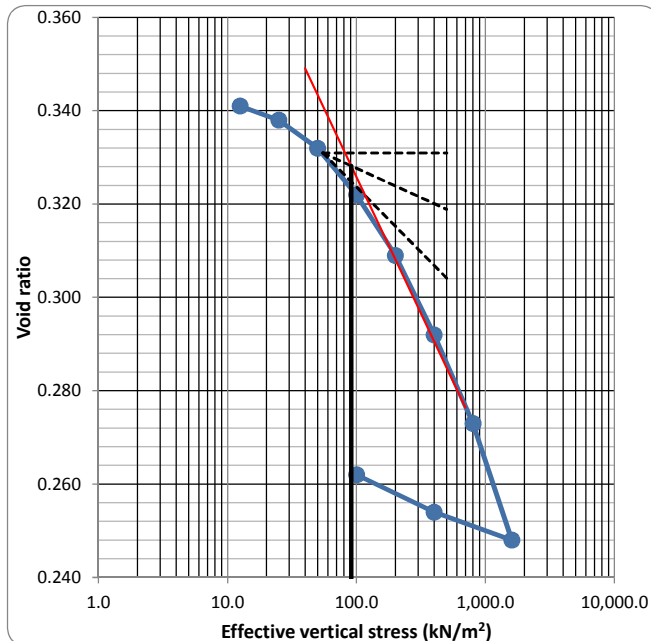
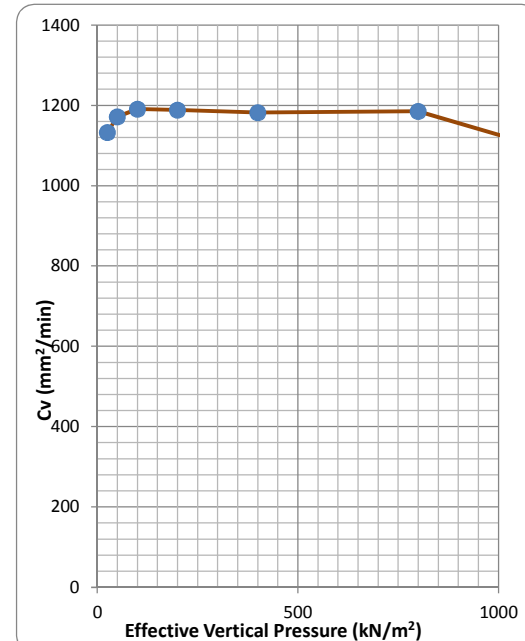
Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.536				
12 - 25	0.531				
25 - 50	0.521	1.02	19.94	0.26	0.085
50 - 100	0.508	0.41	49.20	0.17	0.138
100 - 200	0.493	0.21	95.16	0.10	0.155
200 - 400	0.470	0.31	66.12	0.08	0.083
400 - 799	0.441	0.17	116.66	0.05	0.094
799 - 1599	0.405	0.23	89.18	0.03	0.046
1,599 - 400	0.409				
400 - 100	0.415				

#### GRAPHS



Compression Index (Loading)	0.082	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 455kN = 15.94mN/m2
Compression Index (Unloading)	0.008	
Preconsolidation Pressure (kN/m <sup>2</sup> )	105	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	454.7	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.2	
Signed by (Materials Engineer/Manager)		Received by;

 Draw, Build, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA		 Draw, Build, Test	
<b>One Dimension Consolidation test</b>					
Form No				BS 1377 Part 5	
<b>PROJECT</b>		CENTRAL RAILWAY STUDY. KILOSA GULWE		TESTED BY: Law/ Rose	
<b>CLIENT</b>		PADECO CO. LTD		DATE: 6-May to 15-May-2015	
<b>LOCATION</b>		BH 1 : Depth 26.5 - 27.0m		<b>SAMPLE NO.</b> 6026	
<b>DATE: SAMPLING</b>		--		<b>TESTING</b>	
<b>DATE:</b>				<b>DATE:</b>	
<b>SPECIMEN DETAIL</b>					
Diameter (mm)	50	Initial Moisture Content (%)	24.3		
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	89.64		
Height (mm)	20.16	Initial Void ratio	0.67		
Volume (mm <sup>3</sup> )	39584	Final Moisture Content (%)	25.7		
Specific gravity	2.489	Final Degree of Saturation (%)			
Equivalent Height of Specimen, H <sub>s</sub>	12.05	Unit weight of Soil (kN/m <sup>3</sup> )	18.13		
<b>TEST RESULTS</b>					
<b>Vertical Stress (kN/m<sup>2</sup>)</b>	<b>Void Ratio</b>	<b>T<sub>50</sub> (min)</b>	<b>C<sub>v</sub> (mm<sup>2</sup>/min)</b>	<b>m<sub>v</sub> (m<sup>2</sup>/mN)</b>	<b>k*10<sup>-6</sup>(cm/sec)</b>
0 - 12	0.659				
12 - 25	0.655	2.30	8.71	0.19	0.027
25 - 50	0.645	1.37	14.62	0.24	0.058
50 - 100	0.626	1.13	17.68	0.23	0.067
100 - 200	0.594	1.32	15.16	0.20	0.049
200 - 400	0.549	2.32	8.63	0.14	0.020
400 - 799	0.479	3.98	5.03	0.11	0.009
799 - 1599	0.381	7.77	2.58	0.08	0.003
1,599 - 400	0.399				
400 - 100	0.427				
<b>GRAPHS</b>					
					
Compression Index (Loading)	0.233	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 485kN = 8.08mN/m2			
Compression Index (Unloading)	0.038				
Preconsolidation Pressure (kN/m <sup>2</sup> )	187.3				
Overburden Pressure (kN/m <sup>2</sup> ) - approx	482.2				
Swelling Pressure (kPa)	12				
OverConsolidation Ratio, OCR - approx	0.4				
Signed by (Materials Engineer/Manager)		Received by;			

		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA			
<b>One Dimension Consolidation test</b>					
Form No				BS 1377 Part 5	
<b>PROJECT</b>		CENTRAL RAILWAY STUDY. KILOSA GULWE		TESTED BY: Law/ Rose	
<b>CLIENT</b>		PADECO CO. LTD		DATE: 25-Apr to 4-May-2015	
<b>LOCATION</b>		BH 3 : Depth 1.00 - 1.50m		<b>SAMPLE NO.</b> 6033	
<b>DATE: SAMPLING</b>		--		<b>TESTING</b>	
				CHECKED BY: Jotham	
				DATE:	
<b>SPECIMEN DETAIL</b>					
Diameter (mm)	50	Initial Moisture Content (%)	7.6		
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	61.86		
Height (mm)	20.16	Initial Void ratio	0.34		
Volume (mm <sup>3</sup> )	39584	Final Moisture Content (%)	10.2		
Specific gravity	2.784	Final Degree of Saturation (%)			
Equivalent Height of Specimen, H <sub>s</sub>	15.03	Unit weight of Soil (kN/m <sup>3</sup> )	21.91		
<b>TEST RESULTS</b>					
<b>Vertical Stress (kN/m<sup>2</sup>)</b>	<b>Void Ratio</b>	<b>T<sub>50</sub> (min)</b>	<b>C<sub>v</sub> (mm<sup>2</sup>/min)</b>	<b>m<sub>v</sub> (m<sup>2</sup>/mN)</b>	<b>k*10<sup>-6</sup>(cm/sec)</b>
0 - 12	0.341				
12 - 25	0.338	0.02	1132.33	0.18	3.3
25 - 50	0.332	0.02	1171.83	0.18	3.4
50 - 100	0.322	0.02	1190.84	0.15	2.9
100 - 200	0.309	0.02	1188.48	0.10	1.9
200 - 400	0.292	0.02	1182.02	0.06	1.3
400 - 799	0.273	0.02	1185.17	0.04	0.7
799 - 1599	0.248	0.02	951.62	0.02	0.4
1,599 - 400	0.254				
400 - 100	0.262				
<b>GRAPHS</b>					
					
Compression Index (Loading)	0.058	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 25kN = 5.58mN/m2			
Compression Index (Unloading)	0.012				
Preconsolidation Pressure (kN/m <sup>2</sup> )	91				
Overburden Pressure (kN/m <sup>2</sup> ) - approx	24.1				
Swelling Pressure (kPa)	--				
OverConsolidation Ratio, OCR - approx	3.8				
Signed by (Materials Engineer/Manager)		Received by;			

### One Dimension Consolidation test

Form №			BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD		DATE: 28-May to 6-Jun-2015
<b>LOCATION</b>	BH 5 : Depth 0.50 - 1.00m	<b>SAMPLE NO.</b> 6035	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b>	DATE:

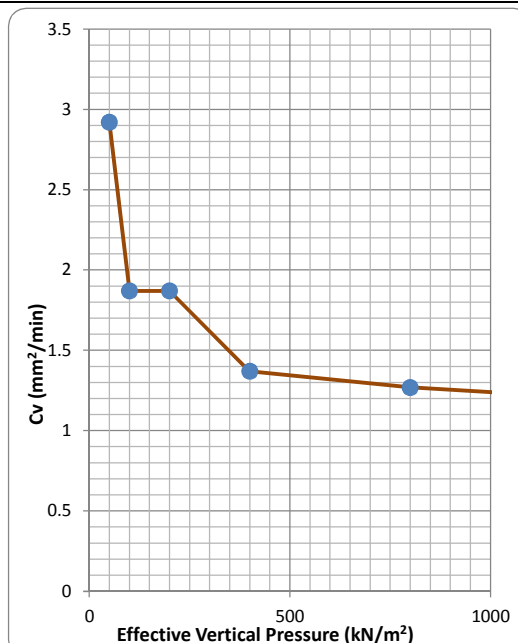
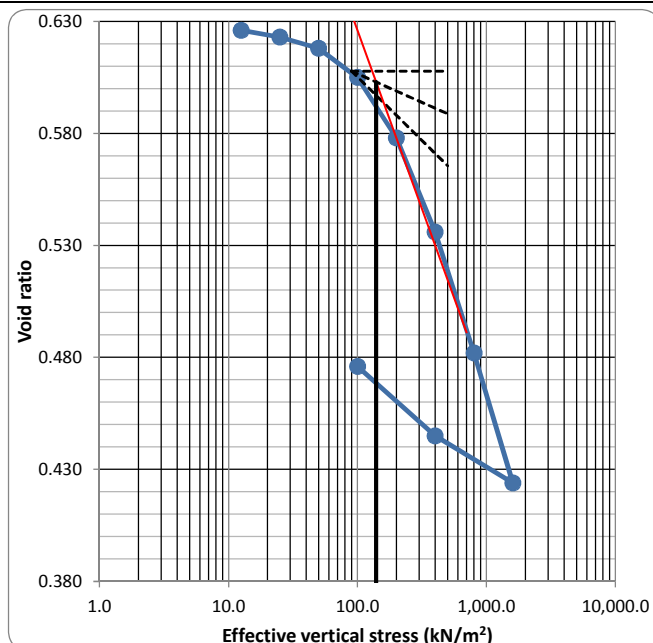
**SPECIMEN DETAIL**

Diameter (mm)	50	Initial Moisture Content (%)	30.0
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	112.92
Height (mm)	20.31	Initial Void ratio	0.63
Volume (mm <sup>3</sup> )	39879	Final Moisture Content (%)	31.8
Specific gravity	2.358	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	12.48	Unit weight of Soil (kN/m <sup>3</sup> )	18.49



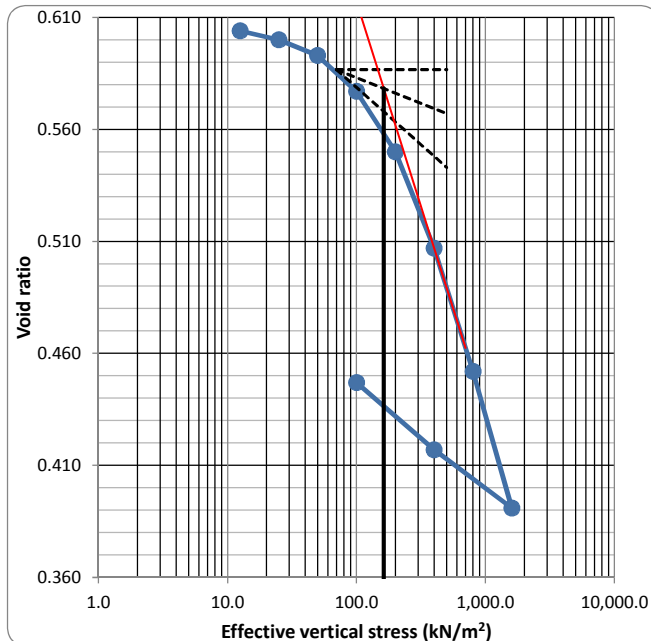
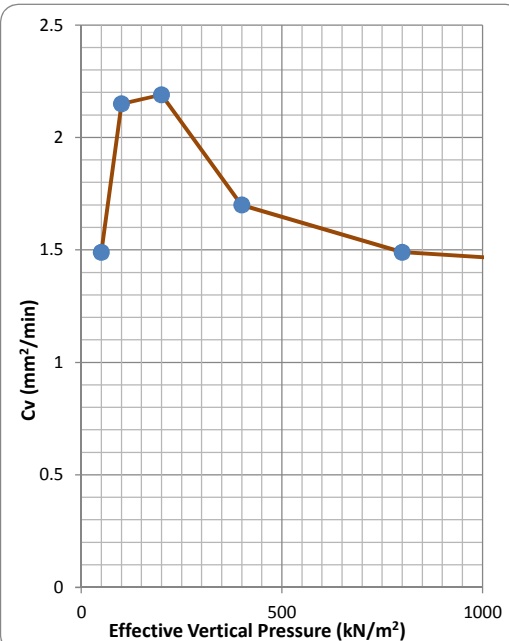
**TEST RESULTS**

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.626				
12 - 25	0.623				
25 - 50	0.618	6.96	2.92	0.12	0.0059
50 - 100	0.605	10.86	1.87	0.16	0.0049
100 - 200	0.578	10.85	1.87	0.17	0.0051
200 - 400	0.536	14.85	1.37	0.13	0.0030
400 - 799	0.482	16.05	1.27	0.09	0.0018
799 - 1599	0.424	17.66	1.15	0.05	0.0009
1,599 - 400	0.445				
400 - 100	0.476				

**GRAPHS**



Compression Index (Loading)	0.159	OCR > 1 , Over Consolidated OCR <=1, Normal Consolidation Eoed at 100kN = 6.12mN/m2
Compression Index (Unloading)	0.043	
Preconsolidation Pressure (kN/m <sup>2</sup> )	139.5	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	11.1	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	12.6	
Signed by (Materials Engineer/Manager)		Received by;

 Draw, Build, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA		 Draw, Build, Test		
<b>One Dimension Consolidation test</b>						
Form No				BS 1377 Part 5		
<b>PROJECT</b>		CENTRAL RAILWAY STUDY. KILOSA GULWE		TESTED BY: Law/ Rose		
<b>CLIENT</b>		PADECO CO. LTD		DATE: 6-May to 15-May-2015		
<b>LOCATION</b>		BH 5 : Depth 4.5 - 5.0m		<b>SAMPLE NO.</b> 6036		
<b>DATE: SAMPLING</b>		--		<b>TESTING</b>		
				CHECKED BY: Jotham		
				DATE:		
<b>SPECIMEN DETAIL</b>						
Diameter (mm)	50	Initial Moisture Content (%)	29.6			
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	112.80			
Height (mm)	20.20	Initial Void ratio	0.61			
Volume (mm <sup>3</sup> )	39663	Final Moisture Content (%)	28.2			
Specific gravity	2.318	Final Degree of Saturation (%)				
Equivalent Height of Specimen, H <sub>s</sub>	12.57	Unit weight of Soil (kN/m <sup>3</sup> )	18.33			
<b>TEST RESULTS</b>						
Vertical Stress (kN/m <sup>2</sup> )		Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12		0.604				
12 - 25		0.600				
25 - 50		0.593	13.52	1.49	0.18	0.004
50 - 100		0.577	9.36	2.15	0.20	0.007
100 - 200		0.550	9.18	2.19	0.17	0.006
200 - 400		0.507	11.82	1.70	0.14	0.004
400 - 799		0.452	13.48	1.49	0.09	0.002
799 - 1599		0.391	14.38	1.40	0.05	0.001
1,599 - 400		0.417				
400 - 100		0.447				
<b>GRAPHS</b>						
						
Compression Index (Loading)		0.183				
Compression Index (Unloading)		0.047				
Preconsolidation Pressure (kN/m <sup>2</sup> )		162.9				
Overburden Pressure (kN/m <sup>2</sup> ) - approx		84.3				
Swelling Pressure (kPa)		--				
OverConsolidation Ratio, OCR - approx		1.9				
Signed by (Materials Engineer/Manager)		Received by;				



### One Dimension Consolidation test

Form №			BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD		DATE: 9-Jun to 22-May-2015
<b>LOCATION</b>	BH 5 : Depth 8.50 - 9.00m	<b>SAMPLE NO.</b> 6037	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b> 9-Jun	DATE:

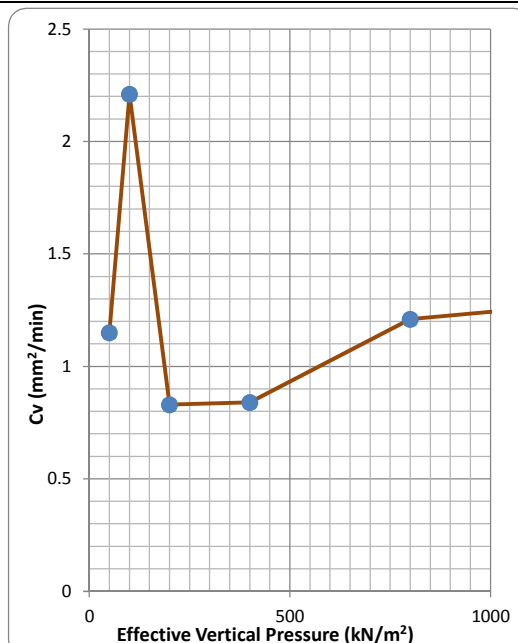
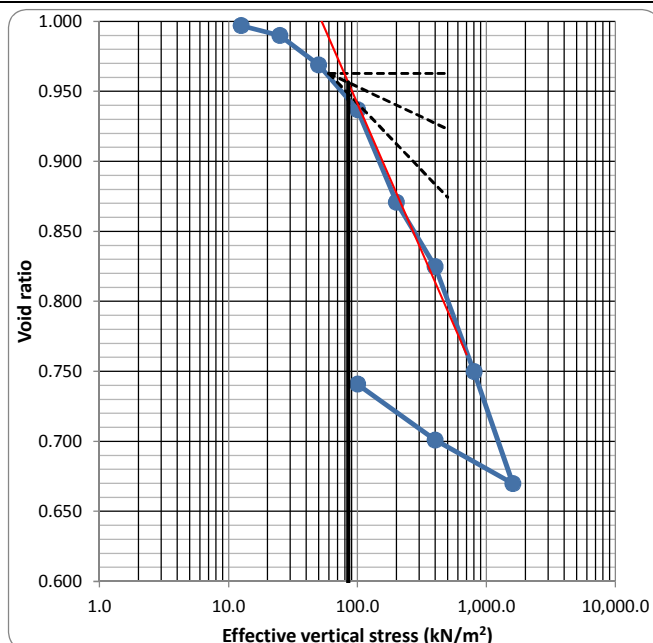
#### SPECIMEN DETAIL

Diameter (mm)	50	Initial Moisture Content (%)	45.5
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	108.69
Height (mm)	20.13	Initial Void ratio	1.00
Volume (mm <sup>3</sup> )	39525	Final Moisture Content (%)	30.4
Specific gravity	2.385	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	10.08	Unit weight of Soil (kN/m <sup>3</sup> )	17.04



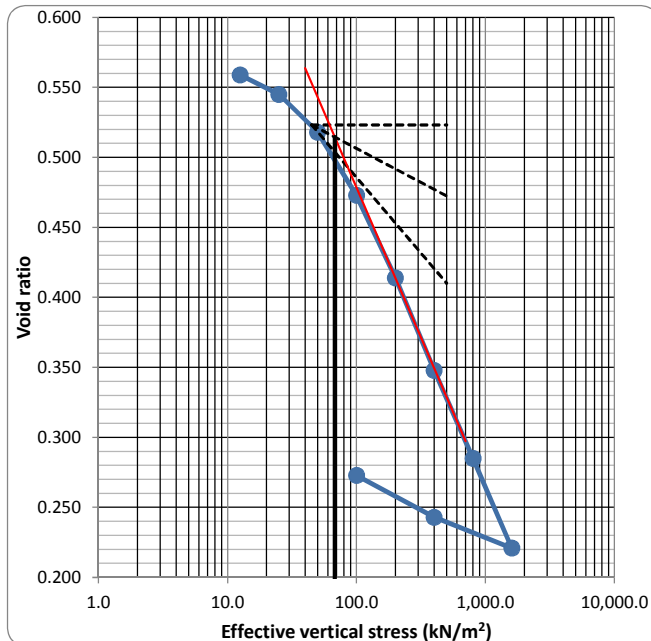
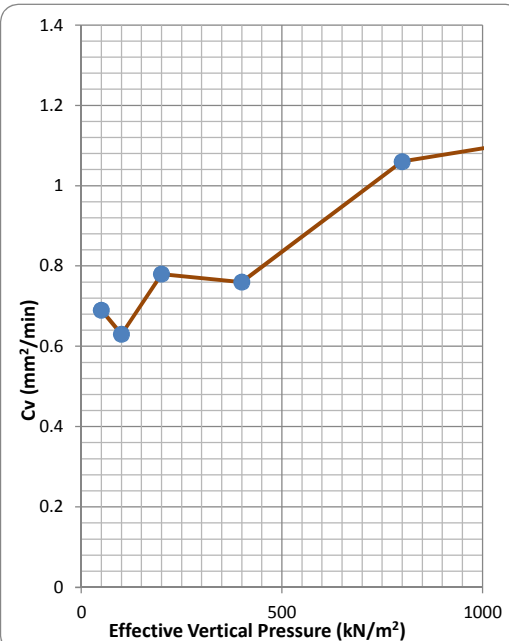
#### TEST RESULTS

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.997				
12 - 25	0.990				
25 - 50	0.969	17.40	1.15	0.42	0.008
50 - 100	0.937	9.02	2.21	0.33	0.012
100 - 200	0.871	24.15	0.83	0.34	0.005
200 - 400	0.825	23.79	0.84	0.12	0.002
400 - 799	0.750	16.54	1.21	0.10	0.002
799 - 1599	0.670	14.84	1.34	0.06	0.001
1,599 - 400	0.701				
400 - 100	0.741				

#### GRAPHS



Compression Index (Loading)	0.212	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 150kN = 2.93mN/m2
Compression Index (Unloading)	0.059	
Preconsolidation Pressure (kN/m <sup>2</sup> )	84.9	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	146.5	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.6	
Signed by (Materials Engineer/Manager)		Received by;

 Draw, Build, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA		 Draw, Build, Test	
<b>One Dimension Consolidation test</b>					
Form №		BS 1377 Part 5			
<b>PROJECT</b>		CENTRAL RAILWAY STUDY. KILOSA GULWE		TESTED BY: Law/ Rose	
<b>CLIENT</b>		PADECO CO. LTD		DATE: 28-May to 6-Jun-2015	
<b>LOCATION</b>		BH 5 : Depth 12.50 - 13.00m		<b>SAMPLE NO.</b> 6038	
<b>DATE: SAMPLING</b>		--		<b>TESTING</b>	
<b>DATE:</b>		<b>DATE:</b>			
<b>SPECIMEN DETAIL</b>					
Diameter (mm)	50	Initial Moisture Content (%)	24.1		
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	94.33		
Height (mm)	20.17	Initial Void ratio	0.58		
Volume (mm <sup>3</sup> )	39604	Final Moisture Content (%)	36.1		
Specific gravity	2.260	Final Degree of Saturation (%)			
Equivalent Height of Specimen, H <sub>s</sub>	12.80	Unit weight of Soil (kN/m <sup>3</sup> )	17.45		
<b>TEST RESULTS</b>					
<b>Vertical Stress (kN/m<sup>2</sup>)</b>	<b>Void Ratio</b>	<b>T<sub>50</sub> (min)</b>	<b>C<sub>v</sub> (mm<sup>2</sup>/min)</b>	<b>m<sub>v</sub> (m<sup>2</sup>/mN)</b>	<b>k*10<sup>-6</sup>(cm/sec)</b>
0 - 12	0.559				
12 - 25	0.545				
25 - 50	0.518	28.84	0.69	0.70	0.0079
50 - 100	0.473	31.90	0.63	0.59	0.0061
100 - 200	0.414	25.58	0.78	0.40	0.0051
200 - 400	0.348	26.26	0.76	0.23	0.0029
400 - 799	0.285	18.88	1.06	0.12	0.0020
799 - 1599	0.221	16.79	1.19	0.06	0.0012
1,599 - 400	0.243				
400 - 100	0.273				
<b>GRAPHS</b>					
					
Compression Index (Loading)	0.214	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 100kN = 1.89mN/m2			
Compression Index (Unloading)	0.043				
Preconsolidation Pressure (kN/m <sup>2</sup> )	67.9				
Overburden Pressure (kN/m <sup>2</sup> ) - approx	10.5				
Swelling Pressure (kPa)	--				
OverConsolidation Ratio, OCR - approx	6.5				
Signed by (Materials Engineer/Manager)		Received by;			

### One Dimension Consolidation test

Form №			BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD		DATE: 25-Apr to 4-May-2015
<b>LOCATION</b>	BH 6 : Depth 1.00 - 1.50m	<b>SAMPLE NO.</b> 6039	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b>	DATE:

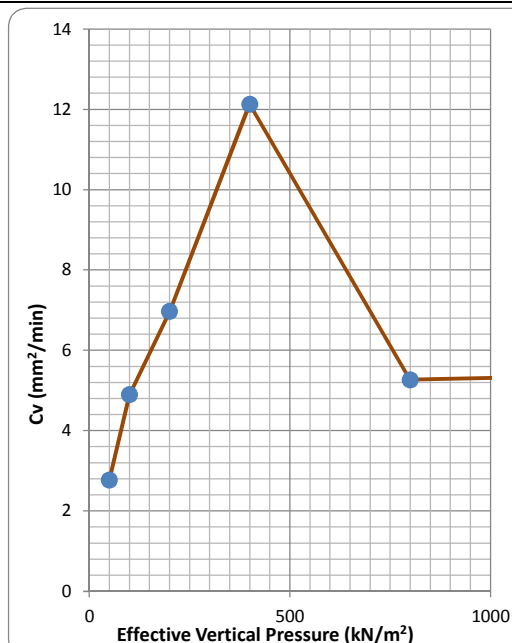
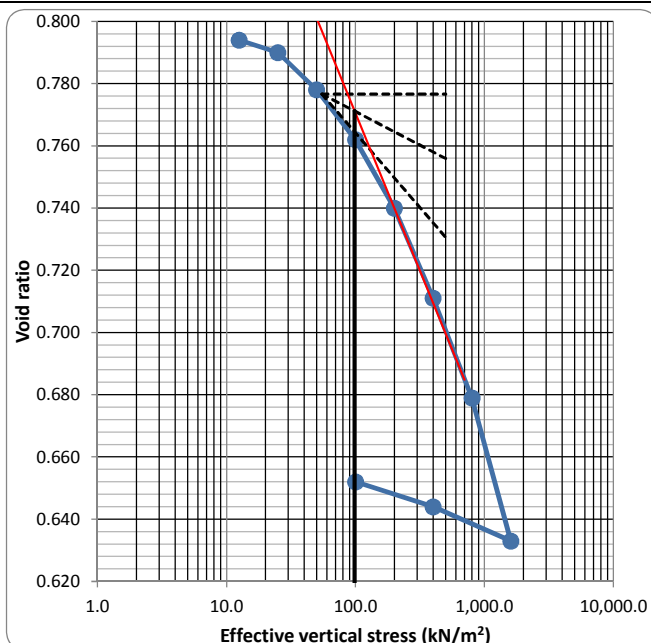
#### SPECIMEN DETAIL

Diameter (mm)	50	Initial Moisture Content (%)	26.1
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	82.74
Height (mm)	20.20	Initial Void ratio	0.80
Volume (mm <sup>3</sup> )	39663	Final Moisture Content (%)	15.4
Specific gravity	2.534	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	11.23	Unit weight of Soil (kN/m <sup>3</sup> )	17.42

#### TEST RESULTS

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)	
0 - 12	0.794					
12 - 25	0.790					
25 - 50	0.778	7.25	2.77	0.27	0.012	
50 - 100	0.762	4.10	4.90	0.18	0.014	
100 - 200	0.740	2.88	6.97	0.12	0.014	
200 - 400	0.711	1.66	12.13	0.08	0.017	
400 - 799	0.679	3.81	5.27	0.05	0.004	
799 - 1599	0.633	3.69	5.44	0.03	0.003	
1,599 - 400	0.644					
400 - 100	0.652					

#### GRAPHS



Compression Index (Loading)	0.101	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 100kN = 6.19mN/m2
Compression Index (Unloading)	0.016	
Preconsolidation Pressure (kN/m <sup>2</sup> )	98.5	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	19.2	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	5.1	
Signed by (Materials Engineer/Manager)		Received by;

### One Dimension Consolidation test

Form No			BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD		DATE: 25-Apr to 4-May-2015
<b>LOCATION</b>	BH 8 : Depth 12.5 - 13.0m	<b>SAMPLE NO.</b> 5918	CHECKED BY: Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b>	DATE:

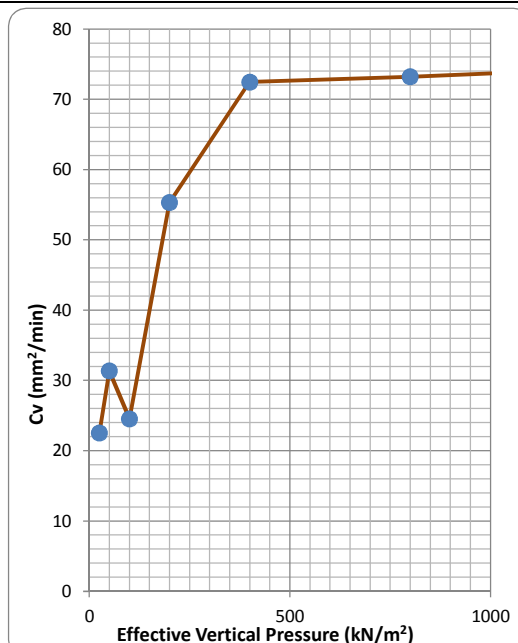
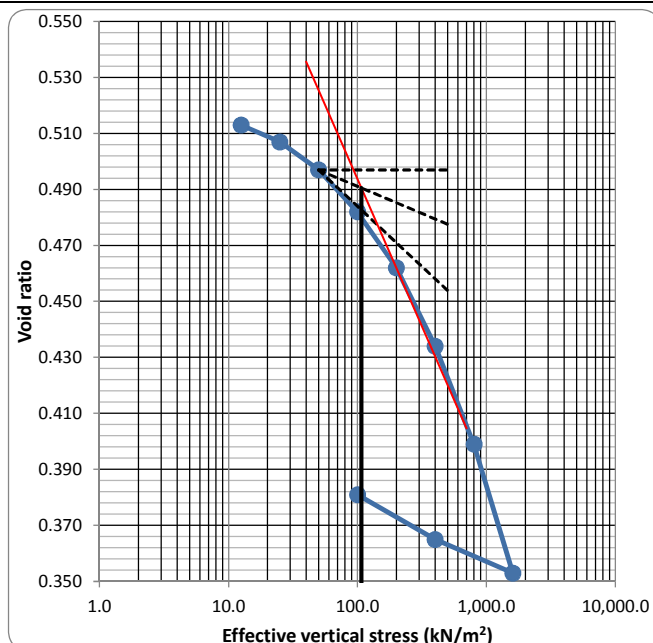
**SPECIMEN DETAIL**

Diameter (mm)	50	Initial Moisture Content (%)	24.3
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	119.71
Height (mm)	20.24	Initial Void ratio	0.52
Volume (mm <sup>3</sup> )	39741	Final Moisture Content (%)	24.1
Specific gravity	2.568	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	13.31	Unit weight of Soil (kN/m <sup>3</sup> )	20.59



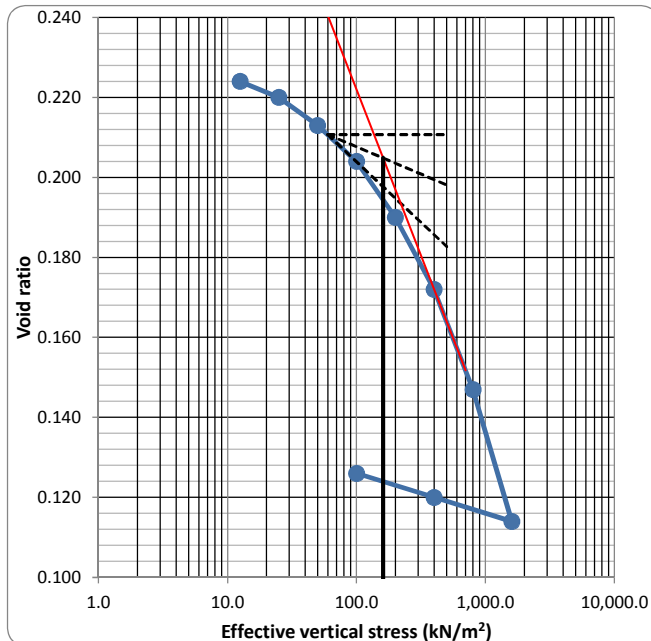
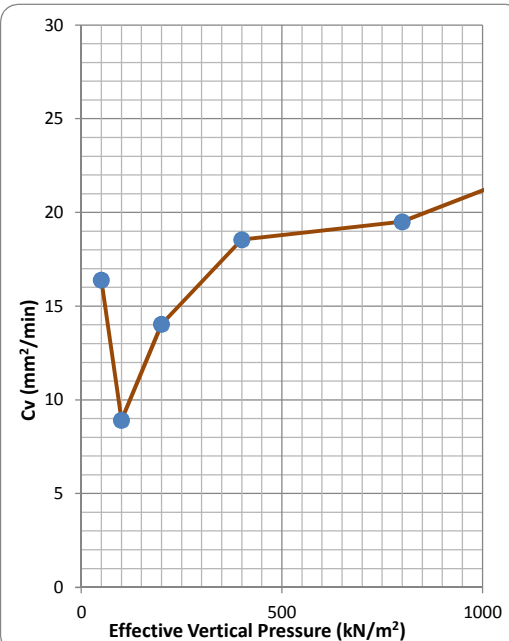
**TEST RESULTS**

Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.513				
12 - 25	0.507	0.89	22.56	0.32	0.117
25 - 50	0.497	0.64	31.36	0.27	0.136
50 - 100	0.482	0.82	24.54	0.20	0.080
100 - 200	0.462	0.36	55.35	0.14	0.122
200 - 400	0.434	0.28	72.45	0.10	0.114
400 - 799	0.399	0.28	73.21	0.06	0.073
799 - 1599	0.353	0.27	75.11	0.04	0.051
1,599 - 400	0.365				
400 - 100	0.381				



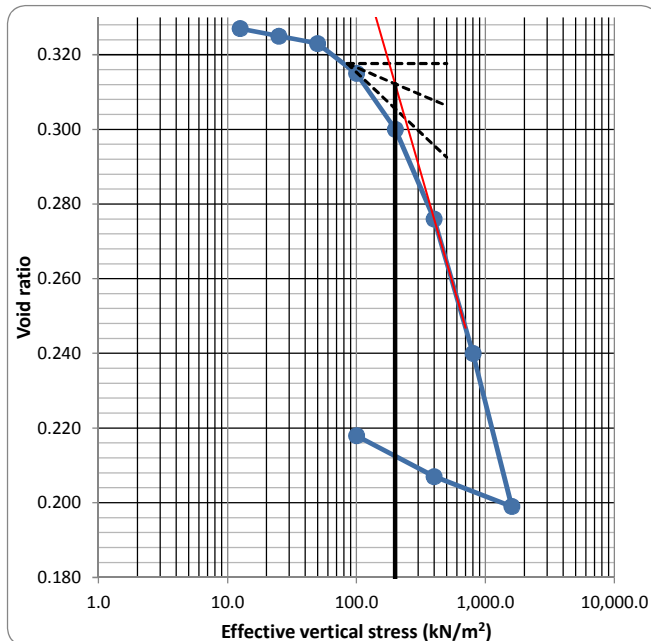
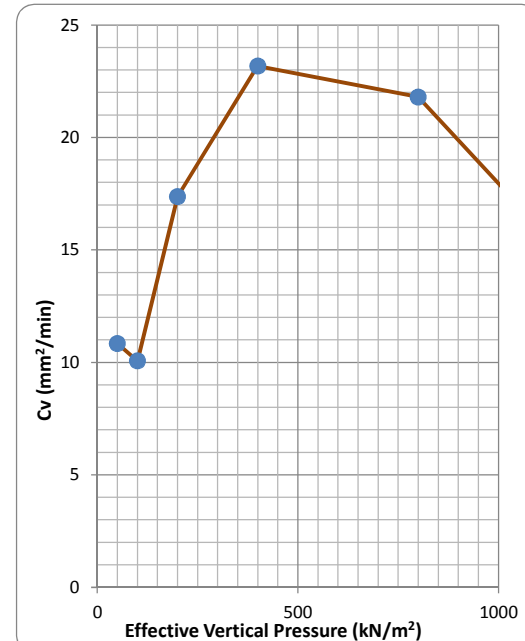
**GRAPHS**



Compression Index (Loading)	0.105	OCR > 1 , Over Consolidated OCR <=1, Normal Consolidation Eoed at 260kN = 9.41mN/m2
Compression Index (Unloading)	0.023	
Preconsolidation Pressure (kN/m <sup>2</sup> )	107.2	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	259.4	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.4	
Signed by (Materials Engineer/Manager)		Received by;

		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA				
<b>One Dimension Consolidation test</b>						
Form №				BS 1377 Part 5		
<b>PROJECT</b>		CENTRAL RAILWAY STUDY. KILOSA GULWE		TESTED BY: Law/ Rose		
<b>CLIENT</b>		PADECO CO. LTD		DATE: 6-May to 15-May-2015		
<b>LOCATION</b>		BH 9 : Depth 0.5 - 1.0m		<b>SAMPLE NO.</b> 5919		
<b>DATE: SAMPLING</b>		--		<b>TESTING</b>		
				CHECKED BY: Jotham		
				DATE:		
<b>SPECIMEN DETAIL</b>						
Diameter (mm)	50	Initial Moisture Content (%)	16.9			
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	172.39			
Height (mm)	20.18	Initial Void ratio	0.23			
Volume (mm <sup>3</sup> )	39623	Final Moisture Content (%)	14.5			
Specific gravity	2.303	Final Degree of Saturation (%)				
Equivalent Height of Specimen, H <sub>s</sub>	16.46	Unit weight of Soil (kN/m <sup>3</sup> )	21.54			
<b>TEST RESULTS</b>						
Vertical Stress (kN/m <sup>2</sup> )		Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12		0.224				
12 - 25		0.220				
25 - 50		0.213	1.22	16.40	0.23	0.062
50 - 100		0.204	2.25	8.92	0.15	0.022
100 - 200		0.190	1.43	14.04	0.12	0.027
200 - 400		0.172	1.08	18.55	0.08	0.023
400 - 799		0.147	1.03	19.50	0.05	0.017
799 - 1599		0.114	0.77	26.13	0.04	0.015
1,599 - 400		0.120				
400 - 100		0.126				
<b>GRAPHS</b>						
						
Compression Index (Loading)	0.083	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 100kN = 7.26mN/m2				
Compression Index (Unloading)	0.010					
Preconsolidation Pressure (kN/m <sup>2</sup> )	160.9					
Overburden Pressure (kN/m <sup>2</sup> ) - approx	12.9					
Swelling Pressure (kPa)	--					
OverConsolidation Ratio, OCR - approx	12.5					
Signed by (Materials Engineer/Manager)		Received by;				



 Draw, Build, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA		 Draw, Build, Test		
<b>One Dimension Consolidation test</b>						
Form №			BS 1377 Part 5			
<b>PROJECT</b>		CENTRAL RAILWAY STUDY. KILOSA GULWE		TESTED BY: Law/ Rose		
<b>CLIENT</b>		PADECO CO. LTD		DATE: 6-May to 15-May-2015		
<b>LOCATION</b>		BH 9 : Depth 4.5 - 5.0m		CHECKED BY: Jotham		
<b>DATE: SAMPLING</b>		-- TESTING		DATE:		
<b>SPECIMEN DETAIL</b>						
Diameter (mm)	50	Initial Moisture Content (%)	16.2			
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	126.01			
Height (mm)	20.15	Initial Void ratio	0.33			
Volume (mm <sup>3</sup> )	39564	Final Moisture Content (%)	13.6			
Specific gravity	2.546	Final Degree of Saturation (%)				
Equivalent Height of Specimen, H <sub>s</sub>	15.19	Unit weight of Soil (kN/m <sup>3</sup> )	21.87			
<b>TEST RESULTS</b>						
Vertical Stress (kN/m <sup>2</sup> )		Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12		0.327				
12 - 25		0.325				
25 - 50		0.323	1.84	10.85	0.06	0.011
50 - 100		0.315	1.99	10.07	0.12	0.020
100 - 200		0.300	1.15	17.37	0.11	0.032
200 - 400		0.276	0.86	23.18	0.09	0.035
400 - 799		0.240	0.92	21.80	0.07	0.025
799 - 1599		0.199	3.10	6.45	0.04	0.004
1,599 - 400		0.207				
400 - 100		0.218				
<b>GRAPHS</b>						
						
Compression Index (Loading)		0.120	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 105kN = 8.46mN/m2			
Compression Index (Unloading)		0.016				
Preconsolidation Pressure (kN/m <sup>2</sup> )		199.1				
Overburden Pressure (kN/m <sup>2</sup> ) - approx		100.6				
Swelling Pressure (kPa)		25				
OverConsolidation Ratio, OCR - approx		2.0				
Signed by (Materials Engineer/Manager)			Received by;			

### One Dimension Consolidation test

Form No		BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>	TESTED BY: Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD	DATE: 28-May to 6-Jun-2015
<b>LOCATION</b>	BH 10 : Depth 7.0 - 7.5m	<b>SAMPLE NO.</b> 5924
<b>DATE: SAMPLING</b>	--	<b>TESTING</b>
		CHECKED BY: Jotham
		DATE:

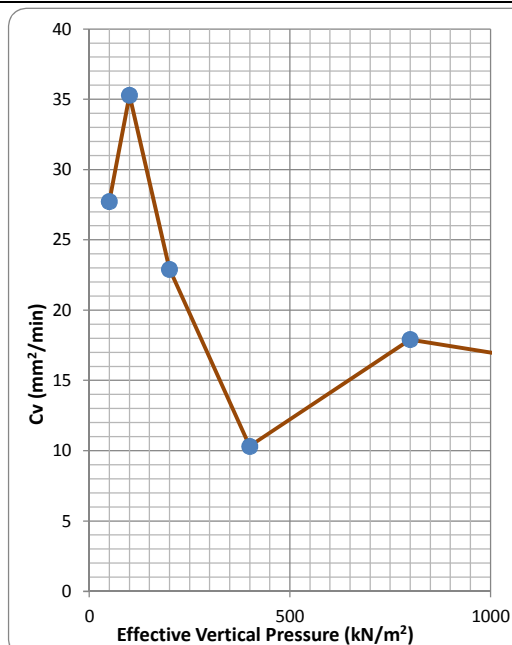
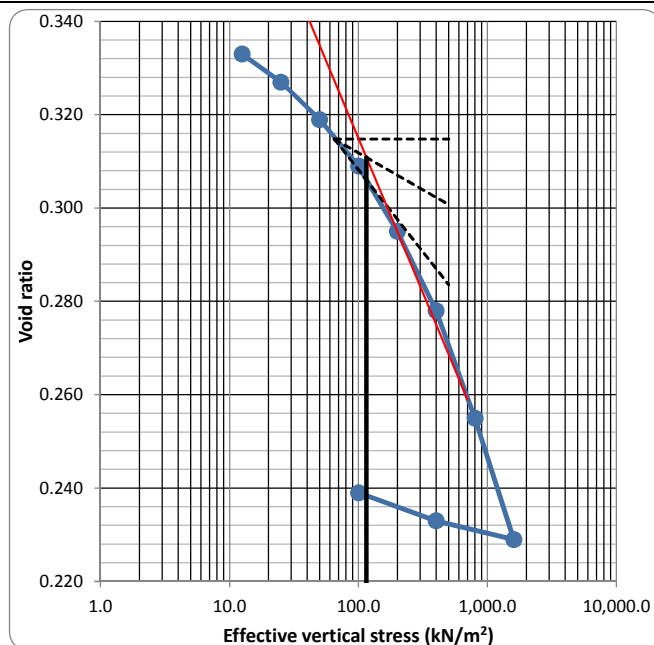
#### SPECIMEN DETAIL

Diameter (mm)	50	Initial Moisture Content (%)	12.7
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	94.95
Height (mm)	20.13	Initial Void ratio	0.34
Volume (mm <sup>3</sup> )	39525	Final Moisture Content (%)	15.7
Specific gravity	2.527	Final Degree of Saturation (%)	
Equivalent Height of Specimen, H <sub>s</sub>	15.04	Unit weight of Soil (kN/m <sup>3</sup> )	20.88



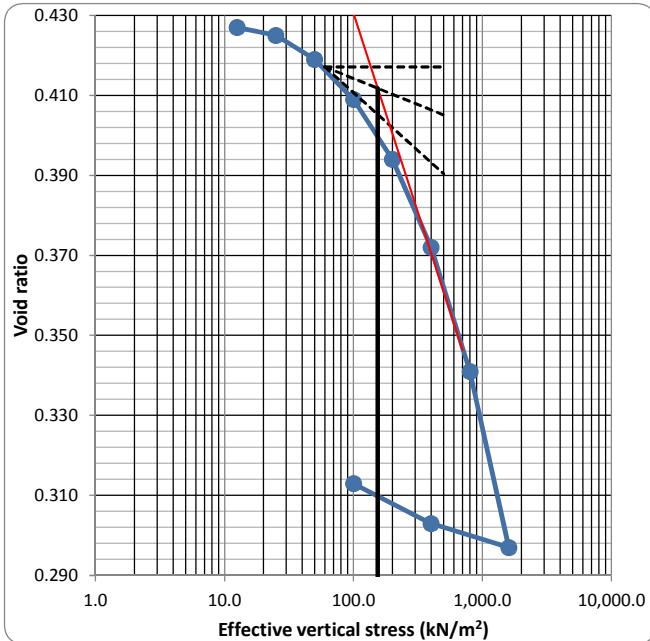
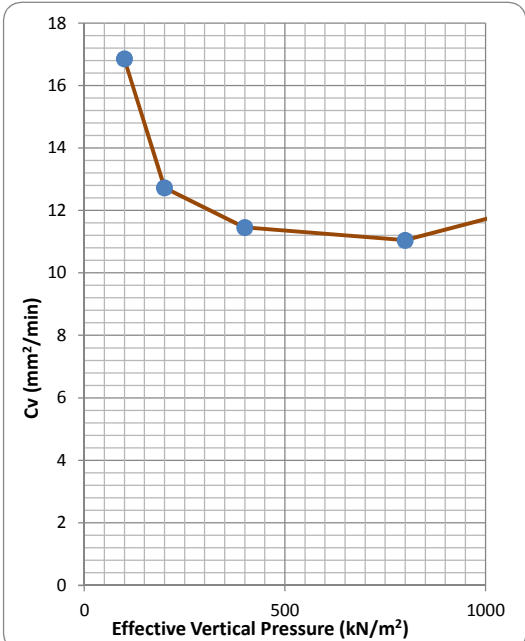
#### TEST RESULTS



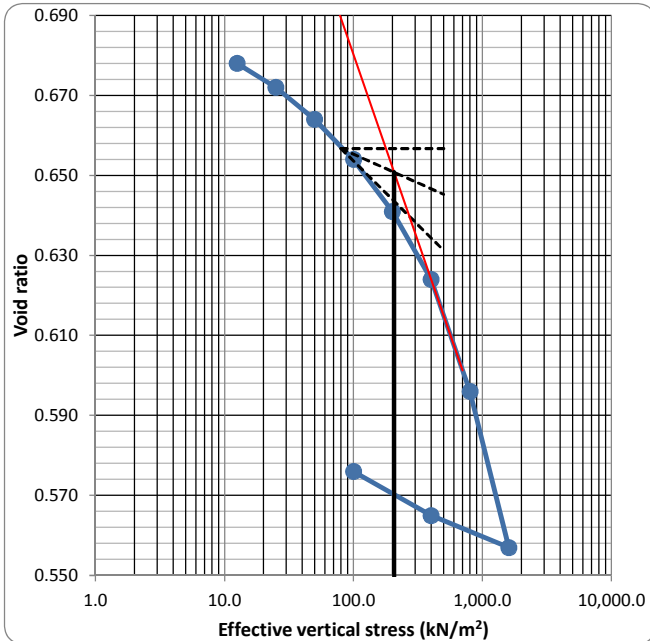
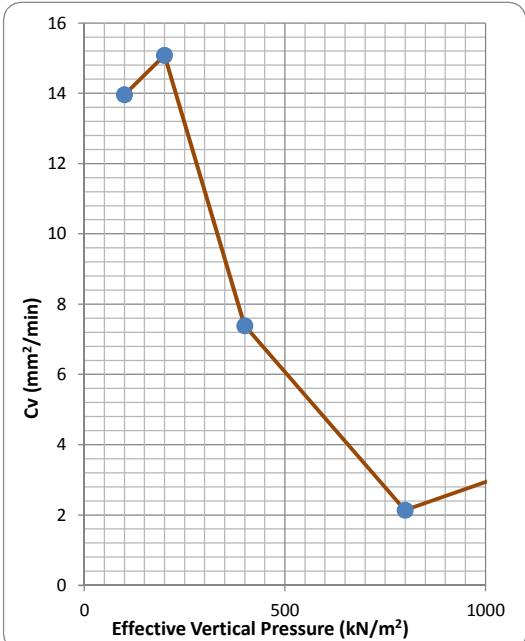
Vertical Stress (kN/m <sup>2</sup> )	Void Ratio	T <sub>50</sub> (min)	C <sub>v</sub> (mm <sup>2</sup> /min)	m <sub>v</sub> (m <sup>2</sup> /mN)	k*10 <sup>-6</sup> (cm/sec)
0 - 12	0.333				
12 - 25	0.327				
25 - 50	0.319	0.72	27.73	0.24	0.109
50 - 100	0.309	0.57	35.29	0.15	0.088
100 - 200	0.295	0.87	22.91	0.11	0.040
200 - 400	0.278	1.93	10.32	0.07	0.011
400 - 799	0.255	1.11	17.91	0.05	0.013
799 - 1599	0.229	1.40	14.24	0.03	0.006
1,599 - 400	0.233				
400 - 100	0.239				

#### GRAPHS



Compression Index (Loading)	0.066	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 150kN = 9.35mN/m2
Compression Index (Unloading)	0.008	
Preconsolidation Pressure (kN/m <sup>2</sup> )	115.3	
Overburden Pressure (kN/m <sup>2</sup> ) - approx	148.2	
Swelling Pressure (kPa)	--	
OverConsolidation Ratio, OCR - approx	0.8	
Signed by (Materials Engineer/Manager)		Received by;

		CIVIL ENGINEERING LABORATORY			
		DAR ES SALAAM			
		TANZANIA			
<b>One Dimension Consolidation test</b>					
Form №					BS 1377 Part 5
<b>PROJECT</b>	<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>			TESTED BY:	Law/ Rose
<b>CLIENT</b>	PADECO CO. LTD			DATE:	25-Apr to 4-May-2015
<b>LOCATION</b>	BH 10 : Depth 9.0 - 9.5m	<b>SAMPLE NO.</b>	5925	CHECKED BY:	Jotham
<b>DATE: SAMPLING</b>	--	<b>TESTING</b>		DATE:	
<b>SPECIMEN DETAIL</b>					
Diameter (mm)	50	Initial Moisture Content (%)	23.4		
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	133.91		
Height (mm)	20.18	Initial Void ratio	0.43		
Volume (mm <sup>3</sup> )	39623	Final Moisture Content (%)	63.5		
Specific gravity	2.459	Final Degree of Saturation (%)			
Equivalent Height of Specimen, H <sub>s</sub>	14.12	Unit weight of Soil (kN/m <sup>3</sup> )	20.82		
<b>TEST RESULTS</b>					
<b>Vertical Stress (kN/m<sup>2</sup>)</b>	<b>Void Ratio</b>	<b>T<sub>50</sub> (min)</b>	<b>C<sub>v</sub> (mm<sup>2</sup>/min)</b>	<b>m<sub>v</sub> (m<sup>2</sup>/mN)</b>	<b>k*10<sup>-6</sup>(cm/sec)</b>
0 - 12	0.427				
12 - 25	0.425				
25 - 50	0.419				
50 - 100	0.409	1.19	16.85	0.14	0.039
100 - 200	0.394	1.58	12.73	0.11	0.022
200 - 400	0.372	1.75	11.46	0.08	0.015
400 - 799	0.341	1.82	11.05	0.06	0.010
799 - 1599	0.297	1.46	13.73	0.04	0.009
1,599 - 400	0.303				
400 - 100	0.313				
<b>GRAPHS</b>					
					
Compression Index (Loading)	0.100	OCR > 1, Over Consolidated OCR <=1, Normal Consolidation Eoed at 190kN = 10.08mN/m2			
Compression Index (Unloading)	0.013				
Preconsolidation Pressure (kN/m <sup>2</sup> )	154.1				
Overburden Pressure (kN/m <sup>2</sup> ) - approx	189.5				
Swelling Pressure (kPa)	--				
OverConsolidation Ratio, OCR - approx	0.8				
Signed by (Materials Engineer/Manager)		Received by;			

 Draw, Build, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA		 Draw, Build, Test	
<b>One Dimension Consolidation test</b>					
Form No				BS 1377 Part 5	
<b>PROJECT</b>		<b>CENTRAL RAILWAY STUDY. KILOSA GULWE</b>		TESTED BY: Law/ Rose	
<b>CLIENT</b>		PADECO CO. LTD		DATE: 28-May to 6-Jun-2015	
<b>LOCATION</b>		BH 10 : Depth 11.0 - 11.5m		<b>SAMPLE NO.</b> 5926	
<b>DATE: SAMPLING</b>		--		<b>TESTING</b>	
<b>DATE:</b>				DATE:	
<b>SPECIMEN DETAIL</b>					
Diameter (mm)	50	Initial Moisture Content (%)	22.4		
Area (mm <sup>2</sup> )	1963	Initial Degree of Saturation (%)	87.22		
Height (mm)	20.32	Initial Void ratio	0.68		
Volume (mm <sup>3</sup> )	39898	Final Moisture Content (%)	26.1		
Specific gravity	2.645	Final Degree of Saturation (%)			
Equivalent Height of Specimen, H <sub>s</sub>	12.10	Unit weight of Soil (kN/m <sup>3</sup> )	18.91		
<b>TEST RESULTS</b>					
<b>Vertical Stress (kN/m<sup>2</sup>)</b>	<b>Void Ratio</b>	<b>T<sub>50</sub> (min)</b>	<b>C<sub>v</sub> (mm<sup>2</sup>/min)</b>	<b>m<sub>v</sub> (m<sup>2</sup>/mN)</b>	<b>k*10<sup>-6</sup>(cm/sec)</b>
0 - 12	0.678				
12 - 25	0.672				
25 - 50	0.664				
50 - 100	0.654	1.46	13.96	0.12	0.027
100 - 200	0.641	1.35	15.08	0.08	0.019
200 - 400	0.624	2.75	7.39	0.05	0.006
400 - 799	0.596	9.51	2.14	0.04	0.002
799 - 1599	0.557	3.82	5.32	0.03	0.003
1,599 - 400	0.565				
400 - 100	0.576				
<b>GRAPHS</b>					
					
Compression Index (Loading)	0.093	OCR > 1 , Over Consolidated OCR <=1, Normal Consolidation Eoed at 175kN = 13.48mN/m2			
Compression Index (Unloading)	0.016				
Preconsolidation Pressure (kN/m <sup>2</sup> )	206.6				
Overburden Pressure (kN/m <sup>2</sup> ) - approx	172.1				
Swelling Pressure (kPa)	--				
OverConsolidation Ratio, OCR - approx	1.2				
Signed by (Materials Engineer/Manager)		Received by;			

CLabs (Tz) Drawn, Built, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA					CLabs (Tz) Drawn, Built, Test			
UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS										
Form №							Standard: BS 5930:1999			
PROJECT		CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE					CHECKED BY: JN			
CLIENT		PADECO COMPANY LTD					APPROVED BY:			
SAMPLE DESCRIPTION		GNEISS								
SOURCE/LOCATION:		BOREHOLE 3								
DATE OF SMPLING		Apr-15 ELEVATION								
TESTED BY		VICTOR SALEMA			TESTING DATE		30-Apr-15			
SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)
A	1.500	2.600								Insufficient specimen, point load test
B	1.500	2.600								
A	3.000	4.400	63.65	127.3	2.00	1.15	148.3	46.63	<b>53.63</b>	72.8
B	3.000	4.400	63.46	124.46	1.96	1.15	253.1	80.06	<b>92.07</b>	
A	5.500	6.500	63.71	71.25	1.12	1.04	164.0	51.47	<b>53.53</b>	54.2
B	5.500	6.500	63.42	92.8	1.46	1.1	157.3	49.82	<b>54.80</b>	
A	9.400	10.400								Insufficient specimen, point load test
B	9.400	10.400								
A	11.100	12.100	63.58	70.65	1.11	1.05	116.6	36.74	<b>38.58</b>	40.5
B	11.100	12.100	63.32	91.23	1.44	1.09	122.6	38.95	<b>42.46</b>	
A	12.500	13.500	63.34	126.2	1.99	1.15	30.7	9.75	<b>11.21</b>	18.9
B	12.500	13.500	63.36	126	1.99	1.15	72.7	23.07	<b>26.53</b>	
A	13.900	14.900	63.34	122	1.93	1.14	205.1	65.12	<b>74.24</b>	53.0
B	13.900	14.900	63.32	117.47	1.86	1.13	88.7	28.18	<b>31.85</b>	
A	15.900	16.900	63.66	124.58	1.96	1.15	217.5	68.37	<b>78.62</b>	52.5
B	15.900	16.900	63.31	111.29	1.76	1.1	75.5	24.00	<b>26.40</b>	
A	17.100	18.900	63.32	123.4	1.95	1.15	246.1	78.19	<b>89.92</b>	65.6
B	17.100	18.900	63.75	126.8	1.99	1.15	114.7	35.95	<b>41.35</b>	
A	19.200	20.100	63.82	124.5	1.95	1.15	197.1	61.65	<b>70.89</b>	59.1
B	19.200	20.100	63.32	111.57	1.76	1.1	135.3	42.99	<b>47.29</b>	
A	21.100	22.100	63.36	126.5	2.00	1.15	181.7	57.66	<b>66.31</b>	66.0
B	21.100	22.100	63.53	127.15	2.00	1.15	181.2	57.19	<b>65.77</b>	
A	22.100	23.100	63.44	126.1	1.99	1.15	171.3	54.22	<b>62.35</b>	79.1
B	22.100	23.100	63.42	120.41	1.90	1.14	265.7	84.15	<b>95.93</b>	
A	23.100	24.100	63.32	125.4	1.98	1.15	239.4	76.06	<b>87.47</b>	90.4
B	23.100	24.100	63.41	124.6	1.96	1.15	256.1	81.14	<b>93.31</b>	
A	24.100	25.900	63.72	127.4	2.00	1.15	56.2	17.63	<b>20.28</b>	28.5
B	24.100	25.900	63.71	124.6	1.96	1.15	101.5	31.86	<b>36.63</b>	
Load correction factor =							1.000			

REMARKS:

Received by:



CLabs (Tz) Drawn, Built, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA					CLabs (Tz) Drawn, Built, Test			
UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS										
Form №							Standard: BS 5930:1999			
PROJECT		CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE					CHECKED BY: JN			
CLIENT		PADECO COMPANY LTD								
SOURCE/LOCATION:		GNEISS								
DATE OF SMPLING		Mar-15		ELEVATION						
TESTED BY		VICTOR SALEMA		TESTING DATE		5-May-15				
SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)
A	5.000	5.500								Insufficient specimen, point load test
B	5.000	5.500								
A	6.500	6.600								Insufficient specimen, point load test
B	6.500	6.600								
A	6.800	8.600	63.58	70.64	1.11	1.03	231.9	73.08	<b>75.27</b>	71.1
B	6.800	8.600	63.81	110.48	1.73	1.14	187.9	58.79	<b>67.02</b>	
A	10.200	10.500								Insufficient specimen, point load test
B	10.200	10.500								
A	11.500	11.700								Insufficient specimen, point load test
B	11.500	11.700								
A	13.200	13.500								Insufficient specimen, point load test
B	13.200	13.500								
A	13.800	14.600	63.50	93.3	1.47	1.1	107.8	34.06	<b>37.46</b>	38.6
B	13.800	14.600	63.22	102.3	1.62	1.11	112.6	35.89	<b>39.84</b>	
A	15.700	16.600	63.32	100.62	1.59	1.11	173.6	55.16	<b>61.22</b>	78.6
B	15.700	16.600	63.40	100.67	1.59	1.11	272.6	86.39	<b>95.90</b>	
A	17.400	18.400	63.32	126.5	2.00	1.15	233.6	74.22	<b>85.35</b>	82.6
B	17.400	18.400	63.06	126.4	2.00	1.15	216.6	69.39	<b>79.80</b>	
A	18.400	19.400	63.85	128	2.00	1.15	258.4	80.74	<b>92.85</b>	103.7
B	18.400	19.400	63.59	126.8	1.99	1.15	316.0	99.55	<b>114.48</b>	
A	19.400	20.400	63.73	91.43	1.43	1.09	316.9	99.40	<b>108.34</b>	100.9
B	19.400	20.400	63.37	68.46	1.08	1.02	288.6	91.55	<b>93.38</b>	
A	20.400	21.400	64.27	67.26	1.05	1.02	54.5	16.81	<b>17.14</b>	18.8
B	20.400	21.400	63.64	72.74	1.14	1.04	62.7	19.72	<b>20.51</b>	
A	21.400	22.400	43.69	55.52	1.27	1.07	22.0	14.68	<b>15.71</b>	21.8
B	21.400	22.400	43.25	57.22	1.32	1.08	37.9	25.81	<b>27.88</b>	
Load correction factor =							1.000			
Material Class										

CLabs (Tz) Drawn, Built, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA					CLabs (Tz) Drawn, Built, Test			
UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS										
Form №								Standard: BS 5930:1999		
PROJECT			CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE					CHECKED BY: JN		
CLIENT			PADECO COMPANY LTD							
SOURCE/LOCATION:			GNEISS							
DATE OF SMPLING			Mar-15		ELEVATION					
TESTED BY			VICTOR SALEMA		TESTING DATE		6-May-15			
SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)
A	20.000	21.000	63.13	66.15	1.05	1.02	66.1	21.13	<b>21.55</b>	21.2
B	20.000	21.000	62.87	79.83	1.27	1.07	60.5	19.50	<b>20.86</b>	
A	21.900	22.900	63.24	81.56	1.29	1.07	71.6	22.81	<b>24.40</b>	26.7
B	21.900	22.900	63.45	57.9	0.91	0.96	95.4	30.19	<b>28.98</b>	
A	22.900	23.900	63.15	101.28	1.60	1.11	53.3	17.03	<b>18.90</b>	17.4
B	22.900	23.900	63.22	98.09	1.55	1	49.8	15.87	<b>15.87</b>	
A	23.900	24.900	62.56	96.86	1.55	1	56.0	18.23	<b>18.23</b>	20.2
B	23.900	24.900	63.12	102.3	1.62	1.11	62.3	19.92	<b>22.11</b>	
A	24.900	25.900	63.81	96.76	1.52	1.1	103.1	32.26	<b>35.48</b>	27.4
B	24.900	25.900	63.16	97.23	1.54	1.1	55.2	17.63	<b>19.39</b>	
A	25.900	26.900	63.87	95.85	1.50	1.1	76.8	23.98	<b>26.38</b>	30.2
B	25.900	26.900	63.11	101.28	1.60	1.11	96.1	30.74	<b>34.12</b>	
A										
B										
A										
B										
A										
B										
A										
B										
A										
B										
Load correction factor =							1.000			
Material Class										

**UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS**

Form №		Standard: BS 5930:1999
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PROJECT	CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE	CHECKED BY: JN
CLIENT	PADECO COMPANY LTD	
SOURCE/LOCATION:	GNEISS	
DATE OF SMPLING	Mar-15 ELEVATION	
TESTED BY	VICTOR SALEMA TESTING DATE 6-May-15	

SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)	
											A
B	6.700	7.000								Insufficient specimen, point load test	
A	8.000	8.500								Insufficient specimen, point load test	
B	8.000	8.500								Insufficient specimen, point load test	
A	9.900	10.500								Insufficient specimen, point load test	
B	9.900	10.500								Insufficient specimen, point load test	
A	11.900	12.700								Insufficient specimen, point load test	
B	11.900	12.700								Insufficient specimen, point load test	
A	13.500	14.000								Insufficient specimen, point load test	
B	13.500	14.000								Insufficient specimen, point load test	
A	14.700	15.500	63.20	71.11	1.13	1.04	126.3	40.28	41.89		
B	14.700	15.500	63.17	96.31	1.52	1.1	65.9	21.04	23.14	32.5	
A	17.000	18.000	63.15	76.86	1.22	1.06	148.6	47.47	50.32		
B	17.000	18.000	63.18	97.88	1.55	1.1	356.4	113.74	125.11	87.7	
A	18.000	19.000	63.28	97.73	1.54	1.1	182.0	57.90	63.69		
B	18.000	19.000	63.20	101.17	1.60	1.11	135.4	43.18	47.93	55.8	
A	19.000	20.000	63.08	100.69	1.60	1.11	118.6	37.97	42.15		
B	19.000	20.000	63.00	98.93	1.57	1.11	146.9	47.15	52.34	47.2	
A	20.000	21.000	63.14	98.04	1.55	1.1	112.3	35.88	39.47		
B	20.000	21.000	63.12	97.3	1.54	1.1	118.8	37.99	41.78	40.6	
A	21.000	22.000								Insufficient specimen, point load test	
B	21.000	22.000								Insufficient specimen, point load test	
Load correction factor =							1.000				

Material Class		



<b>C Labs (Tz)</b> <small>Draw, Build, Test</small>		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA					<b>C Labs (Tz)</b> <small>Draw, Build, Test</small>	
UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS								
Form №								Standard: BS 5930:1999
PROJECT			<b>CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE</b>					CHECKED BY: JN
CLIENT			PADECO COMPANY LTD					
SOURCE/LOCATION:			GNEISS					
DATE OF SEMPLING			Mar-15		ELEVATION			
TESTED BY			VICTOR SALEMA		TESTING DATE		2-May-15	



  

SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)
A	13.000	14.000								Insufficient specimen, point load test
B	13.000	14.000								
A	14.000	15.000	47.47	82.33	1.73	1.12	71.4	40.36	<b>45.21</b>	45.0
B	14.000	15.000	47.51	54.19	1.14	1.04	76.4	43.12	<b>44.84</b>	
A	15.000	16.000	47.54	87.86	1.85	1.13	82.1	46.28	<b>52.29</b>	60.6
B	15.000	16.000	47.71	65.52	1.37	1.08	114.0	63.80	<b>68.90</b>	
A	16.000	17.000	47.60	55.51	1.17	1.05	41.2	23.16	<b>24.32</b>	26.7
B	16.000	17.000	47.59	67.87	1.43	1.09	47.5	26.72	<b>29.12</b>	
A	17.000	18.000	47.57	93.57	1.97	1.15	60.3	33.95	<b>39.04</b>	57.8
B	17.000	18.000	47.85	71.46	1.49	1.1	125.0	69.55	<b>76.50</b>	
Load correction factor =							1.000			



  



Material Class	

			CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA							
<b>UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS</b>										
Form №							Standard: BS 5930:1999			
PROJECT		CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE					CHECKED BY: JN			
CLIENT		PADECO COMPANY LTD								
SOURCE/LOCATION:		GNEISS								
DATE OF SMPLING		Mar-15		ELEVATION						
TESTED BY		VICTOR SALEMA		TESTING DATE		5-May-15				
SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)
A	18.000	20.000								Insufficient specimen, point load test
B	18.000	20.000								
A	20.000	21.000	63.28	108.6	1.72	1.12	101.5	32.29	<b>36.16</b>	39.7
B	20.000	21.000	63.48	101.47	1.60	1.11	123.4	39.01	<b>43.30</b>	
A	21.000	22.000	63.67	53.66	0.84	0.92	204.5	64.26	<b>59.12</b>	53.5
B	21.000	22.000	63.61	63.6	1.00	1	152.1	47.89	<b>47.89</b>	
A	22.000	23.000	47.28	64.42	1.36	1.08	62.8	35.79	<b>38.65</b>	37.8
B	22.000	23.000	47.36	67.22	1.42	1.09	59.6	33.85	<b>36.90</b>	
A	23.000	24.000	47.57	72.56	1.53	1.1	57.1	32.14	<b>35.36</b>	41.0
B	23.000	24.000	47.57	75.55	1.59	1.11	74.8	42.11	<b>46.74</b>	
A	24.000	25.000	47.52	71.3	1.50	1.1	50.5	28.49	<b>31.34</b>	41.5
B	24.000	25.000	47.49	72.7	1.53	1.1	83.0	46.88	<b>51.57</b>	
Load correction factor =							1.000			
Material Class										

		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA								
<b>UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS</b>										
Form №							Standard: BS 5930:1999			
PROJECT		<b>CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE</b>					CHECKED BY: JN			
CLIENT		PADECO COMPANY LTD								
SOURCE/LOCATION:		GNEISS								
DATE OF SMPLING		Mar-15		ELEVATION						
TESTED BY		VICTOR SALEMA		TESTING DATE		6-May-15				
SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)
A	9.450	11.000								Insufficient specimen, point load test
B	9.450	11.000								
A	13.000	13.500								Insufficient specimen, point load test
B	13.000	13.500								
A	15.450	16.700								Insufficient specimen, point load test
B	15.450	16.700								
A	25.300	26.300								Insufficient specimen, point load test
B	25.300	26.300								
A	27.000	28.000	47.49	64.61	1.36	1.08	50.0	28.24	<b>30.50</b>	35.6
B	27.000	28.000	47.43	65.88	1.39	1.09	66.0	37.37	<b>40.74</b>	
A	29.400	30.400	46.92	71.32	1.52	1.1	84.2	48.72	<b>53.59</b>	53.6
B	29.400	30.400	47.11	68.23	1.45	1.09	85.7	49.19	<b>53.62</b>	
A	30.400	31.400	46.99	67.69	1.44	1.09	77.6	44.77	<b>48.80</b>	43.8
B	30.400	31.400	46.72	62.71	1.34	1.08	61.7	36.01	<b>38.89</b>	
A	31.400	32.400	47.26	76.82	1.63	1.11	50.2	28.63	<b>31.78</b>	41.6
B	31.400	32.400	47.59	62.36	1.31	1.08	84.8	47.70	<b>51.51</b>	
A	32.400	33.000	47.36	60.36	1.27	1.07	134.8	76.56	<b>81.92</b>	76.3
B	32.400	33.000	47.13	64.1	1.36	1.08	114.1	65.43	<b>70.67</b>	
A										
B										
A										
B										
Load correction factor =							1.000			
Material Class										





			CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA							
<b>UNCONFINED COMPRESSIVE STRENGTH OF ROCK SPECIMENS</b>										
Form №							Standard: BS 5930:1999			
PROJECT			CENTRAL RAILWAY JICA STUDY: KILOSA - GULWE				CHECKED BY: JN			
CLIENT			PADECO COMPANY LTD							
SOURCE/LOCATION:			GNEISS							
DATE OF SMPLING			Mar-15		ELEVATION					
TESTED BY			VICTOR SALEMA		TESTING DATE		6-May-15			
SPECIMEN №.	DEPTH		DIAMETER OF CORE (mm)	HEIGHT OF SPECIMEN (mm)	HEIGHT/DIAMETER RATIO	HEIGHT/DIA. CORRECTION FACTOR	LOAD AT FAILURE (KN)	UNCONFINED COMPRESSIVE STRENGTH (MPa)	CORRECTED UNCONFINED COMPRESSIVE STRENGTH (MPa)	AVERAGE CORRECTED UNCONFINED COMPRESSIVE STRENGTH (Mpa)
A	25.800	26.800	47.47	83.35	1.76	1.13	82.3	46.53	<b>52.57</b>	54.6
B	25.800	26.800	47.51	74.29	1.56	1.1	91.2	51.47	<b>56.62</b>	
A	26.800	27.800	47.54	86.89	1.83	1.13	78.9	44.47	<b>50.25</b>	56.6
B	26.800	27.800	47.71	71.52	1.50	1.1	102.3	57.25	<b>62.98</b>	
A	27.800	28.800	47.60	62.51	1.31	1.08	68.6	38.57	<b>41.65</b>	48.6
B	27.800	28.800	47.59	69.82	1.47	1.1	89.9	50.57	<b>55.62</b>	
A	28.800	29.800	47.57	94.54	1.99	1.15	72.3	40.70	<b>46.81</b>	51.7
B	28.800	29.800	47.85	75.47	1.58	1.11	91.6	50.96	<b>56.57</b>	
A	29.800	30.800	47.59	68.67	1.44	1.09	102.4	57.60	<b>62.78</b>	67.4
B	29.800	30.800	47.63	72.89	1.53	1.4	91.7	51.49	<b>72.09</b>	
A										
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Load correction factor =								1.000		
Material Class										

 <small>Draw, Test, Test</small>	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 <small>Draw, Test, Test</small>							
<b>POINT LOAD INDEX TEST</b>									
Form №		ISRM							
PROJET	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA	CHECKED BY: JN							
CLIENT	PADECO Co. Ltd	DATE May-15							
SAMPLE DESCRIPTION	GNEISS	APPROVED BY:							
SOURCE/LOCATION:	BOREHOLE 3								
DATE OF SMPLING	Apr-15 ELEVATION								
TESTED BY	VICTOR SALEMA TESTING DATE Apr-15	DATE							
SPECIMEN №.	DEPTH	DIAMETER OF CORE, De (mm)	HEIGHT OF CORE	HEIGHT TO DIAMETER RATIO	LOAD, P (kN)	POINT LOAD INDEX Is = P/De <sup>2</sup> (Mpa)	DIAMETER CORRECTION FACTOR, (De/50) <sup>2</sup>	Is (50)	ESTIMATED UCS (Mpa)
A	2	62.58	30.51	0.49	11.75	3.00	1.11	3.32	16.6
B	2.2	63.32	34.02	0.54	15.63	3.90	1.11	4.34	21.7
A									
B									
A	10	61.23	29.12	0.48	66.41	17.71	1.10	19.40	97.0
B	10.2	62.45	34.56	0.55	72.11	18.49	1.11	20.44	102.2
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REMARKS:

Received by

 Draw, Test, Test		CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA				 Draw, Test, Test			
POINT LOAD INDEX TEST									
Form №							ISRM		
PROJET		GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA					CHECKED BY: JN		
CLIENT		PADECO Co. Ltd					DATE May-15		
SAMPLE DESCRIPTION		GNEISS					APPROVED BY:		
SOURCE/LOCATION:		BOREHOLE 4					DATE		
DATE OF SMPLING		Apr-15					TESTING DATE		
TESTED BY		VICTOR SALEMA			TESTING DATE		Apr-15		
SPECIMEN №.	DEPTH	DIAMETER OF CORE, De (mm)	HEIGHT OF CORE	HEIGHT TO DIAMETER RATIO	LOAD, P (kN)	POINT LOAD INDEX Is = $P/De^2$ (Mpa)	DIAMETER CORRECTION FACTOR, (De/50) <sup>2</sup>	Is (50)	ESTIMATED UCS (Mpa)
A	5.200	64.85	53.47	10.28	3.69	0.88	1.12	0.99	4.9
B	5.300	64.39	39.26	7.41	3.54	0.85	1.12	0.96	4.8
A	5.900	48.66	32.54	5.52	6.75	2.85	0.99	2.82	14.1
B	6.200	46.23	32.11	5.18	8.11	3.79	0.97	3.66	18.3
A	7.000	23.11	18.95	2.71	4.32	8.09	0.71	5.72	28.6
B	7.500	27.11	19.18	2.56	3.57	4.86	0.76	3.69	18.4
A	11.300	36.45	22.65	2.00	6.89	5.19	0.87	4.50	22.5
B	11.400	42.58	24.56	2.15	8.11	4.47	0.93	4.16	20.8
A	11.600	64.00	57.25	4.94	3.50	0.85	1.12	0.95	4.8
B	11.700	53.42	25.61	2.19	6.11	2.14	1.03	2.21	11.0
A	13.300	26.12	21.65	1.63	9.11	13.35	0.75	9.97	49.8
B	13.500	25.64	22.36	1.66	9.43	14.34	0.74	10.62	53.1
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REMARKS:

Received by \_\_\_\_\_



 <small>Draw, Test, Test</small>	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 <small>Draw, Test, Test</small>
<b>POINT LOAD INDEX TEST</b>		
Form №		ISRM
PROJET	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA	CHECKED BY: JN
CLIENT	PADECO Co. Ltd	DATE: May-15
SAMPLE DESCRIPTION	GNEISS	APPROVED BY:
SOURCE/LOCATION:	BOREHOLE 6	
DATE OF SMPLING	Apr-15 ELEVATION	
TESTED BY	VICTOR SALEMA TESTING DATE	DATE
		Apr-15

SPECIMEN №.	DEPTH	DIAMETER OF CORE, De (mm)	HEIGHT OF CORE	HEIGHT TO DIAMETER RATIO	LOAD, P (kN)	POINT LOAD INDEX Is = P/De <sup>2</sup> (Mpa)	DIAMETER CORRECTION FACTOR, (De/50) <sup>2</sup>	Is (50)	ESTIMATED UCS (Mpa)
A	6.700	59.11	32.11	0.54	16.11	4.61	1.85	8.55	42.7
B	6.800	52.36	33.11	0.63	14.23	5.19	1.64	8.52	42.6
A	8.200	49.56	29.56	0.60	12.31	5.01	1.55	7.79	39.0
B	8.400	45.12	23.45	0.52	13.22	6.49	1.42	9.19	46.0
A	10.200	47.32	22.11	0.47	11.69	5.22	1.48	7.75	38.7
B	10.400	48.72	28.11	0.58	15.62	6.58	1.53	10.06	50.3
A	12.100	42.63	32.45	0.76	16.12	8.87	1.34	11.86	59.3
B	12.500	39.45	36.45	0.92	18.92	12.16	1.24	15.04	75.2
A	13.700	22.65	15.63	0.69	8.26	16.10	0.71	11.44	57.2
B	13.900	28.96	18.26	0.63	15.63	18.64	0.91	16.93	84.6
A	14.900	36.98	22.36	0.60	22.63	16.55	1.16	19.19	96.0
B	15.200	42.65	22.36	0.52	30.21	16.61	1.34	22.22	111.1
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REMARKS:

Received by



 Draw, <span style="color:red">✂</span> , Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 Draw, <span style="color:red">✂</span> , Test
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**POINT LOAD INDEX TEST**

Form №	ISRM
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PROJET	GEO TECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA	CHECKED BY: JN
CLIENT	PADECO Co. Ltd	DATE May-15
SAMPLE DESCRIPTION	GNEISS	
SOURCE/LOCATION:	BOREHOLE 8	APPROVED BY:
DATE OF SMPLING	Apr-15 ELEVATION	
TESTED BY	VICTOR SALEMA TESTING DATE Apr-15	DATE

SPECIMEN №.	DEPTH	DIAMETER OF CORE, De (mm)	HEIGHT OF CORE	HEIGHT TO DIAMETER RATIO	LOAD, P (kN)	POINT LOAD INDEX Is = P/De <sup>2</sup> (Mpa)	DIAMETER CORRECTION FACTOR, (De/50) <sup>2</sup>	Is (50)	ESTIMATED UCS (Mpa)
A	19.000	55.11	22.24	0.40	22.51	7.41	1.73	12.81	64.1
B	19.500	49.23	25.63	0.52	25.62	10.57	1.54	16.32	81.6

REMARKS:

Received by



 <small>Draw, Test, Test</small>	<b>CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA</b>	 <small>Draw, Test, Test</small>
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**POINT LOAD INDEX TEST**



Form №	ISRM
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PROJET	GEO TECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA	CHECKED BY: JN
CLIENT	PADECO Co. Ltd	DATE May-15
SAMPLE DESCRIPTION	GNEISS	APPROVED BY:
SOURCE/LOCATION:	BOREHOLE 9	
DATE OF SMLPLING	Apr-15 ELEVATION	
TESTED BY	VICTOR SALEMA TESTING DATE Apr-15	

SPECIMEN №.	DEPTH	DIAMETER OF CORE, De (mm)	HEIGHT OF CORE	HEIGHT TO DIAMETER RATIO	LOAD, P (kN)	POINT LOAD INDEX Is = P/De² (Mpa)	DIAMETER CORRECTION FACTOR, (De/50)²	Is (50)	ESTIMATED UCS (Mpa)
A	10.200	39.25	22.11	0.56	19.12	12.41	1.23	15.28	76.4
B	10.500	41.32	23.62	0.57	17.56	10.28	1.30	13.33	66.6
A	13.200	32.11	16.45	0.51	15.11	14.65	1.01	14.76	73.8
B	13.400	29.46	18.27	0.62	18.92	21.80	0.92	20.14	100.7
A	15.900	35.96	18.26	0.51	16.23	12.55	1.13	14.16	70.8
B	6.400	38.91	29.62	0.76	18.11	11.96	1.22	14.60	73.0
A	25.700	36.52	22.34	0.61	16.45	12.33	1.15	14.13	70.6
B	25.900	42.63	22.64	0.53	22.31	12.28	1.34	16.42	82.1
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REMARKS:
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Received by	
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 Draw, Build, Test	<b>CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA</b>	 Draw, Build, Test
<b>DRY DENSITY AND POROSITY TEST</b>		
Form No		

PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA		CHECKED BY:
LOCATION / SOURCE	BORE HOLE 3		DATE:
TESTED BY:	VICTOR/JOHN		APPROVED BY
DATE OF TESTING	6-May-2015	DATE OF SAMPLING	Apr-15

TEST No:																
SAMPLE DESCRIPTION																
DEPTH (m)	1.50-2.60	3.00-4.40	5.50-6.50	9.4-10.4	11.1-12.1	12.5-13.5	13.9-14.9	15.9-16.9	17.1-18.9	19.2-20.1	20.1-21.1	21.1-22.1	22.1-23.1	23.1-24.1	24.1-25.1	
Container No.		XB	WE	RO	BN	7B	NN	TH	GIT	57	SR	C2	48.00	72	B2	
Container + surface wet rock	g	156.44	147.67	79.38	159.35	134.88	190.48	146.54	168.84	163.03	150.43	124.19	164.01	186.22	157.91	
Container + dry rock	g	156.09	146.86	79.17	158.96	134.11	190.19	146.34	168.51	162.71	150.24	124.04	163.86	186.07	157.81	
Weight of Container	g	23.41	31.81	28.79	22.60	23.84	23.77	13.10	23.71	18.51	13.38	31.99	19.65	23.69	13.49	
Diameter of rock specimen	cm	6.33	6.29	4.73	6.37	6.31	6.35	6.34	6.34	6.25	6.35	6.31	6.35	6.36	6.35	
Thickness of the specimen	cm	1.46	1.36	1.07	1.63	1.51	1.80	1.52	1.62	1.78	1.52	1.13	1.71	1.85	1.64	
Weight of Dry rock	g	132.68	115.05	50.38	136.36	110.27	166.42	133.24	144.80	144.20	136.86	92.05	144.21	162.38	144.32	
cross section area (A)	cm <sup>2</sup>	31.45	31.06	17.56	31.85	31.26	31.65	31.55	31.55	30.66	31.65	31.26	31.65	31.75	31.65	
Volume of sample(V)	cm <sup>3</sup>	45.92	42.24	18.79	51.92	47.20	56.98	47.96	51.12	54.58	48.11	35.32	54.13	58.74	51.91	
saturated surface dry mass	g	133.03	115.86	50.59	136.75	111.04	166.71	133.44	145.13	144.52	137.05	92.20	144.36	162.53	144.42	
Pore volume (Vv)	cm <sup>3</sup>	0.35	0.81	0.21	0.39	0.77	0.29	0.20	0.33	0.32	0.19	0.15	0.15	0.15	0.10	
DRY DENSITY	g/cm <sup>3</sup>	<b>2.889</b>	<b>2.724</b>	<b>2.681</b>	<b>2.626</b>	<b>2.336</b>	<b>2.921</b>	<b>2.778</b>	<b>2.833</b>	<b>2.642</b>	<b>2.845</b>	<b>2.606</b>	<b>2.664</b>	<b>2.764</b>	<b>2.780</b>	
POROSITY	%	<b>0.76</b>	<b>1.92</b>	<b>1.12</b>	<b>0.75</b>	<b>1.63</b>	<b>0.51</b>	<b>0.42</b>	<b>0.65</b>	<b>0.59</b>	<b>0.39</b>	<b>0.42</b>	<b>0.28</b>	<b>0.26</b>	<b>0.19</b>	

COMMENTS
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	Received by:
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 C Labs (Tz) Draw, Build, Test	<b>CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA</b>	 C Labs (Tz) Draw, Build, Test
<b>DRY DENSITY AND POROSITY TEST</b>		
Form №		

PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA		CHECKED BY:
LOCATION / SOURCE	BORE HOLE 4		DATE:
TESTED BY:	VICTOR/JOHN		APPROVED BY
DATE OF TESTING	6-May-2015	DATE OF SAMPLING	Mar-15

TEST №:															
SAMPLE DESCRIPTION															
DEPTH (m)	5.00-5.50	6.50-6.6	6.80-8.60	10.2-10.5	11.5-11.7	13.2-13.5	13.8-14.6	15.7-16.6	17.4-18.4	18.4-19.4	19.4-204	20.4-21.4	21.4-22.4		
Container No.	DM		DK	KY	CS		NO 75	10	T4	R11	51.00	KK	OB		
Container + surface wet rock	g	118.68		192.54	200.48	262.64		258.53	125.50	137.98	124.54	151.91	117.68	155.71	
Container + dry rock	g	118.52		192.18	199.82	262.27		258.22	125.26	137.88	124.33	151.31	117.52	155.44	
Weight of Container	g	32.39		57.62	56.02	129.58		125.81	23.53	13.54	19.03	24.54	32.34	32.60	
Diameter of rock specimen	cm	6.30		6.32	6.30	6.26		6.33	6.19	6.32	6.33	6.32	6.30	6.32	
Thickness of the specimen	cm	1.13		1.49	1.55	1.44		1.71	1.37	1.57	1.31	1.65	1.13	1.51	
Weight of Dry rock	g	86.13		134.56	143.80	132.69		132.41	101.73	124.34	105.30	126.77	85.18	122.84	
cross section area (A)	cm <sup>2</sup>	31.16		31.35	31.16	30.76		31.45	30.08	31.35	31.45	31.35	31.16	31.35	
Volume of sample(V)	cm <sup>3</sup>	35.21		46.72	48.29	44.30		53.79	41.21	49.23	41.20	51.74	35.21	47.35	
saturated surface dry mass	g	86.29		134.92	144.46	133.06		132.72	101.97	124.44	105.51	127.37	85.34	123.11	
Pore volume (Vv)	cm <sup>3</sup>	0.16		0.36	0.66	0.37		0.31	0.24	0.10	0.21	0.60	0.16	0.27	
DRY DENSITY	g/cm <sup>3</sup>	<b>2.446</b>		<b>2.880</b>	<b>2.978</b>	<b>2.995</b>		<b>2.462</b>	<b>2.469</b>	<b>2.526</b>	<b>2.556</b>	<b>2.450</b>	<b>2.419</b>	<b>2.595</b>	
POROSITY	%	<b>0.45</b>		<b>0.77</b>	<b>1.37</b>	<b>0.84</b>		<b>0.58</b>	<b>0.58</b>	<b>0.20</b>	<b>0.51</b>	<b>1.16</b>	<b>0.45</b>	<b>0.57</b>	

COMMENTS
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	Received by:
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 Draw, Build, Test	<b>CIVIL ENGINEERING LABORATORY</b> <b>DAR ES SALAAM</b> <b>TANZANIA</b>	 Draw, Build, Test
<b>DRY DENSITY AND POROSITY TEST</b>		
Form №		

PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA		CHECKED BY:
LOCATION / SOURCE	BORE HOLE 5		DATE:
TESTED BY:	VICTOR/JOHN		APPROVED BY
DATE OF TESTING	6-May-2015	DATE OF SAMPLING	Mar-15
			DATE

TEST №:																		
SAMPLE DESCRIPTION																		
DEPTH (m)		20.0-21.0	21.9-22.9	22.9-23.9	23.9-24.9	24.9-25.9	25.9-26.9											
Container No.		21.00	FB	R	FR	DP	176											
Container + surface wet rock	g	117.68	155.70	149.38	145.67	75.37	158.36											
Container + dry rock	g	116.72	154.74	147.87	144.86	75.19	157.97											
Weight of Container	g	32.34	32.60	43.43	31.76	28.84	22.56											
Diameter of rock specimen	cm	6.30	6.32	6.31	6.29	4.73	6.37											
Thickness of the specimen	cm	1.13	1.51	1.33	1.36	1.07	1.63											
Weight of Dry rock	g	84.38	122.14	104.44	113.10	46.35	135.41											
cross section area (A)	cm <sup>2</sup>	31.16	31.35	31.26	31.06	17.56	31.85											
Volume of sample(V)	cm <sup>3</sup>	35.21	47.35	41.57	42.24	18.79	51.92											
saturated surface dry mass	g	85.34	123.10	105.95	113.91	46.53	135.80											
Pore volume (Vv)	cm <sup>3</sup>	0.96	0.96	1.51	0.81	0.18	0.39											
DRY DENSITY	g/cm <sup>3</sup>	2.40	2.58	2.51	2.68	2.47	2.61											
POROSITY	%	2.73	2.03	3.63	1.92	0.96	0.75											

COMMENTS
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	Received by:
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 Draw, Build, Test	<b>CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA</b>	 Draw, Build, Test
<b>DRY DENSITY AND POROSITY TEST</b>		
Form №		

PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA		CHECKED BY:
LOCATION / SOURCE	BORE HOLE 6		DATE:
TESTED BY:	VICTOR/JOHN		APPROVED BY
DATE OF TESTING	6-May-2015	DATE OF SAMPLING	Mar-15

TEST №:														
SAMPLE DESCRIPTION														
DEPTH (m)	6.7-7.00	8.00-8.50	9.90-10.50	11.9-12.7	13.5-14.0	14.7-15.5	17.0-18.0	18.0-19.0	19.0-20.0	20.0-21.0	21.0-22.0			
Container No.		YT	BQ	ON	PQ	O	1922.00	P2	MP	NO 37				
Container + surface wet rock	g	79.23	85.46	99.56	87.81	172.14	176.09	192.44	200.38	261.64				
Container + dry rock	g	79.19	85.29	99.44	87.53	171.71	175.70	192.08	199.92	261.27				
Weight of Container	g	28.86	31.76	31.13	29.49	55.43	48.14	57.62	56.02	129.58				
Diameter of rock specimen	cm	4.73	4.66	4.63	4.73	6.32	6.32	6.32	6.30	6.26				
Thickness of the specimen	cm	1.07	1.11	1.60	1.19	1.45	1.41	1.49	1.55	1.44				
Weight of Dry rock	g	50.33	53.53	68.31	58.04	116.28	127.56	134.46	143.90	131.69				
cross section area (A)	cm <sup>2</sup>	17.56	17.05	16.83	17.56	31.35	31.35	31.35	31.16	30.76				
Volume of sample(V)	cm <sup>3</sup>	18.79	18.95	26.92	20.90	45.46	44.21	46.72	48.29	44.30				
saturated surface dry mass	g	50.37	53.70	68.43	58.32	116.71	127.95	134.82	144.36	132.06				
Pore volume (Vv)	cm <sup>3</sup>	0.04	0.17	0.12	0.28	0.43	0.39	0.36	0.46	0.37				
DRY DENSITY	g/cm <sup>3</sup>	<b>2.678</b>	<b>2.825</b>	<b>2.537</b>	<b>2.777</b>	<b>2.558</b>	<b>2.885</b>	<b>2.878</b>	<b>2.980</b>	<b>2.973</b>				
POROSITY	%	<b>0.21</b>	<b>0.90</b>	<b>0.45</b>	<b>1.34</b>	<b>0.95</b>	<b>0.88</b>	<b>0.77</b>	<b>0.95</b>	<b>0.84</b>				

COMMENTS
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	Received by:
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 Draw, Build, Test	<b>CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA</b>	 Draw, Build, Test
<b>DRY DENSITY AND POROSITY TEST</b>		
Form №		



PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA		CHECKED BY:
LOCATION / SOURCE	BORE HOLE 7		DATE:
TESTED BY:	VICTOR/JOHN		APPROVED BY
DATE OF TESTING	6-May-2015	DATE OF SAMPLING	Mar-15

TEST №:														
SAMPLE DESCRIPTION														
DEPTH (m)		13.0-14.0	14.0-15.0	15.0-16.0	16.0-17.0	17.0-18.0								
Container No.		LL	YT	BQ	ON	PQ								
Container + surface wet rock	g	117.28	79.23	85.46	99.56	87.81								
Container + dry rock	g	116.75	79.19	85.29	99.44	87.53								
Weight of Container	g	32.36	28.86	31.76	31.13	29.49								
Diameter of rock specimen	cm	6.32	4.73	4.66	4.63	4.73								
Thickness of the specimen	cm	1.14	1.07	1.11	1.60	1.19								
Weight of Dry rock	g	84.39	50.33	53.53	68.31	58.04								
cross section area (A)	cm <sup>2</sup>	31.35	17.56	17.05	16.83	17.56								
Volume of sample(V)	cm <sup>3</sup>	35.74	18.79	18.95	26.92	20.90								
saturated surface dry mass	g	84.92	50.37	53.70	68.43	58.32								
Pore volume (Vv)	cm <sup>3</sup>	0.53	0.04	0.17	0.12	0.28								
DRY DENSITY	g/cm <sup>3</sup>	2.361	2.678	2.825	2.537	2.777								
POROSITY	%	1.48	0.21	0.90	0.45	1.34								

COMMENTS
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	Received by:
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 <small>Draw, Build, Test</small>	<b>CIVIL ENGINEERING LABORATORY</b> <b>DAR ES SALAAM</b> <b>TANZANIA</b>	 <small>Draw, Build, Test</small>
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DRY DENSITY AND POROSITY TEST
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Form №		
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PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA	CHECKED BY:
LOCATION / SOURCE	BORE HOLE 8	DATE:
TESTED BY:	VICTOR/JOHN	APPROVED BY
DATE OF TESTING	6-May-2015	DATE
	DATE OF SAMPLING	Mar-15

TEST №:																				
SAMPLE DESCRIPTION																				
DEPTH (m)	18.0-20.0	20.0-21.0	21.0-22.0	22.0-23.0	23.0-24.0	24.0-25.0														
Container No.		R4	AM	LV	36.00	34.00														
Container + surface wet rock	g	129.46	127.04	84.44	72.16	73.97														
Container + dry rock	g	129.10	126.21	84.30	71.93	73.57														
Weight of Container	g	36.07	32.17	44.17	30.86	31.73														
Diameter of rock specimen	cm	6.35	6.38	4.63	4.75	4.75														
Thickness of the specimen	cm	1.20	1.14	0.99	0.95	1.01														
Weight of Dry rock	g	93.03	94.04	40.13	41.07	41.84														
cross section area (A)	cm <sup>2</sup>	31.65	31.95	16.83	17.71	17.71														
Volume of sample(V)	cm <sup>3</sup>	37.98	36.43	16.66	16.83	17.89														
saturated surface dry mass	g	93.39	94.87	40.27	41.30	42.24														
Pore volume (Vv)	cm <sup>3</sup>	0.36	0.83	0.14	0.23	0.40														
DRY DENSITY	g/cm <sup>3</sup>	<b>2.449</b>	<b>2.582</b>	<b>2.409</b>	<b>2.441</b>	<b>2.339</b>														
POROSITY	%	<b>0.95</b>	<b>2.28</b>	<b>0.84</b>	<b>1.37</b>	<b>2.24</b>														

COMMENTS
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	Received by:
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 Draw, Build, Test	<b>CIVIL ENGINEERING LABORATORY</b> <b>DAR ES SALAAM</b> <b>TANZANIA</b>	 Draw, Build, Test
<b>DRY DENSITY AND POROSITY TEST</b>		
Form №		

PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA		CHECKED BY:
LOCATION / SOURCE	BORE HOLE 9		DATE:
TESTED BY:	VICTOR/JOHN		APPROVED BY
DATE OF TESTING	6-May-2015	DATE OF SAMPLING	Mar-15

TEST №:																
SAMPLE DESCRIPTION																
DEPTH (m)	9.45-11.00	13.0-13.5	15.45-16.7	25.3-26.3	27.0-28.0	29.4-30.4	30.4-31.4	31.4-32.4	32.4-33.0							
Container No.	TW	AA	MK	NJ	DP	mg	FT	AY	P16							
Container + surface wet rock	g	77.16	129.47	128.04	84.54	75.37	75.23	83.47	91.36	86.81						
Container + dry rock	g	75.93	129.13	127.21	84.39	75.19	75.19	83.28	91.04	86.53						
Weight of Container	g	30.86	36.07	32.17	44.17	28.84	28.84	31.76	31.12	29.49						
Diameter of rock specimen	cm	4.75	6.35	6.38	4.63	4.73	4.73	4.66	4.73	4.73						
Thickness of the specimen	cm	0.95	1.20	1.14	0.99	1.07	1.07	1.11	1.27	1.19						
Weight of Dry rock	g	45.07	93.06	95.04	40.22	46.35	46.35	51.52	59.92	57.04						
cross section area (A)	cm <sup>2</sup>	17.71	31.65	31.95	16.83	17.56	17.56	17.05	17.56	17.56						
Volume of sample(V)	cm <sup>3</sup>	16.83	37.98	36.43	16.66	18.79	18.79	18.95	22.30	20.90						
saturated surface dry mass	g	46.30	93.40	95.87	40.37	46.53	46.39	51.71	60.24	57.32						
Pore volume (Vv)	cm <sup>3</sup>	1.23	0.34	0.83	0.15	0.18	0.04	0.19	0.32	0.28						
DRY DENSITY	g/cm <sup>3</sup>	<b>2.679</b>	<b>2.450</b>	<b>2.609</b>	<b>2.414</b>	<b>2.466</b>	<b>2.466</b>	<b>2.719</b>	<b>2.686</b>	<b>2.729</b>						
POROSITY	%	<b>7.31</b>	<b>0.90</b>	<b>2.28</b>	<b>0.90</b>	<b>0.96</b>	<b>0.21</b>	<b>1.00</b>	<b>1.43</b>	<b>1.34</b>						

COMMENTS
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	Received by:
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 Draw, Build, Test	<b>CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA</b>	 Draw, Build, Test
<b>DRY DENSITY AND POROSITY TEST</b>		
Form №		

PROJECT	GEOTECHNICAL INVESTIGATION WORKS ON THE PREPARATORY SURVEY ON FLOOD PROTECTION MEASURES FOR CENTRAL RAILWAY LINE IN TANZANIA		CHECKED BY:
LOCATION / SOURCE	BORE HOLE 5		DATE:
TESTED BY:	VICTOR/JOHN		APPROVED BY
DATE OF TESTING	6-May-2015	DATE OF SAMPLING	Mar-15

TEST №:														
SAMPLE DESCRIPTION														
DEPTH (m)		25.8-26.8	26.8-27.8	27.8-28.8	28.8-29.8	29.8-30.8								
Container No.		no88	SH	BB	A13	13								
Container + surface wet rock	g	195.04	104.78	66.33	77.16	125.30								
Container + dry rock	g	194.97	104.57	66.11	77.02	124.91								
Weight of Container	g	127.68	21.23	10.10	13.31	13.58								
Diameter of rock specimen	cm	4.77	4.78	4.39	4.74	4.73								
Thickness of the specimen	cm	1.48	1.75	1.53	1.57	2.51								
Weight of Dry rock	g	67.29	83.34	56.01	63.71	111.33								
cross section area (A)	cm <sup>2</sup>	17.86	17.94	15.13	17.64	17.56								
Volume of sample(V)	cm <sup>3</sup>	26.43	31.39	23.15	27.69	44.08								
saturated surface dry mass	g	67.36	83.55	56.23	63.85	111.72								
Pore volume (Vv)	cm <sup>3</sup>	0.07	0.21	0.22	0.14	0.39								
DRY DENSITY	g/cm <sup>3</sup>	<b>2.546</b>	<b>2.655</b>	<b>2.420</b>	<b>2.301</b>	<b>2.525</b>								
POROSITY	%	<b>0.26</b>	<b>0.67</b>	<b>0.95</b>	<b>0.51</b>	<b>0.88</b>								

COMMENTS
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	Received by:
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<b>C Labs (Tz)</b> Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	<b>C Labs (Tz)</b> Draw, Build, Test
<b>DETERMINATION OF CHLORIDE IN WATER SAMPLES</b>		
Form No		Standard: ASTM D 512 MOHR'S METHOD

PROJECT	CENTRAL RAILWAY JICA STUDY. KILOSA - GULWE	CHECKED BY: VS
CLIENT	PADECO	DATE May 2015
LOCATION	BH 1	APPROVED BY:
TESTED BY	VICTOR SALEMA	
DATE OF SAMPLING	Apr-15      TESTED      May-15	

Samplpe reference (km) /Test No		1	2		REMARKS
<b>I</b>	<b>STANDARDISATION OF AgNO<sub>3</sub></b>				
A	Mass of NaCl used	g	0.235	0.236	Average
B	Initial Volume of AgNO <sub>3</sub>	ml	2.00	2.10	
C	Final volume of AgNO <sub>3</sub>	ml	37.52	37.05	
D	Volume of AgNO <sub>3</sub> used	ml	35.52	34.95	
E	Concentration of Standardised AgNO <sub>3</sub>	N	0.100	0.100	0.10
<b>II</b>	<b>DETERMINATION OF CHLORIDE CONTENT</b>				
F	Wt of water used	g	50.00	50.00	
G	Density of water	g/cc	1.00	1.00	
H	Volume of water used	ml	50	50.000	
J	pH of water	pH	8.55	8.41	
K	Initial Volume of AgNO <sub>3</sub>	ml	38.2	39.4	
L	Final volume of AgNO <sub>3</sub>	ml	39.4	40.8	
M	Titre AgNO <sub>3</sub>	ml	1.2	1.4	
N	Concentration of Water	M	0.0024	0.0028	
O	Chloride content	mg/l	85.1	99.3	
P	Average chloride content	mg/l	92.2		
$E = A / (0.05844)D$ <p>E : Normality of AgNO<sub>3</sub> solution</p> <p>A: Mass of NaCl used for titration in grams</p> <p>D: Volume of AgNO<sub>3</sub> used for titration in ml</p> $O = N \times 35.45 \times 1000$					

	Received by :
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<b>C Labs (Tz)</b> Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	<b>C Labs (Tz)</b> Draw, Build, Test
<b>DETERMINATION OF CHLORIDE IN WATER SAMPLES</b>		
Form No		Standard: ASTM D 512 MOHR'S METHOD

PROJECT	CENTRAL RAILWAY JICA STUDY. KILOSA - GULWE		CHECKED BY: VS
CLIENT	PADECO		DATE May 2015
LOCATION	BH 2		APPROVED BY:
TESTED BY	VICTOR SALEMA		
DATE OF SAMPLING	Apr-15	TESTED May-15	

Samplpe reference (km) /Test No			1	2		REMARKS
<b>I</b>	<b>STANDARDISATION OF AgNO<sub>3</sub></b>					
A	Mass of NaCl used	g	0.235	0.236	Average	
B	Initial Volume of AgNO <sub>3</sub>	ml	2.00	2.10		
C	Final volume of AgNO <sub>3</sub>	ml	37.52	37.05		
D	Volume of AgNO <sub>3</sub> used	ml	35.52	34.95		
E	Concentration of Standardised AgNO <sub>3</sub>	N	0.100	0.100	0.10	
<b>II</b>	<b>DETERMINATION OF CHLORIDE CONTENT</b>					
F	Wt of water used	g	49.00	50.00		
G	Density of water	g/cc	1.00	1.00		
H	Volume of water used	ml	49	50.000		
J	pH of water	pH	8.85	8.11		
K	Initial Volume of AgNO <sub>3</sub>	ml	33.1	34.1		
L	Final volume of AgNO <sub>3</sub>	ml	34.1	35.2		
M	Titre AgNO <sub>3</sub>	ml	1	1.1		
N	Concentration of Water	M	0.0020	0.0022		
O	Chloride content	mg/l	70.9	78.0		
P	Average chloride content	mg/l	74.4			
$E = A / (0.05844) D$ <p>E : Normality of AgNO<sub>3</sub> solution</p> <p>A: Mass of NaCl used for titration in grams</p> <p>D: Volume of AgNO<sub>3</sub> used for titration in ml</p> $O = N \times 35.45 \times 1000$						

	Received by :
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<b>C Labs (Tz)</b> Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	<b>C Labs (Tz)</b> Draw, Build, Test
<b>DETERMINATION OF CHLORIDE IN WATER SAMPLES</b>		
Form No		Standard: ASTM D 512 MOHR'S METHOD

PROJECT	CENTRAL RAILWAY JICA STUDY. KILOSA - GULWE		CHECKED BY: VS
CLIENT	PADECO		DATE May 2015
LOCATION	BH 5		APPROVED BY:
TESTED BY	VICTOR SALEMA		
DATE OF SAMPLING	Apr-15	TESTED May-15	

Samplpe reference (km) /Test No			1	2		REMARKS
<b>I</b>	<b>STANDARDISATION OF AgNO<sub>3</sub></b>					
A	Mass of NaCl used	g	0.235	0.236	Average	
B	Initial Volume of AgNO <sub>3</sub>	ml	2.00	2.10		
C	Final volume of AgNO <sub>3</sub>	ml	37.52	37.05		
D	Volume of AgNO <sub>3</sub> used	ml	35.52	34.95		
E	Concentration of Standardised AgNO <sub>3</sub>	N	0.100	0.100	0.10	
<b>II</b>	<b>DETERMINATION OF CHLORIDE CONTENT</b>					
F	Wt of water used	g	50.00	50.00		
G	Density of water	g/cc	1.00	1.00		
H	Volume of water used	ml	50	50.000		
J	pH of water	pH	8.17	8.20		
K	Initial Volume of AgNO <sub>3</sub>	ml	43.6	44.3		
L	Final volume of AgNO <sub>3</sub>	ml	44.3	44.8		
M	Titre AgNO <sub>3</sub>	ml	0.7	0.5		
N	Concentration of Water	M	0.0014	0.0010		
O	Chloride content	mg/l	49.6	35.5		
P	Average chloride content	mg/l	42.5			
$E = A / (0.05844) D$ <p>E : Normality of AgNO<sub>3</sub> solution</p> <p>A: Mass of NaCl used for titration in grams</p> <p>D: Volume of AgNO<sub>3</sub> used for titration in ml</p> $O = N \times 35.45 \times 1000$						

	Received by :
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<b>C Labs (Tz)</b> Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	<b>C Labs (Tz)</b> Draw, Build, Test
<b>DETERMINATION OF CHLORIDE IN WATER SAMPLES</b>		
Form No		Standard: ASTM D 512 MOHR'S METHOD

PROJECT	CENTRAL RAILWAY JICA STUDY. KILOSA - GULWE	CHECKED BY: VS
CLIENT	PADECO	DATE May 2015
LOCATION	BH 6	APPROVED BY:
TESTED BY	VICTOR SALEMA	
DATE OF SAMPLING	Apr-15	
		DATE

Samplpe reference (km) /Test No		1	2		REMARKS
<b>I</b>	<b>STANDARDISATION OF AgNO<sub>3</sub></b>				
A	Mass of NaCl used	g	0.235	0.236	Average
B	Initial Volume of AgNO <sub>3</sub>	ml	2.00	2.10	
C	Final volume of AgNO <sub>3</sub>	ml	37.52	37.05	
D	Volume of AgNO <sub>3</sub> used	ml	35.52	34.95	
E	Concentration of Standardised AgNO <sub>3</sub>	N	0.100	0.100	0.10
<b>II</b>	<b>DETERMINATION OF CHLORIDE CONTENT</b>				
F	Wt of water used	g	50.00	50.00	
G	Density of water	g/cc	1.00	1.00	
H	Volume of water used	ml	50	50.000	
J	pH of water	pH	8.68	8.20	
K	Initial Volume of AgNO <sub>3</sub>	ml	40.9	44.3	
L	Final volume of AgNO <sub>3</sub>	ml	42.1	45.5	
M	Titre AgNO <sub>3</sub>	ml	1.2	1.2	
N	Concentration of Water	M	0.0024	0.0024	
O	Chloride content	mg/l	85.1	85.1	
P	Average chloride content	mg/l	85.1		
$E = A / (0.05844) D$ <p>E : Normality of AgNO<sub>3</sub> solution</p> <p>A: Mass of NaCl used for titration in grams</p> <p>D: Volume of AgNO<sub>3</sub> used for titration in ml</p> $O = N \times 35.45 \times 1000$					

	Received by :
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<b>C Labs (Tz)</b> Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	<b>C Labs (Tz)</b> Draw, Build, Test
<b>DETERMINATION OF CHLORIDE IN WATER SAMPLES</b>		
Form No		Standard: ASTM D 512 MOHR'S METHOD

PROJECT	CENTRAL RAILWAY JICA STUDY. KILOSA - GULWE		CHECKED BY: VS
CLIENT	PADECO		DATE May 2015
LOCATION	BH 7		APPROVED BY:
TESTED BY	VICTOR SALEMA		
DATE OF SAMPLING	Apr-15	TESTED May-15	

Samplpe reference (km) /Test No			1	2		REMARKS
<b>I</b>	<b>STANDARDISATION OF AgNO<sub>3</sub></b>					
A	Mass of NaCl used	g	0.235	0.236	Average	
B	Initial Volume of AgNO <sub>3</sub>	ml	2.00	2.10		
C	Final volume of AgNO <sub>3</sub>	ml	37.52	37.05		
D	Volume of AgNO <sub>3</sub> used	ml	35.52	34.95		
E	Concentration of Standardised AgNO <sub>3</sub>	N	0.100	0.100	0.10	
						$E = A / (0.05844)D$
						E : Normality of AgNO <sub>3</sub> solution
						A: Mass of NaCl used for titration in grams
						D: Volume of AgNO <sub>3</sub> used for titration in ml
						$O = N \times 35.45 \times 1000$
<b>II</b>	<b>DETERMINATION OF CHLORIDE CONTENT</b>					
F	Wt of water used	g	50.00	50.00		
G	Density of water	g/cc	1.00	1.00		
H	Volume of water used	ml	50	50.000		
J	pH of water	pH	8.76	8.85		
K	Initial Volume of AgNO <sub>3</sub>	ml	6.4	7.6		
L	Final volume of AgNO <sub>3</sub>	ml	7.6	8.9		
M	Titre AgNO <sub>3</sub>	ml	1.2	1.3		
N	Concentration of Water	M	0.0024	0.0026		
O	Chloride content	mg/l	85.1	92.2		
P	Average chloride content	mg/l	88.6			

	Received by :
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<b>C Labs (Tz)</b> Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	<b>C Labs (Tz)</b> Draw, Build, Test
<b>DETERMINATION OF CHLORIDE IN WATER SAMPLES</b>		
Form No		Standard: ASTM D 512 MOHR'S METHOD

PROJECT	CENTRAL RAILWAY JICA STUDY. KILOSA - GULWE	CHECKED BY: VS
CLIENT	PADECO	DATE May 2015
LOCATION	BH 9	APPROVED BY:
TESTED BY	VICTOR SALEMA	
DATE OF SAMPLING	Apr-15	
		DATE

Samplpe reference (km) /Test No		1	2		REMARKS
<b>I</b>	<b>STANDARDISATION OF AgNO<sub>3</sub></b>				
A	Mass of NaCl used	g	0.235	0.236	Average
B	Initial Volume of AgNO <sub>3</sub>	ml	2.00	2.10	
C	Final volume of AgNO <sub>3</sub>	ml	37.52	37.05	
D	Volume of AgNO <sub>3</sub> used	ml	35.52	34.95	
E	Concentration of Standardised AgNO <sub>3</sub>	N	0.100	0.100	0.10
<b>II</b>	<b>DETERMINATION OF CHLORIDE CONTENT</b>				
F	Wt of water used	g	50.00	50.00	
G	Density of water	g/cc	1.00	1.00	
H	Volume of water used	ml	50	50.000	
J	pH of water	pH	8.70	8.65	
K	Initial Volume of AgNO <sub>3</sub>	ml	8.9	10.2	
L	Final volume of AgNO <sub>3</sub>	ml	10.2	11.6	
M	Titre AgNO <sub>3</sub>	ml	1.3	1.4	
N	Concentration of Water	M	0.0026	0.0028	
O	Chloride content	mg/l	92.2	99.3	
P	Average chloride content	mg/l	95.7		
$E = A / (0.05844)D$ <p>E : Normality of AgNO<sub>3</sub> solution</p> <p>A: Mass of NaCl used for titration in grams</p> <p>D: Volume of AgNO<sub>3</sub> used for titration in ml</p> $O = N \times 35.45 \times 1000$					



	Received by :
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<b>C Labs (Tz)</b> Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	<b>C Labs (Tz)</b> Draw, Build, Test
<b>DETERMINATION OF CHLORIDE IN WATER SAMPLES</b>		
Form No		Standard: ASTM D 512 MOHR'S METHOD

PROJECT	CENTRAL RAILWAY JICA STUDY. KILOSA - GULWE	CHECKED BY: VS
CLIENT	PADECO	DATE May 2015
LOCATION	BH 9	APPROVED BY:
TESTED BY	VICTOR SALEMA	
DATE OF SAMPLING	Apr-15      TESTED May-15	

Samplpe reference (km) /Test No		1	2		REMARKS
<b>I</b>	<b>STANDARDISATION OF AgNO<sub>3</sub></b>				
A	Mass of NaCl used	g	0.235	0.236	Average
B	Initial Volume of AgNO <sub>3</sub>	ml	2.00	2.10	
C	Final volume of AgNO <sub>3</sub>	ml	37.52	37.05	
D	Volume of AgNO <sub>3</sub> used	ml	35.52	34.95	
E	Concentration of Standardised AgNO <sub>3</sub>	N	0.100	0.100	0.10
<b>II</b>	<b>DETERMINATION OF CHLORIDE CONTENT</b>				
F	Wt of water used	g	50.00	50.00	
G	Density of water	g/cc	1.00	1.00	
H	Volume of water used	ml	50	50.000	
J	pH of water	pH	8.81	8.61	
K	Initial Volume of AgNO <sub>3</sub>	ml	35.5	36.7	
L	Final volume of AgNO <sub>3</sub>	ml	36.7	37.9	
M	Titre AgNO <sub>3</sub>	ml	1.2	1.2	
N	Concentration of Water	M	0.0024	0.0024	
O	Chloride content	mg/l	85.1	85.1	
P	Average chloride content	mg/l	85.1		
$E = A / (0.05844)D$ <p>E : Normality of AgNO<sub>3</sub> solution</p> <p>A: Mass of NaCl used for titration in grams</p> <p>D: Volume of AgNO<sub>3</sub> used for titration in ml</p> $O = N \times 35.45 \times 1000$					

	Received by :
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 C Labs (Tz) Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 C Labs (Tz) Draw, Build, Test
<b>Determination of Sulphate Content on Water Samples</b>		
Form №		ASTM D 516 -07 / BS 1377 Part 3:1990

<b>PROJECT</b>	CENTRAL RAILWAY JICA SYUDY : KILOSA GULWE	CHECKED BY: JN
<b>CLIENT</b>	PADECO	DATE: May-15
<b>TESTED BY</b>	VICTOR SALEMA BH 1	APPROVED BY:
<b>DATE OF SAMPLING</b>	April-15 TESTING May-15	DATE:

	Sample Description			
A	Test №		1	2
B	Volume of water sample used	ml	50.100	50.100
C	Crucible reference	№	G	I
D	Wt of crucible	gm	29.596	24.124
E	Wt of crucible + ashless filter after ignition	gm	29.633	24.163
F	Wt of sulphate salt collected ( F-E )	gm	0.037	0.039
G	Sulphate content = $411500 \times F/B$	mg/L	303.9	319.5
H	Average sulphate content $SO_4^{2-}$	mg/L	311.7	

COMMENTS:
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Signed by (Materials Engineer/Manager)	Received by:
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 C Labs (Tz) Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 C Labs (Tz) Draw, Build, Test
<b>Determination of Sulphate Content on Water Samples</b>		
Form №		ASTM D 516 -07 / BS 1377 Part 3:1990

<b>PROJECT</b>	CENTRAL RAILWAY JICA SYUDY : KILOSA GULWE	CHECKED BY: JN
<b>CLIENT</b>	PADECO	DATE: May-15
<b>TESTED BY</b>	VICTOR SALEMA BH 2	APPROVED BY:
<b>DATE OF SAMPLING</b>	March-15 TESTING May-15	DATE:

	Sample Description			
A	Test №		1	2
B	Volume of water sample used	ml	50.100	50.100
C	Crucible reference	№	C	O
D	Wt of crucible	gm	23.288	30.156
E	Wt of crucible + ashless filter after ignition	gm	23.332	30.201
F	Wt of sulphate salt collected ( F-E )	gm	0.044	0.045
G	Sulphate content = $411500 \times F/B$	mg/L	360.6	371.3
H	Average sulphate content $SO_4^{2-}$	mg/L	365.9	

COMMENTS:
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Signed by (Materials Engineer/Manager)	Received by:
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 C Labs (Tz) Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 C Labs (Tz) Draw, Build, Test
<b>Determination of Sulphate Content on Water Samples</b>		
Form №		ASTM D 516 -07 / BS 1377 Part 3:1990

<b>PROJECT</b>	CENTRAL RAILWAY JICA SYUDY : KILOSA GULWE	CHECKED BY: JN
<b>CLIENT</b>	PADECO	DATE: May-15
<b>TESTED BY</b>	VICTOR SALEMA BH 5	APPROVED BY:
<b>DATE OF SAMPLING</b>	March-15 TESTING May-15	DATE:

	Sample Description			
A	Test №		1	2
B	Volume of water sample used	ml	50.000	50.100
C	Crucible reference	№	Q	J
D	Wt of crucible	gm	24.867	33.126
E	Wt of crucible + ashless filter after ignition	gm	24.901	33.160
F	Wt of sulphate salt collected ( F-E )	gm	0.034	0.034
G	Sulphate content = $411500 \times F/B$	mg/L	279.8	280.2
H	Average sulphate content $SO_4^{2-}$	mg/L	280.0	

COMMENTS:
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Signed by (Materials Engineer/Manager)	Received by:
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 C Labs (Tz) Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 C Labs (Tz) Draw, Build, Test
<b>Determination of Sulphate Content on Water Samples</b>		
Form №		ASTM D 516 -07 / BS 1377 Part 3:1990



<b>PROJECT</b>	CENTRAL RAILWAY JICA SYUDY : KILOSA GULWE	CHECKED BY: JN
<b>CLIENT</b>	PADECO	DATE: May-15
<b>TESTED BY</b>	VICTOR SALEMA BH 6	APPROVED BY:
<b>DATE OF SAMPLING</b>	March-15 TESTING May-15	DATE:

	Sample Description			
A	Test №		1	2
B	Volume of water sample used	ml	50.000	50.100
C	Crucible reference	№	N	M
D	Wt of crucible	gm	30.467	30.526
E	Wt of crucible + ashless filter after ignition	gm	30.492	30.552
F	Wt of sulphate salt collected ( F-E )	gm	0.025	0.026
G	Sulphate content = $411500 \times F/B$	mg/L	205.7	213.6
H	Average sulphate content $SO_4^{2-}$	mg/L	209.7	

COMMENTS:
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Signed by (Materials Engineer/Manager)	Received by:
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 C Labs (Tz) Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 C Labs (Tz) Draw, Build, Test
<b>Determination of Sulphate Content on Water Samples</b>		
Form No		ASTM D 516 -07 / BS 1377 Part 3:1990

<b>PROJECT</b>	CENTRAL RAILWAY JICA SYUDY : KILOSA GULWE	CHECKED BY: JN
<b>CLIENT</b>	PADECO	DATE: May-15
<b>TESTED BY</b>	VICTOR SALEMA BH 7	APPROVED BY:
<b>DATE OF SAMPLING</b>	March-15 TESTING May-15	DATE:

	Sample Description			
A	Test No		1	2
B	Volume of water sample used	ml	50.000	50.100
C	Crucible reference	No	K	O
D	Wt of crucible	gm	24.631	33.265
E	Wt of crucible + ashless filter after ignition	gm	24.658	33.292
F	Wt of sulphate salt collected ( F-E )	gm	0.027	0.027
G	Sulphate content = $411500 \times F/B$	mg/L	219.7	219.3
H	Average sulphate content $SO_4^{2-}$	mg/L	219.5	

COMMENTS:
-----------

Signed by (Materials Engineer/Manager)	Received by:
--	--------------



 C Labs (Tz) Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 C Labs (Tz) Draw, Build, Test
<b>Determination of Sulphate Content on Water Samples</b>		
Form №		ASTM D 516 -07 / BS 1377 Part 3:1990

<b>PROJECT</b>	CENTRAL RAILWAY JICA SYUDY : KILOSA GULWE	CHECKED BY: JN
<b>CLIENT</b>	PADECO	DATE: May-15
<b>TESTED BY</b>	VICTOR SALEMA BH 8	APPROVED BY:
<b>DATE OF SAMPLING</b>	March-15 TESTING May-15	DATE:

	Sample Description		1	2
A	Test №			
B	Volume of water sample used	ml	50.000	50.100
C	Crucible reference	№	V	Q
D	Wt of crucible	gm	33.312	33.416
E	Wt of crucible + ashless filter after ignition	gm	33.347	33.450
F	Wt of sulphate salt collected ( F-E )	gm	0.035	0.034
G	Sulphate content = $411500 \times F/B$	mg/L	292.2	281.7
H	Average sulphate content $SO_4^{2-}$	mg/L	286.9	

COMMENTS:
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Signed by (Materials Engineer/Manager)	Received by:
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 C Labs (Tz) Draw, Build, Test	CIVIL ENGINEERING LABORATORY DAR ES SALAAM TANZANIA	 C Labs (Tz) Draw, Build, Test
<b>Determination of Sulphate Content on Water Samples</b>		
Form No		ASTM D 516 -07 / BS 1377 Part 3:1990

<b>PROJECT</b>	CENTRAL RAILWAY JICA SYUDY : KILOSA GULWE	CHECKED BY: JN
<b>CLIENT</b>	PADECO	DATE: May-15
<b>TESTED BY</b>	VICTOR SALEMA BH 9	APPROVED BY:
<b>DATE OF SAMPLING</b>	March-15 TESTING May-15	DATE:

	Sample Description			
A	Test No		1	2
B	Volume of water sample used	ml	50.000	50.100
C	Crucible reference	No	K	G
D	Wt of crucible	gm	25.879	32.155
E	Wt of crucible + ashless filter after ignition	gm	25.926	32.201
F	Wt of sulphate salt collected ( F-E )	gm	0.047	0.046
G	Sulphate content = $411500 \times F/B$	mg/L	387.6	377.8
H	Average sulphate content $SO_4^{2-}$	mg/L	382.7	

COMMENTS:
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Signed by (Materials Engineer/Manager)	Received by:
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**Geotechnical Investigation Works on the  
Preparatory Survey on Flood Protection  
Measures for Central Railway Line in the  
United Republic of Tanzania**

**Kilosa – Gulwe Section**

**Ground Investigation Phase II Report**

February 2016





C-Labs(Tz) Ltd  
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DAR ES SALAAM  
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C.LabsTz@gmail.com

**REPORT TITLE:**

**Phase II Geotechnical Investigation for the Preparatory Survey on Flood Protection Measures for the Central Railway Line between Kilosa and Gulwe**

**Report No:**

CL-S095/S1147

**PROJECT LOCATION:**

Kilosa – Gulwe Section of Central Railway

**DATE:**

25<sup>th</sup> Feb 2015

**CLIENT:**

PADECO COMPANY LTD.  
(JICA study team)

**AUTHOR:**

Jotham Ntensibe  
Yustino Kwingwa

**Background:**

In August 2015, PADECO Company Limited of 6-17-19 Shinbashi, Minato-ku, Tokyo, 105-0004, JAPAN requested C-Labs to carry out a second phase (Phase II) of the Geotechnical Investigation for the Preparatory Survey on Flood Protection Measures for the Central Railway Line between Kilosa and Gulwe in the United Republic of Tanzania - as part of the detailed design, for the JICA study team.

The Investigation was executed starting mid-December and into January 2016.

This report contains the findings of the geotechnical investigation.

This report is presented as a purely factual report of the tests results as required by the terms of reference.

**SECTION**

● Geotechnical  
Soils  
Bitumen

Asphalt  
Chemistry  
Cement  
Concrete

**List of Symbols**

MSL	Mean Sea Level
SPT	Standard Penetration Test – with a 63.5kg hammer
N, N <sub>60</sub>	SPT value, corrected SPT value
USCS	Unified Soil classification system
BSCS	British soil classification system
LL, PL, PI	Liquid Limit, Plastic Limit, Plasticity Index
NMC, w	Natural Moisture Content, moisture content
SG, G	Specific Gravity
U4 / U100	Undisturbed sample – 4 inches / 100mm diameter
DS	Disturbed Sample
GWT	Ground Water Table
$\gamma, \gamma_w$	Unit weight of soil (gamma), Unit weight of water
c	Soil cohesion. Units of pressure, kPa
s <sub>u</sub>	Undrained shear strength. Units of pressure, kPa
$\phi$	Angle of friction (phi)
$\alpha$	Adhesion Factor
K <sub>s</sub>	Coefficient of Earth Pressure
k	permeability
OCR	Over consolidation ratio
m <sub>v</sub>	Coefficient of volume compressibility
E <sub>s</sub>	Elasticity Modulus
$\mu$	Poisson's Ratio
e, e <sub>0</sub>	Void Ratio, Initial void ratio
c <sub>r</sub>	Compression / Compressibility index
c <sub>s</sub>	Recompression index
s <sub>e</sub>	settlement
S	Degree of saturation
$\sigma, p$	Overburden pressure, soil pressure
u	Pore pressure

## CONTENTS

- 1.0 TERMS OF REFERENCE and CONDITIONS ON SITE
  - 2.0 SITE LOCATION
  - 3.0 GEOLOGY
  - 4.0 INVESTIGATION METHODOLOGY
  - 5.0 SOIL TEST RESULTS
  - 6.0 TEST RESULTS ON ROCK CORES
  - 7.0 GENERAL LITHOLOGY
  - 8.0 CHEMICAL TESTS ON GROUND WATER
  - APPENDICES
- 

### 1 TERMS OF REFERENCE compared to CONDITIONS ON SITE

In summary, the investigation was tasked to carry out the following.

- 1) Drilling at 12 locations between Kilosa and Gulwe along the Central Corridor Railway, to fill in gaps in the initial survey.
- 2) Core Drilling including Standard Penetration Test (SPT) including sampling and Laboratory Tests, to a depth of maximum 30m or to a depth where 5.0 meter thickness of more than 50 N values of STP can be confirmed, or at least 2m of sound rock is encountered.

The locations for boreholes 12, 13 14 and 15 had to be adjusted on site in consultation with the study team, on site to place them accurately. The locations of MZ-01 and MZ-02 were adjusted to avoid drilling in the river channels -in which there was a continuous threat of dangerous flash floods at the time of drilling. The revised locations were maintained in the line of the intended river retraining, in consultation with the study team.

The drilling rig was washed away at borehole 19. A new borehole was drilled about 2m away from the original location two weeks later. The new borehole 19 and borehole 20 were drilled in excess of 30m with the intent of confirming the existence of solid rock, because the team made it known these are proposed bridge site locations. In borehole 20, sound rock was encountered between 30 and 31.5m (1.5m) depth but this degenerated to weathered rock soon after.

The boreholes prefixed as MS and MZ are located in channels intended to be retrained. There were drilled to a maximum of 30m where no rock was found.

The camera with some of the last site photographs was lost in the rains.

On exploration, the depth to sound rock was found as follows:



**Table 1-A Depth of soil, weathered rock and intact rock investigated in each borehole**

	Depth of Soil - to Weathered Rock	Depth of Weathered Rock	Depth of intact Rock
BH 12	0 - 3.1m	3.1 - 17.5m	17.5 - 18.5m
BH 13	0 - 22.5m	--	22.5 - 23.5m
BH 14	0 - 18.1m	--	18.1 - 19.0m
BH 15	0 - 23.4m	23.4 - 25.4m	25.4 - 26.4m
BH 18	0 - 9.1m	9.1 - 15.9m	15.9 - 16.8m
BH 19	0 - 33.0m	33.0 - 36.0m	36.0 - 37.3m
BH 20	0 - 27.5m	27.5 - 30m, 31.5 - 33m	30.0 - 31.5m
MS-01	0 - 30.0m	--	--
MS-02	0 - 30.0m	--	--
MS-03	0 - 7.7m	7.7 - 18.4m	18.4m - 20m
MZ-01	0 - 7.6	7.6 - 30m	--
MZ-02	0 - 21.8m	21.8 - 30m	--

## 2 SITE LOCATION

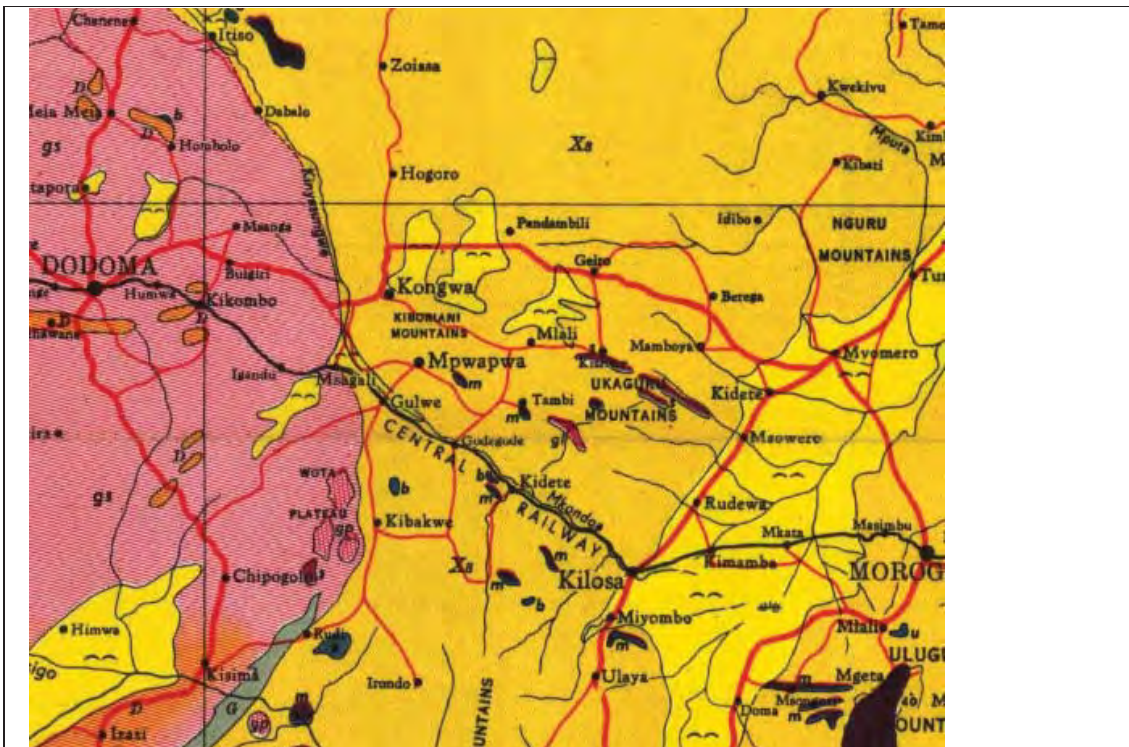
The Central Railway Line between Kilosa and Gulwe runs in the valley of the NW-SW flowing river Mkondoa along which the altitude falls from about 790m in Gulwe to 520m in Kilosa. The river collects from the mountains including Ukaguru, Kiboriani, Ulugaro mountains at the western fringes of the Wami/Ruvu catchment. Many rock outcrops are found on the Kilosa end of the project and past Gode Gode towards Gulwe. The hydraulics of the tributaries from the surrounding mountains have caused disruptions on the operation of the existing central railway line. The railway generally runs south of the river.



Figure 2-A: Topography of the Project area

### 3 GEOLOGY

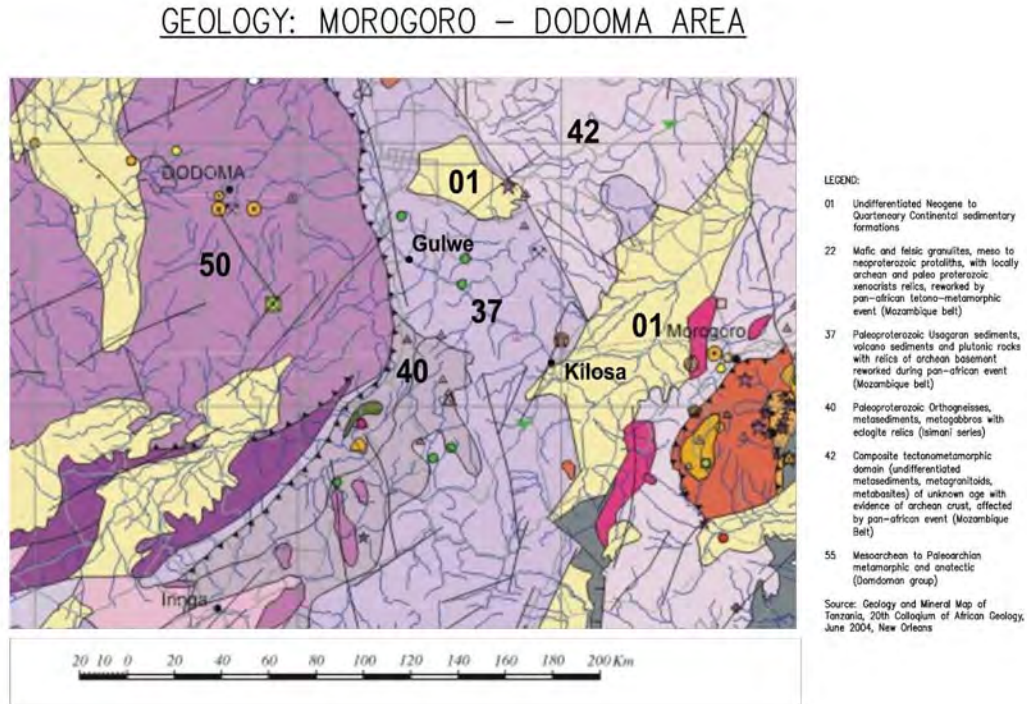
The two maps below illustrate the general geology of the project route.



Source: Geological Map of Tanganyika, Geological survey Department Dodoma, 1959

**Figure 2a. Typical Geology between Kilosa and Gulwe**

- Xs = Usagaran Archean formations. Marble; Quartzite; Graphite Schist, Chlorite, Amphiboles, Mica and Kyanite Schist; Hornblende, Biotite and garnet gneiss; acid gneiss; granulite; charnockite.
- m= metagabbros (Archean)
- b= un-metamorphosed gabbroic and anorthositic rocks, as well as more or less metamorphosed peridotite, pyroxenite, and serpentine (mainly Pre-Cambrian)



**Figure 3-A: Typical Geology between Kilosa and Gulwe.**

**3.2 Key geological formations.**

Metapsammitic granulites of the Usagara Archean formations.

The Archean rocks in Central Tanzania (2.5 – 4 billion years old) consist of belts of greenstone (volcano-sedimentary) sequences, found within a larger region of predominantly younger granitic rocks.

But in the Usagaran formations found in Central and Eastern Tanzania including the project area, a later Pan African tectonic-thermal Pretorozioc event occurred (0.5 to 2.5 billion years), and a variety of high grade metamorphic rocks of both sedimentary and igneous origin were formed from the Archean . Amphibolite grade metamorphic assemblages predominate related to the granitization

and migmatization of the event, the same that effected the Mozambican Belt<sup>1</sup>. The structural trends are mostly North to South.

## 4 INVESTIGATION METHODOLOGY:

### 4.1 Location of the boreholes:

The location of the boreholes was selected by the client. A total of ten boreholes were drilled close to bridge locations, on the side opposite to the river. The GPS locations and a map of the physical locations is found in Table 1 and figure 3 below. The boreholes prefixed with MS and MZ are in the line of rivers to be retrained. Those without prefixes are along proposed structures.

**Table 4-A Location of the Boreholes**

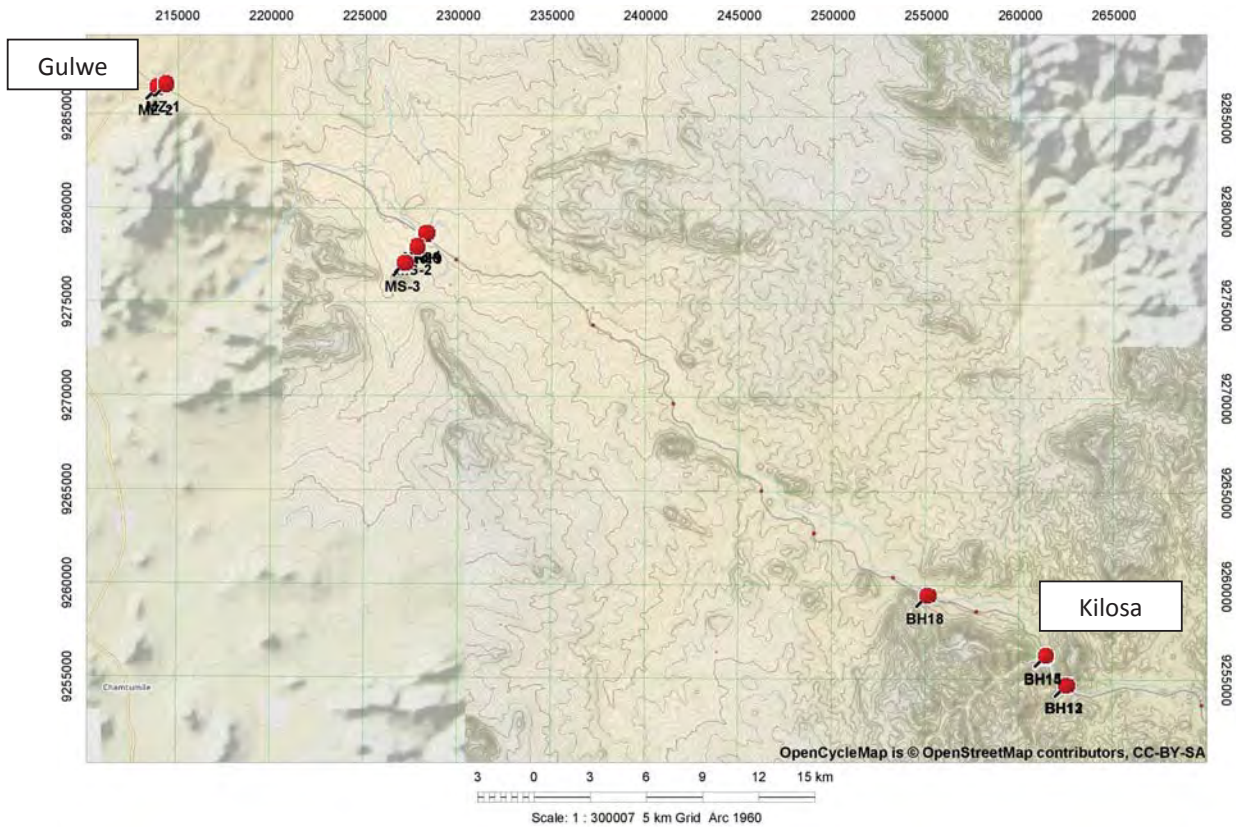
Label	Easting*	Northing*	Approximate Elevation**
BH12	262 435.04	9 254 637.46	560.2
BH13	262 400.22	9 254 633.10	559.6
BH14	261 300.91	9 256 147.01	566.8
BH15	261 291.47	9 256 205.38	566.3
BH18	254 985.49	9 259 373.13	602.5
BH19	228 119.59	9 278 470.29	753.7
BH20	228 027.19	9 278 515.98	754.5
MS-01	228 146.62	9 278 599.55	752.6
MS-02	227 636.77	9 277 880.84	
MS-03	227 014.11	9 276 995.71	
MZ-01	214 178.51	9 286 527.62	783.2
MZ-02	213 773.25	9 286 360.02	787.7

\*UTM Arc 1960 Zone 37

\*\*Elevations derived relative to features on adjacent railway. MS-02 and MS-03 too far from railway.

<sup>1</sup> A brief Introduction to the Geology and Mining Industry of Tanzania, SIKA Resources Inc, Oct 2011 Toronto Ontario





**Figure 4-A: Locations of the boreholes**

#### 4.2 Boring Methods

The primary method used was rotary drilling using 120mm and 150mm bits and bentonite fluid. Before SPT and sampling, the boreholes were cleaned and sufficient length of sample was taken to ensure an uncontaminated undisturbed sample was obtained in each U100 sampler. The SPT's were carried out immediately after sampling in clean boreholes.

The weathered rock generally has SPT values greater than 5 but core recovery was poor. The solid rock pieces have on average only about 25MPa UCS. The sound rock can be described as weak to medium strong and it breaks easily along foliation planes. A Single core HQ (61mm nominal diameter) and a single core NQ (47mm nominal diameter) barrels were used to drill through the rock.

#### 4.3 Sampling:

The following samples were taken as boring progressed:

- 100mm dia undisturbed soil samples were taken every 2m or less wherever possible. Undisturbed soil samples could hardly be recovered in any of the locations tested because of the sandy nature of the soil.
- Disturbed samples were taken from the SPT sampler. They were used for visual classification on site and for further confirmation of the results. The SPT samples have not suffered any

wash out and are ideal to confirm the grading of the drilling washout indicated as a disturbed sample

- Continuous samples of the rock were taken for visual descriptions and strength testing. The recovery in the weak and weathered rock type was poor – as explained earlier.

#### 4.4 In-situ Tests

SPT sounding was carried out every 2m in each borehole to refusal (taken as  $N > 50$ blows) - usually in weathered rock. Thereafter drilling continued without SPT's .

#### 4.5 Laboratory Tests Carried Out

Laboratory tests on the undisturbed soil samples have been carried out as follows.

Classification testing (grading and plasticity) was carried out on undisturbed samples so as to show progression of the classification of soil with depth in each borehole. The testing was done to BS 1377 Part 2.

These predominantly Sandy soils were tested using the direct shear apparatus to obtain angle of friction  $\phi'$ . There were hardly any cohesive soils in the locations drilled at. Testing was done to BS 1377 Part 7.

6 samples of ground water were tested for pH, Chloride content and Sulphate content.

A visual assessment of the Rock cores was carried out to determine Rock Quality designation index and in addition, the bulk density, absorption, UCS strength and point load index were determined at about 1 – 2m interval depths for each borehole. Tests were carried out in accordance with the recommendations of the International Society of Rock Mechanics ISRM and British Standards.

## 5 SOIL TEST RESULTS

### 5.1 Soil summaries

A summary of the findings in each borehole can be found on the borehole logs in **Appendix A1 to A12**. The logs contain:

- Field Soil descriptions,
- SPT results,
- A summary of the Classification Results,

### 5.2 Detailed Results

A summary of the laboratory tests on each soil sample can be found in **Appendix B and C** including include

:

- Results of the Particle size analysis

- Results of the Atterberg's limits test including Linear Shrinkage
- Results of the Direct Shear Tests (DS).

In the summaries, the soil has been classified to the British Soil Classification System (BSCS) found in BS 5930 – *Code of practice for site investigations*, but also to the Unified Soil Classification System (USCS). The former has clearer descriptions of the plasticity of the clays and silts and in our experience, correlates more closely to the field descriptions. But the USCS classification is more widely used for analysis and has appropriately been reported in the summaries in the Appendices to this report.

The soils encountered in these test locations, in river courses are predominantly sandy soils for which it was not possible to recover undisturbed samples.



## 6 TEST RESULTS ON THE ROCK CORES:

### 6.1 Field Observations

Detailed descriptions of the Rock types encountered can be found in the field logs in **Appendix A1 to A12**. The descriptions include pictures of the rock cores and an estimation of the Rock Quality Designation.

### 6.2 Lab Tests on Rocks

Tests on the rocks included UCS and Point Load Index tests for strength, bulk density and absorption. These results can be found in **Appendix D** and **Appendix E**. The rocks cored at the test locations have an average UCS of 23MPa and range from 7MPa in Borehole 18 to 49MPa in Borehole 15. Similarly Point Load Indices measured diametrically were an average 2.6. The highest point loads were recorded in Borehole 15 and the lower reaches of Borehole 12. The lowest point load strengths were in Boreholes 14 and 19. In terms of the recommendations of the ISRM<sup>2</sup>, the rock is weak to moderately strong. They are not hard rocks (which are generally considered to have UCS values greater than 50MPa)

## 7 GENERAL LITHOLOGY

Borehole 12: Brownish Sand upto 3m depth. Black and White sand follows mixed with fragments of rock upto 12.5m. This suggests completely weathered rock zone. The railway cut adjacent to the borehole has heavily folded schists that disintegrate to sand. From 12.5 to 17.5m - Bands of weak black and white metamorphosed sandstones. From 17.5 to end of hole at 18.5m stronger metasediments. There was no ground water in this borehole.

Borehole 13: 22.5m of Sandy Soil interspersed with moderately thick rocky layers, dense and stony between 21 and 22.5m, overlying quartzitic / gneiss rock. The clean sands in this borehole and the difficulty of recovering even the disturbed samples suggest ground water is flowing.

Borehole 14: Similar in formation to Borehole 13. The sandy soils with rocky layers extend to 18.1m depth followed by rock

Borehole 15: Similar in formation to boreholes 13 and 14. The sandy layers extend to 23.4m and is more gravelly and with cobbles between 20 and 23.4m through which SPT reaches refusal. 23.4 to 25.4 is completely weathered rock and beyond 23.4, the intact rock is similar to that found in Borehole 14.

Borehole 18: Loose sand up to 9m overlying, completely or highly weathered rock white (feldspar with indistinct foliation) and black (metamorphic with distinct foliation) rock to 14m, overlying slightly weathered metamorphic rock to 17m. The recovery in this borehole was poor because of weak bonding. Rock is steeply dipped.

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<sup>2</sup> International Society for Rock Mechanics

Borehole 19: Brown riverine sand to 33m overlying moderately weak banded gneiss 33-37m. The black bands are heavily sheared, have a lot of mica and are generally weaker.

Borehole 20: Brown sand upto 27.5m, overlying slightly weathered quartzitic rock to 31.5m which degenerates to completely weathered rock by 33m depth.

MS-1: Close to River Kinyasinge. All 30m drilled consist of thinly bedded sand, evident in the 6m gorge adjacent to the boring location.

MS-2: First 23m consist of silty or clayey sand of varying density and 23 - 30m consists of sand with cobbles for which SPT values reach refusal - because of the large number of cobbles,

MS-3: Increasingly dense clayey sand to 7m overlying bands of soft and hard rock, some black some white - at various degrees of weathering up to 20m. 18.4 to 20m is relatively intact rock.

MZ-01: Borehole adjacent to the Kinyasinge River consists of Loose sand upto 7m, followed by completely or highly weathered metamorphic rock upto 24m, which easily disintegrates into sand for which SPT values could be read, which as then followed by sand and cobbles to 30m for which the SPT values could not be taken.

MZ-02: Loose clay and sandy clays to 12.5m followed by cemented sandstone to 15m followed by sand with gravels and cobbles to 21.8m followed by pitted limestone to 30m

## 8 CHEMICAL TESTS ON WATER

The table below has a summary of the chemical tests on water collected from the boreholes. No ground water was encountered in Boreholes 12, 19 and 20. It was inferred during the drilling that the ground water in boreholes 13, 14 and 15 is flowing noticeably, underground.

The water in BH MS-01 was not tested.

**Table 8-A Results of Chemical Tests on Ground Water**

	pH	Chloride content Cl <sup>-</sup> , mg/l	Sulphate Content SO <sub>4</sub> <sup>-</sup> , mg/l
BH 13	6.71	39.0	190.1
BH 14	6.94	88.6	229.2
BH 15	7.07	92.2	174.9
BH 18	7.02	117	602.8
MS 01			
MZ 01	7.07	145.3	637.0
MZ 02	6.98	145.3	2320.4

It can be seen that the sulphate content in the water in BH 18 and MZ-01 and MZ-02 is very high. Detailed test result sheets can be found in **Appendix F**

END  
C-Labs(Tz) Ltd

## LIST OF APPENDICES

### SOIL AND ROCK LOGS

APPENDIX A1: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE 12

APPENDIX A2: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE 13

APPENDIX A3: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE 14

APPENDIX A4: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE 15

APPENDIX A5: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE 18

APPENDIX A6: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE 19

APPENDIX A7: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE 20

APPENDIX A8: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE MS-01

APPENDIX A9: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE MS-02

APPENDIX A10: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE MS-03

APPENDIX A11: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE MZ-01

APPENDIX A12: BOREHOLE LOGS AND PHOTOGRAPHS BOREHOLE MZ-02

### TESTS ON SOIL SAMPLES

APPENDIX B: SUMMARIES OF SOIL CLASSIFICATION

APPENDIX C: THE DIRECT SHEAR TEST RESULTS


### TESTS ON ROCK CORES





APPENDIX D: THE UCS AND POINT LOAD STRENGTH RESULTS ON ROCK CORES

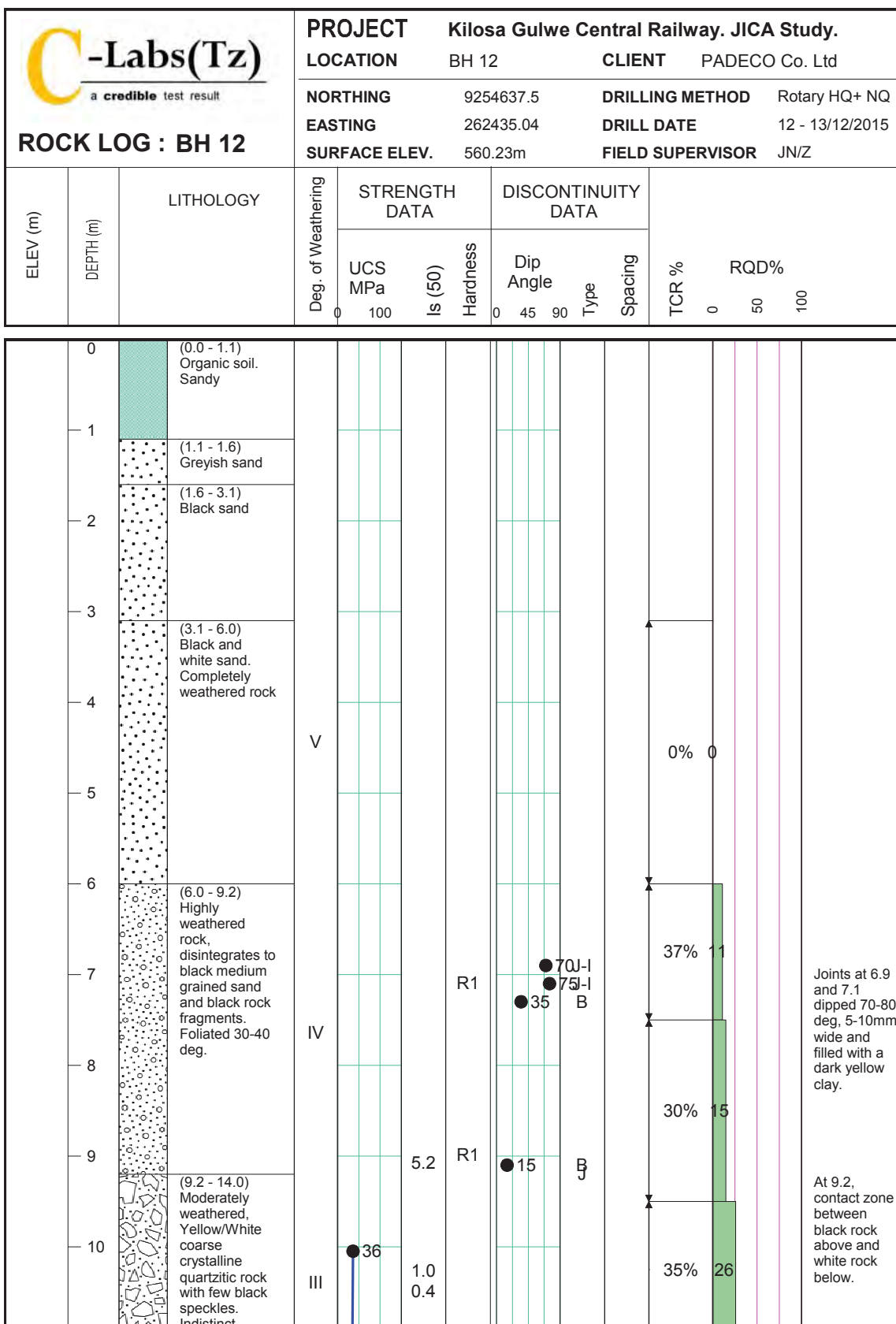
APPENDIX E: BULK DENSITY AND ABSORPTION

### TESTS ON WATER SAMPLES


APPENDIX F: CHEMICAL TEST RESULTS ON THE GROUND WATER

 <p><b>C-Labs(Tz)</b> a credible test result</p>		<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.																
		<b>LOCATION</b> BH 12	<b>CLIENT</b> PADECO Co. Ltd															
<b>SOIL LOG: BH 12</b>		<b>NORTHING</b> 9254637.5	<b>DRILLING METHOD</b> Rotary HQ+ NQ															
		<b>EASTING</b> 262435.04	<b>DRILL DATE</b> 12 - 13/12/2015															
		<b>SURFACE ELEV.</b> 560.23m	<b>FIELD SUPERVISOR</b> JN/Z															
ELEV (m)	DEPTH (m)	SAMPLE TYPE & PROPERTIES	LITHOLOGY	SPT	REMARKS													
					0	10	20	30	40	50	60	70						
560	0.0		(0.0 - 1.1) Organic soil. Sandy															
559	1.0	DS SC G.S.F=17.60.23 PI=9.1	(1.1 - 1.6) Greyish sand															
			(1.6 - 3.1) Black sand	30.50-14cm														
558	2.0	DS SP-SM G.S.F=04.84.11 PI=NP																
557	3.0	DS SW-SM G.S.F=10.83.06 PI=NP	(3.1 - 6.0) Black and white sand. Completely weathered rock															No Ground Water table encountered in this borehole
556	4.0																	
555	5.0																	
554	6.0		(6.0 - 9.5) Black sand and black rock fragments. Highly weathered rock															
553	7.0																	
552	8.0																	
551	9.0																	
550	10.0		(9.5 - 12.5) White sand and white hard rock fragments. Highly weathered rock															
549	11.0																	Drilling stopped at 11m and recommenc

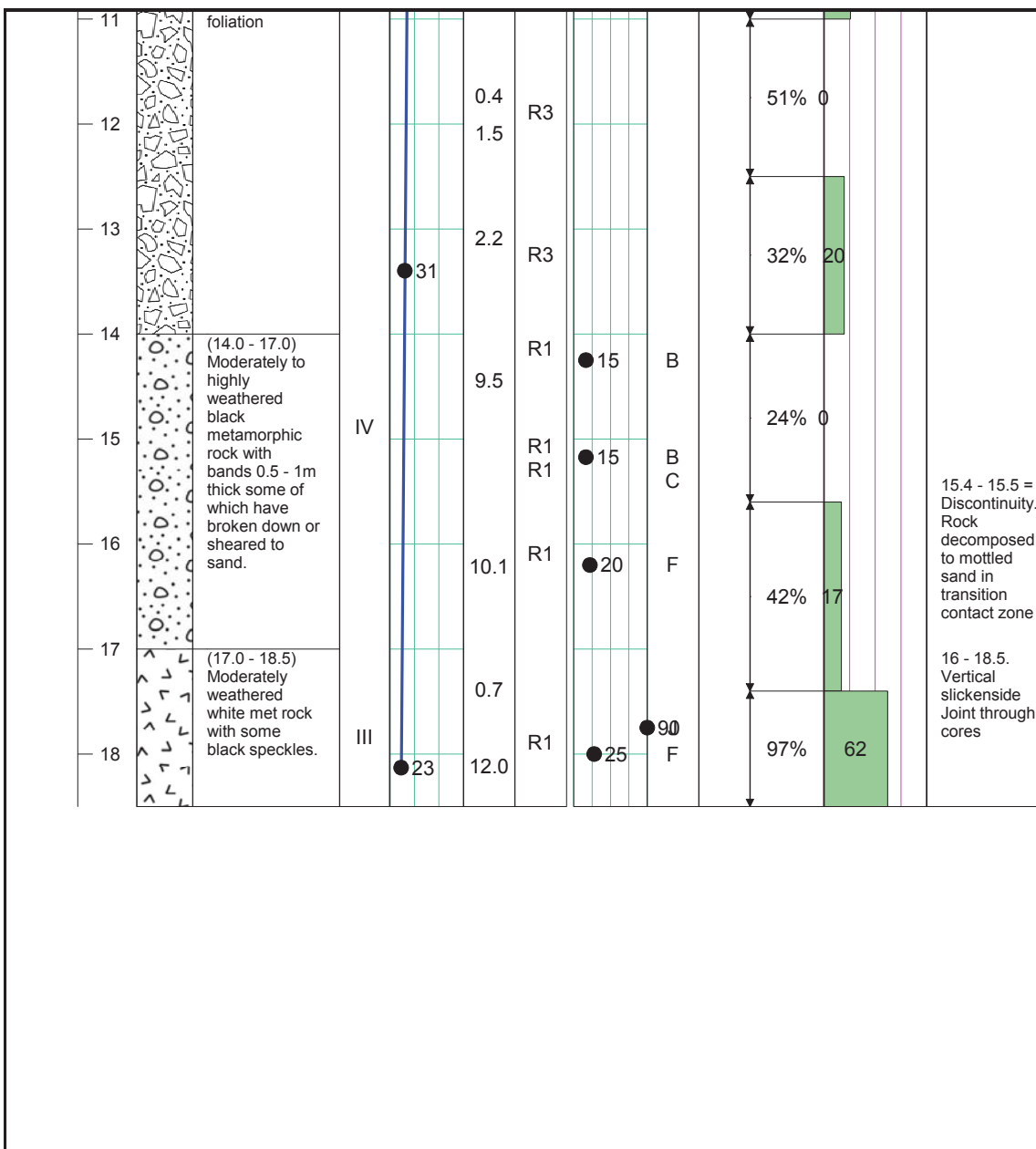
 <p><b>C-Labs(Tz)</b> a credible test result</p>		<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.								
		<b>LOCATION</b> BH 12	<b>CLIENT</b> PADECO Co. Ltd							
<b>SOIL LOG: BH 12</b>		<b>NORTHING</b> 9254637.5	<b>DRILLING METHOD</b> Rotary HQ+ NQ							
		<b>EASTING</b> 262435.04	<b>DRILL DATE</b> 12 - 13/12/2015							
		<b>SURFACE ELEV.</b> 560.23m	<b>FIELD SUPERVISOR</b> JN/Z							
ELEV (m)	DEPTH (m)	SAMPLE TYPE & PROPERTIES	LITHOLOGY	SPT						REMARKS
				0	10	20	30	40	50	
548	12.0	DS SM G.S.F=00.83.16 PI=NP								continued on 13-Dec
547	13.0			(12.5 - 17.5) Bands of either Black (<0.5m) and white (upto 1.5m seen) metasandstone. Some bands are weak and disintegrate easily to Sand						
546	14.0									
545	15.0									
544	16.0									
543	17.0									
542	18.0			(17.5 - 18.5) White with some black hard rock						





	<b>PROJECT</b>	Kilosa Gulwe Central Railway. JICA Study.			
	<b>LOCATION</b>	BH 12	<b>CLIENT</b>	PADECO Co. Ltd	
	<b>NORTHING</b>	9254637.5	<b>DRILLING METHOD</b>	Rotary HQ+ NQ	
	<b>EASTING</b>	262435.04	<b>DRILL DATE</b>	12 - 13/12/2015	
<b>ROCK LOG : BH 12</b>		<b>SURFACE ELEV.</b>	560.23m	<b>FIELD SUPERVISOR</b>	JN/Z

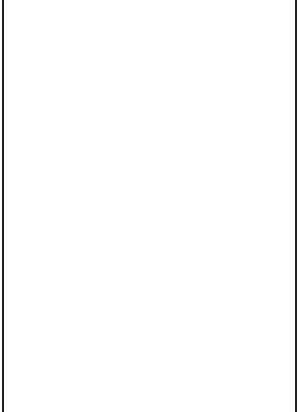


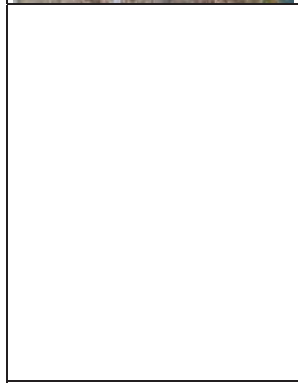



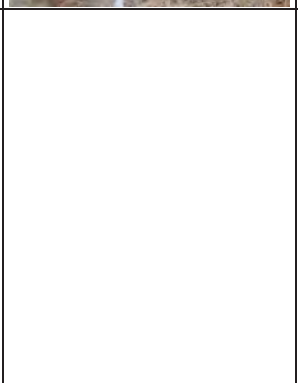

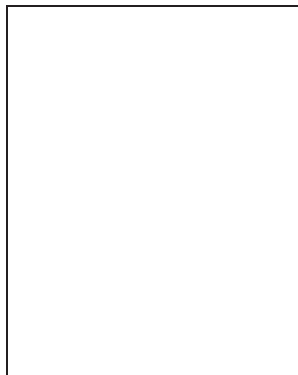



ELEV (m)	DEPTH (m)	LITHOLOGY	Deg. of Weathering	STRENGTH DATA			DISCONTINUITY DATA			RQD%				
				UCS MPa	Is (50)	Hardness	Dip Angle	Type	Spacing	TCR %	RQD%			
				0	100		0	45	90			0	50	100



BOREHOLE 12 - PROFILE PICTURES

<b>0-2m</b>				
<b>2-4m</b>				
<b>4-6m</b>				
<b>6-8m</b>				


BOREHOLE 12 - PROFILE PICTURES


<p><b>8- 10m</b></p>	<p><b>10- 12m</b></p>	<p><b>12- 14m</b></p>	<p><b>14- 16m</b></p>
			
			
			
			

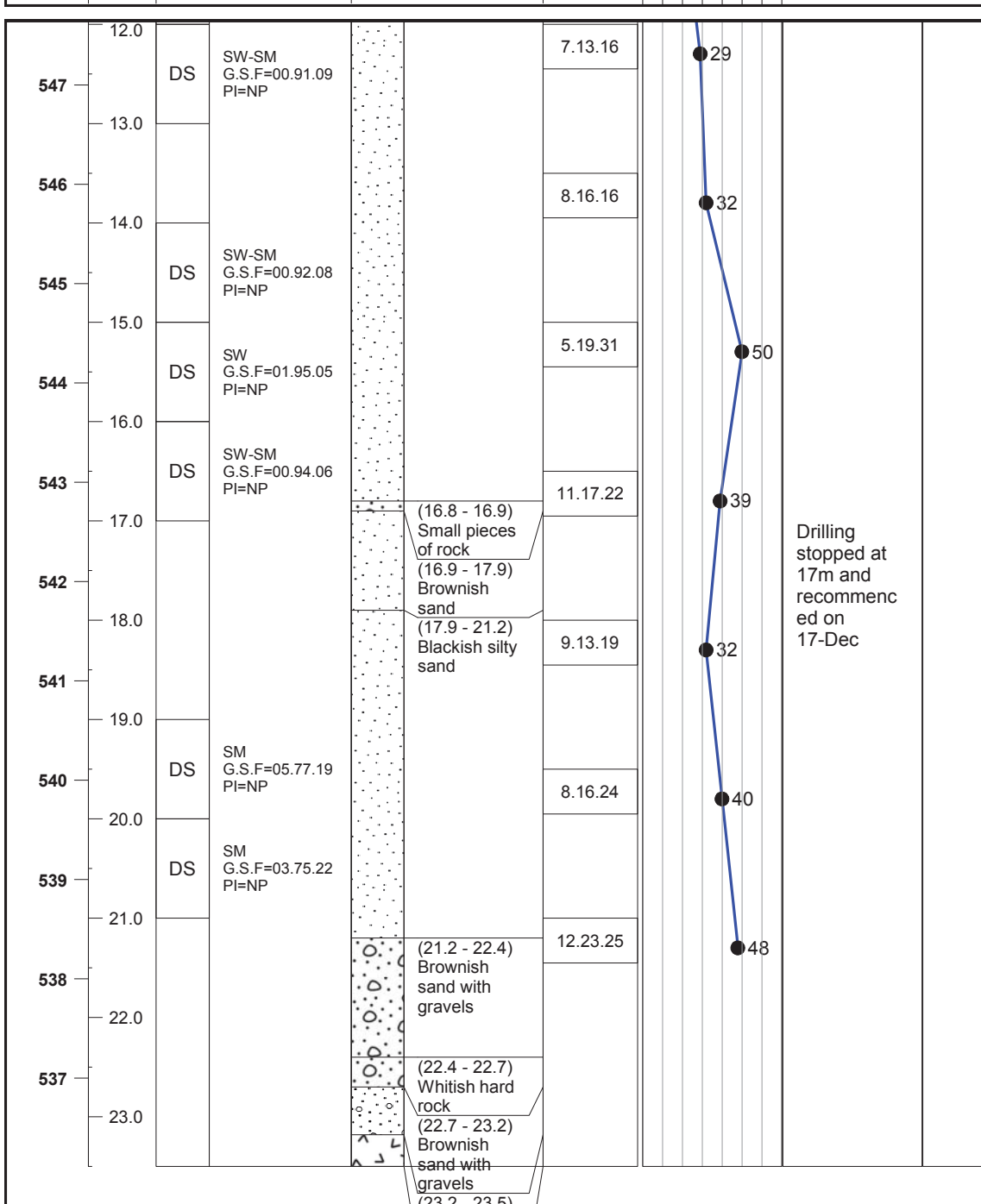



BOREHOLE 12 - PROFILE PICTURES

	
	
	
	
<p><b>16-18m</b></p>	
<p><b>18-20m</b></p>	

ELEV (m)		DEPTH (m)		SAMPLE TYPE & PROPERTIES		LITHOLOGY		SPT		REMARKS	
				<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study. <b>LOCATION</b> BH 13 <b>CLIENT</b> PADECO Co. Ltd <b>NORTHING</b> 9254633.15 <b>DRILLING METHOD</b> Rotary HQ+ NQ <b>EASTING</b> 262400.22 <b>DRILL DATE</b> 14 - 17/12/2015 <b>SURFACE ELEV.</b> 559.611m <b>FIELD SUPERVISOR</b> JN/Z							
<b>SOIL LOG: BH 13</b>											
559	0.0	DS	CL G.S.F=01.28.71 PI=28.5	(0.0 - 2.2) Top soil. Black sand							No recovery in any of the SPT tests nor U4 tubes  Flowing Ground Water encountered at 3m  Drilling stopped at 5m and recommenced on 15-Dec
558	1.0				3.5.6						
557	2.0			(2.2 - 2.6) Whitish sand							
556	3.0			(2.6 - 4.3) Blackish sand	4.3.1						
555	4.0	DS	SM G.S.F=23.49.28 PI=NP								
554	5.0	DS	SM G.S.F=01.81.18 PI=NP	(4.3 - 4.4) Whitish sand with gravels	3.3.3						
553	6.0	DS	SM G.S.F=00.85.15 PI=NP	(4.4 - 7.9) Blackish silty sand							
552	7.0	DS	SM G.S.F=01.84.15 PI=NP		2.2.3						
551	8.0	DS	SW G.S.F=00.98.02 PI=NP	(7.9 - 9.4) Blackish to whitish sand							
550	9.0	DS	SW G.S.F=00.97.03 PI=NP								
549	10.0	DS	SW G.S.F=00.96.04 PI=NP	(9.4 - 16.8) Brownish sand	7.12.14						
548	11.0	SPT	SW G.S.F=00.95.05 PI=NP		6.9.11						

 <p><b>C-Labs(Tz)</b> a credible test result</p>	<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.	
	<b>LOCATION</b> BH 13	<b>CLIENT</b> PADECO Co. Ltd
	<b>NORTHING</b> 9254633.15	<b>DRILLING METHOD</b> Rotary HQ+ NQ
	<b>EASTING</b> 262400.22	<b>DRILL DATE</b> 14 - 17/12/2015
<b>SOIL LOG: BH 13</b>		<b>SURFACE ELEV.</b> 559.611m
		<b>FIELD SUPERVISOR</b> JN/Z



		<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.										
		<b>LOCATION</b> BH 13	<b>CLIENT</b> PADECO Co. Ltd									
<b>ROCK LOG : BH 13</b>		<b>NORTHING</b> 9254633.15	<b>DRILLING METHOD</b> Rotary HQ+ NQ									
		<b>EASTING</b> 262400.22	<b>DRILL DATE</b> 14 - 17/12/2015									
		<b>SURFACE ELEV.</b> 559.611m	<b>FIELD SUPERVISOR</b> JN/Z									
ELEV (m)	DEPTH (m)	LITHOLOGY	Deg. of Weathering	STRENGTH DATA			DISCONTINUITY DATA			TCR %		
				UCS MPa	Is (50)	Hardness	Dip Angle	Type	Spacing	0	50	100
	20	(17.9 - 21.2) Blackish silty SAND										
	21	(21.2 - 22.4) Brownish SAND with gravels										
	22	(22.4 - 22.7) Weathered Quartzitic rock		● 30								
	23	(22.7 - 23.2) Brownish SAND with gravels	III			R4				50%	48	
		(23.2 - 23.5) Moderately weathered, white crystalline Quartzitic Rock										



BOREHOLE 13 - PROFILE PICTURES






BOREHOLE 13 - PROFILE PICTURES


<p><b>8- 10m</b></p>				
<p><b>10- 12m</b></p>				
<p><b>12- 14m</b></p>				
<p><b>14- 16m</b></p>				




BOREHOLE 13 - PROFILE PICTURES

<p>16- 18m</p>				
<p>18- 20m</p>				
<p>20- 22m</p>				
<p>22- 24m</p>				

ELEV (m)		DEPTH (m)	SAMPLE TYPE & PROPERTIES	LITHOLOGY	SPT	REMARKS
566		0.0		(0.0 - 0.5) Top soil.		
566		1.0		Loose darkish grey silty gravelly SAND		
565		2.0		(0.5 - 1.2) Moist loose, brownish grey silty SAND. Few gravels	8.8.8	
564		3.0		(1.2 - 1.5) Dry, loose darkish grey fine silty SAND		Water table encountered at 2.5m
563		4.0		(1.5 - 1.7) As above - medium dense		
562		5.0	DS GM G.S.F=62.11.28 PI=NP	(1.7 - 6.4) Moist to wet, brownish to light grey medium dense silty coarse SAND with few cobbles	10.10.14	
561		6.0	SPT SW-SM G.S.F=08.84.08 PI=NP		4.13.12	
560		7.0		(6.4 - 8.5) Wet, medium dense, brownish grey silty medium coarse SAND		
559		8.0	DS SW G.S.F=02.96.03 PI=NP			
559		8.0	SPT SW G.S.F=01.96.03 PI=NP		6.14.13	
558		9.0		(8.5 - 11.0) As above - coarse SAND		
557		10.0	DS SW G.S.F=47.52.02 PI=NP			
556		11.0			5.12.14	
555				(11.0 - 14.0) Wet medium dense, darkish grey silty fine		

		<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.											
		<b>LOCATION</b> BH 14	<b>CLIENT</b> PADECO Co. Ltd										
<b>SOIL LOG: BH 14</b>		<b>NORTHING</b> 9256147.06	<b>DRILLING METHOD</b> Rotary PQ+ NQ										
		<b>EASTING</b> 261300.91	<b>DRILL DATE</b> 15 - 17/12/2015										
		<b>SURFACE ELEV.</b> 566.817m	<b>FIELD SUPERVISOR</b> JN/SD										
ELEV (m)	DEPTH (m)	SAMPLE TYPE & PROPERTIES	LITHOLOGY	SPT	0	10	20	30	40	50	60	70	REMARKS
554	12.0	SPT SW G.S.F=00.96.04 PI=NP	SAND	4.15.13				28					
553	13.0	DS - G.S.F=--- PI=NP											
552	14.0	SPT SW G.S.F=39.57.05 PI=9.7	(14.0 - 16.0) Wet, medium dense, brownish grey silty medium coarse SAND	8.11.17				28					
551	15.0	DS - G.S.F=--- PI=NP											
550	16.0		(16.0 - 18.1) Wet, medium dense, darkish brown silty SAND with some cobbles	6.12.13				25					
549	17.0												
548	18.0		(18.1 - 19.0) Intact ROCK	8.15.15				30					
	19.0												

			<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.										
			<b>LOCATION</b> BH 14	<b>CLIENT</b> PADECO Co. Ltd									
<b>ROCK LOG : BH 14</b>			<b>NORTHING</b>	9256147.06	<b>DRILLING METHOD</b>	Rotary PQ+ NQ							
			<b>EASTING</b>	261300.91	<b>DRILL DATE</b>	15 - 17/12/2015							
			<b>SURFACE ELEV.</b>	566.817m	<b>FIELD SUPERVISOR</b>	JN/SD							
ELEV (m)	DEPTH (m)	LITHOLOGY	Deg. of Weathering	STRENGTH DATA			DISCONTINUITY DATA			TCR %			
				UCS MPa	Is (50)	Hardness	Dip Angle	Type	Spacing	0	50	100	
			0 100				0 45 90						
	15	(14.0 - 16.0) Wet, medium dense, brownish grey silty medium coarse SAND											
	16	(16.0 - 18.1) Wet, medium dense, darkish brown silty SAND with some cobbles											
	17												
	18	(18.1 - 19.0) Intact ROCK		● 19	0.8	0.8					99%	35	
	19												




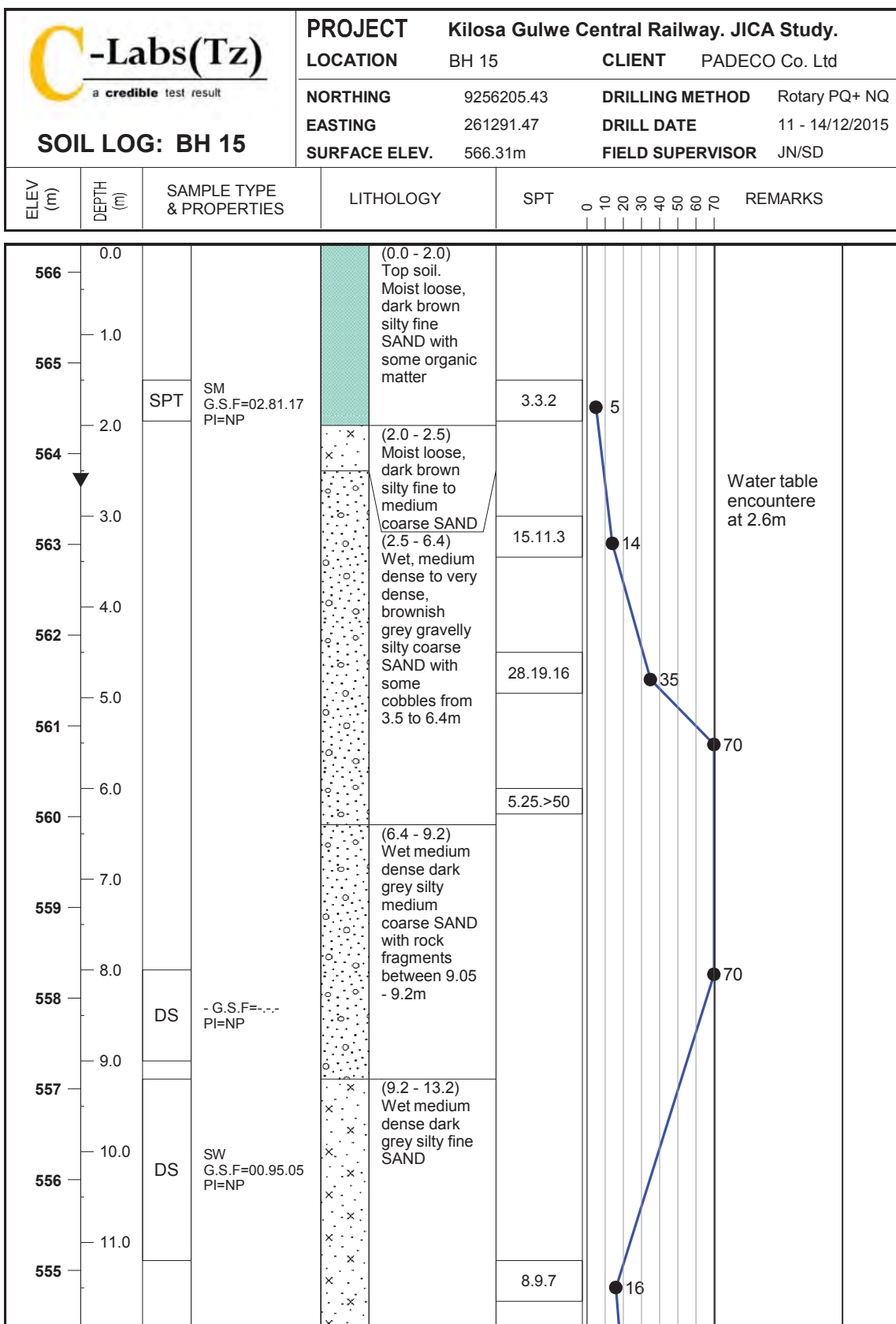
BOREHOLE 14 - PROFILE PICTURES


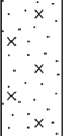

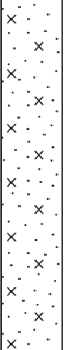

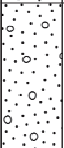
<b>0-2m</b>		<b>2-4m</b>		<b>4-6m</b>		<b>6-8m</b>		<b>8-10m</b>	
									
									
									





BOREHOLE 14 - PROFILE PICTURES

					
					
					
					
<b>10-12m</b>		<b>12-14m</b>	<b>14-16m</b>	<b>16-18m</b>	<b>18-20m</b>



 <p><b>C-Labs(Tz)</b> a credible test result</p>		<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.										
		<b>LOCATION</b> BH 15	<b>CLIENT</b> PADECO Co. Ltd									
<b>SOIL LOG: BH 15</b>		<b>NORTHING</b> 9256205.43	<b>DRILLING METHOD</b> Rotary PQ+ NQ									
		<b>EASTING</b> 261291.47	<b>DRILL DATE</b> 11 - 14/12/2015									
		<b>SURFACE ELEV.</b> 566.31m	<b>FIELD SUPERVISOR</b> JN/SD									
ELEV (m)	DEPTH (m)	SAMPLE TYPE & PROPERTIES	LITHOLOGY	SPT	REMARKS							
					0	10	20	30	40	50	60	70
554	12.0	DS SW G.S.F=00.98.02 PI=NP										
	13.0											
553	13.2 - 20.5	SPT SW G.S.F=29.67.04 PI=NP	(13.2 - 20.5) Moist medium dense, dark grey silty fine SAND	7.11.13	● 24							
552	14.0											
551	15.0											
550	16.0											
549	17.0		SPT SM G.S.F=04.82.15 PI=NP		7.11.13	● 24						
548	18.0											
547	19.0	DS SW G.S.F=00.96.04 PI=NP										
546	20.0											
545	21.0											
544	22.0											
543	23.0		(23.4 - 25.4) Weathered rock									

		<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.											
		<b>LOCATION</b> BH 15	<b>CLIENT</b> PADECO Co. Ltd										
<b>SOIL LOG: BH 15</b>		<b>NORTHING</b> 9256205.43	<b>DRILLING METHOD</b> Rotary PQ+ NQ										
		<b>EASTING</b> 261291.47	<b>DRILL DATE</b> 11 - 14/12/2015										
		<b>SURFACE ELEV.</b> 566.31m	<b>FIELD SUPERVISOR</b> JN/SD										
ELEV (m)	DEPTH (m)	SAMPLE TYPE & PROPERTIES	LITHOLOGY	SPT	0	10	20	30	40	50	60	70	REMARKS
542	24.0		Crumbles to silty sand and cobbles during drilling										
541	25.0		(25.4 - 26.4) Hard Intact rock										
540	26.0												

			<b>PROJECT</b> Kilosa Gulwe Central Railway. JICA Study.										
			<b>LOCATION</b> BH 15	<b>CLIENT</b> PADECO Co. Ltd									
<b>ROCK LOG : BH 15</b>			<b>NORTHING</b> 9256205.43	<b>DRILLING METHOD</b> Rotary PQ+ NQ									
			<b>EASTING</b> 261291.47	<b>DRILL DATE</b> 11 - 14/12/2015									
			<b>SURFACE ELEV.</b> 566.31m	<b>FIELD SUPERVISOR</b> JN/SD									
ELEV (m)	DEPTH (m)	LITHOLOGY	Deg. of Weathering	STRENGTH DATA			DISCONTINUITY DATA			TCR %			
				UCS MPa	Is (50)	Hardness	Dip Angle	Type	Spacing	0	50	100	
			0	0	100		0	45	90				
	20	(13.2 - 20.5) Moist medium dense, dark grey silty fine SAND											
	21	(20.5 - 23.4) Wet brownish grey silty SAND with scattered cobbles											
	22												
	23												
	24	(23.4 - 25.4) Weathered rock. Crumbles to silty sand and cobbles during drilling									22%	0	
	25					● 49	1.9				45%	0	
	26	(25.4 - 26.4) Hard Intact rock					0.7	1.1			80%	0	

BOREHOLE 15 - PROFILE PICTURES

				
				
				
				
				
<b>0-2m</b>	<b>2-4m</b>	<b>4-6m</b>	<b>6-8m</b>	<b>8-10m</b>



BOREHOLE 15 - PROFILE PICTURES

<b>10- 12m</b>				
<b>12- 14m</b>				
<b>14- 16m</b>				
<b>16- 18m</b>				
<b>18- 20m</b>				



BOREHOLE 15 - PROFILE PICTURES

<p>20- 22m</p>				
<p>22- 24m</p>				
<p>24- 26m</p>				
<p>26- 28m</p>				