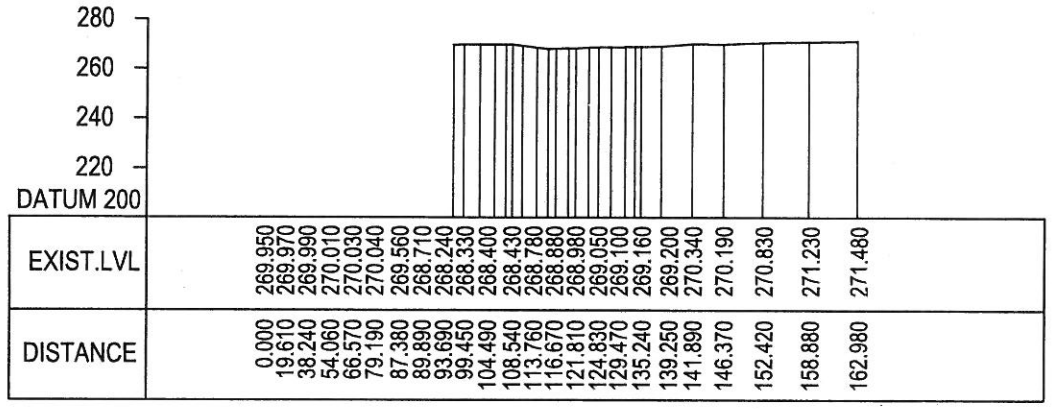
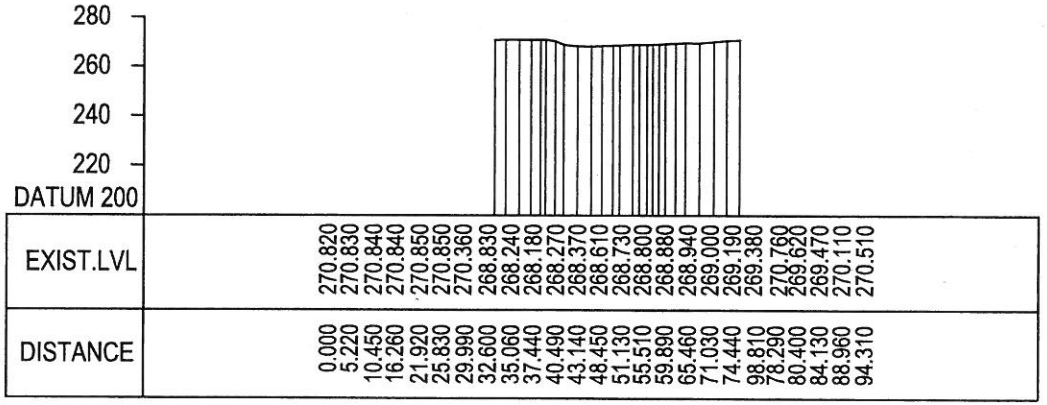


CROSS SECTION - 18



CROSS SECTION - 19

DATE	DESCRIPTION	CHKD.	APPRD.
	REVISIONS		

CLIENT:- DEDICATED FREIGHT CORRIDOR CORPORATION OF INDIA LIMITED
(A Govt. of India Enterprise)
Old Railway colony (Near Anand Market)
Ambala Cantt-133001
Telefax: 0171-2612412

TITLE:-
CROSS SECTION OF MARKANDA RIVER AT PROP.CH:-53+000
SPAN SIZE:-
6 x 45.7m OPEN WEB GIRDER

SCALE :	AS SHOWN	SIGNATURE
DATE :	APRIL-2013	
PREP.BY	GM	
DESG.BY		
CHKD. BY	NNA	
Appvd By:		

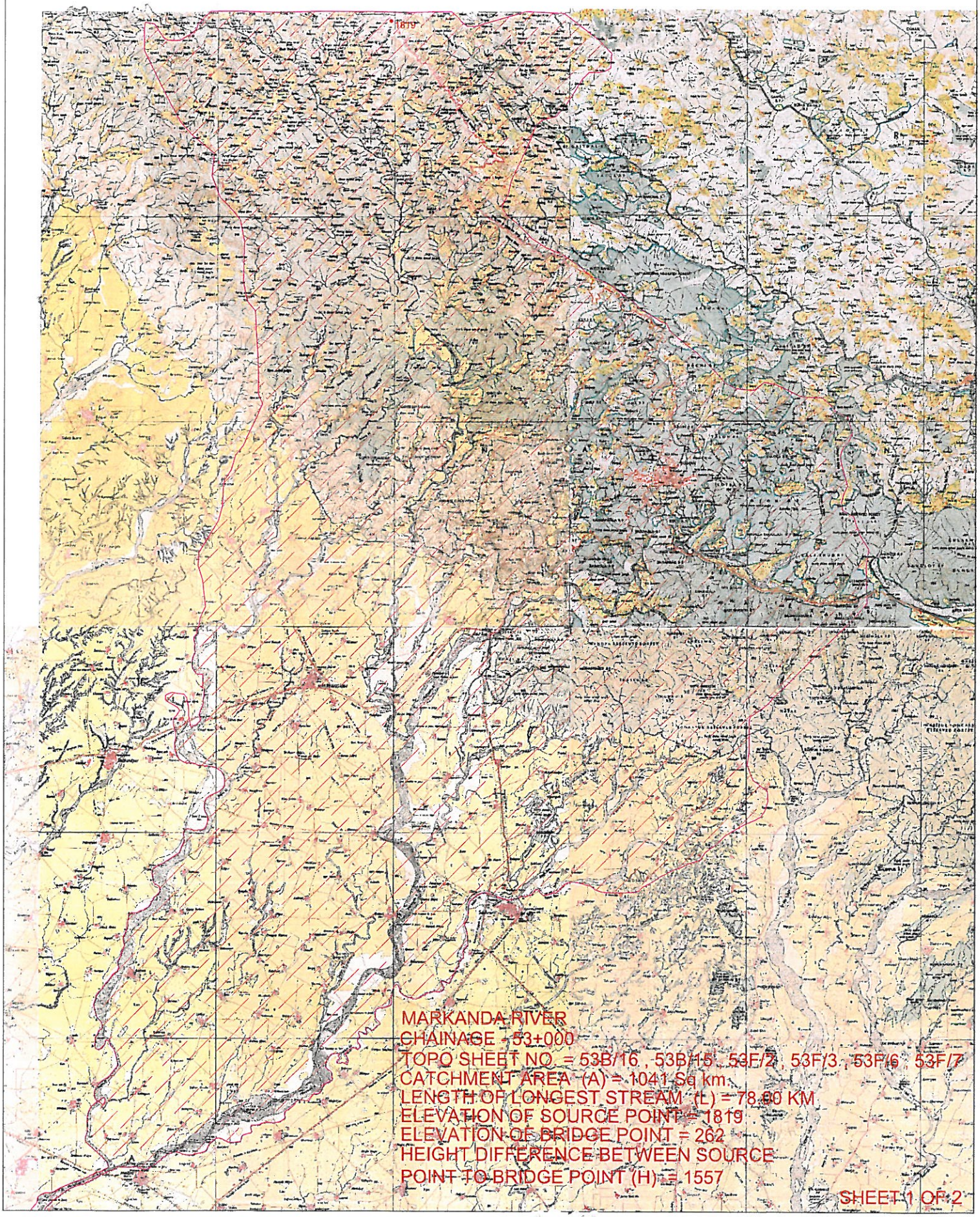
ARKITECHNO
ARKITECHNO Consultants (India) Pvt.Ltd
ISO 9001-2008 Certified Company
Plot No# N3/91,IRC Village,Nayapalli
Bhubaneswar-751015,Odisha
Phone:+91-674-2554205,Telefax:2553689
Web:www.arkitechno.com

DRAWING NO.
ATCPL/DFCC/2013/BR/68/CS

REV. 65

SHEET NO-6

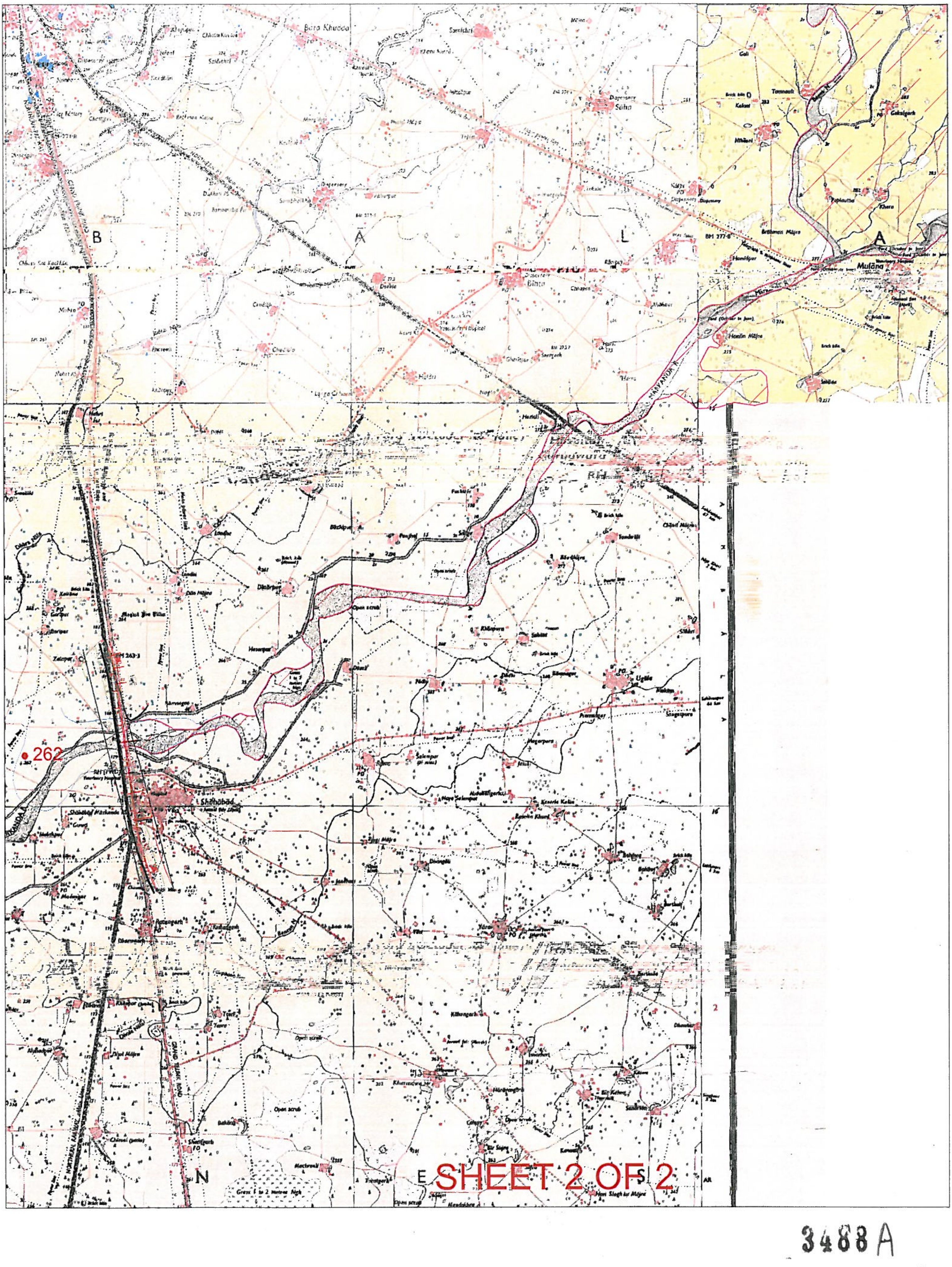
CATCHMENT AREA MARKING IN TOPOSHEET



MARKANDA RIVER
CHAINAGE - 53+000
TOPO SHEET NO. = 53B/16 , 53B/15 , 53F/2 , 53F/3 , 53F/6 , 53F/7
CATCHMENT AREA (A) = 1041 Sq km.
LENGTH OF LONGEST STREAM (L) = 78.00 KM
ELEVATION OF SOURCE POINT = 1819
ELEVATION OF BRIDGE POINT = 262
HEIGHT DIFFERENCE BETWEEN SOURCE POINT TO BRIDGE POINT (H) = 1557

SHEET 1 OF 2

3488



3488 A

SILT FACTOR CALCULATION

Discharge Calculations :-
Hydrology & Hydraullic calculations @ 53+000

1.0 Discharge Calculations as per Empirical Formula (Dickens) :

Details of the Bridge :

Chainage = 53+000 km

Preparation of Catchment Area Plan:

A catchment plan showing the river/stream , contours and spot levels was prepared for determining the physiographic parameters as follow:

Physiographic Parameters:

Catchment Area (M) = 1041.000 sq km

Discharge Calculations :

Discharge $Q = CM^{3/4}$, As per Dickens Formula

Where
Q = The Peak run-off in cum/sec
C = 14
M = 1041.0 Sq.km

$\therefore Q = 14 \times 1041.0^{3/4}$
$= \mathbf{2565.760}$ **cu.m/sec**

2.0 Discharge Calculations as per Rational Formula :

$Q = 0.028\ P\ .\ f\ .\ A\ .\ Ic$

Where Q = Maximum run-off in cu.m / sec

A = Area of catchment in hectares = 104100.0 From Topo Sheet

P = Percentage coefficient of runoff for the catchment characteristics (vide Table 4.1, SP-13-2004,pg 13) = 0.6

f = fraction depending on the catchment area from f curve(Sp-13-2004,pg 14) = 0.62

Ic = Critical Intensity of rainfall in cm per hour

$= Io \left(\frac{2}{tc + 1} \right)$ Io = one hour rainfall

Where $Io = \frac{F}{2} \left(1 + \frac{1}{T} \right)$ = 7.30 cm/hr

F = Precipitation of the storm in cm = 7.3 cm

T = Duration in hours = 1 hrs

tc = Concentration time of Catchment in hours

$= 0.870 \left(\frac{L^3}{H} \right)^{0.385}$ = 7.868 hrs

From Topo Sheet
L = The distance from the critical point to the culvert in km. = 78.000

H = The fall in level from the critical point to the bridge in metre. = 1557.0

$\therefore Q = A.Io.\lambda$

$I = \frac{0.056\ f.\ P}{tc + 1} = \frac{0.056 \times 0.62 \times 0.6}{7.868 + 1} = 0.002349154$

$Q = 104100 \times 7.3 \times 0.002 =$ **1785.192 cu.m/sec**

3489

Discharge calculation by Synthetic Unitgraph Method

1 Design data

Catchment Area	(A)	=	1041	sqkm
Length of Longest Stream	(L)	=	78	km
Length of Longest Stream from cg to site	(L_c)	=	39	km
Unit Duration of Unitgraph	(t)	=	1.0	hr

2 Computation of Equivalent Stream Slope (S)

Sl. No.	Reduced distance	Reduced levels	L_i	D_i	$D_{i-1} + D_i$	$L_i(D_{i-1}+ D_i)$
	(kms)	(m)	(kms)	(m)	(m)	(mxkm)
1	2	3	4	5	6	7
1	0.000	270.747	0		-	-
2	0.144	270.736	0.144	-0.011	-	0.00
3	0.316	270.711	0.172	-0.036	-0.047	-0.01
4	0.349	270.680	0.033	-0.067	-0.103	0.00
5	0.437	270.659	0.088	-0.088	-0.155	-0.01
6	0.458	270.648	0.021	-0.099	-0.187	0.00
7	0.545	270.190	0.087	-0.557	-0.656	-0.06
8	0.704	270.178	0.160	-0.5691	-1.1261	-0.18
9	0.740	270.176	0.035	-0.5714	-1.1405	-0.04
10	0.818	270.164	0.078	-0.5826	-1.154	-0.09
11	0.957	270.160	0.139	-0.5874	-1.17	-0.16
12	1.060	270.140	0.104	-0.6069	-1.1943	-0.12
13	1.145	270.136	0.084	-0.6114	-1.2183	-0.10
14	1.161	270.121	0.016	-0.6258	-1.2372	-0.02
15	1.284	270.120	0.123	-0.6269	-1.2527	-0.15
			1.284			**-0.9597**

Slope (S) = $\Sigma \frac{Li(D_{i-1}+D_i)}{L^2}$ = **0.5820** m/km

3490

3 Determination of 1-hour Synthetic Unitgraph Parameters:-

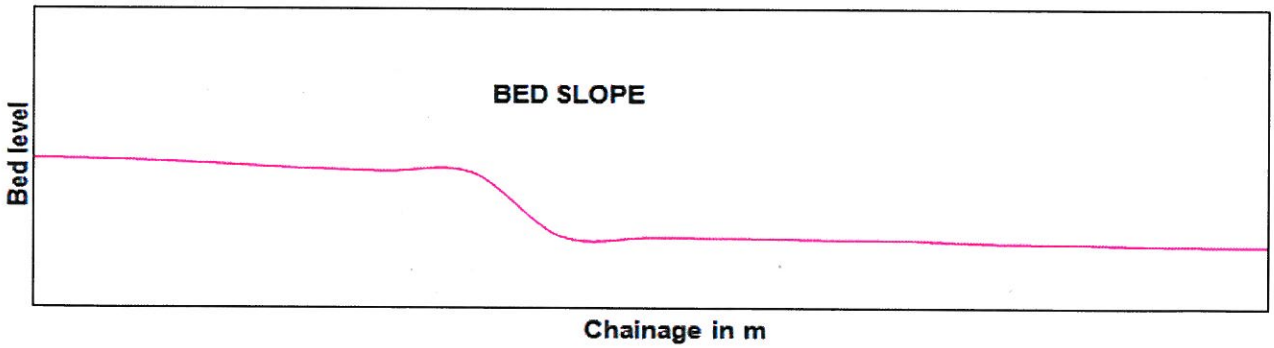
Time fromcenter of unit rain fall to Unit hydrograph in hr.	tp	=	$0.433[L/\sqrt{s}]^{0.704}$
		=	40.86 hr
Peak discharge of unit hydrograph in cumecs / Sq. Km	q_p	=	$1.161 \times (tp)^{-0.635}$
		=	0.11 cumecs / Sq. Km
Width of unit hydrograph at 50% of Max discharge ordinate	W_{50}	=	$2.284(q_p)^{-1.0}$
		=	20.75 hr
Width of unit hydrograph at 75% of Max discharge ordinate	W_{75}	=	$1.331(q_p)^{-0.991}$
		=	11.86 hr
Width of rising side of unit hydrograph at 50% of Max discharge ordinate =			$0.827 \times (qp)^{-1.023}$
	W_{R50}	=	7.905 hr
Width of rising side of unit hydrograph at 75% of Max discharge ordinate =			$0.561 \times (qp)^{-1.037}$
	W_{R50}	=	5.531 hr
Base width of Unit hydrograph	T_B	=	$8.375 \times (tp)^{0.512}$
		=	55.97 hr
Time from the start of rise to the peak of unit hydrograph	T_M	=	$t_p + t_r / 2$
		=	41.36 hr
Peak discharge of unit hydrograph	Qp	=	q_p X A
		=	114.6 cumecs

Slope of River bed calculations :-

Bed Slope / Longitudinal Slope of River Bed :

S. No.	length	LBL
1	0	270.747
2	144	270.736
3	316	270.711
4	349	270.68
5	437	270.659
6	458	270.648
7	545	270.19
8	704	270.178
9	740	270.176
10	818	270.164
11	957	270.16
12	1060	270.14
13	1145	270.136
14	1161	270.121
15	1284	270.12

Bed slope = -0.00062 - ve sign indicate Down Ward Slope



Discharge Calculations as per Area-velocity Method :-

At Upstream Site(500 m from Bridge center)

Q = A x V

Where

A = Cross Sectional Area

V = Velocity, calculated from Manning's formula

$= \frac{1}{n} \times R^{2/3} \times S^{1/2}$

R = Hydraulic Mean depth = A / P

P = Wetted Perimeter

S = Bed Slope, measured over a long reach

n = Coefficient of rugosity

Chainage 53+000 :

H.F.L = 273.147 m L.B.L = 268.090 m

Bed slope S = 0.00062 Spread length = 330.000 m

Rugosity coefficient, n = 0.050

S.No.	H.F.L	offset (M)	Bed Level	D.O.F	A.D.O.F	Distance	Area	W.P
1	2	3	4	5	6	7	8	9
							(6 x 7)	sqrt{7*7+ (h1-h2)^2}
1	273.147	0.00	275.55	0.000	0.000	0.000	0.000	0.000
2	273.147	50.00	270.50	2.650	1.325	50.000	66.250	50.070
3	273.147	100.00	268.53	4.616	3.633	50.000	181.650	50.039
4	273.147	150.00	268.10	5.048	4.832	50.000	241.600	50.002
5	273.147	200.00	268.09	5.057	5.053	50.000	252.625	50.000
6	273.147	250.00	268.58	4.569	4.813	50.000	240.650	50.002
7	273.147	330.00	275.36	0.000	2.285	80.000	182.760	80.130
		AVG. B.L =	270.672					

Total (Cross sectional Area, A) = **1165.535** sq. m

Wetted Perimeter, P in m = **330.243**

Hydraulic Radius, R = A / P = = **3.529 m**

Velocity, V = $1/n * R^{2/3}. S^{1/2}$ = **1.154 m/sec**

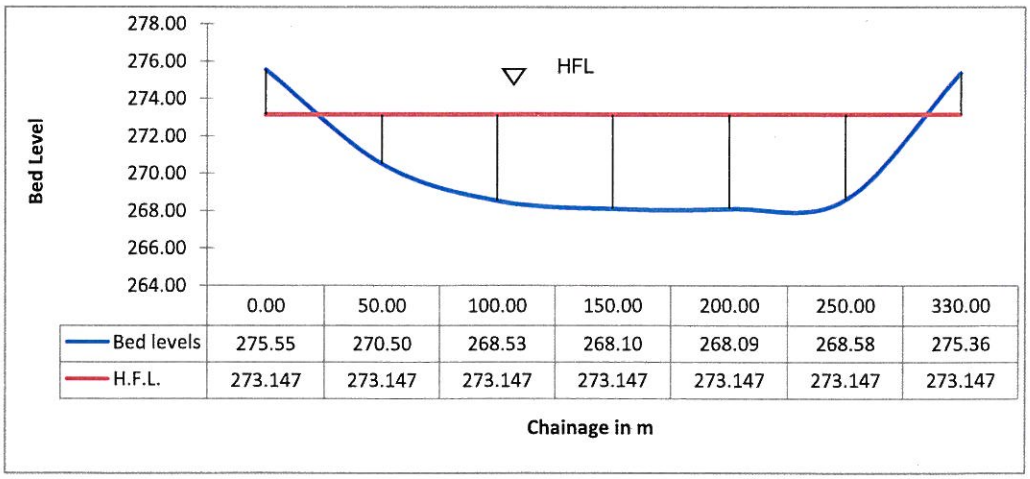
Discharge, Q = A*V = 1345.484 cumecs

Say **1346.00** cumecs

Linear water way = **330.000** m

Abbreviations

H.F.L. - High Flood Level
D.O.F. - Depth Of Flow
A.D.O.F. - Average Depth Of Flow
W.P. - Wetted Perimeter
L.B.L. - Lowest Bed Level



Discharge Calculations as per Area-velocity Method :-

At Upstream Site(100 m from Bridge center)

Q = A x V

Where

A = Cross Sectional Area

V = Velocity, calculated from Manning's formula

$= \frac{1}{n} \times R^{2/3} \times S^{1/2}$

R = Hydraulic Mean depth = A / P

P = Wetted Perimeter

S = Bed Slope, measured over a long reach

n = Coefficient of rugosity

Chainage 53+000 :

H.F.L = 273.147 m L.B.L = 267.947 m

Bed slope S = 0.00062 Spread length = 330.000 m

Rugosity coefficient, n = 0.050

S.No.	H.F.L	offset (M)	Bed Level	D.O.F	A.D.O.F	Distance	Area	W.P
1	2	3	4	5	6	7	8	9
							(6 x 7)	sqrt{7*7+ (h1-h2)^2}
1	273.147	0.00	276.047	0.000	0.000	0.000	0.000	0.000
2	273.147	50.00	270.357	2.790	1.395	50.000	69.750	50.078
3	273.147	100.00	268.250	4.897	3.844	50.000	192.175	50.044
4	273.147	150.00	267.976	5.171	5.034	50.000	251.700	50.001
5	273.147	200.00	267.947	5.200	5.185	50.000	259.275	50.000
6	273.147	250.00	268.388	4.759	4.980	50.000	248.975	50.002
7	273.147	330.00	275.890	0.000	2.380	80.000	190.360	80.141
		AVG. B.L =	270.694					

Total (Cross sectional Area, A) = **1212.235** sq. m

Wetted Perimeter, P in m = **330.266**

Hydraulic Radius, R = A / P = = **3.670 m**

Velocity, V = $1/n * R^{2/3}. S^{1/2}$ = **1.185 m/sec**

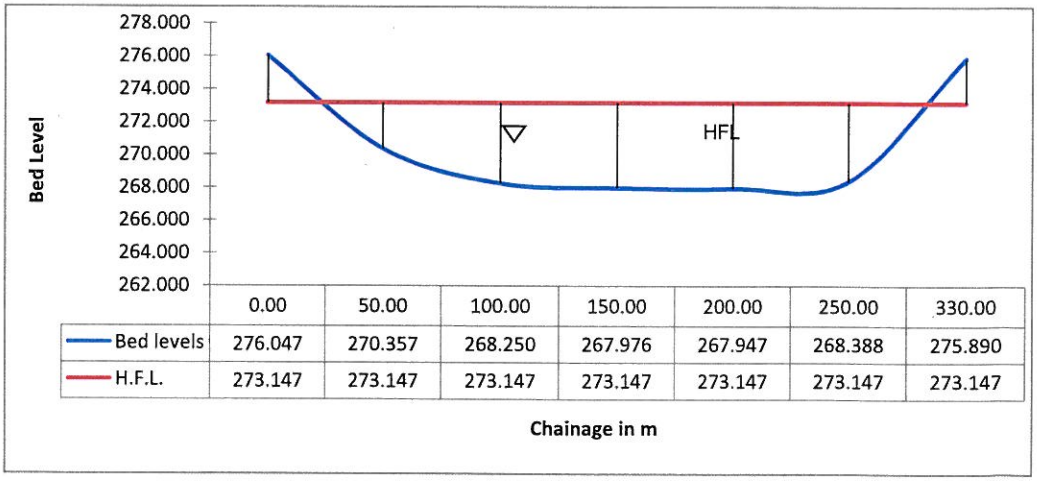
Discharge, Q = A*V = 1436.463 cumecs

Say **1437.00** cumecs

Linear water way = **330.000** m

Abbreviations

H.F.L. - High Flood Level
D.O.F. - Depth Of Flow
A.D.O.F. - Average Depth Of Flow
W.P. - Wetted Perimeter
L.B.L. - Lowest Bed Level



Discharge Calculations as per Area-velocity Method :- *At Bridge Site*

Q = A x V

Where A = Cross Sectional Area

V = Velocity, calculated from Manning's formula

$= \frac{1}{n} \times R^{2/3} \times S^{1/2}$

R = Hydraulic Mean depth = A / P

P = Wetted Perimeter

S = Bed Slope, measured over a long reach

n = Coefficient of rugosity

Chainage 53+000 :

H.F.L = 273.147 m L.B.L = 267.646 m

Bed slope S = 0.00062 Spread length = 330.000 m

Rugosity coefficient, n = 0.050

S.No.	H.F.L	offset (M)	Bed Level	D.O.F	A.D.O.F	Distance	Area	W.P
1	2	3	4	5	6	7	8	9
							(6 x 7)	sqrt{7*7+ (h1-h2)^2}
1	273.147	0.00	276.247	0.000	0.000	0.000	0.000	0.000
2	273.147	50.00	270.253	2.894	1.447	50.000	72.350	50.084
3	273.147	100.00	268.070	5.077	3.986	50.000	199.275	50.048
4	273.147	150.00	267.757	5.390	5.234	50.000	261.675	50.001
5	273.147	200.00	267.646	5.501	5.446	50.000	272.275	50.000
6	273.147	250.00	268.257	4.890	5.196	50.000	259.775	50.004
7	273.147	330.00	277.000	0.000	2.445	80.000	195.600	80.149
		AVG. B.L =	270.747					

Total (Cross sectional Area, A) = **1260.950** sq. m

Wetted Perimeter, P in m = **330.285**

Hydraulic Radius, R = A / P = = **3.818 m**

Velocity, V = $1/n * R^{2/3} . S^{1/2}$ = **1.216 m/sec**

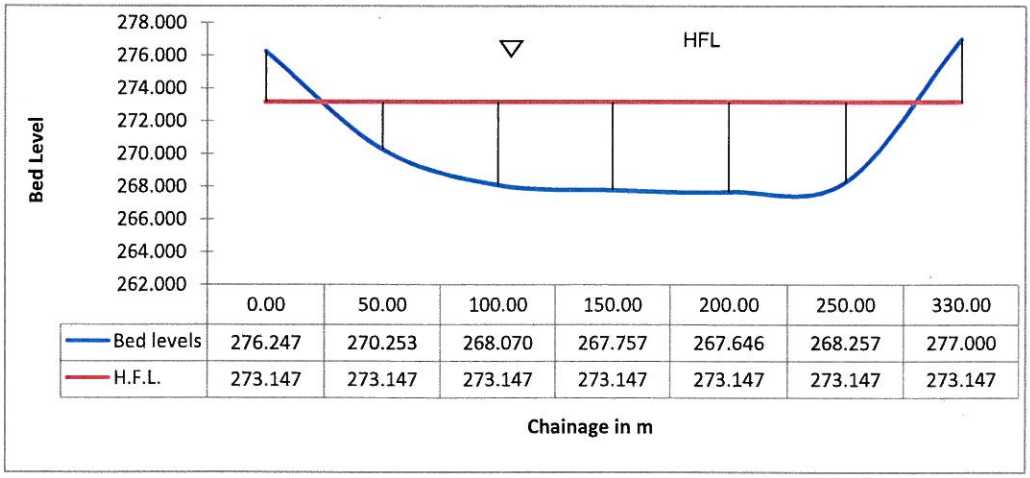
Discharge, Q = A*V = 1533.896 cumecs

Say **1534.00** cumecs

Linear water way = **330.000** m

Abbreviations

H.F.L. - High Flood Level
D.O.F. - Depth Of Flow
A.D.O.F. - Average Depth Of Flow
W.P. - Wetted Perimeter
L.B.L. - Lowest Bed Level



Discharge Calculations as per Area-velocity Method :-

At Down stream Site
(100 m from Bridge center)

Q = A x V

Where
A = Cross Sectional Area
V = Velocity, calculated from Manning's formula
= $\frac{1}{n} \times R^{2/3} \times S^{1/2}$
R = Hydraulic Mean depth = A / P
P = Wetted Perimeter
S = Bed Slope, measured over a long reach
n = Coefficient of rugosity

Chainage 53+000 :

H.F.L = 273.147 m L.B.L = 267.278 m

Bed slope S = 0.00062 Spread length = 330.000 m

Rugosity coefficient, n = 0.050

S.No.	H.F.L	offset (M)	Bed Level	D.O.F	A.D.O.F	Distance	Area	W.P
1	2	3	4	5	6	7	8	9
							(6 x 7)	sqrt{7*7+ (h1-h2)^2}
1	273.147	0.00	277.847	0.000	0.000	0.000	0.000	0.000
2	273.147	50.00	269.808	3.339	1.670	50.000	83.475	50.111
3	273.147	100.00	267.910	5.237	4.288	50.000	214.400	50.036
4	273.147	150.00	267.278	5.869	5.553	50.000	277.650	50.004
5	273.147	200.00	267.332	5.815	5.842	50.000	292.100	50.000
6	273.147	250.00	267.657	5.490	5.653	50.000	282.625	50.001
7	273.147	330.00	278.495	0.000	2.745	80.000	219.600	80.188
		AVG. B.L =	270.904					

Total (Cross sectional Area, A) = **1369.850** sq. m
Wetted Perimeter, P in m = **330.341**

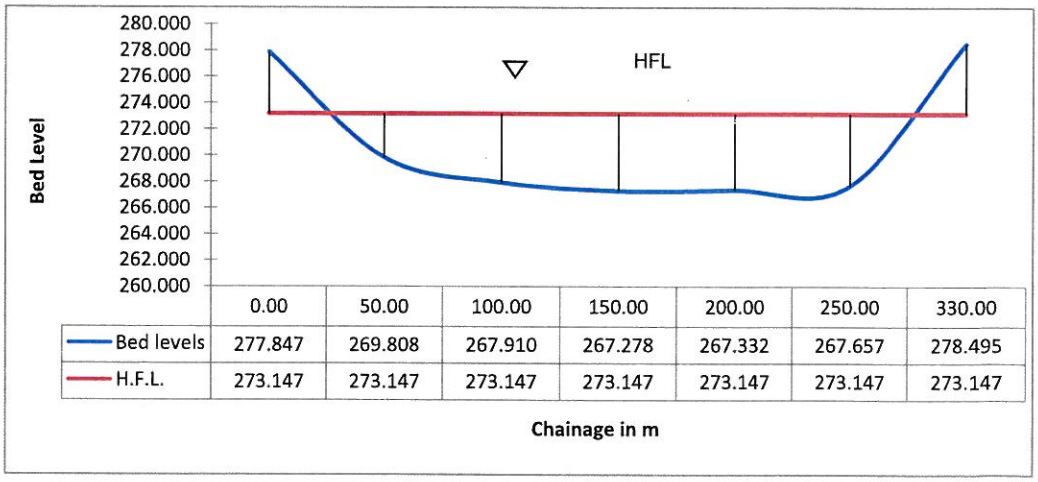
Hydraulic Radius, R = A / P = = **4.147 m**

Velocity, V = $1/n * R^{2/3} . S^{1/2}$ = **1.285 m/sec**

Discharge, Q = A*V = 1760.785 cumecs
Say **1761.00** cumecs

Linear water way = **330.000** m

Abbreviations
H.F.L. - High Flood Level
D.O.F. - Depth Of Flow
A.D.O.F. - Average Depth Of Flow
W.P. - Wetted Perimeter
L.B.L. - Lowest Bed Level



3496

Discharge Calculations as per Area-velocity Method :-

At Down stream Site
(500 m from Bridge center)

Q = A x V

Where
A = Cross Sectional Area
V = Velocity, calculated from Manning's formula
= $\frac{1}{n} \times R^{2/3} \times S^{1/2}$
R = Hydraulic Mean depth = A / P
P = Wetted Perimeter
S = Bed Slope, measured over a long reach
n = Coefficient of rugosity

Chainage 53+000 :

H.F.L = 273.147 m L.B.L = 266.278 m

Bed slope S = 0.00062 Spread length = 330.000 m

Rugosity coefficient, n = 0.050

S.No.	H.F.L	offset (M)	Bed Level	D.O.F	A.D.O.F	Distance	Area	W.P
1	2	3	4	5	6	7	8	9
							(6 x 7)	sqrt{7*7+ (h1-h2)^2}
1	273.147	0.00	277.847	0.000	0.000	0.000	0.000	0.000
2	273.147	50.00	268.808	4.339	2.170	50.000	108.475	50.188
3	273.147	100.00	266.910	6.237	5.288	50.000	264.400	50.036
4	273.147	150.00	266.278	6.869	6.553	50.000	327.650	50.004
5	273.147	200.00	266.332	6.815	6.842	50.000	342.100	50.000
6	273.147	250.00	266.657	6.490	6.653	50.000	332.625	50.001
7	273.147	330.00	278.495	0.000	3.245	80.000	259.600	80.263
		AVG. B.L =	270.190					

Total (Cross sectional Area, A) = **1634.850** sq. m
Wetted Perimeter, P in m = **330.492**

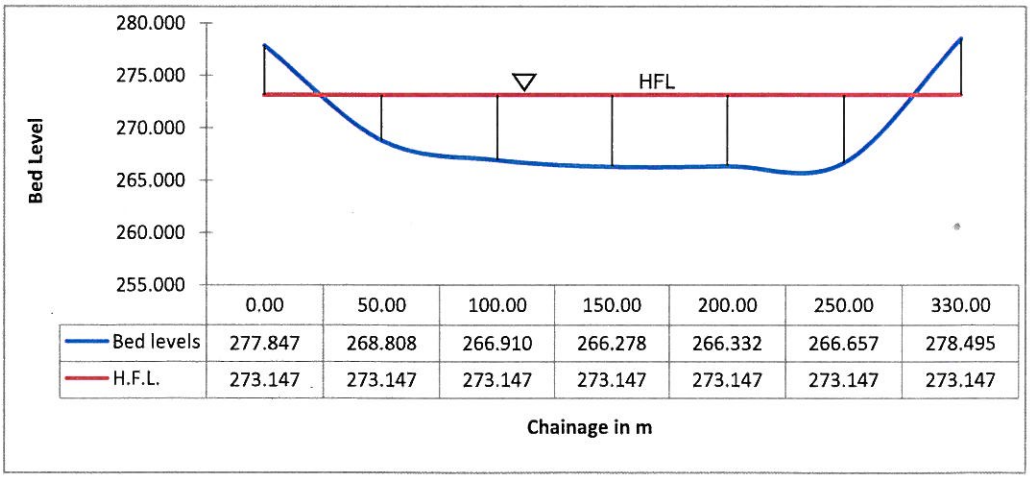
Hydraulic Radius, R = A / P = = **4.947 m**

Velocity, V = $1/n * R^{2/3} . S^{1/2}$ = **1.446 m/sec**

Discharge, Q = A*V = 2363.643 cumecs
Say **2364.00** cumecs

Linear water way = **330.000** m

Abbreviations
H.F.L. - High Flood Level
D.O.F. - Depth Of Flow
A.D.O.F. - Average Depth Of Flow
W.P. - Wetted Perimeter
L.B.L. - Lowest Bed Level



3457

Design Discharge :-

Design discharge :

Formula	Discharge from catchment	Units
Emperical formula	2565.76	Cumecs
Rational Formula	1785.19	Cumecs
A-V method (at SOC)	2364.00	Cumecs

Max. discharge = 2565.76 Cumecs

Second Highest = 2364.00 Cumecs

As per Cl.6.2 of IRC SP:13,

1.5 x 2364.00 = 3546.00 Cumecs

Hence Design discharge = **2565.76 Cumecs**

Design discharge for foundation design :

As per Indian Rail Standard Code

Catchment area (in km^2)		Increase over design discharge in percent	
0 -	500	30	%
500 -	5000	30 -	20
5000 -	25000	20 -	10
>25000		10	%

Design discharge for foundation = 1.3 x 2565.76

3336.00 Cumecs

3498

Linear water way & Afflux :-

1 **Linear Water Way:**

Design discharge	=	2364.00 m^3/s	(As calculated)
Velocity of river	=	1.45 m/s	
HFL	=	273.147 m	
Bed level	=	267.646 m	
Depth of water	=	5.50 m	
Assumed Afflux	=	0.05 m	
Velocity of approach	=	1.437 m/s	
Head due to velocity of approach (V^2 / 2g)	=	0.105 m	
Total head	=	0.156 m	
Velocity through vent (2gh)	=	1.75 m/s	
Velocity allowable	=	1.75 m/s	
Linear water way required	=	245.48 m	
Proposed vent way (6 x 45.7)	=	274.20 m	O.K

2 **Check for Afflux**

As per Cl. 2.2.7 of Pocket Book for Bridge Engineers published by Indian Road Congress, New Delhi

By Molesworth formula

Afflux = $\left[\frac{V^2}{17.89}+0.015\right]\times\left[\left(\frac{Au}{Ae}\right)^2-1\right]$

Velocity, V	=	1.45 m/sec		
Unobstructed area, Au	=	1260.950 m^2		
Effective vent area, Ae	=	1508.37 m^2		
Afflux	=	0.000 m	<	Assumed afflux
		Hence OK		

3 **Design of Formation Level**

Vertical clearance (V_c) required = 0.90 m

Bottom of deck level to be provided = 274.098 m

4 **Scour Depth Calculations :**

$d_{sm} = 1.34\ (D_b^2 / K_{sf})^{1/3}$ As per cl.703.2 of IRC 78 - 2000

where, D_b = the discharge in cumecs per metre width.
K_{sf} = silt factor

$D_b = \frac{3336.0}{274.2} = 12.166$ cumecs/m

K_{sf} = 0.64 (As per Dr. Ghuman and Gupta Geotech Consultants)

d_{sm} = 1.34 x (12.166^2 / 0.64)^(1/3) = **8.225** m below HFL

Max. depth of scour for Piers = $2 \times d_{sm}$ = 16.45 m below HFL

Max. depth of scour for Abutment = $1.27 \times d_{sm}$ = 10.45 m below HFL

Scour level for Abutments = 262.70 m

Scour level for Piers = 256.70 m

3499

SILT FACTOR CALCULATION

3500

MARKANDA RIVER			
Bore Hole No	**Depth (m)**	**Sub-Starta**	**Silt Factor**
BH-1(A2)	1.5	Sandy Silt	2.14
BH-2(P5)	1.5	Sandy Silt	2.07
BH-3(P4)	1.5	Fine Sand	2.25
BH-4(P3)	1.5	Fine Sand	2.05
BH-5(P2)	1.5	Fine Sand	2.26
BH-6(P1)	1.5	Silty Sand	1.9

Arki Techno Consultants (India) Pvt. Ltd

ARKITECHNO

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL WITH SILT FACTOR

(AS PER IS 2720, P- 4 & IRC 5)

Client:	DFCC		
Project Name	3 Nos important Bridges		
Type of Sample	SPT	Date of Testing :	27.09.12
Location	BH-1(Markanda River-Ambala)	Sampled by :	T. K. Das
Depth	1.5m	Tested by :	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100

Weight of oven dried sample after washing (gm) :- 67.29

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %	Average size of Particle in mm	Column 3 X Column 6
1	2	3	4	5	6	7
4.75	0	0.00	0.00	100.00	2.38	0.00
2.00	32.34	32.34	32.34	67.66	3.38	109.15
0.425	29.61	29.61	61.95	38.05	1.21	35.90
0.075	4.62	4.62	66.57	33.43	0.25	1.16
Pan	0.72	33.43	100.00	0.00	0.0375	1.25
Wash Loss	32.71					
Total	100					

Gravel Content (%)= 0.00 **Sand Content (%) 66.57** **Silt and clay % 33.43**

Weighted mean dia of Particle (d_{sm}) = 1.47 **Silt Factor 1.76 X sqrt (d_{sm}) = 2.14**

Remarks :-

Lab Manager Checked By

3502

Appendix -III

(Laboratory Test Results)

3503

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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	1.5m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 66.56

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	32.34	32.34	32.34	67.66
0.425	29.61	29.61	61.95	38.05
0.075	4.62	4.62	66.57	33.43
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 66.57 **Silt and clay %** 33.43

Remarks :-

3504

Lab Manager Checked By

Arki Techno Consultants (India) Pvt. Ltd

ARKITECHNO CONSULTANTS (INDIA) PVT. LTD.

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	4.5m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 68.39

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	33.26	33.26	33.26	66.74
0.425	30.07	30.07	63.33	36.67
0.075	5.07	5.07	68.40	31.60
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 68.40 **Silt and clay %** 31.60

Remarks :-

3503

Lab Manager Checked By

Arki Techno Consultants (India) Pvt. Ltd

ARKITECHNO CONSULTANTS (INDIA) PVT. LTD.

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	10.5m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 5.68

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	3.13	3.13	3.13	96.87
0.425	2.31	2.31	5.44	94.56
0.075	0.24	0.24	5.68	94.32
Total	100.00			

Gravel Content (%)= **0.00**

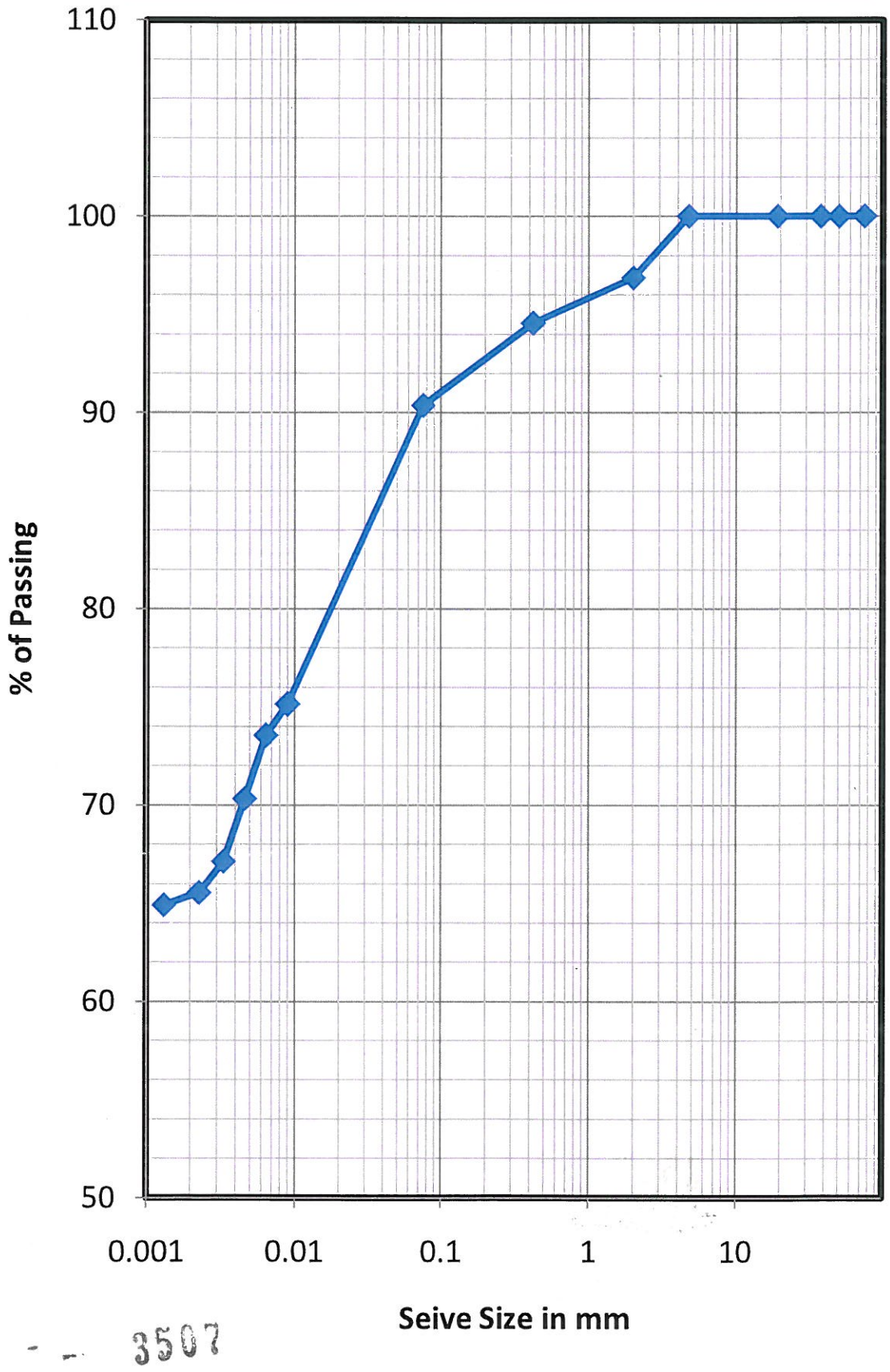
Sand Content (%) = 5.68 **Silt and clay %** 94.32

Remarks :-

3506

Lab Manager Checked By

Grain Size Distribution Curve
BH-1,D-10.5m



3507

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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	12.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 5.46

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	3.04	3.04	3.04	96.96
0.425	2.23	2.23	5.27	94.73
0.075	0.20	0.20	5.47	94.53
Total	100.00			

Gravel Content (%)= **0.00**

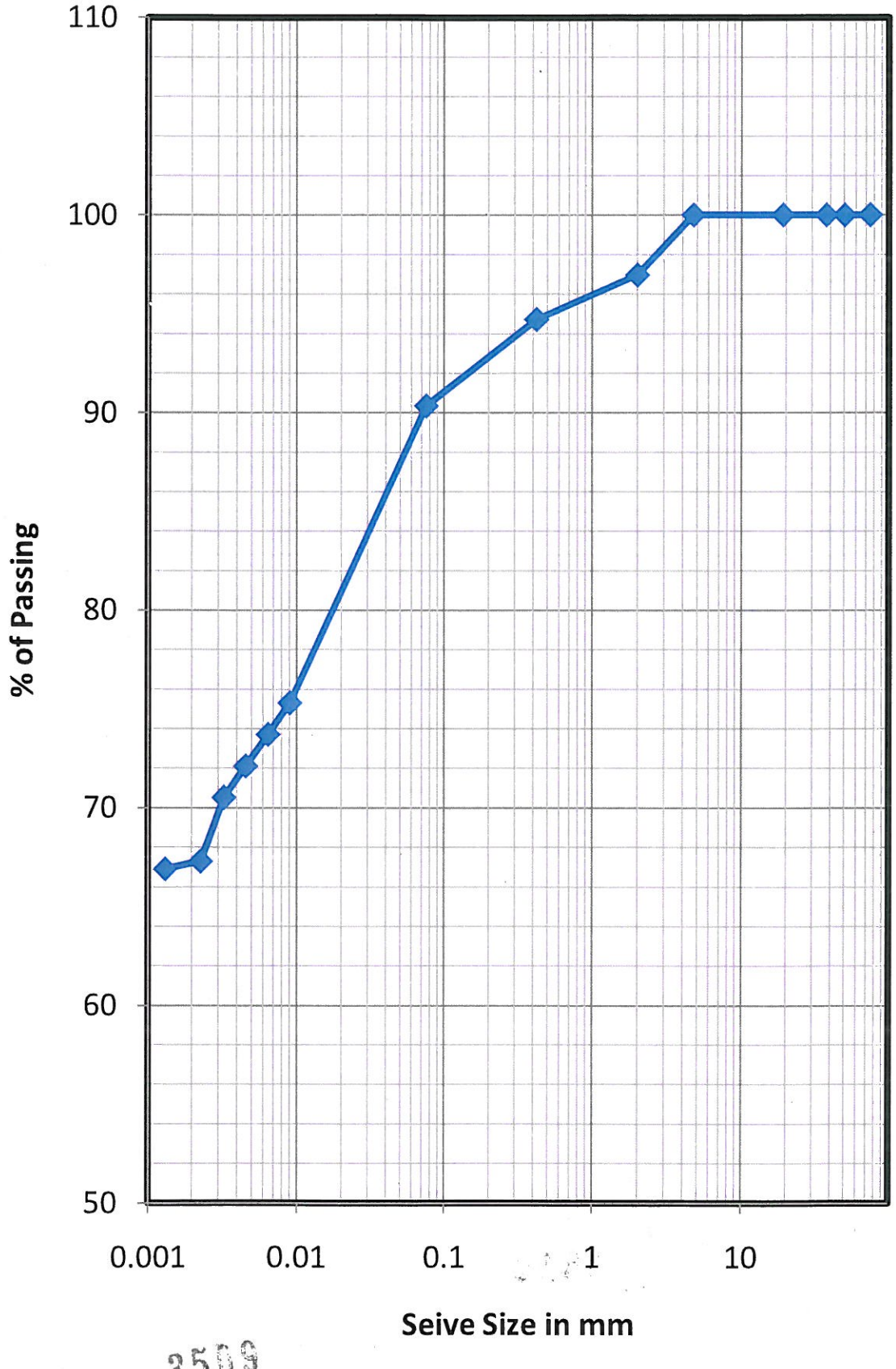
Sand Content (%) = 5.47 **Silt and clay %** 94.53

Remarks :-

3508

Lab Manager Checked By

Grain Size Distribution Curve
BH-1,D-12.0m



3509

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GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	13.5m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 6.31

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	3.34	3.34	3.34	96.66
0.425	2.62	2.62	5.96	94.04
0.075	0.36	0.36	6.32	93.68
Total	100.00			

Gravel Content (%)= **0.00**

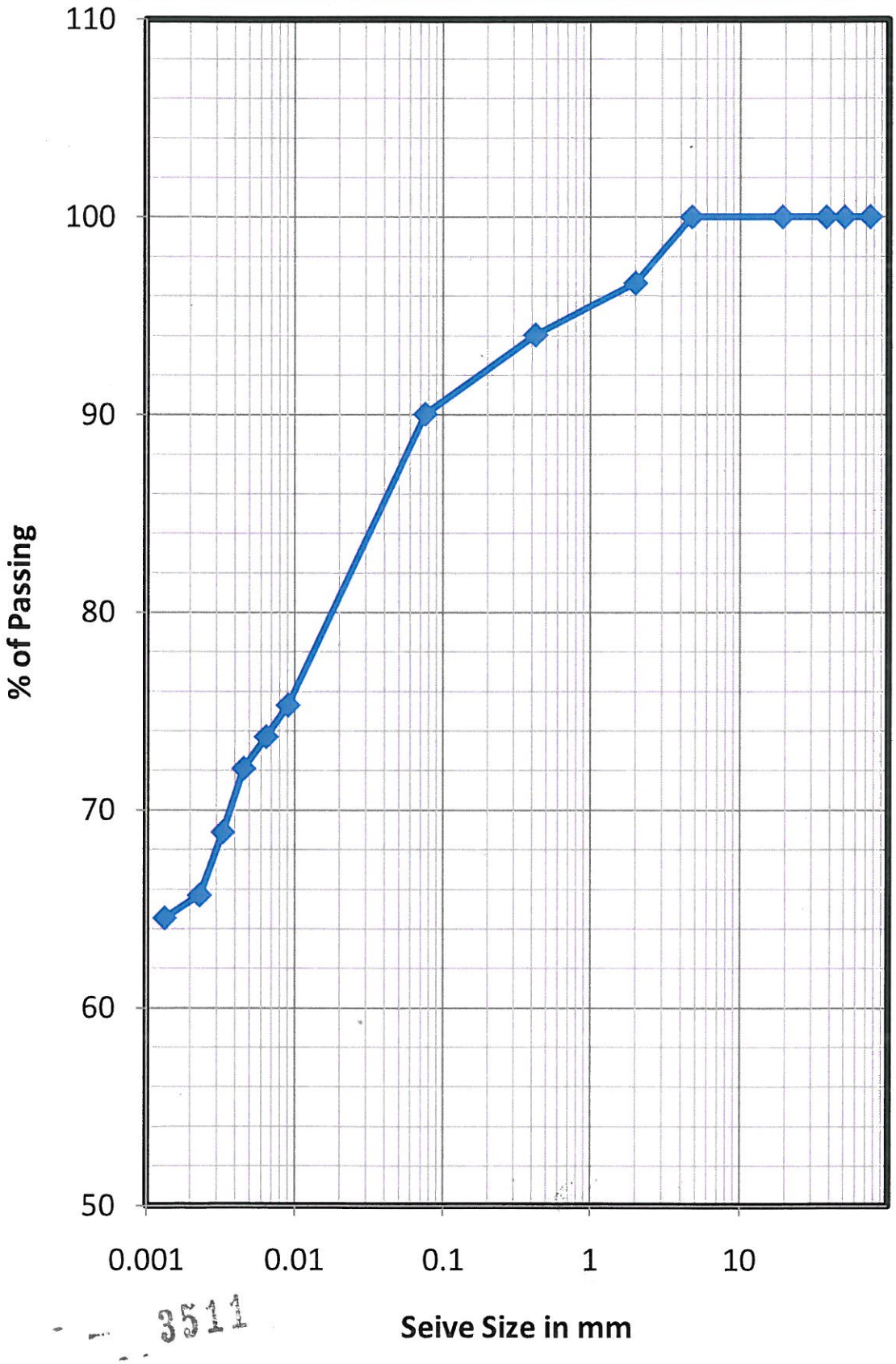
Sand Content (%) = 6.32 **Silt and clay %** 93.68

Remarks :-

3510

Lab Manager Checked By

Grain Size Distribution Curve
BH-1,D-13.5m



3511

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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	15.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 5.50

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	3.13	3.13	3.13	96.87
0.425	2.16	2.16	5.29	94.71
0.075	0.22	0.22	5.51	94.49
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 5.51 **Silt and clay %** 94.49

Remarks :-

3512

Lab Manager

Checked By

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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	18.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 6.17

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	3.41	3.41	3.41	96.59
0.425	2.46	2.46	5.87	94.13
0.075	0.31	0.31	6.18	93.82
Total	100.00			

Gravel Content (%)= **0.00**

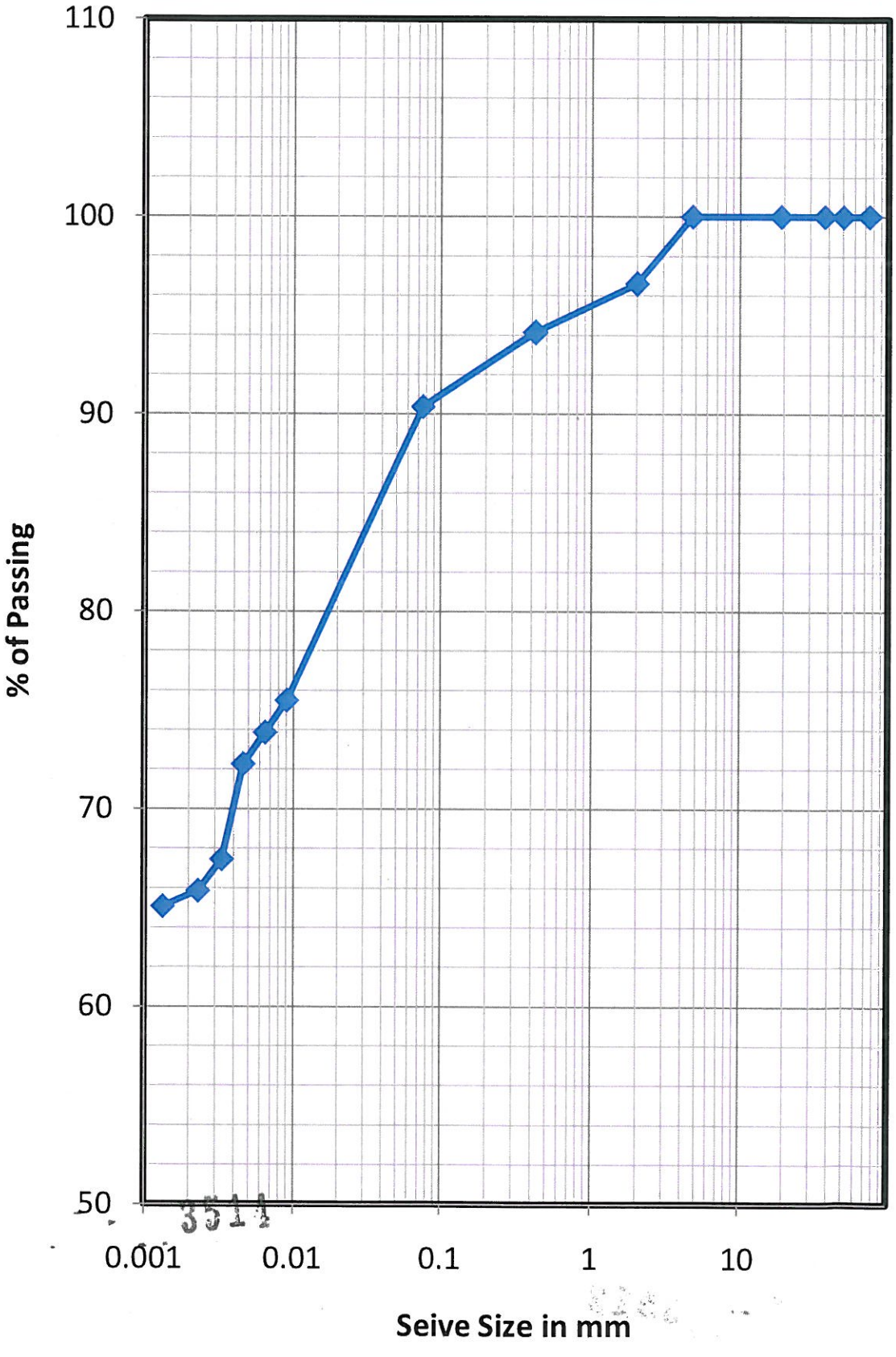
Sand Content (%) = 6.18 **Silt and clay %** 93.82

Remarks :-

3513

Lab Manager Checked By

Grain Size Distribution Curve
BH-1,D-18.0m



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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	19.5m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 5.31

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	3.04	3.04	3.04	96.96
0.425	2.09	2.09	5.13	94.87
0.075	0.19	0.19	5.32	94.68
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 5.32 **Silt and clay %** 94.68

Remarks :-

Lab Manager 3515 Checked By

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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	22.5m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 5.63

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	3.17	3.17	3.17	96.83
0.425	2.22	2.22	5.39	94.61
0.075	0.24	0.24	5.63	94.37
Total	100.00			

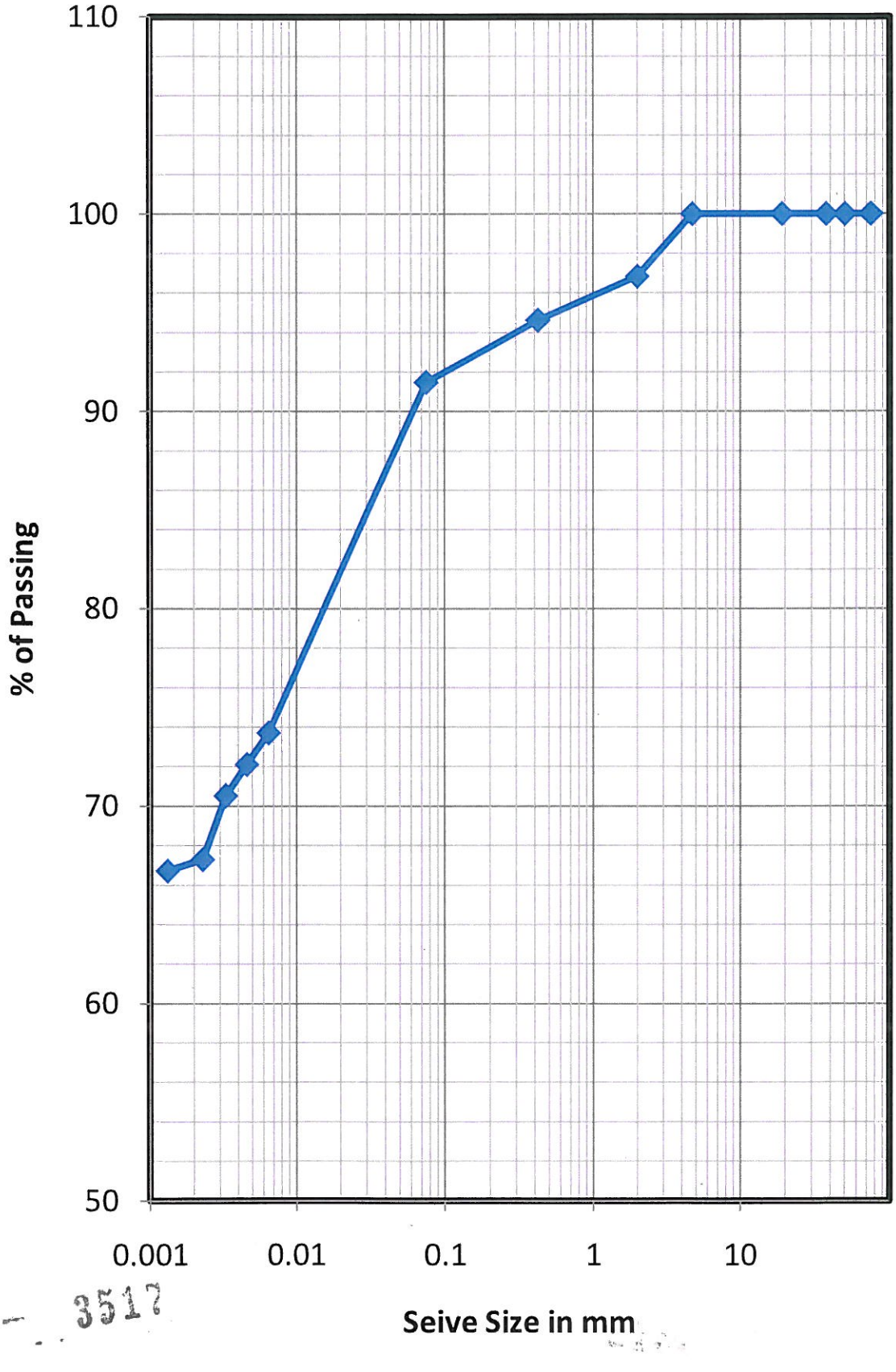
Gravel Content (%)= **0.00**

Sand Content (%) = 5.63 **Silt and clay %** 94.37

Remarks :-

Lab Manager 3519 Checked By

Grain Size Distribution Curve
BH-1,D-22.5m



3517

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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	24.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 78.25

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	35.76	35.76	35.76	64.24
0.425	31.87	31.87	67.63	32.37
0.075	10.63	10.63	78.26	21.74
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 78.26 **Silt and clay %** 21.74

Remarks :-

Lab Manager 3513 Checked By

Arki Techno Consultants (India) Pvt. Ltd

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N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	27.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 0.53

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	0.25	0.25	0.25	99.75
0.425	0.22	0.22	0.47	99.53
0.075	0.06	0.06	0.53	99.47
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 0.53 **Silt and clay %** 99.47

Remarks :-

Lab Manager

3513

Checked By

Arki Techno Consultants (India) Pvt. Ltd

ARKITECHNO CONSULTANTS (INDIA) PVT. LTD.

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	33.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 0.63

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	0.30	0.30	0.30	99.70
0.425	0.26	0.26	0.56	99.44
0.075	0.08	0.08	0.64	99.36
Total	100.00			

Gravel Content (%)= **0.00**

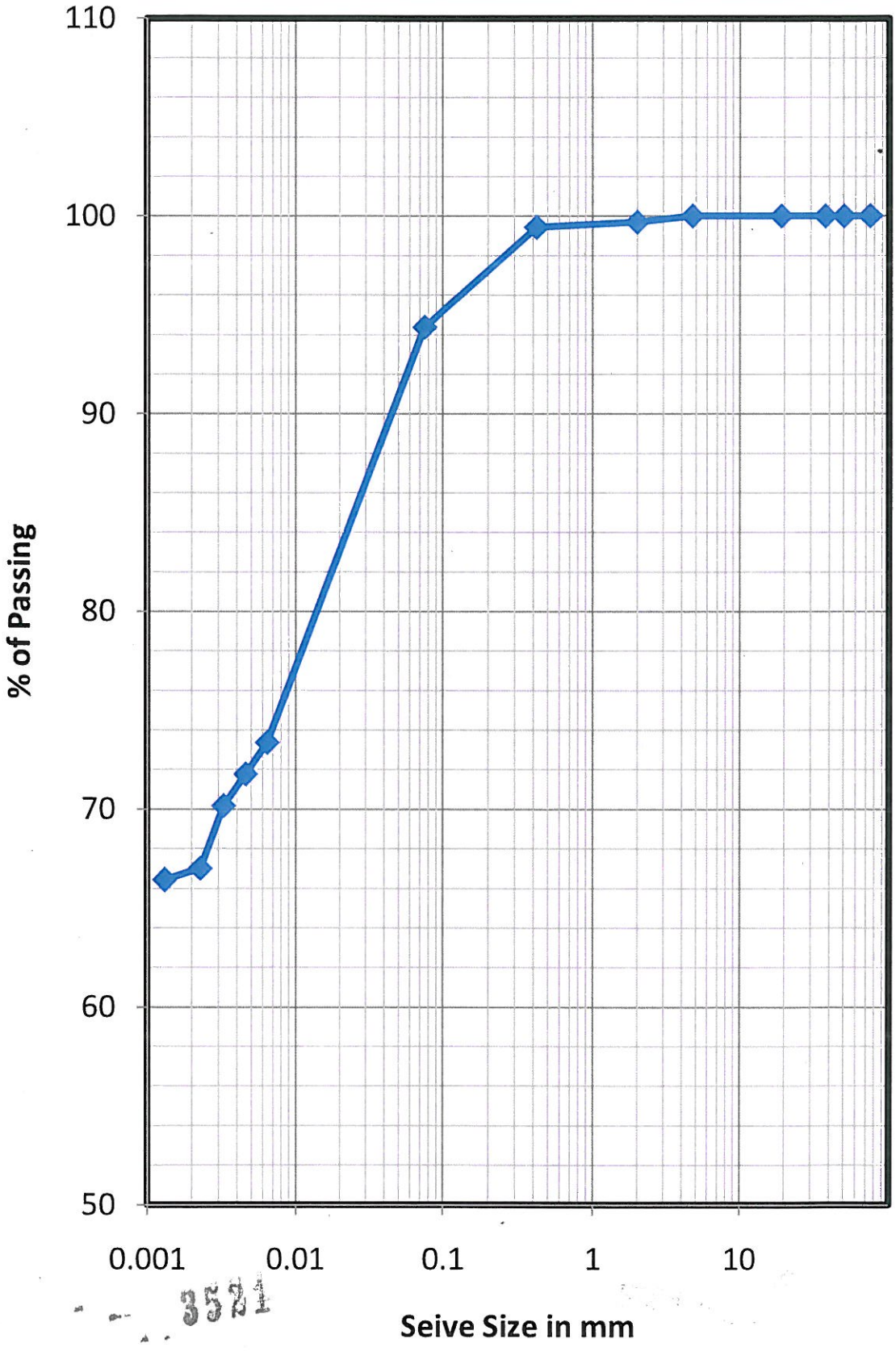
Sand Content (%) = 0.64 **Silt and clay %** 99.36

Remarks :-

3520

Lab Manager Checked By

Grain Size Distribution Curve
BH-1,D-33.0m



3521

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ARKITECHNO CONSULTANTS (INDIA) PVT. LTD.

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	39.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 0.29

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	0.15	0.15	0.15	99.85
0.425	0.11	0.11	0.26	99.74
0.075	0.03	0.03	0.29	99.71
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 0.29 **Silt and clay %** 99.71

Remarks :-

3522

Lab Manager

Checked By

Arki Techno Consultants (India) Pvt. Ltd

ARKITECHNO CONSULTANTS (INDIA) PVT. LTD.

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	40.5m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 0.40

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	0.20	0.20	0.20	99.80
0.425	0.16	0.16	0.36	99.64
0.075	0.05	0.05	0.41	99.59
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 0.41 **Silt and clay %** 99.59

Remarks :-

Lab Manager

3523

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Arki Techno Consultants (India) Pvt. Ltd

ARKITECHNO CONSULTANTS (INDIA) PVT. LTD.

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL AS PER IS 2720 (P- 4)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date of Testing	:	27.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T. K. Das
Depth	:	50.0m	Tested by	:	D.Mohanty

Weight of oven dried sample before washing (gm) :- 100.00

Weight of oven dried sample after washing (gm) :- 68.01

Sieve Size mm	Individual Weight Retained in gm.	Individual Wt. Retained In %	Cummulative Wt Retained In %	Cummulative Wt Passing In %
75	0	0.00	0.00	100.00
50	0	0.00	0.00	100.00
37.5	0	0.00	0.00	100.00
19	0	0.00	0.00	100.00
4.75	0.00	0.00	0.00	100.00
2.00	31.57	31.57	31.57	68.43
0.425	25.84	25.84	57.41	42.59
0.075	10.60	10.60	68.01	31.99
Total	100.00			

Gravel Content (%)= **0.00**

Sand Content (%) = 68.01 **Silt and clay %** 31.99

Remarks :-

Lab Manager

3321

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ARKI TECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL - HYDROMETER METHOD

Client : DFCC

Project Name : G.I For 3 Nos. Important Bridges

Type of Sample : UDS

Location : BH-1(Markanda River- Ambala)

Sampled by : T.K.Das

Depth : 10.5m

Date of Testing : 28.09.12

Tested by : D.Mohanty

(I)	Percentage of 75 micron passing (from sieve analysis)		94.32
(II)	Mass of dry soil passing 2mm sieve taken (gm)		50
(III)	Mass of dry soil retained on 75micron sieve (gm)		2.8
(IV)	Mass of dry soil passing 75 micron Wh (gm)		47.2
(V)	Specific gravity of soil grains, Gs		2.67
(VI)	Top Meniscus reading on hydrometer stem		2.0
(VII)	Bottom meniscus reading on hydrometer stem		2.5
(VIII)	Meniscuss correction, Cm = + [(VII) - (VI)]		0.5
a	Hydrometer No	1	
	Volume of Hydrometer V (cm3)	50	
	Height of bulb (h) in cm	16.5	
b	Sedimentation Jar No	1	
	Cross sectional area of jar (A) in cm2	35.714	

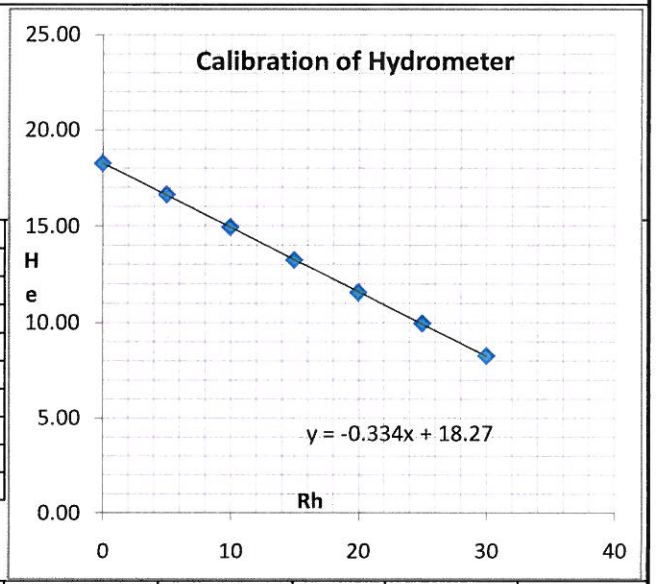
CALIBRATION OF HYDROMETER

(Rh)	H (cm)	He (cm)
30	0.7	8.25
25	2.4	9.95
20	4.0	11.55
15	5.7	13.25
10	7.4	14.95
5	9.1	16.65
0	10.7	18.25
-5	12.4	19.95

Rh = hydrometer Reading

H = height corresponding to Rh

He = Effective height = H + 0.5*(h -V/A)



Time	Elapsed Time (min)	Hydrometer Reading (Rh)	Temperature (o C)	Composite Correction +/- C	Effective depth h (cm)	Rc1 = Rh + Cm	Sqrt (h/t)	Viscosity (gm/cm2)	Factor M	Particle 'C' (cm) (8) x (10)	Rc2 = Rh + C (3) + (5)	Factor N	% Finner w.r.t Wd F (12) x (13)	% Finner w.r.t total mass (14) x (I)/100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.30	0.5	29.24	29	-2.0	8.50	29.74	0.532	0.000008341	0.012240833	0.00651715	27.24	3.390	92.35	87.10
	1	29.00	29	-2.0	8.58	29.50	0.378	0.000008341	0.012240833	0.00462999	27.00	3.390	91.53	86.34
	2	28.00	29	-2.0	8.92	28.50	0.273	0.000008341	0.012240833	0.00333698	26.00	3.390	88.14	83.14
	4	27.00	29	-2.0	9.25	27.50	0.196	0.000008341	0.012240833	0.00240338	25.00	3.390	84.75	79.94
	8	26.50	29	-2.0	9.42	27.00	0.140	0.000008341	0.012240833	0.00171472	24.50	3.390	83.06	78.34
	15	26.00	29	-2.0	9.59	26.50	0.103	0.000008341	0.012240833	0.00126331	24.00	3.390	81.36	76.74
	30	25.50	29	-2.0	9.75	26.00	0.074	0.000008341	0.012240833	0.00090104	23.50	3.390	79.67	75.14
	60	25.00	29	-2.0	9.92	25.50	0.052	0.000008341	0.012240833	0.00064256	23.00	3.390	77.97	73.54
	120	24.00	29	-2.0	10.25	24.50	0.038	0.000008341	0.012240833	0.00046195	22.00	3.390	74.58	70.35
	240	23.00	29	-2.0	10.59	23.50	0.027	0.000008341	0.012240833	0.00033192	21.00	3.390	71.19	67.15
	480	22.50	32	-2.0	10.76	23.00	0.019	0.000007821	0.011853101	0.00022906	20.50	3.390	69.50	65.55
	1440	22.30	32	-2.0	10.82	22.80	0.011	0.000007821	0.011853101	0.000132656	20.30	3.390	68.82	64.91

Lab Manager

Checked By

ARKI TECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL - HYDROMETER METHOD

Client : DFCC

Project Name : G.I For 3 Nos. Important Bridges

Type of Sample : SPT

Location : BH-1(Markanda River- Ambala)

Sampled by : T.K.Das

Depth : 12.0m

Date of Testing : 28.09.12

Tested by : D.Mohanty

(I)	Percentage of 75 micron passing (from sieve analysis)		94.53
(II)	Mass of dry soil passing 2mm sieve taken (gm)		50
(III)	Mass of dry soil retained on 75micron sieve (gm)		2.7
(IV)	Mass of dry soil passing 75 micron Wh (gm)		47.3
(V)	Specific gravity of soil grains, Gs		2.66
(VI)	Top Meniscus reading on hydrometer stem		2.0
(VII)	Bottom meniscus reading on hydrometer stem		2.5
(VIII)	Meniscuss correction, Cm = + [(VII) - (VI)]		0.5
a	Hydrometer No	1	
	Volume of Hydrometer V (cm3)	50	
	Height of bulb (h) in cm	16.5	
b	Sedimentation Jar No	1	
	Cross sectional area of jar (A) in cm2	35.714	

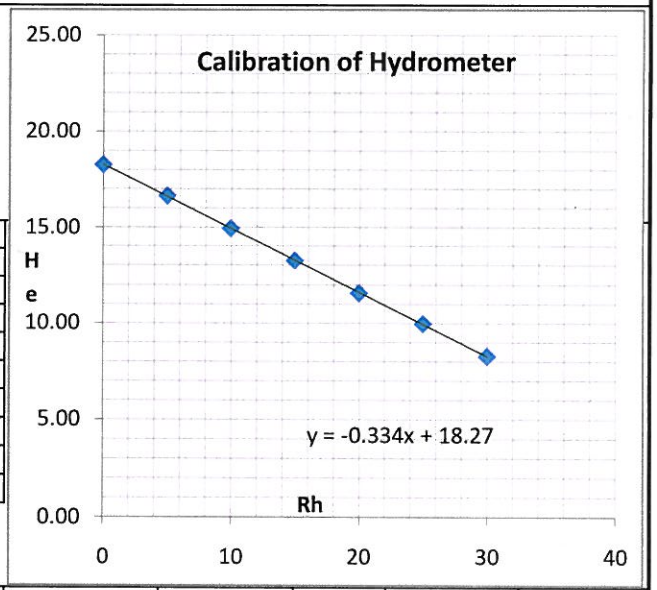
CALIBRATION OF HYDROMETER

(Rh)	H (cm)	He (cm)
30	0.7	8.25
25	2.4	9.95
20	4.0	11.55
15	5.7	13.25
10	7.4	14.95
5	9.1	16.65
0	10.7	18.25
-5	12.4	19.95

Rh = hydrometer Reading

H = height corresponding to Rh

He = Effective height = H + 0.5*(h -V/A)



Time	Elapsed Time (min)	Hydrometer Reading (Rh)	Temperature (o C)	Composite Correction +/- C	Effective depth h (cm)	Rc1 = Rh + Cm	Sqrt (h/t)	Viscosity (gm/cm2)	Factor M	Particle 'C' (cm) (8) x (10)	Rc2 = Rh + C (3) + (5)	Factor N	% Finner w.r.t Wd F (12) x (13)	% Finner w.r.t total mass (14) x (I)/100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.30	0.5	29.31	29	-2.0	8.48	29.81	0.532	0.000008341	0.012277647	0.00652776	27.31	3.390	92.59	87.52
	1	29.00	29	-2.0	8.58	29.50	0.378	0.000008341	0.012277647	0.00464392	27.00	3.390	91.54	86.53
	2	28.00	29	-2.0	8.92	28.50	0.273	0.000008341	0.012277647	0.00334702	26.00	3.390	88.15	83.33
	4	27.00	29	-2.0	9.25	27.50	0.196	0.000008341	0.012277647	0.00241061	25.00	3.390	84.76	80.12
	8	26.50	29	-2.0	9.42	27.00	0.140	0.000008341	0.012277647	0.00171988	24.50	3.390	83.06	78.52
	15	26.00	29	-2.0	9.59	26.50	0.103	0.000008341	0.012277647	0.00126711	24.00	3.390	81.37	76.92
	30	25.50	29	-2.0	9.75	26.00	0.074	0.000008341	0.012277647	0.00090375	23.50	3.390	79.67	75.31
	60	25.00	29	-2.0	9.92	25.50	0.052	0.000008341	0.012277647	0.00064450	23.00	3.390	77.98	73.71
	120	24.50	29	-2.0	10.09	25.00	0.037	0.000008341	0.012277647	0.00045955	22.50	3.390	76.28	72.11
	240	24.00	29	-2.0	10.25	24.50	0.027	0.000008341	0.012277647	0.00032763	22.00	3.390	74.59	70.51
	480	23.00	32	-2.0	10.59	23.50	0.019	0.000007821	0.011888750	0.00022795	21.00	3.390	71.20	67.30
	1440	22.88	32	-2.0	10.63	23.38	0.011	0.000007821	0.011888750	0.000131862	20.88	3.390	70.78	66.91

Lab Manager

Checked By

ARKI TECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL - HYDROMETER METHOD

Client : DFCC

Project Name : G.I For 3 Nos. Important Bridges

Type of Sample : UDS

Location : BH-1(Markanda River- Ambala)

Sampled by : T.K.Das

Depth : 13.5m

Date of Testing : 28.09.12

Tested by : D.Mohanty

(I)	Percentage of 75 micron passing (from sieve analysis)		93.68
(II)	Mass of dry soil passing 2mm sieve taken (gm)		50
(III)	Mass of dry soil retained on 75micron sieve (gm)		3.2
(IV)	Mass of dry soil passing 75 micron Wh (gm)		46.8
(V)	Specific gravity of soil grains, Gs		2.66
(VI)	Top Meniscus reading on hydrometer stem		2.0
(VII)	Bottom meniscus reading on hydrometer stem		2.5
(VIII)	Meniscuss correction, Cm = + [(VII) - (VI)]		0.5
a	Hydrometer No	1	
	Volume of Hydrometer V (cm3)	50	
	Height of bulb (h) in cm	16.5	
b	Sedimentation Jar No	1	
	Cross sectional area of jar (A) in cm2	35.714	

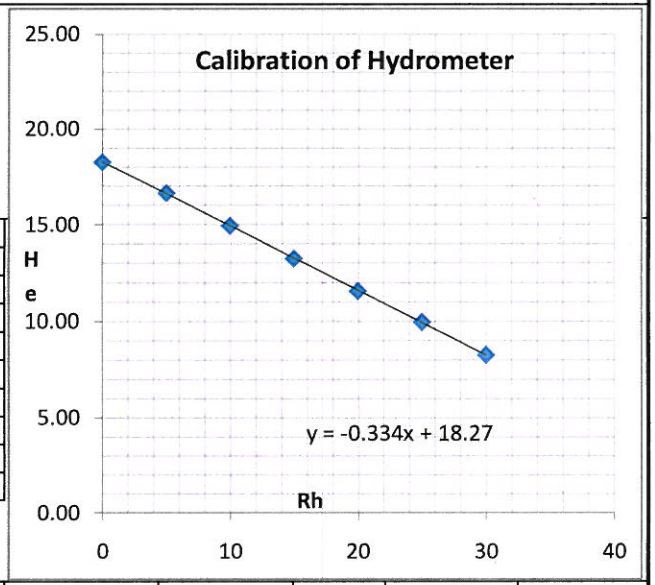
CALIBRATION OF HYDROMETER

(Rh)	H (cm)	He (cm)
30	0.7	8.25
25	2.4	9.95
20	4.0	11.55
15	5.7	13.25
10	7.4	14.95
5	9.1	16.65
0	10.7	18.25
-5	12.4	19.95

Rh = hydrometer Reading

H = height corresponding to Rh

He = Effective height = H + 0.5*(h -V/A)



Time	Elapsed Time (min)	Hydrometer Reading (Rh)	Temperature (o C)	Composite Correction +/- C	Effective depth h (cm)	Rc1 = Rh + Cm	Sqrt (h/t)	Viscosity (gm/cm2)	Factor M	Particle 'C' (cm) (8) x (10)	Rc2 = Rh + C (3) + (5)	Factor N	% Finner w.r.t Wd F (12) x (13)	% Finner w.r.t total mass (14) x (I)/100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.30	0.5	29.86	29	-2.0	8.30	30.36	0.526	0.000008341	0.012277647	0.00645667	27.86	3.421	95.31	89.29
	1	29.50	29	-2.0	8.42	30.00	0.375	0.000008341	0.012277647	0.00459852	27.50	3.421	94.08	88.13
	2	28.50	29	-2.0	8.75	29.00	0.270	0.000008341	0.012277647	0.00331553	26.50	3.421	90.66	84.93
	4	27.50	29	-2.0	9.09	28.00	0.195	0.000008341	0.012277647	0.00238876	25.50	3.421	87.24	81.72
	8	26.50	29	-2.0	9.42	27.00	0.140	0.000008341	0.012277647	0.00171988	24.50	3.421	83.82	78.52
	15	26.00	29	-2.0	9.59	26.50	0.103	0.000008341	0.012277647	0.00126711	24.00	3.421	82.10	76.92
	30	25.50	29	-2.0	9.75	26.00	0.074	0.000008341	0.012277647	0.00090375	23.50	3.421	80.39	75.31
	60	25.00	29	-2.0	9.92	25.50	0.052	0.000008341	0.012277647	0.00064450	23.00	3.421	78.68	73.71
	120	24.50	29	-2.0	10.09	25.00	0.037	0.000008341	0.012277647	0.00045955	22.50	3.421	76.97	72.11
	240	23.50	29	-2.0	10.42	24.00	0.027	0.000008341	0.012277647	0.00033028	21.50	3.421	73.55	68.90
	480	22.50	32	-2.0	10.76	23.00	0.019	0.000007821	0.011888750	0.00022974	20.50	3.421	70.13	65.70
	1440	22.14	32	-2.0	10.88	22.64	0.011	0.000007821	0.011888750	0.000133386	20.14	3.421	68.89	64.54

Lab Manager

Checked By

ARKI TECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL - HYDROMETER METHOD

Client : DFCC

Project Name : G.I For 3 Nos. Important Bridges

Type of Sample : SPT

Location : BH-1(Markanda River- Ambala)

Sampled by : T.K.Das

Depth : 18.0m

Date of Testing : 28.09.12

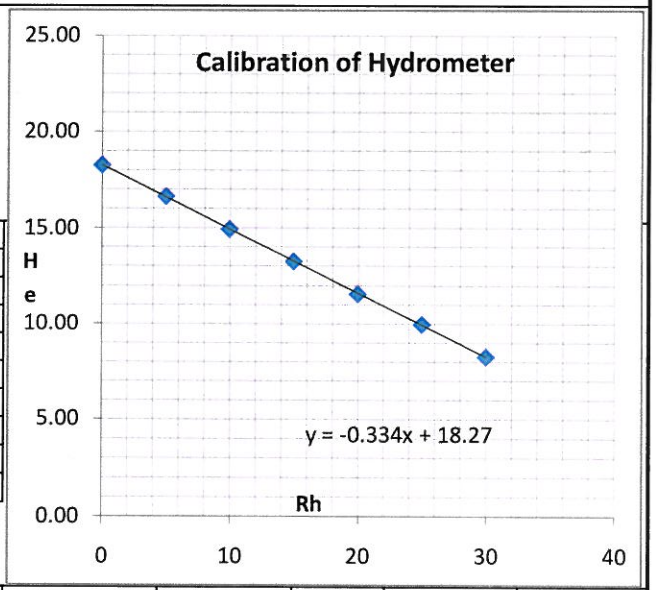
Tested by : D.Mohanty

(I)	Percentage of 75 micron passing (from sieve analysis)		93.82
(II)	Mass of dry soil passing 2mm sieve taken (gm)		50
(III)	Mass of dry soil retained on 75micron sieve (gm)		3.1
(IV)	Mass of dry soil passing 75 micron Wh (gm)		46.9
(V)	Specific gravity of soil grains, Gs		2.65
(VI)	Top Meniscus reading on hydrometer stem		2.0
(VII)	Bottom meniscus reading on hydrometer stem		2.5
(VIII)	Meniscuss correction, Cm = + [(VII) - (VI)]		0.5
a	Hydrometer No	1	
	Volume of Hydrometer V (cm3)	50	
	Height of bulb (h) in cm	16.5	
b	Sedimentation Jar No	1	
	Cross sectional area of jar (A) in cm2	35.714	

CALIBRATION OF HYDROMETER

(Rh)	H (cm)	He (cm)
30	0.7	8.25
25	2.4	9.95
20	4.0	11.55
15	5.7	13.25
10	7.4	14.95
5	9.1	16.65
0	10.7	18.25
-5	12.4	19.95

Rh = hydrometer Reading
H = height corresponding to Rh
He = Effective height = H + 0.5*(h -V/A)



Time	Elapsed Time (min)	Hydrometer Reading (Rh)	Temperature (o C)	Composite Correction +/- C	Effective depth h (cm)	Rc1 = Rh + Cm	Sqrt (h/t)	Viscosity (gm/cm2)	Factor M	Particle 'C' (cm) (8) x (10)	Rc2 = Rh + C (3) + (5)	Factor N	% Finner w.r.t Wd F (12) x (13)	% Finner w.r.t total mass (14) x (I)/100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.30	0.5	28.63	29	-2.0	8.71	29.13	0.539	0.000008341	0.012314796	0.00663461	26.63	3.424	91.17	85.54
	1	28.50	29	-2.0	8.75	29.00	0.382	0.000008341	0.012314796	0.00470306	26.50	3.424	90.73	85.12
	2	28.00	29	-2.0	8.92	28.50	0.273	0.000008341	0.012314796	0.00335715	26.00	3.424	89.02	83.52
	4	27.50	29	-2.0	9.09	28.00	0.195	0.000008341	0.012314796	0.00239598	25.50	3.424	87.30	81.91
	8	26.50	29	-2.0	9.42	27.00	0.140	0.000008341	0.012314796	0.00172508	24.50	3.424	83.88	78.70
	15	26.00	29	-2.0	9.59	26.50	0.103	0.000008341	0.012314796	0.00127094	24.00	3.424	82.17	77.09
	30	25.50	29	-2.0	9.75	26.00	0.074	0.000008341	0.012314796	0.00090648	23.50	3.424	80.46	75.48
	60	25.00	29	-2.0	9.92	25.50	0.052	0.000008341	0.012314796	0.00064645	23.00	3.424	78.75	73.88
	120	24.50	29	-2.0	10.09	25.00	0.037	0.000008341	0.012314796	0.00046094	22.50	3.424	77.03	72.27
	240	23.00	29	-2.0	10.59	23.50	0.027	0.000008341	0.012314796	0.00033393	21.00	3.424	71.90	67.45
	480	22.50	32	-2.0	10.76	23.00	0.019	0.000007821	0.011924722	0.00023044	20.50	3.424	70.19	65.85
	1440	22.26	32	-2.0	10.83	22.76	0.011	0.000007821	0.011924722	0.000133538	20.26	3.424	69.37	65.08

Lab Manager

Checked By

ARKI TECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL - HYDROMETER METHOD

Client : DFCC

Project Name : G.I For 3 Nos. Important Bridges

Type of Sample : UDS

Location : BH-1(Markanda River- Ambala)

Sampled by : T.K.Das

Depth : 22.5m

Date of Testing : 28.09.12

Tested by : D.Mohanty

(I)	Percentage of 75 micron passing (from sieve analysis)		94.37
(II)	Mass of dry soil passing 2mm sieve taken (gm)		50
(III)	Mass of dry soil retained on 75micron sieve (gm)		2.8
(IV)	Mass of dry soil passing 75 micron Wh (gm)		47.2
(V)	Specific gravity of soil grains, Gs		2.66
(VI)	Top Meniscus reading on hydrometer stem		2.0
(VII)	Bottom meniscus reading on hydrometer stem		2.5
(VIII)	Meniscuss correction, Cm = + [(VII) - (VI)]		0.5
a	Hydrometer No	1	
	Volume of Hydrometer V (cm3)	50	
	Height of bulb (h) in cm	16.5	
b	Sedimentation Jar No	1	
	Cross sectional area of jar (A) in cm2	35.714	

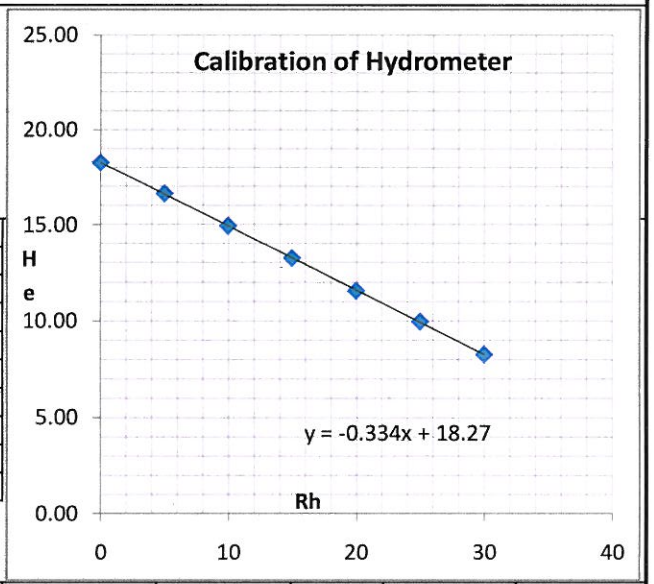
Rh = hydrometer Reading

H = height corresponding to Rh

He = Effective height = H + 0.5*(h -V/A)

CALIBRATION OF HYDROMETER

(Rh)	H (cm)	He (cm)
30	0.7	8.25
25	2.4	9.95
20	4.0	11.55
15	5.7	13.25
10	7.4	14.95
5	9.1	16.65
0	10.7	18.25
-5	12.4	19.95



Time	Elapsed Time (min)	Hydrometer Reading (Rh)	Temperature (o C)	Composite Correction +/- C	Effective depth h (cm)	Rc1 = Rh + Cm	Sqrt (h/t)	Viscosity (gm/cm2)	Factor M	Particle 'C' (cm) (8) x (10)	Rc2 = Rh + C (3) + (5)	Factor N	% Finner w.r.t Wd F (12) x (13)	% Finner w.r.t total mass (14) x (I)/100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.30	0.5	28.64	29	-2.0	8.70	29.14	0.539	0.000008341	0.012277647	0.00661333	26.64	3.396	90.47	85.38
	1	28.50	29	-2.0	8.75	29.00	0.382	0.000008341	0.012277647	0.00468887	26.50	3.396	89.99	84.93
	2	28.00	29	-2.0	8.92	28.50	0.273	0.000008341	0.012277647	0.00334702	26.00	3.396	88.30	83.33
	4	27.50	29	-2.0	9.09	28.00	0.195	0.000008341	0.012277647	0.00238876	25.50	3.396	86.60	81.72
	8	27.00	29	-2.0	9.25	27.50	0.139	0.000008341	0.012277647	0.00170456	25.00	3.396	84.90	80.12
	15	26.50	29	-2.0	9.42	27.00	0.102	0.000008341	0.012277647	0.00125602	24.50	3.396	83.20	78.52
	30	26.00	29	-2.0	9.59	26.50	0.073	0.000008341	0.012277647	0.00089598	24.00	3.396	81.50	76.92
	60	25.00	29	-2.0	9.92	25.50	0.052	0.000008341	0.012277647	0.00064450	23.00	3.396	78.11	73.71
	120	24.50	29	-2.0	10.09	25.00	0.037	0.000008341	0.012277647	0.00045955	22.50	3.396	76.41	72.11
	240	24.00	29	-2.0	10.25	24.50	0.027	0.000008341	0.012277647	0.00032763	22.00	3.396	74.71	70.51
	480	23.00	32	-2.0	10.59	23.50	0.019	0.000007821	0.011888750	0.00022795	21.00	3.396	71.32	67.30
	1440	22.82	32	-2.0	10.65	23.32	0.011	0.000007821	0.011888750	0.000131985	20.82	3.396	70.70	66.72

Lab Manager

Checked By

ARKI TECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL - HYDROMETER METHOD

Client : DFCC

Project Name : G.I For 3 Nos. Important Bridges

Type of Sample : SPT

Location : BH-1(Markanda River- Ambala)

Sampled by : T.K.Das

Depth : 33.0m

Date of Testing : 28.09.12

Tested by : D.Mohanty

(I)	Percentage of 75 micron passing (from sieve analysis)		99.36
(II)	Mass of dry soil passing 2mm sieve taken (gm)		50
(III)	Mass of dry soil retained on 75micron sieve (gm)		0.3
(IV)	Mass of dry soil passing 75 micron Wh (gm)		49.7
(V)	Specific gravity of soil grains, Gs		2.68
(VI)	Top Meniscus reading on hydrometer stem		2.0
(VII)	Bottom meniscus reading on hydrometer stem		2.5
(VIII)	Meniscuss correction, Cm = + [(VII) - (VI)]		0.5
a	Hydrometer No	1	
	Volume of Hydrometer V (cm3)	50	
	Height of bulb (h) in cm	16.5	
b	Sedimentation Jar No	1	
	Cross sectional area of jar (A) in cm2	35.714	

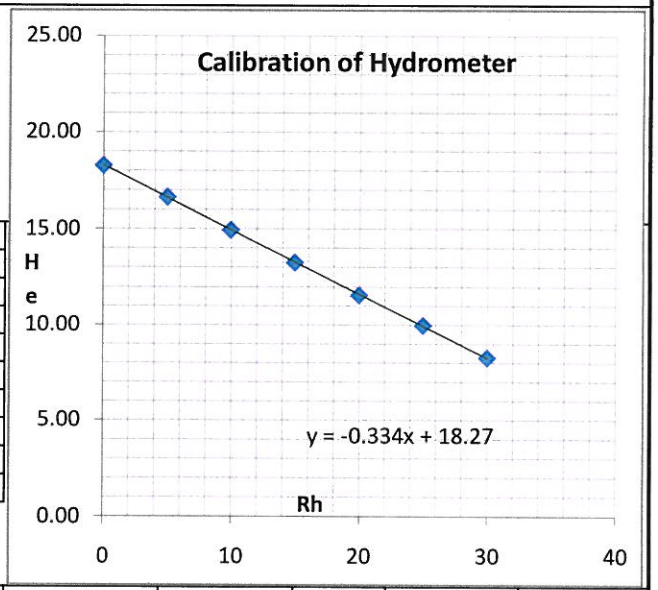
CALIBRATION OF HYDROMETER

(Rh)	H (cm)	He (cm)
30	0.7	8.25
25	2.4	9.95
20	4.0	11.55
15	5.7	13.25
10	7.4	14.95
5	9.1	16.65
0	10.7	18.25
-5	12.4	19.95

Rh = hydrometer Reading

H = height corresponding to Rh

He = Effective height = H + 0.5*(h -V/A)



Time	Elapsed Time (min)	Hydrometer Reading (Rh)	Temperature (o C)	Composite Correction +/- C	Effective depth h (cm)	Rc1 = Rh + Cm	Sqrt (h/t)	Viscosity (gm/cm2)	Factor M	Particle 'C' (cm) (8) x (10)	Rc2 = Rh + C (3) + (5)	Factor N	% Finner w.r.t Wd F (12) x (13)	% Finner w.r.t total mass (14) x (I)/100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.30	0.5	29.57	29	-2.0	8.39	30.07	0.529	0.000008341	0.012204347	0.00645548	27.57	3.211	88.53	87.96
	1	29.50	29	-2.0	8.42	30.00	0.375	0.000008341	0.012204347	0.00457107	27.50	3.211	88.30	87.74
	2	29.00	29	-2.0	8.58	29.50	0.267	0.000008341	0.012204347	0.00326414	27.00	3.211	86.70	86.14
	4	28.50	29	-2.0	8.75	29.00	0.191	0.000008341	0.012204347	0.00233044	26.50	3.211	85.09	84.55
	8	28.00	29	-2.0	8.92	28.50	0.136	0.000008341	0.012204347	0.00166352	26.00	3.211	83.49	82.95
	15	27.00	29	-2.0	9.25	27.50	0.101	0.000008341	0.012204347	0.00123740	25.00	3.211	80.28	79.76
	30	26.50	29	-2.0	9.42	27.00	0.072	0.000008341	0.012204347	0.00088284	24.50	3.211	78.67	78.17
	60	25.00	29	-2.0	9.92	25.50	0.052	0.000008341	0.012204347	0.00064065	23.00	3.211	73.85	73.38
	120	24.50	29	-2.0	10.09	25.00	0.037	0.000008341	0.012204347	0.00045680	22.50	3.211	72.25	71.79
	240	24.00	29	-2.0	10.25	24.50	0.027	0.000008341	0.012204347	0.00032567	22.00	3.211	70.64	70.19
	480	23.00	32	-2.0	10.59	23.50	0.019	0.000007821	0.011817771	0.00022659	21.00	3.211	67.43	67.00
	1440	22.82	32	-2.0	10.65	23.32	0.011	0.000007821	0.011817771	0.000131197	20.82	3.211	66.85	66.42

Lab Manager

Checked By

ARKI TECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

GRAIN SIZE ANALYSIS OF SOIL - HYDROMETER METHOD

Client : DFCC

Project Name : G.I For 3 Nos. Important Bridges

Type of Sample : SPT

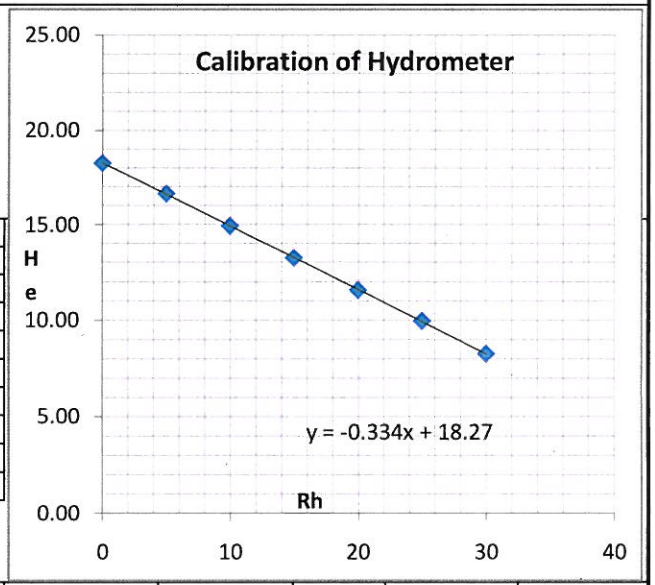
Location : BH-1(Markanda River- Ambala)

Sampled by : T.K.Das

Depth : 40.5m

Date of Testing : 28.09.12

Tested by : D.Mohanty



(I)	Percentage of 75 micron passing (from sieve analysis)		99.59
(II)	Mass of dry soil passing 2mm sieve taken (gm)		50
(III)	Mass of dry soil retained on 75micron sieve (gm)		0.2
(IV)	Mass of dry soil passing 75 micron Wh (gm)		49.8
(V)	Specific gravity of soil grains, Gs		2.66
(VI)	Top Meniscus reading on hydrometer stem		2.0
(VII)	Bottom meniscus reading on hydrometer stem		2.5
(VIII)	Meniscuss correction, Cm = + [(VII) - (VI)]		0.5
a	Hydrometer No	1	
	Volume of Hydrometer V (cm3)	50	
	Height of bulb (h) in cm	16.5	
b	Sedimentation Jar No	1	
	Cross sectional area of jar (A) in cm2	35.714	

CALIBRATION OF HYDROMETER

(Rh)	H (cm)	He (cm)
30	0.7	8.25
25	2.4	9.95
20	4.0	11.55
15	5.7	13.25
10	7.4	14.95
5	9.1	16.65
0	10.7	18.25
-5	12.4	19.95

Rh = hydrometer Reading

H = height corresponding to Rh

He = Effective height = H + 0.5*(h -V/A)

Time	Elapsed Time (min)	Hydrometer Reading (Rh)	Temperature (o C)	Composite Correction +/- C	Effective depth h (cm)	Rc1 = Rh + Cm	Sqrt (h/t)	Viscosity (gm/cm2)	Factor M	Particle 'C' (cm) (8) x (10)	Rc2 = Rh + C (3) + (5)	Factor N	% Finner w.r.t Wd F (12) x (13)	% Finner w.r.t total mass (14) x (I)/100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10.30	0.5	29.87	29	-2.0	8.29	30.37	0.526	0.000008341	0.012277647	0.00645537	27.87	3.218	89.69	89.32
	1	29.50	29	-2.0	8.42	30.00	0.375	0.000008341	0.012277647	0.00459852	27.50	3.218	88.50	88.13
	2	29.50	29	-2.0	8.42	30.00	0.265	0.000008341	0.012277647	0.00325165	27.50	3.218	88.50	88.13
	4	29.00	29	-2.0	8.58	29.50	0.189	0.000008341	0.012277647	0.00232196	27.00	3.218	86.89	86.53
	8	29.00	29	-2.0	8.58	29.50	0.134	0.000008341	0.012277647	0.00164187	27.00	3.218	86.89	86.53
	15	29.00	29	-2.0	8.58	29.50	0.098	0.000008341	0.012277647	0.00119905	27.00	3.218	86.89	86.53
	30	28.50	29	-2.0	8.75	29.00	0.070	0.000008341	0.012277647	0.00085607	26.50	3.218	85.28	84.93
	60	28.50	29	-2.0	8.75	29.00	0.049	0.000008341	0.012277647	0.00060533	26.50	3.218	85.28	84.93
	120	28.50	29	-2.0	8.75	29.00	0.035	0.000008341	0.012277647	0.00042803	26.50	3.218	85.28	84.93
	240	28.00	29	-2.0	8.92	28.50	0.025	0.000008341	0.012277647	0.00030554	26.00	3.218	83.67	83.33
	480	28.00	32	-2.0	8.92	28.50	0.018	0.000007821	0.011888750	0.00020921	26.00	3.218	83.67	83.33
	1440	27.92	32	-2.0	8.94	28.42	0.010	0.000007821	0.011888750	0.000120958	25.92	3.218	83.42	83.08

Lab Manager

Checked By

Arki Techno Consultants (India) Pvt.Ltd

ARKITECHNO

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

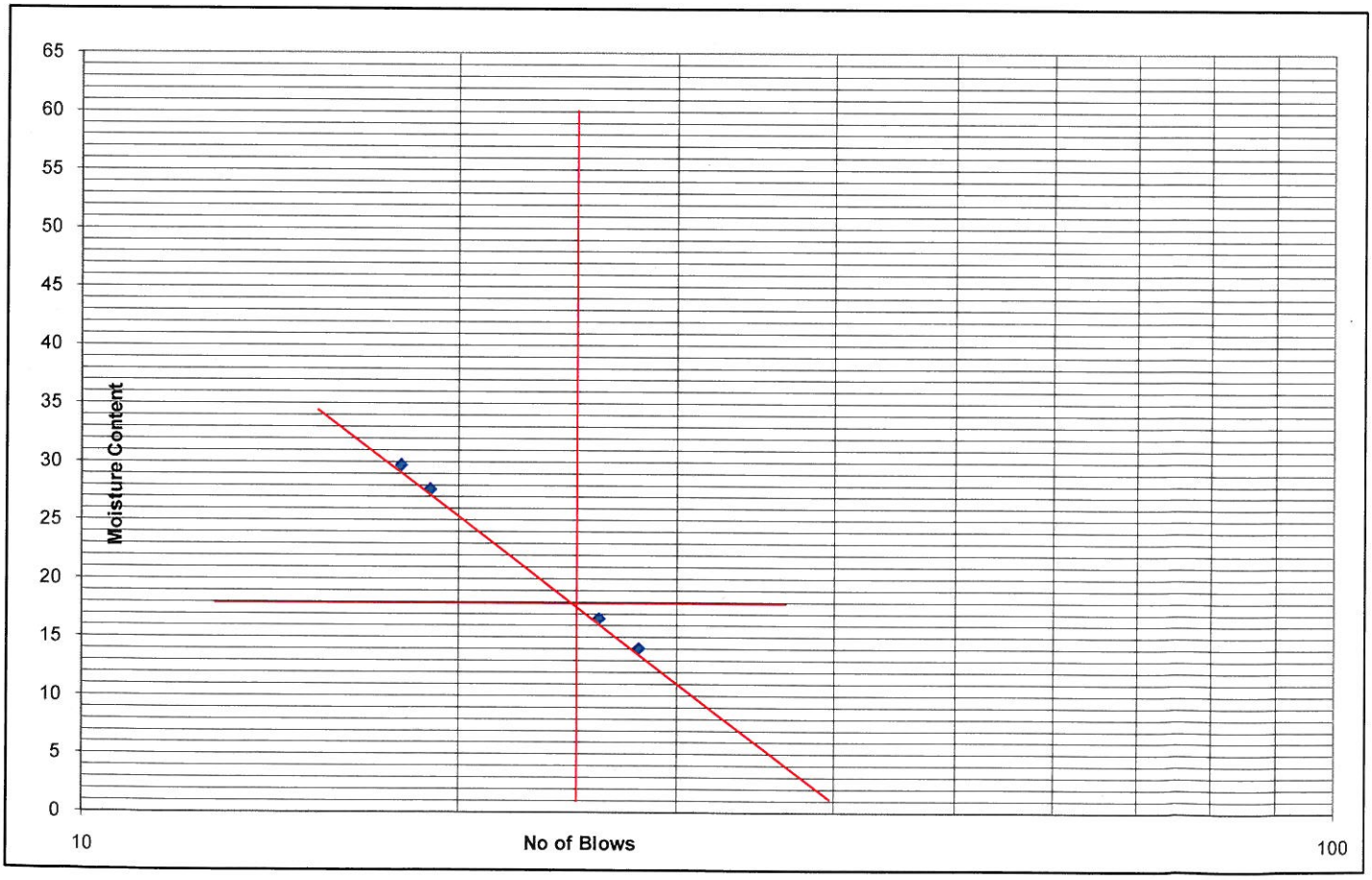
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	4.5m	Tested by	:	D.Mohanty

Number of Blows	28	26	19	18	Plastic Limit	
Container No.	C19	C20	C21	C22	NP	
Container Weight (gm) (W1)	30.48	35.24	37.88	34.61		
Container + Wt. of wet soil (gm) (W2)	84.58	97.14	98.85	102.77		
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.91	88.32	85.65	87.16		
Wt. Of water (gm) (W2-W1)-(W3-W1)	6.67	8.82	13.20	15.61		
Wt. of oven dry soil (gm) (W3-W1)	47.43	53.08	47.77	52.55		
Moisture Content (%)= (W2-W1)-(W3-W1)]/(W3-W1) X 100	**14.07**	**16.61**	**27.64**	**29.71**		

Result Summary

Liquid Limit (WL)	18	%
Plastic Limit (Wp)	_	%
Plasticity Index (Ip)	_	%



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Arki Techno Consultants (India) Pvt.Ltd

ARKITECHNO

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

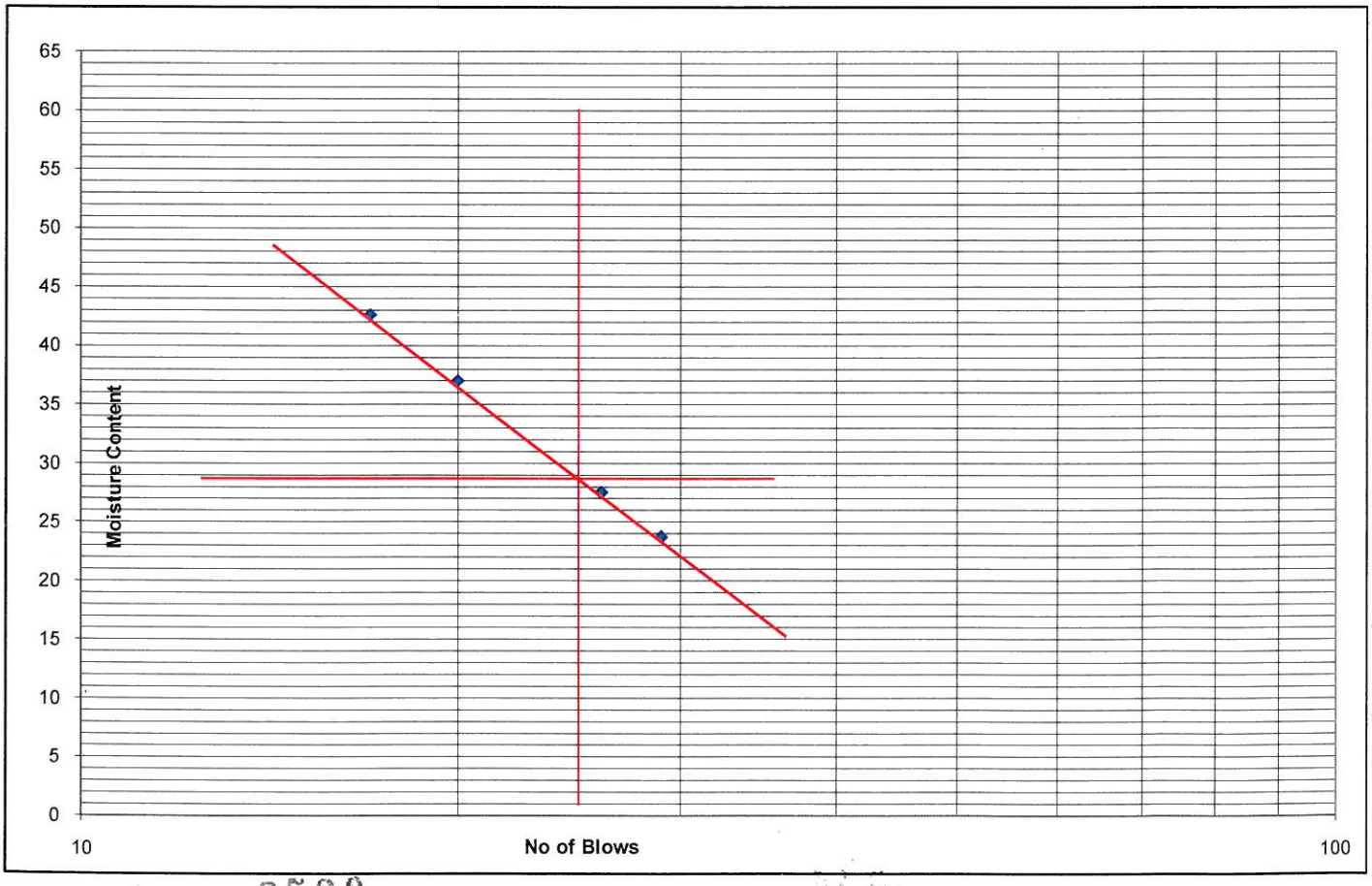
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	7.5m	Tested by	:	D.Mohanty

Number of Blows	29	26	20	17	Plastic Limit	
Container No.	C7	C8	C9	C10	C11	C12
Container Weight (gm) (W1)	32.58	37.21	33.14	35.42	31.85	36.97
Container + Wt. of wet soil (gm) (W2)	88.50	102.88	105.21	109.21	89.54	89.02
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.78	88.70	85.75	87.16	81.63	80.67
Wt. Of water (gm) (W2-W1)-(W3-W1)	10.72	14.18	19.47	22.05	7.91	8.35
Wt. of oven dry soil (gm) (W3-W1)	45.20	51.49	52.61	51.74	49.78	43.70
Moisture Content (%)= [(W2-W1)-(W3-W1)]/(W3-W1) X 100	**23.71**	**27.53**	**37.01**	**42.62**	**17.54**	**17.40**

Result Summary

Liquid Limit (WL)	29	%
Plastic Limit (Wp)	17	%
Plasticity Index (Ip)	12	%



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Arki Techno Consultants (India) Pvt.Ltd

ARKITECHNO

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

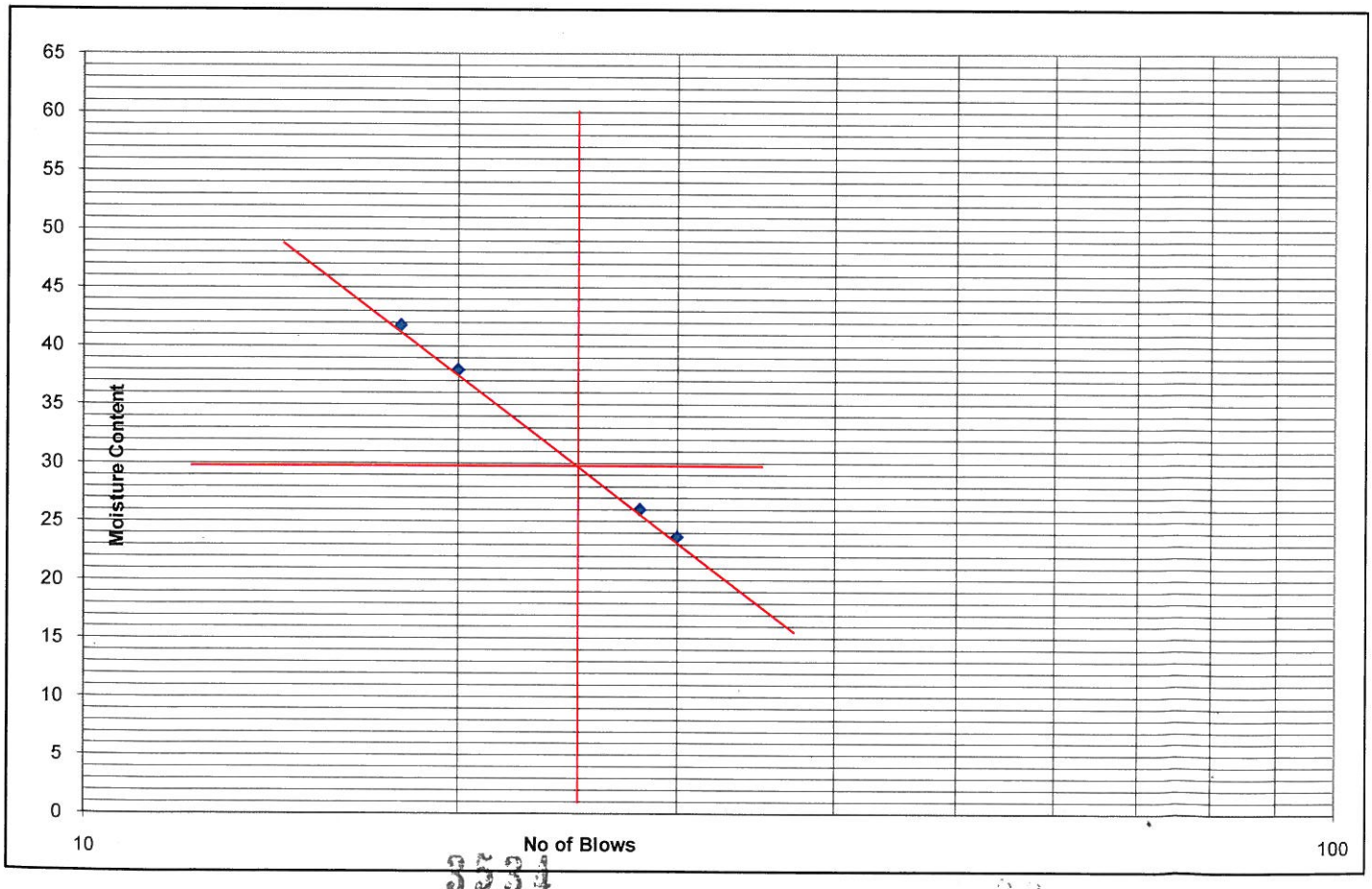
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	10.5m	Tested by	:	D.Mohanty

Number of Blows	30	28	20	18	Plastic Limit	
Container No.	C13	C14	C9	C16	C17	C18
Container Weight (gm) (W1)	39.64	36.34	33.14	32.28	30.76	32.24
Container + Wt. of wet soil (gm) (W2)	86.82	102.52	105.70	109.95	90.44	88.03
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.78	88.84	85.75	87.07	82.04	80.89
Wt. Of water (gm) (W2-W1)-(W3-W1)	9.04	13.68	19.96	22.88	8.40	7.13
Wt. of oven dry soil (gm) (W3-W1)	38.15	52.50	52.61	54.79	51.28	48.65
Moisture Content (%)= (W2-W1)-(W3-W1)]/(W3-W1) X 100	**23.70**	**26.05**	**37.94**	**41.76**	**16.37**	**14.66**

Result Summary

Liquid Limit (WL)	30	%
Plastic Limit (Wp)	16	%
Plasticity Index (Ip)	14	%



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ARKITECHNO CONSULTANTS (INDIA) PVT. LTD.

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

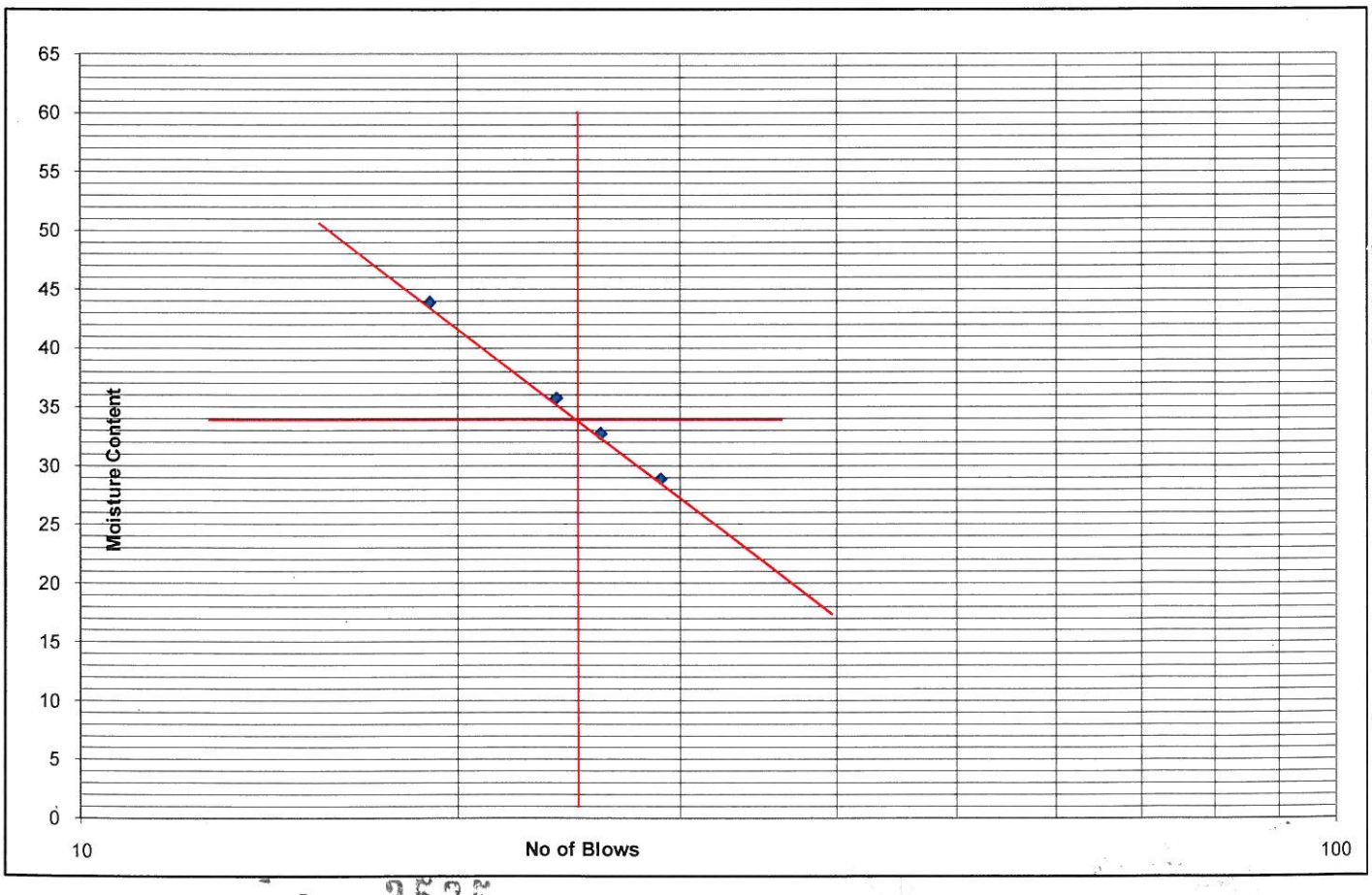
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	12.0m	Tested by	:	D.Mohanty

Number of Blows	29	26	24	19	Plastic Limit	
Container No.	C37	C38	C39	C40	C41	C42
Container Weight (gm) (W1)	38.52	37.22	39.43	30.5	37.6	35.55
Container + Wt. of wet soil (gm) (W2)	88.75	105.78	102.33	112.25	89.89	88.93
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.49	88.88	85.77	87.33	82.13	81.27
Wt. Of water (gm) (W2-W1)-(W3-W1)	11.26	16.90	16.56	24.92	7.76	7.66
Wt. of oven dry soil (gm) (W3-W1)	38.97	51.66	46.34	56.83	44.53	45.72
Moisture Content (%)= [(W2-W1)-(W3-W1)]/(W3-W1) X 100	**28.88**	**32.72**	**35.74**	**43.86**	**17.43**	**16.76**

Result Summary

Liquid Limit (WL)	34	%
Plastic Limit (Wp)	17	%
Plasticity Index (Ip)	17	%



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Arki Techno Consultants (India) Pvt.Ltd

ARKITECHNO

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

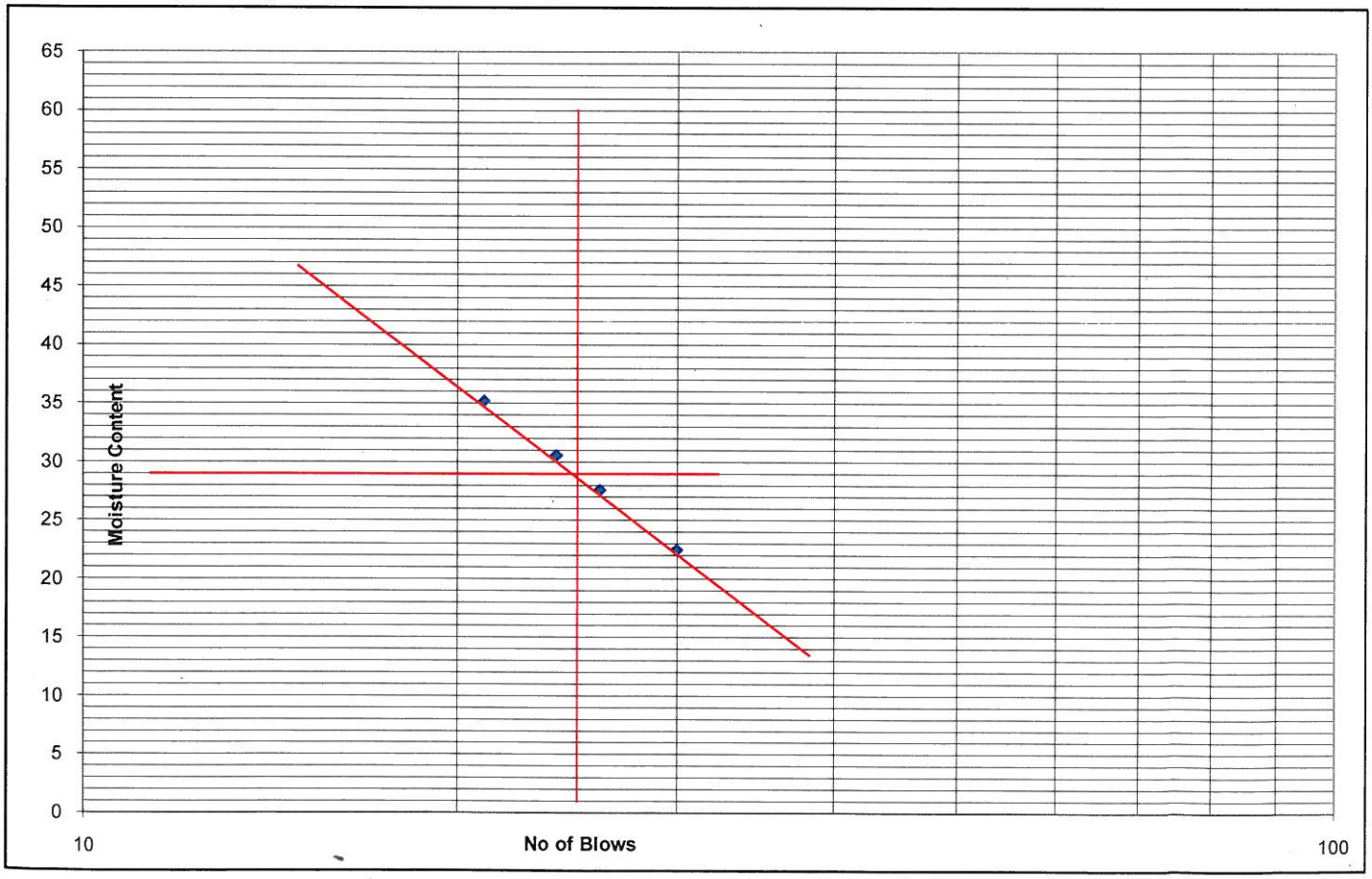
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	13.5m	Tested by	:	D.Mohanty

Number of Blows	30	26	24	21	Plastic Limit	
Container No.	C25	C26	C27	C28	C29	C30
Container Weight (gm) (W1)	35.83	33.36	31.2	39.42	34.86	30.76
Container + Wt. of wet soil (gm) (W2)	86.84	104.87	102.65	104.33	90.34	90.04
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.48	89.40	85.92	87.42	82.35	81.99
Wt. Of water (gm) (W2-W1)-(W3-W1)	9.37	15.47	16.73	16.91	7.99	8.05
Wt. of oven dry soil (gm) (W3-W1)	41.65	56.04	54.72	48.00	47.49	51.23
Moisture Content (%)= (W2-W1)-(W3-W1)]/(W3-W1) X 100	**22.49**	**27.61**	**30.57**	**35.22**	**16.83**	**15.71**

Result Summary

Liquid Limit (WL)	29	%
Plastic Limit (Wp)	16	%
Plasticity Index (Ip)	13	%



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Arki Techno Consultants (India) Pvt.Ltd

ARKITECHNO

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

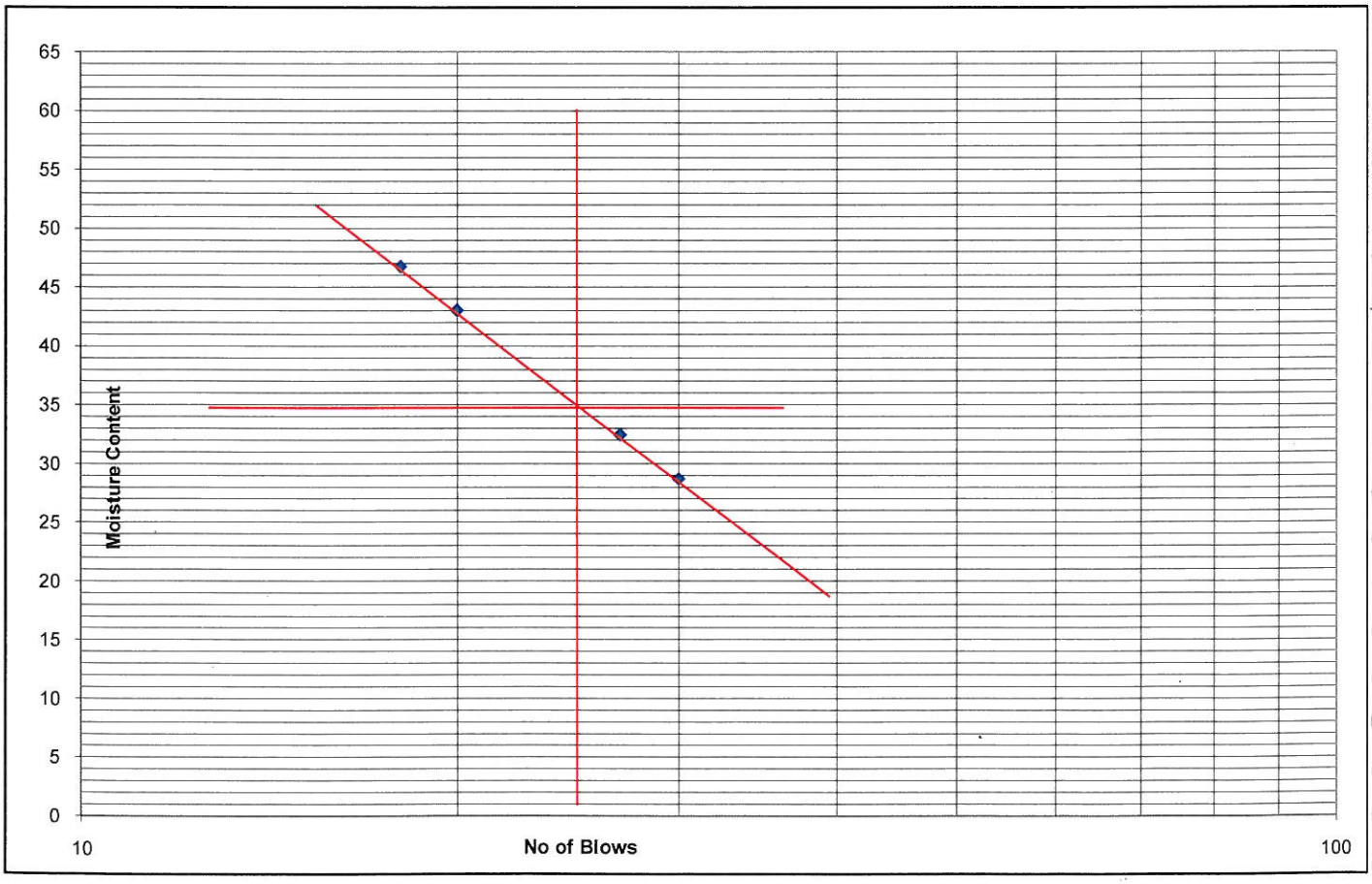
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	15.0m	Tested by	:	D.Mohanty

Number of Blows	30	27	20	18	Plastic Limit	
Container No.	C1	C2	C3	C4	C5	C6
Container Weight (gm) (W1)	33.6	34.2	36.7	32.65	31.26	30.12
Container + Wt. of wet soil (gm) (W2)	90.18	107.24	107.05	112.93	91.68	90.59
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.56	89.34	85.89	87.36	82.45	81.88
Wt. Of water (gm) (W2-W1)-(W3-W1)	12.62	17.89	21.16	25.57	9.23	8.72
Wt. of oven dry soil (gm) (W3-W1)	43.96	55.14	49.19	54.71	51.19	51.76
Moisture Content (%)= [(W2-W1)-(W3-W1)]/(W3-W1) X 100	**28.71**	**32.45**	**43.01**	**46.73**	**18.02**	**16.84**

Result Summary

Liquid Limit (WL)	35	%
Plastic Limit (Wp)	17	%
Plasticity Index (Ip)	18	%



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ARKITECHNO CONSULTANTS (INDIA) PVT LTD

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

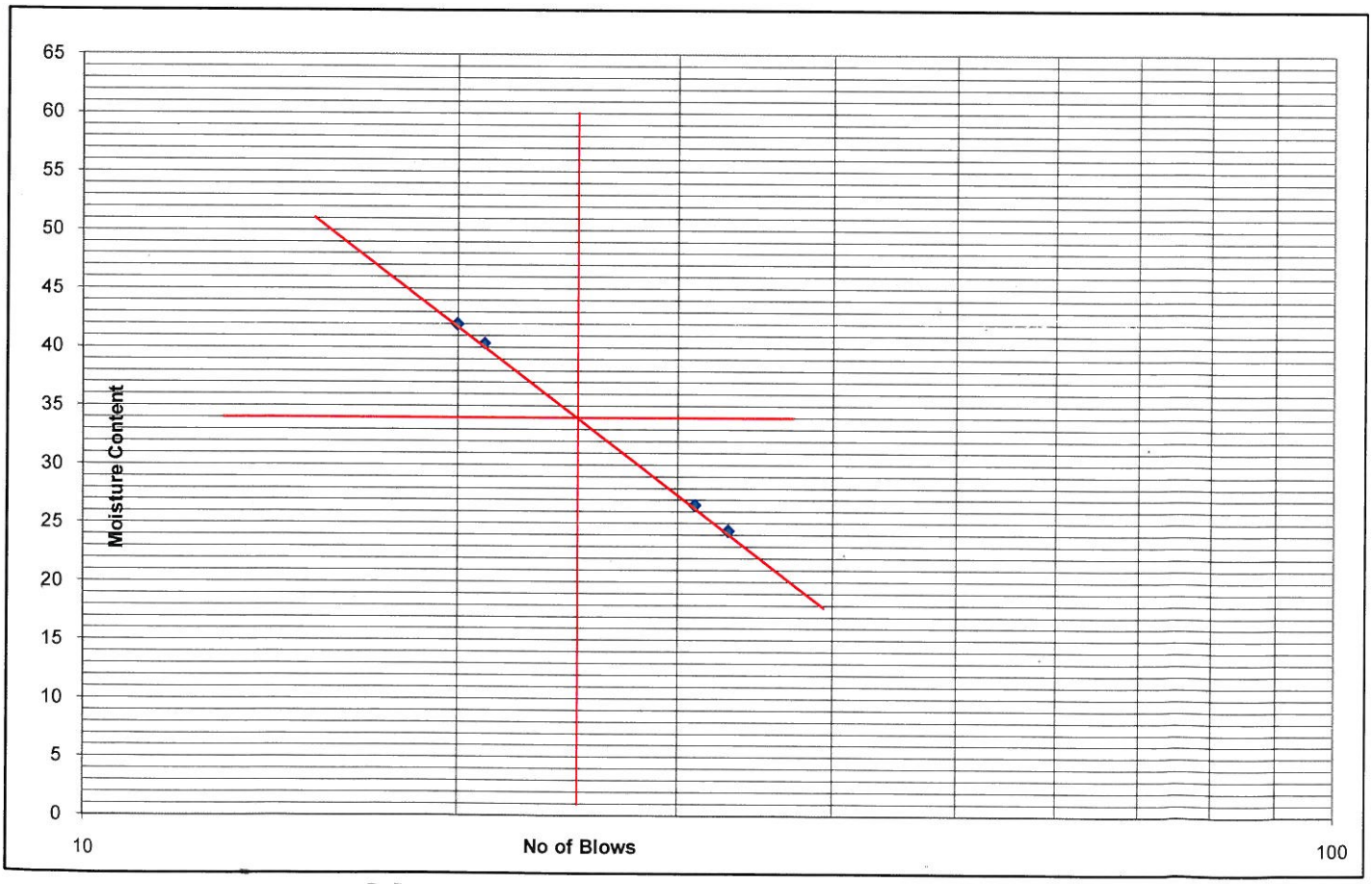
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	SPT	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	18.0m	Tested by	:	D.Mohanty

Number of Blows	33	31	21	20	Plastic Limit	
Container No.	A13	A14	A15	A16	A17	A18
Container Weight (gm) (W1)	30.74	36.34	35.26	32.28	30.76	32.29
Container + Wt. of wet soil (gm) (W2)	88.77	103.28	106.50	110.57	92.05	90.08
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.40	89.22	86.02	87.43	82.63	81.92
Wt. Of water (gm) (W2-W1)-(W3-W1)	11.37	14.06	20.49	23.14	9.42	8.16
Wt. of oven dry soil (gm) (W3-W1)	46.66	52.88	50.76	55.15	51.87	49.63
Moisture Content (%)= (W2-W1)-(W3-W1)]/(W3-W1) X 100	**24.37**	**26.59**	**40.36**	**41.96**	**18.17**	**16.44**

Result Summary

Liquid Limit (WL)	34	%
Plastic Limit (Wp)	17	%
Plasticity Index (Ip)	17	%



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Arki Techno Consultants (India) Pvt.Ltd

ARKITECHNO

N 3/91, IRC Village, Bhubaneswar

DETERMINATION OF LIQUID LIMIT AND PLASTIC LIMIT

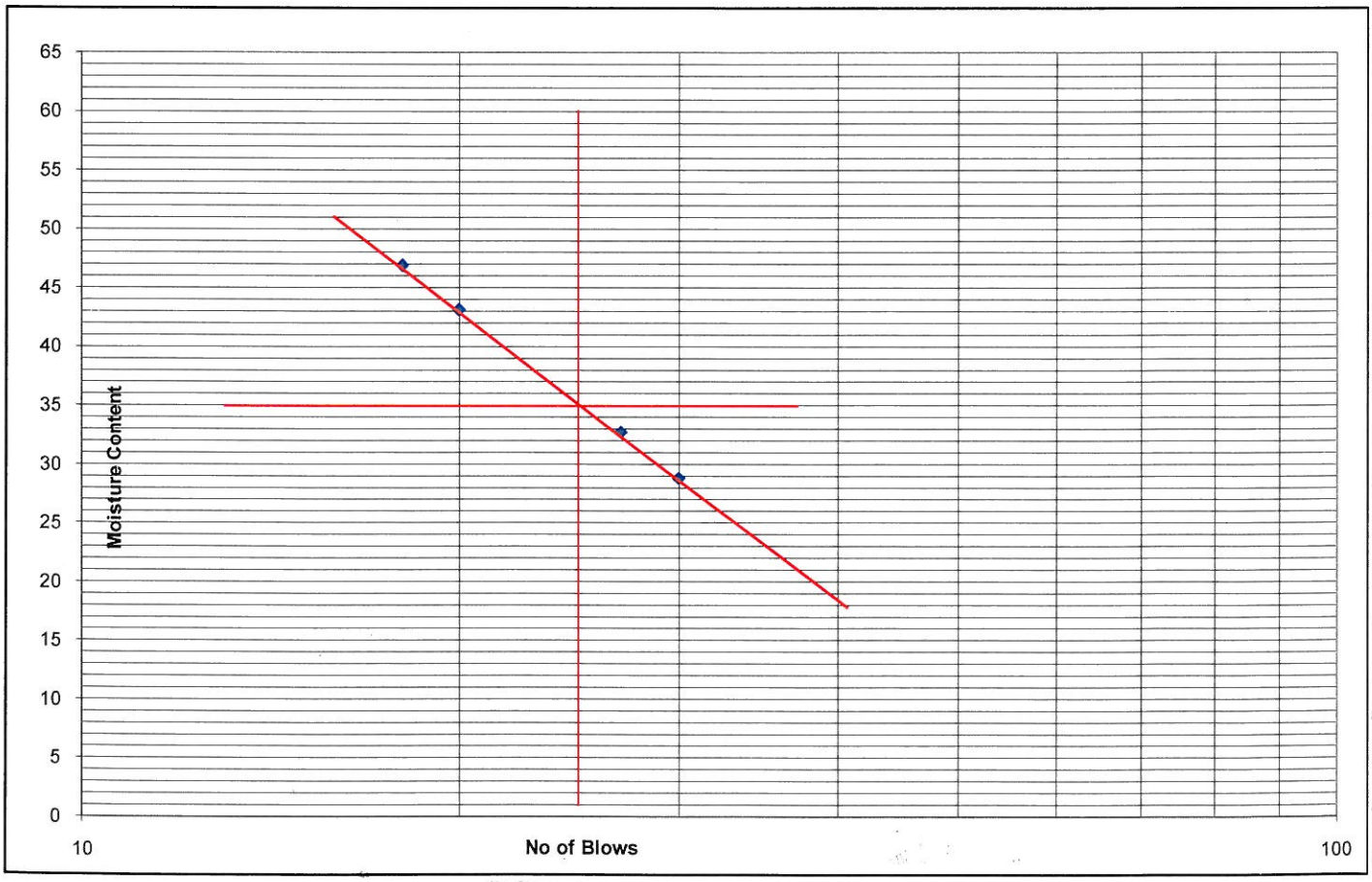
IS : 2720 (Part -5)

Client	:	DFCC			
Project Name	:	G.I For 3 Nos. Important Bridges			
Type of Sample	:	UDS	Date Of Testing	:	28.09.12
Location	:	BH-1(Markanda River-Ambala)	Sampled by	:	T.K.Das
Depth	:	22.5m	Tested by	:	D.Mohanty

Number of Blows	30	27	20	18	Plastic Limit	
Container No.	A1	A2	A3	A4	A5	A6
Container Weight (gm) (W1)	30.58	33.64	36.7	32.65	34.87	31.29
Container + Wt. of wet soil (gm) (W2)	90.40	107.41	107.15	113.24	91.64	91.52
Wt of Container + Wt. of oven dry soil (gm) (W3)	77.02	89.22	85.93	87.52	82.68	82.23
Wt. Of water (gm) (W2-W1)-(W3-W1)	13.38	18.19	21.22	25.72	8.95	9.29
Wt. of oven dry soil (gm) (W3-W1)	46.44	55.58	49.23	54.87	47.81	50.94
Moisture Content (%)= [(W2-W1)-(W3-W1)]/(W3-W1) X 100	**28.82**	**32.73**	**43.11**	**46.88**	**18.73**	**18.24**

Result Summary

Liquid Limit (WL)	35	%
Plastic Limit (Wp)	18	%
Plasticity Index (Ip)	17	%



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