SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 15.00

Date of Start: 04-03-2015

Table No. A1

Location: Village Road

Chainage (Km): 0.650

Reduced Level: 100.0m assumed

WATER TABLE (m) : 8.00

Date of Completion: 04-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	99.500	DS1		Light Gray Sandy Silt (ML) (1.50m)	0	33	64	3										
15	1.50	98.500	SPT1		Light Gray Sandy Silt (ML-CL)														
	2.50	97.500	UDS1		(3.00m)	0	29	65	6	24	18	6	2.66	1.69	1.55	9.3	UUT	0.50	10
12	3.00	97.000	SPT2		Light Gray Fine Sand (SP-SM)														
16	4.50	95.500	SPT3																
	5.50	94.500	UDS2			0	93	7	0	N	P	-	2.62	1.73	1.58	9.5	DST	0.00	31
18	6.00	94.000	SPT4																
17	7.50	92.500	SPT5																
	8.50	91.500	UDS3																
20	9.00	91.000	SPT6			0	89	11	0	N	P	-							
39	10.50	89.500	SPT7												1.65*		DST	0	33
	11.50	88.500	UDS4																
44	12.00	88.000	SPT8			0	93	7	0	N	P	-	2.60						
41	13.50	86.500	SPT9																
	14.50	85.500	UDS5																
34	15.00	85.000	SPT10		(15.00m)	0	92	8	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 27-02-2015

Table No. A1a

Location: MAJOR BRIDGE

Chainage (Km): 1+172

Reduced Level: 204.640

WATER TABLE (m) : 7.00

Date of Completion: 28-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	204.140	DS1		Light Gray Sandy Silt (ML-CL)	0	33	61	6										
6	1.50	203.140	SPT1																
	2.50	202.140	UDS1			0	31	63	6	24	18	6	2.66	1.69	1.52	11.2	UUT	0.45	12
11	3.00	201.640	SPT2																
7	4.50	200.140	SPT3																
	5.50	199.140	UDS2			0	33	59	8	26	20	6	2.67	1.74	1.52	14.2	UUT	0.50	10
5	6.00	198.640	SPT4																
					(7.50m)														
14	7.50	197.140	SPT5		Light Gray Silty Fine Sand (SM)														
	8.50	196.140	UDS3																
21	9.00	195.640	SPT6			0	86	14	0	N	P	-							
					(10.50m)														
22	10.50	194.140	SPT7		Light Gray Fine Sand (SP-SM)										1.63*		DST	0	32
	11.50	193.140	UDS4																
28	12.00	192.640	SPT8			0	92	8	0	N	P	-							
31	13.50	191.140	SPT9																
	14.50	190.140	UDS5																
37	15.00	189.640	SPT10			0	93	7	0	N	P	-							
					(16.50m)														
44	16.50	188.140	SPT11		Light Gray Clayey Silt (CL)					33	21	12							
	17.50	187.14	UDS6			5	12	70	13				2.68	1.99	1.68	18.7			
46	18.00	186.64	SPT12																

Contd. On Table No. A1b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 27-02-2015

Table No. A1b

Location: MAJOR BRIDGE

Chainage (Km): 1+172

Reduced Level: 204.640

WATER TABLE (m) : 7.00

Date of Completion: 28-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
35	19.50	185.140	SPT13		Light Gray Clayey Silt (CL)														
	20.50	184.140	UDS7		(21.00m)	4	11	73	12	33	22	11		1.99	1.7	18.5	UUT	1.40	10
61	21.00	183.640	SPT14		Light Gray Silty Fine Sand (SM)														
62	22.50	182.140	SPT15			0	56	34	0	N	P	-							
	23.50	181.140	UDS8																
63	24.00	180.640	SPT16																
64	25.50	179.140	SPT17			0	80	20	0	N	P	-							
	26.50	178.140	UDS9																
63	27.00	177.640	SPT18										2.64		1.70*		DST	0.00	34
68	28.50	176.140	SPT19																
	29.50	175.140	UDS10																
61	30.00	174.640	SPT20		(30.00m)	0	84	16	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 30.00

Date of Start: 24-02-2015

Table No. A2a

Location: MAJOR BRIDGE

Chainage (Km): 1+172

Reduced Level: 204.640

WATER TABLE (m) : 9.50

Date of Completion: 25-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	204.140	DS1		Light Gray Sandy Silt (ML-CL)	0	33	61	6										
13	1.50	203.140	SPT1																
	2.50	202.140	UDS1			0	31	63	6	24	18	6	2.66	1.69	1.52	11.2	UUT	0.45	12
18	3.00	201.640	SPT2		(4.50m)														
16	4.50	200.140	SPT3		Light Gray Fine Sand (SP-SM)														
	5.50	199.140	UDS2			0	33	59	8	26	20	6	2.67	1.74	1.52	14.2	UUT	0.50	10
8	6.00	198.640	SPT4																
18	7.50	197.140	SPT5																
	8.50	196.140	UDS3																
21	9.00	195.640	SPT6			0	86	14	0	N	P	-							
19	10.50	194.140	SPT7												1.63*		DST	0	32
	11.50	193.140	UDS4																
19	12.00	192.640	SPT8			0	92	8	0	N	P	-							
30	13.50	191.140	SPT9		(13.50m) Light Gray Fine Sand (SP)														
	14.50	190.140	UDS5																
35	15.00	189.640	SPT10			0	93	7	0	N	P	-							
36	16.50	188.140	SPT11							33	21	12							
	17.50	187.14	UDS6			5	12	70	13				2.68	1.99	1.68	18.7			
36	18.00	186.64	SPT12		(18.00m) Light Gray Clayey Silt (CL)														

Contd. On Table No. A2b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 30.00

Date of Start: 24-02-2015

Table No. A2b

Location: MAJOR BRIDGE

Chainage (Km): 1+172

Reduced Level: 204.640

WATER TABLE (m) : 9.50

Date of Completion: 25-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
34	19.50	185.140	SPT13		Light Gray Clayey Silt (CL)														
	20.50	184.140	UDS7			4	11	73	12	33	22	11		1.99	1.7	18.5	UUT	1.40	10
41	21.00	183.640	SPT14																
35	22.50	182.140	SPT15			0	56	34	0	N	P	-							
	23.50	181.140	UDS8		(24.00m)														
46	24.00	180.640	SPT16		Light Gray Fine Sand (SP-SM)														
53	25.50	179.140	SPT17			0	80	20	0	N	P	-							
	26.50	178.140	UDS9																
54	27.00	177.640	SPT18										2.64		1.70*		DST	0.00	34
60	28.50	176.140	SPT19																
	29.50	175.140	UDS10																
54	30.00	174.640	SPT20		(30.00m)	0	84	16	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 13-02-2015

Table No. B1a

Location: MAJOR BRIDGE

Chainage (Km): 2+109

Reduced Level: 207.753

WATER TABLE (m) : 13.00

Date of Completion: 15-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	207.253	DS1		Filled Up Soils (1.50m)														
29	1.50	206.253	SPT1		Light Brown Sandy Silt (ML-CL)					26	20	6							
	2.50	205.253	UDS1			0	17	77	6				2.66	1.70	1.55	9.6	UUT	0.40	10
15	3.00	204.753	SPT2																
20	4.50	203.253	SPT3																
	5.50	202.253	UDS2		(6.00m)	0	29	66	5	24	18	6	1.75	1.59	10.20				
24	6.00	201.753	SPT4		Light Gray Silty Fine Sand (SM)														
23	7.50	200.253	SPT5																
	8.50	199.253	UDS3			0	82	18	0	N	P	-	2.63	1.79	1.62	10.6	DST	0.00	32
31	9.00	198.753	SPT6																
35	10.50	197.253	SPT7																
	11.50	196.253	UDS4																
37	12.00	195.753	SPT8																
41	13.50	194.253	SPT9			6	55	39	0	N	P	-							
	14.50	193.253	UDS5																
43	15.00	192.753	SPT10																
48	16.50	191.253	SPT11			0	70	30	0	N	P	-							
	17.50	190.25	UDS6		(18.00m)														
51	18.00	189.75	SPT12		Light Gray Fine Sand (SP-SM)	0	90	10	0	N	P	-							

Contd. On Table No. B1b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 13-02-2015

Table No. B1b

Location: MAJOR BRIDGE

Chainage (Km): 2+109

Reduced Level: 207.753

WATER TABLE (m) : 13.00

Date of Completion: 15-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
52	19.50	188.253	SPT13		Light Gray Fine Sand (SP-SM)								2.62		1.66*		DST	0.0	34
	20.50	187.253	UDS7																
52	21.00	186.753	SPT14																
61	22.50	185.253	SPT15			0	91	9	0	N	P	-							
	23.50	184.253	UDS8		(24.00m)														
26	24.00	183.753	SPT16		Light Brown Sandy Silt (ML-CL)					25	19	6							
31	25.50	182.253	SPT17																
	26.50	181.253	UDS9			0	37	57	6				2.65	1.99	1.68	18.2	UUT	1.30	11
37	27.00	180.753	SPT18																
51	28.50	179.253	SPT19																
	29.50	178.253	UDS10		(30.00m)	0	32	68	6	24	19	5							
53	30.00	177.753	SPT20		Light Brown Silty Fine Sand (SM)	0	85	15	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 30.00

Date of Start: 17-02-2015

Table No. B2a

Location: MAJOR BRIDGE

Chainage (Km): 2+109

Reduced Level: 207.753

WATER TABLE (m) : 12.50

Date of Completion: 18-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	207.253	DS1		Light Brown Sandy Silt (ML)	0	39	58	3										
22	1.50	206.253	SPT1																
	2.50	205.253	UDS1			0	37	60	3	N	P	-	2.65	1.69	1.56	8.6	DST	0.00	29
20	3.00	204.753	SPT2		(4.50m)														
26	4.50	203.253	SPT3		Light Gray Silty Fine Sand (SM)														
	5.50	202.253	UDS2			0	69	31	3	N	P	-		1.73	1.58	9.7	DST	0.00	30
21	6.00	201.753	SPT4		(7.50m)														
25	7.50	200.253	SPT5		Light Gray Fine Sand (SP-SM)														
	8.50	199.253	UDS3			0	88	12	0	N	P	-	2.63	1.79	1.62	10.3	DST	0.00	32
31	9.00	198.753	SPT6																
30	10.50	197.253	SPT7		(11.50m)														
	11.50	196.253	UDS4		Light Gray Silty Fine Sand (SM)														
22	12.00	195.753	SPT8			0	55	45	0	N	P	-							
25	13.50	194.253	SPT9										2.64		1.65*		DST	0	32
	14.50	193.253	UDS5																
29	15.00	192.753	SPT10																
31	16.50	191.253	SPT11			0	67	33	0	N	P	-							
	17.50	190.25	UDS6		(18.00m)														
28	18.00	189.75	SPT12		Light Gray Fine Sand (SP-SM)														

Contd. On Table No. B2b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 30.00

Date of Start: 17-02-2015

Table No. B2b

Location: MAJOR BRIDGE

Chainage (Km): 2+109

Reduced Level: 207.753

WATER TABLE (m) : 12.50

Date of Completion: 18-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
29	19.50	188.253	SPT13		Light Gray Fine Sand (SP-SM)	0	92	8	0	N	P	-							
	20.50	187.253	UDS7		(21.00m)														
32	21.00	186.753	SPT14		Light Brown Sandy Silt (ML-CL)														
23	22.50	185.253	SPT15							26	20	6							
	23.50	184.253	UDS8			6	17	71	6				2.66	1.98	1.67	18.5			
21	24.00	183.753	SPT16																
32	25.50	182.253	SPT17																
	26.50	181.253	UDS9			0	40	54	6	24	19	5		1.99	1.68	18.2	UUT	1.30	12
39	27.00	180.753	SPT18		(28.50m)														
57	28.50	179.253	SPT19		Light gray Fine Sand (SP-SM)										1.68*		DST	0.00	34
	29.50	178.253	UDS10																
58	30.00	177.753	SPT20		(30.00m)	0	93	7	0	N	P	-							

BHOOMI

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Merut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 18-02-2015

Date of Completion: 19-02-2015

Table No. C1a

Job No. 201414

Chainage (Km): 2+306

Reduced Level: 206.666

WATER TABLE (m) : 11.50

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	206.166	DS1		Light Brown Sandy Silt (ML-CL)	0	38	57	5										
16	1.50	205.166	SPT1							26	20	6							
	2.50	204.166	UDS1			1	12	81	6				2.66	1.71	1.55	10.5	UUT	0.40	10
27	3.00	203.666	SPT2																
23	4.50	202.166	SPT3																
					(5.50m)														
	5.50	201.166	UDS2		Light Brown Sandy Silt (ML)	0	18	79	3	22	18	4	2.64	1.74	1.58	10.2	DST	0.00	30
17	6.00	200.666	SPT4																
					(7.50m)														
27	7.50	199.166	SPT5		Light Gray Fine Sand (SP-SM)	0	88	12	0	N	P	-							
	8.50	198.166	UDS3																
31	9.00	197.666	SPT6																
35	10.50	196.166	SPT7			0	89	11	0	N	P	-							
	11.50	195.166	UDS4																
38	12.00	194.666	SPT8										2.62		1.65*		DST	0.00	33
35	13.50	193.166	SPT9																
	14.50	192.166	UDS5																
37	15.00	191.666	SPT10																
32	16.50	190.166	SPT11			0	90	10	0	N	P	-							
	17.50	189.17	UDS6																
31	18.00	188.67	SPT12																

Contd. On Table No. C1b

BHOOMI

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Merut Section of DFCC Meerut			BH.No. 1	Termination Depth (m)	Date of Start: 18-02-2015	Table No. C1b
Chainage (Km): 2+306	**Reduced Level:** 206.666		WATER TABLE (m) : 11.50	30.00	Date of Completion: 19-02-2015	Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
35	19.50	187.166	SPT13		Light Gray Fine Sand (SP-SM)														
	20.50	186.166	UDS7																
33	21.00	185.666	SPT14			0	89	11	0	N	P	-							
					(22.50m)														
28	22.50	184.166	SPT15		Light Gray Clayey Silt (CL)					34	23	11							
	23.50	183.166	UDS8			0	9	77	14				2.68	2.00	1.67	19.5			
33	24.00	182.666	SPT16																
29	25.50	181.166	SPT17																
	26.50	180.166	UDS9			0	8	79	13	35.0	23.0	12.0		2.01	1.69	19.2	UUT	1.40	9
					(27.00m)														
45	27.00	179.666	SPT18		Light Brown Silty Fine Sand (SM)														
51	28.50	178.166	SPT19			0	85	15	0	N	P	-							
	29.50	177.166	UDS10																
59	30.00	176.666	SPT20		(30.00m)														

BHOOMI

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Merut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 30.00

Date of Start: 21-02-2015

Table No. C2a

Chainage (Km): 2+306

Reduced Level: 206.666

WATER TABLE (m) : 11.00

Date of Completion: 22-02-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	206.166	DS1		Light Brown Sandy Silt (ML-CL)														
20	1.50	205.166	SPT1																
	2.50	204.166	UDS1			0	23	71	6	26	20	6	2.66	1.71	1.56	9.6	UUT	0.40	10
14	3.00	203.666	SPT2																
17	4.50	202.166	SPT3																
					(5.50m)														
	5.50	201.166	UDS2		Light Gray Sandy Silt (ML)	0	21	76	3	23	19	4		1.75	1.58	10.5			
16	6.00	200.666	SPT4																
20	7.50	199.166	SPT5																
	8.50	198.166	UDS3			0	38	59	3	N	P	-	2.64	1.80	1.62	11.2	DST	0.00	31
24	9.00	197.666	SPT6																
					(10.50m)														
33	10.50	196.166	SPT7		Light Gray Fine Sand (SP-SM)	0	76	24	0	N	P	-							
	11.50	195.166	UDS4																
37	12.00	194.666	SPT8																
41	13.50	193.166	SPT9																
	14.50	192.166	UDS5																
43	15.00	191.666	SPT10			0	82	18	0	N	P	-							
48	16.50	190.166	SPT11										2.63		1.66*		DST	0.00	33
	17.50	189.17	UDS6																
56	18.00	188.67	SPT12																

Contd. On Table No. C2b

BHOOMI

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Merut Section of DFCC Meerut			BH.No. 2	Termination Depth (m)	Date of Start: 21-02-2015	Table No. C2b
Chainage (Km): 2+306	**Reduced Level:** 206.666		WATER TABLE (m) : 11.00	30.00	Date of Completion: 22-02-2015	Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
63	19.50	187.166	SPT13		Light Gray Fine Sand (SP-SM)														
	20.50	186.166	UDS7																
59	21.00	185.666	SPT14		(22.50m)	0	87	13	0	N	P	-							
40	22.50	184.166	SPT15		Light Gray Sandy Silt (ML-CL)														
	23.50	183.166	UDS8			6	14	74	6	27	20	7		1.98	1.67	18.3	UUT	1.35	10
38	24.00	182.666	SPT16																
42	25.50	181.166	SPT17																
	26.50	180.166	UDS9			5	18	71	6	26	20	6	2.66	1.98	1.68	17.9			
59	27.00	179.666	SPT18		(27.00m) Light Brown Silty Fine Sand (SM)														
62	28.50	178.166	SPT19												1.70*		DST	0.00	34
	29.50	177.166	UDS10																
67	30.00	176.666	SPT20		(30.00m)	0	85	15	0	N	P	-							

BHOOMI

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Merut Section of DFCC Meerut

BH.No. 3

Termination Depth (m): 30.00

Date of Start: 09-03-2015

Date of Completion: 10-03-2015

Table No. C3a

Job No. 201414

Chainage (Km): 2+306

Reduced Level: 206.666

WATER TABLE (m) : 8.00

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	206.166	DS1		Light Gray Sandy Silt (ML-CL) (1.50m)	6	19	69	6										
7	1.50	205.166	SPT1		Light Brown Clayey Silt (CL)														
	2.50	204.166	UDS1			6	4	77	13	34	22	12	2.67	1.73	1.53	13.2	UUT	0.50	9
11	3.00	203.666	SPT2																
16	4.50	202.166	SPT3			4	9	75	12	33	22	11		1.81	1.58	14.7			
	5.50	201.166	UDS2		(6.00m)														
20	6.00	200.666	SPT4		Light Gray Silty Fine Sand (SM)														
33	7.50	199.166	SPT5		(8.50m)	0	61	39	0	N	P	-							
	8.50	198.166	UDS3		Light Gray Fine Sand (SP-SM)														
35	9.00	197.666	SPT6			0	88	12	0	N	P	-							
41	10.50	196.166	SPT7										2.63		1.66*		DST	0	33
	11.50	195.166	UDS4																
47	12.00	194.666	SPT8			0	92	8	0	N	P	-							
55	13.50	193.166	SPT9																
	14.50	192.166	UDS5																
45	15.00	191.666	SPT10										2.62		1.67*		DST	0	34
49	16.50	190.166	SPT11			0	93	7	0	N	P	-							
	17.50	189.17	UDS6																
56	18.00	188.67	SPT12																

Contd. On Table No. C3b

BHOOMI

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Merut Section of DFCC Meerut

BH.No. 3

Termination Depth (m): 30.00

Date of Start: 09-03-2015

Table No. C3b

Chainage (Km): 2+306

Reduced Level: 206.666

WATER TABLE (m) : 8.00

Date of Completion: 10-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
35	19.50	187.166	SPT13		Light Brown Sandy Silt (ML-CL)														
	20.50	186.166	UDS7			0	32	62	6	24	18	6	2.66	1.97	1.67	17.9	UUT	1.35	10
25	21.00	185.666	SPT14																
41	22.50	184.166	SPT15		(23.50m)														
	23.50	183.166	UDS8		Light Gray Fine Sand (SP-SM)														
61	24.00	182.666	SPT16			0	93	7	0	N	P	-							
66	25.50	181.166	SPT17																
	26.50	180.166	UDS9																
70	27.00	179.666	SPT18												1.72*		DST	0.00	35
71	28.50	178.166	SPT19			0	94	6	0	N	P	-							
	29.50	177.166	UDS10																
64	30.00	176.666	SPT20		(30.00m)														

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 12-03-2015

Table No. B1

Location: Minor Bridge

Chainage (Km): 2.873

Reduced Level: 209.001

WATER TABLE (m) : 10.50

Date of Completion: 12-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	208.501	DS1		Light Brown Sandy Silt (ML-CL)	0	27	67	6										
5	1.50	207.501	SPT1																
	2.50	206.501	UDS1			0	30	64	6	24	18	6	2.66	1.74	1.53	13.5	UUT	0.45	10
7	3.00	206.001	SPT2																
13	4.50	204.501	SPT3																
	5.50	203.501	UDS2			0	26	69	5	25	19	6		1.79	1.57	14.2			
					(6.00m)														
17	6.00	203.001	SPT4		Light Gray Silty Fine Sand (SM)														
17	7.50	201.501	SPT5			0	77	23	0	N	P	-							
	8.50	200.501	UDS3																
19	9.00	200.001	SPT6																
23	10.50	198.501	SPT7																
	11.50	197.501	UDS4			0	85	15	0	N	P	-	2.63	1.90	1.62	17.3	DST	0.00	31
26	12.00	197.001	SPT8		(12.00m)														

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 13-03-2015

Date of Completion: 13-03-2015

Table No. C1

Job No. 201414

Location: Minor Bridge

Chainage (Km): 3.490

Reduced Level (m): 209.334

WATER TABLE (m) : 11.00

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	208.834	DS1		Light Brown Sandy Silt (ML-CL)	0	22	73	5										
14	1.50	207.834	SPT1																
	2.50	206.834	UDS1			0	22	72	6	25	19	6	2.66	1.71	1.55	10.6	UUT	0.50	9
15	3.00	206.334	SPT2		(4.50m)														
18	4.50	204.834	SPT3		Light Gray Clayey Silt (CL)														
	5.50	203.834	UDS2			0	10	77	13	31	22	9	2.68	1.81	1.60	13.2	UUT	0.70	10
21	6.00	203.334	SPT4		(7.50m)														
19	7.50	201.834	SPT5		Light Gray Fine Sand (SP-SM)														
	8.50	200.834	UDS3			0	90	10	0	N	P	-		1.85	1.63	13.5	DST	0.00	32
30	9.00	200.334	SPT6																
34	10.50	198.834	SPT7																
	11.50	197.834	UDS4																
43	12.00	197.334	SPT8		(12.00m)	0	89	11	0	N	P	-	2.63						

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 13-03-2015

Table No. D1

Location: Minor Bridge

Chainage (Km): 4.252

Reduced Level (m): 209.998

WATER TABLE (m) : 10.20

Date of Completion: 14-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	209.498	DS1		Light Brown Silty Fine Sand (SM) (1.50m)	0	52	48	0										
5	1.50	208.498	SPT1		Light Gray Sandy Silt (ML)														
	2.50	207.498	UDS1			0	26	71	3	21	17	4	2.65	1.70	1.52	12.1	DST	0.00	30
6	3.00	206.998	SPT2		(4.50m)														
10	4.50	205.498	SPT3		Light Gray Sandy Silt (ML-CL)														
	5.50	204.498	UDS2		(6.00m)	0	20	74	6	26	20	6		1.77	1.56	13.5			
22	6.00	203.998	SPT4		Light Gray Silty Fine Sand (SM)														
22	7.50	202.498	SPT5																
	8.50	201.498	UDS3			0	79	21	0	N	P	-	2.64	1.81	1.60	13.2	DST	0.00	31
26	9.00	200.998	SPT6																
31	10.50	199.498	SPT7																
	11.50	198.498	UDS4																
45	12.00	197.998	SPT8		(12.00m)	0	80	20	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 14-03-2015

Table No. E1

Location: Minor Bridge

Chainage (Km): 5+163

Reduced Level (m): 209.732

WATER TABLE (m) : NOT MET

Date of Completion: 14-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	209.232	DS1		Filled Up Soils (1.50m)														
36	1.50	208.232	SPT1		Light Gray Sandy Silt (ML-CL)														
	2.50	207.232	UDS1			0	24	70	6	25	19	6	2.66	1.70	1.55	9.7	UUT	0.45	12
11	3.00	206.732	SPT2		(4.50m)														
14	4.50	205.232	SPT3		Light Gray Sandy Silt (ML)														
	5.50	204.232	UDS2			0	29	68	3	21	17	4	2.65	1.77	1.60	10.5	DST	0.00	30
19	6.00	203.732	SPT4		(7.50m)														
23	7.50	202.232	SPT5		Light Gray Silty Fine Sand (SM)														
	8.50	201.232	UDS3			0	72	28	0	N	P	-		1.79	1.62	10.3	DST	0.00	32
26	9.00	200.732	SPT6																
29	10.50	199.232	SPT7		(11.50m)	0	77	23	0	N	P	-	2.63						
	11.50	198.232	UDS4		Light Gray Fine Sand (SP-SM)														
36	12.00	197.732	SPT8		(12.00m)	0	92	8	0	N	P	-							

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SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Muzaffarnagar Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 15-03-2015

Table No. F1

Chainage (Km): 6+099

Reduced Level (m): 209.709

WATER TABLE (m) : NOT MET

Date of Completion: 15-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	209.209	DS1		Dark Gray Sandy Silt (ML - CL) (1.50m)	0	27	67	6										
7	1.50	208.209	SPT1		Light Brown Sandy Silt (CL)					33	22	11							
	2.50	207.209	UDS1			0	16	72	12				2.68	1.73	1.53	13.2	UUT	0.45	10
8	3.00	206.709	SPT2																
17	4.50	205.209	SPT3																
	5.50	204.209	UDS2		(6.00m)	0	14	75	11	32	22	10		1.82	1.60	13.5			
23	6.00	203.709	SPT4		Light Brown Silty Fine Sand (SM) (7.50m)	0	81	19	0	N	P	-							
27	7.50	202.209	SPT5		Light Gray Fine Sand (SP-SM)														
	8.50	201.209	UDS3			0	90	10	0	N	P	-	2.63	1.81	1.62	11.5	DST	0.00	31
30	9.00	200.709	SPT6																
34	10.50	199.209	SPT7																
	11.50	198.209	UDS4			0	92	8	0	N	P	-		1.84	1.64	12.2			
43	12.00	197.709	SPT8		(12.00m)														

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 15-03-2015

Table No. G1

Location: Minor Bridge

Chainage (Km): 7+064

Reduced Level (m): 209.884

WATER TABLE (m) : NOT MET

Date of Completion: 16-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	209.384	DS1		Light Gray Sandy Silt (ML - CL)	0	23	72	5										
31	1.50	208.384	SPT1																
	2.50	207.384	UDS1			0	22	72	6	26	19	7	2.66	1.70	1.55	9.5	UUT	0.40	12
26	3.00	206.884	SPT2		(4.50m)														
19	4.50	205.384	SPT3		Light Gray Silty Fine Sand (SM)														
	5.50	204.384	UDS2			0	70	30	0	N	P	-		1.76	1.60	9.8			
23	6.00	203.884	SPT4																
28	7.50	202.384	SPT5																
	8.50	201.384	UDS3			0	73	27	0	N	P	-	2.63	1.80	1.63	10.4	DST	0.00	32
37	9.00	200.884	SPT6																
43	10.50	199.384	SPT7																
	11.50	198.384	UDS4			0	79	21	0	N	P	-		1.85	1.67	10.9			
49	12.00	197.884	SPT8		(12.00m)														

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SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Muzaffarnagar Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 02-04-2015

Table No.H1

Chainage (Km): 8+060

Reduced Level (m): 210.385

WATER TABLE (m) : Not Met

Date of Completion: 02-04-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	209.885	DS1		Light Gray Sandy Silt (ML)	0	36	61	3										
12	1.50	208.885	SPT1																
	2.50	207.885	UDS1			0	38	59	3	N	P	-	2.64	1.70	1.54	10.7	DST	0.00	28
					(3.00m)														
12	3.00	207.385	SPT2		Light Gray Sandy Silt (ML-CL)														
16	4.50	205.885	SPT3			0	17	77	6										
	5.50	204.885	UDS2							26	19	7		1.80	1.59	13.5			
					(6.00m)														
17	6.00	204.385	SPT4		Light Gray Clayey Silt (CL)														
21	7.50	202.885	SPT5																
	8.50	201.885	UDS3			0	9	78	13				2.68	1.85	1.62	14.4	UUT	0.70	9
					(9.00m)														
23	9.00	201.385	SPT6		Light Gray Clayey Silt (Cl)					42	23	19							
21	10.50	199.885	SPT7																
					(11.50m)														
	11.50	198.885	UDS4		Gray Fine Sand (SP-SM)	0	90	10	0	N	P	-		1.87	1.66	12.7	DST	0.00	33
25	12.00	198.385	SPT8		(12.00m)														

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 16-03-2015

Table No. I1

Location: Major Bridge

Chainage (Km): 8+977

Reduced Level (m): 212.888

WATER TABLE (m) : 10.50

Date of Completion: 16-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	212.388	DS1		Light Gray Sandy Silt (ML - CL) (1.50m)	0	24	70	6										
4	1.50	211.388	SPT1		Light Gray Clayey Silt (CL)					33	22	11							
	2.50	210.388	UDS1			0	10	77	13				2.67	1.70	1.48	14.7	UUT	0.40	9
7	3.00	209.888	SPT2																
8	4.50	208.388	SPT3																
	5.50	207.388	UDS2			0	13	73	14	34	22	12		1.75	1.52	15.2	UUT	0.65	10
13	6.00	206.888	SPT4																
16	7.50	205.388	SPT5																
	8.50	204.388	UDS3		(9.00m)	0	13	74	13	33	22	12	2.68	1.84	1.58	16.7			
25	9.00	203.888	SPT6		Light Gray Silty Fine Sand (SM) (10.50m)	0	75	25	0	N	P	-							
23	10.50	202.388	SPT7		Light Gray Sandy Silt (CL)														
	11.50	201.388	UDS4		(12.00m)	0	14	76	10	30	21	9	2.67	1.97	1.65	19.2	UUT	1.20	9
20	12.00	200.888	SPT8		Light Gray Fine Sand (SP-SM)	0	89	11	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 17-03-2015

Table No.J1

Location: Minor Bridge

Chainage (Km): 10+030

Reduced Level (m): 212.290

WATER TABLE (m) : Not Met

Date of Completion: 17-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	211.790	DS1		Light Gray Clayey Silt (CL)	0	6	81	13										
4	1.50	210.790	SPT1																
	2.50	209.790	UDS1			0	7	80	13	34	22	12	2.68	1.70	1.48	14.7	UUT	0.50	9
8	3.00	209.290	SPT2																
					(4.50m)														
13	4.50	207.790	SPT3		Light Gray Sandy Silt (ML)														
	5.50	206.790	UDS2			0	30	67	3	N	P	-	2.64	1.79	1.58	13.2	DST	0.00	30
16	6.00	206.290	SPT4																
					(7.50m)														
21	7.50	204.790	SPT5		Light Gray Silty Fine Sand (SM)														
	8.50	203.790	UDS3			0	79	21	0	N	P	-	2.63	1.86	1.64	13.5	DST	0.00	32
23	9.00	203.290	SPT6																
24	10.50	201.790	SPT7																
	11.50	200.790	UDS4																
					(12.00m)														
27	12.00	200.290	SPT8		Light Gray Fine Sand (SP-SM)	0	92	8	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 18-03-2015

Table No.K1

Location: Minor Bridge

Chainage (Km): 10+973

Reduced Level (m): 212.165

WATER TABLE (m) : 11.00

Date of Completion: 18-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	211.665	DS1		Light Gray Sandy Silt (ML-CL)	0	21	73	6										
25	1.50	210.665	SPT1																
	2.50	209.665	UDS1			0	23	72	5	25	19	6	2.65	1.73	1.58	9.5	UUT	0.50	12
20	3.00	209.165	SPT2																
					(4.50m)														
24	4.50	207.665	SPT3		Light Gray Clayey (CL)														
	5.50	206.665	UDS2			0	5	81	14	34	22	12	2.68	1.82	1.60	13.7	UUT	0.85	10
27	6.00	206.165	SPT4																
					(7.50m)														
30	7.50	204.665	SPT5		Light Gray Silty Fine Sand (SM)														
	8.50	203.665	UDS3			0	78	22	0	N	P	-		1.86	1.64	13.5	DST	0.00	32
33	9.00	203.165	SPT6																
					(10.50m)														
37	10.50	201.665	SPT7		Light Gray Fine Sand (SP-SM)														
	11.50	200.665	UDS4			0	88	12	0	N	P	-	2.63						
41	12.00	200.165	SPT8																
					(12.00m)														

BHOOMI

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Muzaffarnagar Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 19-03-2015

Table No.L1

Chainage (Km): 11+987

Reduced Level (m): 212.114

WATER TABLE (m) : Not Met

Date of Completion: 19-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	211.614	DS1		Light Brown Sandy Silt (ML-CL)	0	19	76	5										
11	1.50	210.614	SPT1																
	2.50	209.614	UDS1			0	17	77	6	25	19	6	2.65	1.72	1.54	11.5	UUT	0.50	10
15	3.00	209.114	SPT2		(4.50m)														
19	4.50	207.614	SPT3		Light Gray Clayey (CL)														
	5.50	206.614	UDS2		(6.00m)	6	9	73	12	33	22	11	2.67	1.81	1.60	13.2	UUT	0.70	9
21	6.00	206.114	SPT4		Light Gray Fine Sand (SP-SM)														
27	7.50	204.614	SPT5																
	8.50	203.614	UDS3			0	90	10	0	N	P	-		1.84	1.64	12.4	DST	0.00	31
34	9.00	203.114	SPT6																
34	10.50	201.614	SPT7																
	11.50	200.614	UDS4																
39	12.00	200.114	SPT8		(12.00m)	0	92	8	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 24-03-2015

Table No. D1a

Location: MAJOR BRIDGE

Chainage (Km): 13+841

Reduced Level: 214.107

WATER TABLE (m) : 14.80

Date of Completion: 26-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.607	DS1		Light Brown Sandy Silt (ML-CL)	4	18	72	6										
26	1.50	212.607	SPT1																
	2.50	211.607	UDS1			0	17	77	6	25	19	6	2.65	1.71	1.55	10.4	UUT	0.50	10
					(3.00m)														
21	3.00	211.107	SPT2		Light Gray Clayey Silt (CL)														
22	4.50	209.607	SPT3							33	21	12							
					(5.50m)														
	5.50	208.607	UDS2		Light Gray Clayey Silt (Cl)	0	6	73	21					1.78	1.57	13.5	UUT	0.73	12
18	6.00	208.107	SPT4							41	24	17							
25	7.50	206.607	SPT5																
	8.50	205.607	UDS3			0	5	72	23				2.69	1.86	1.62	14.7			
					(9.00m)														
28	9.00	205.107	SPT6		Light Gray Sandy Silt (ML-CL)					25	18	7							
31	10.50	203.607	SPT7			0	23	72	5										
					(11.50m)														
	11.50	202.607	UDS4		Light Gray Silty Fine Sand (SM)									1.88	1.66	13.5	DST	0.00	32
37	12.00	202.107	SPT8			0	66	34	0	N	P	-							
40	13.50	200.607	SPT9																
					(14.50m)														
	14.50	199.607	UDS5		Light Gray Fine Sand (SP-SM)														
45	15.00	199.107	SPT10			0	91	9	0	N	P	-							
50	16.50	197.607	SPT11										2.63		1.68*		DST	0	34
	17.50	196.61	UDS6																
50	18.00	196.11	SPT12																

Contd. On Table No. D1b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 24-03-2015

Table No. D1b

Location: MAJOR BRIDGE

Chainage (Km): 13+841

Reduced Level: 214.107

WATER TABLE (m) : 14.80

Date of Completion: 26-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
56	19.50	194.607	SPT13		Light Gray Fine Sand (SP-SM)	0	92	8	0	N	P	-							
	20.50	193.607	UDS7																
59	21.00	193.107	SPT14		(22.50m)														
31	22.50	191.607	SPT15		Light Gray Silty Fine Sand (SM)														
	23.50	190.607	UDS8			5	67	28	0	N	P	-	2.64	1.97	1.68	17.5	DST	0	35
36	24.00	190.107	SPT16		(25.50m)														
66	25.50	188.607	SPT17		Light Gray Fine Sand (SP-SM)														
	26.50	187.607	UDS9																
70	27.00	187.107	SPT18			0	93	7	0	N	P	-							
72	28.50	185.607	SPT19																
	29.50	184.607	UDS10																
80	30.00	184.107	SPT20		(30.00m)	0	92	8	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 12.00

Date of Start: 27-03-2015

Table No. D2

Location: MAJOR BRIDGE

Chainage (Km): 13+841

Reduced Level: 214.107

WATER TABLE (m) : Not Met

Date of Completion: 27-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.607	DS1		Light Gray Sandy Silt (ML-CL)	0	22	73	5										
34	1.50	212.607	SPT1																
	2.50	211.607	UDS1			0	28	66	6	24	19	5	2.65	1.70	1.55	9.4	UUT	0.45	12
13	3.00	211.107	SPT2		(3.00m) Light Gray Clayey Silt (CL)														
16	4.50	209.607	SPT3			2	6	78	14										
	5.50	208.607	UDS2							34	22	12		1.80	1.60	12.5			
17	6.00	208.107	SPT4																
19	7.50	206.607	SPT5																
	8.50	205.607	UDS3			6	8	73	13				2.68	1.83	1.62	13.2	UUT	0.80	9
20	9.00	205.107	SPT6							33	22	11							
22	10.50	203.607	SPT7		(11.50m)														
	11.50	202.607	UDS4		Light Gray Silty Fine Sand (SM)	0	72	28	0	N	P	-							
27	12.00	202.107	SPT8																

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 3

Termination Depth (m): 30.00

Date of Start: 27-03-2015

Table No. D3a

Location: MAJOR BRIDGE

Chainage (Km): 13+841

Reduced Level: 214.107

WATER TABLE (m) : 13.60

Date of Completion: 28-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.607	DS1		Light Gray Sandy Silt (ML-CL) (1.50m)	0	17	78	5										
20	1.50	212.607	SPT1		Light Gray Clayey Silt (CL)														
	2.50	211.607	UDS1			0	9	78	13	33	22	11	2.67	1.72	1.55	11.2	UUT	0.50	10
14	3.00	211.107	SPT2		(4.50m)														
21	4.50	209.607	SPT3		Light Gray Sandy Silt (ML-CL)					25	19	6							
	5.50	208.607	UDS2			0	19	75	6					1.80	1.60	12.3	UUT	0.65	11
29	6.00	208.107	SPT4																
28	7.50	206.607	SPT5																
	8.50	205.607	UDS3			0	22	73	5	25	18	7	2.65	1.85	1.64	12.5			
21	9.00	205.107	SPT6		(9.00m) Light Gray Sandy Silt (ML)														
24	10.50	203.607	SPT7																
	11.50	202.607	UDS4			0	33	64	3	N	P	-		1.85	1.64	12.7	DST	0.00	31
28	12.00	202.107	SPT8		(12.00m) Light Gray Fine Sand (SP-SM)														
37	13.50	200.607	SPT9			0	90	10	0	N	P	-							
	14.50	199.607	UDS5																
39	15.00	199.107	SPT10										2.63		1.66*		DST	0	33
50	16.50	197.607	SPT11																
	17.50	196.61	UDS6																
59	18.00	196.11	SPT12			0	92	8	0	N	P	-							

Contd. On Table No. D3 b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 3

Termination Depth (m): 30.00

Date of Start: 27-03-2015

Table No. D3b

Location: MAJOR BRIDGE

Chainage (Km): 13+841

Reduced Level: 214.107

WATER TABLE (m) : 13.60

Date of Completion: 28-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
64	19.50	194.607	SPT13		Light Gray Fine Sand (SP-SM)														
	20.50	193.607	UDS7																
64	21.00	193.107	SPT14		(22.50m)														
64	22.50	191.607	SPT15		Light Gray Silty Fine Sand (SM)														
	23.50	190.607	UDS8			6	67	27	0	N	P	-	2.64	2.00	1.71	17.2	DST	0	34
69	24.00	190.107	SPT16		(25.50m)														
70	25.50	188.607	SPT17		Light Gray Fine Sand (SP-SM)														
	26.50	187.607	UDS9																
76	27.00	187.107	SPT18			0	91	9	0	N	P	-							
75	28.50	185.607	SPT19																
	29.50	184.607	UDS10																
82	30.00	184.107	SPT20		(30.00m)	0	92	8	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 29-03-2015

Date of Completion: 30-03-2015

Table No. E1a

Job No. 201414

Location: RFO

Chainage (Km): 14+069

Reduced Level: 213.830

WATER TABLE (m) : 13.40

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.330	DS1		Light Gray Sandy Silt (ML-CL) (1.50m)	0	17	78	5										
21	1.50	212.330	SPT1		Light Gray Clayey Silt (CL)														
	2.50	211.330	UDS1			0	9	79	12	33	22	11	2.67	1.76	1.58	11.7	UUT	0.55	10
21	3.00	210.830	SPT2		(4.50m)														
24	4.50	209.330	SPT3		Light Gray Sandy Silt (ML-CL)														
	5.50	208.330	UDS2			0	16	78	6					1.80	1.60	12.5			
22	6.00	207.830	SPT4							26	20	6							
26	7.50	206.330	SPT5																
	8.50	205.330	UDS3			3	17	75	5				2.65	1.85	1.64	12.8	UUT	0.80	11
32	9.00	204.830	SPT6		(10.50m)														
36	10.50	203.330	SPT7		Light Gray Sandy Silt (ML)														
	11.50	202.330	UDS4		(12.00m)	0	33	64	3	N	P	-		1.88	1.66	13.2			
40	12.00	201.830	SPT8		Light Gray Fine Sand (SP-SM)														
47	13.50	200.330	SPT9			0	91	9	0										
	14.50	199.330	UDS5																
54	15.00	198.830	SPT10																
52	16.50	197.330	SPT11			0	93	7	0	N	P	-	2.63						
	17.50	196.33	UDS6																
60	18.00	195.83	SPT12												1.68*		DST	0	34

Contd. On Table No. E1b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 30.00

Date of Start: 29-03-2015

Table No. E1b

Location: RFO

Chainage (Km): 14+069

Reduced Level: 213.830

WATER TABLE (m) : 13.40

Date of Completion: 30-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
61	19.50	194.330	SPT13		Light Gray Fine Sand (SP-SM)														
	20.50	193.330	UDS7																
60	21.00	192.830	SPT14		(22.50m)	0	92	8	0	N	P	-							
52	22.50	191.330	SPT15		Light Gray Clayey Silt (Cl)														
	23.50	190.330	UDS8			0	6	72	22				2.69	2.07	1.72	20.4			
50	24.00	189.830	SPT16							41	24	17							
61	25.50	188.330	SPT17																
	26.50	187.330	UDS9		(27.00m)	0	9	73	18					2.07	1.73	19.70	UUT	1.65	9
69	27.00	186.830	SPT18		Light gray Fine Sand (SP-SM)														
75	28.50	185.330	SPT19			0	91	9	0	N	P	-							
	29.50	184.330	UDS10																
78	30.00	183.830	SPT20		(30.00m)										1.73*		DST	0.0	34

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 30.00

Date of Start: 31-03-2015

Table No. E2a

Location: RFO

Chainage (Km): 14+069

Reduced Level: 213.830

WATER TABLE (m) : 13.30

Date of Completion: 01-04-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.330	DS1		Dark Gray Sandy Silt (ML-CL)	0	16	79	5										
					(1.50m)														
20	1.50	212.330	SPT1		Light Gray Clayey Silt (CL)														
	2.50	211.330	UDS1			0	8	79	13	33	22	11	2.67	1.75	1.56	12.3	UUT	0.55	10
					(3.00m)														
21	3.00	210.830	SPT2		Light Brown Sandy Silt (ML-CL)														
25	4.50	209.330	SPT3																
	5.50	208.330	UDS2			0	19	75	6	25	19	6	2.66	1.80	1.60	12.8	UUT	0.75	12
					(6.00m)														
20	6.00	207.830	SPT4		Light Brown Sandy Silt (ML)														
25	7.50	206.330	SPT5																
	8.50	205.330	UDS3			0	39	58	3	N	P	-		1.85	1.64	12.5			
					(9.00m)														
30	9.00	204.830	SPT6		Light Gray Silty Fine Sand (SM)														
29	10.50	203.330	SPT7																
	11.50	202.330	UDS4			0	81	19	0	N	P	-		1.87	1.66	12.9	DST	0.00	33
					(12.00m)														
34	12.00	201.830	SPT8		Light Gray Fine Sand (SP-SM)														
32	13.50	200.330	SPT9			0	92	8	0	N	P	-							
	14.50	199.330	UDS5																
39	15.00	198.830	SPT10																
45	16.50	197.330	SPT11			0	90	10	0	N	P	-	2.63						
	17.50	196.33	UDS6																
49	18.00	195.83	SPT12												1.68*		DST	0	34

Contd. On Table No. E2b

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 30.00

Date of Start: 31-03-2015

Table No. E2b

Location:

Chainage (Km): 14+069

Reduced Level: 213.830

WATER TABLE (m) : 13.30

Date of Completion: 01-04-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
53	19.50	194.330	SPT13		Light Gray Fine Sand (SP-SM)														
	20.50	193.330	UDS7																
51	21.00	192.830	SPT14		(22.50m)	0	92	8	0	N	P	-							
43	22.50	191.330	SPT15		Light Gray Clayey Silt (CL)					32	22	10							
	23.50	190.330	UDS8			8	9	71	12				2.66	2.04	1.69	20.5			
51	24.00	189.830	SPT16																
51	25.50	188.330	SPT17																
	26.50	187.330	UDS9		(27.00m)	12	8	70	10	32	21	11		2.06	1.72	19.80	UUT	1.35	10
63	27.00	186.830	SPT18		Light gray Fine Sand (SP-SM)														
68	28.50	185.330	SPT19												1.72*		DST	0.00	35
	29.50	184.330	UDS10																
73	30.00	183.830	SPT20		(30.00m)	0	92	8	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 21-03-2015

Table No.A-1

Location: Minor Bridge

Chainage (Km): 13+136

Reduced Level (m): 212.439

WATER TABLE (m) : Not Met

Date of Completion: 22-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	211.939	DS1			0	19	75	6										
5	1.50	210.939	SPT1		Light Gray Sandy Silt (ML-CL)														
	2.50	209.939	UDS1							26	20	6	2.65	1.71	1.53	11.5	UUT	0.50	10
15	3.00	209.439	SPT2			0	11	83	6										
					(4.50m)														
18	4.50	207.939	SPT3		Light Gray sandy silt with gravels (ML-CL)														
	5.50	206.939	UDS2			6	17	71	6	25	19	6		1.79	1.60	11.9			
					(6.00m)														
21	6.00	206.439	SPT4			0	55	45	0										
24	7.50	204.939	SPT5																
	8.50	203.939	UDS3										2.63	1.80	1.63	10.7	DST	0.00	31
28	9.00	203.439	SPT6		Light Gray Silty Fine Sand (SP-SM)	0	73	27	0	N	P	-							
31	10.50	201.939	SPT7																
	11.50	200.939	UDS4											1.83	1.65	11.2			
36	12.00	200.439	SPT8		(12.00m)														

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-02-2015

Table No.B-1

Location: Minor Bridge

Chainage (Km): 15+227

Reduced Level (m): 214.423

WATER TABLE (m) : Not Met

Date of Completion: 04-03-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.923	DS1		Dark Gray Sandy Silt (ML-CL) (1.50m)	0	16	79	5										
5	1.50	212.923	SPT1																
	2.50	211.923	UDS1			0	8	79	13	33	22	11	2.67	1.70	1.51	12.3	UUT	0.40	10
7	3.00	211.423	SPT2																
18	4.50	209.923	SPT3		Light gray clayey silt of low plasticity (CL)														
	5.50	208.923	UDS2			0	7	80	13	33	21	12		1.81	1.60	12.9			
21	6.00	208.423	SPT4																
29	7.50	206.923	SPT5		(8.50m)														
	8.50	205.923	UDS3			0	54	46	0	N	P	-	2.64	1.82	1.64	11.2	DST	0.00	31
34	9.00	205.423	SPT6		Light gray silty fine sand (SM)														
38	10.50	203.923	SPT7		(11.50m)														
	11.50	202.923	UDS4		Light gray clayey silt of low plasticity (CL)	0	8	78	14	34	22	12	2.68	1.89	1.66	13.7			
42	12.00	202.423	SPT8		(12.00m)														

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-03-2015

Table No.C-1

Location: Minor Bridge

Chainage (Km): 16+144

Reduced Level (m): 213.770

WATER TABLE (m) : Not Met

04-04-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.270	DS1			0	7	80	13										
16	1.50	212.270	SPT1																
	2.50	211.270	UDS1							34	22	12	2.68	1.71	1.53	11.9	UUT	0.50	9
8	3.00	210.770	SPT2		Light gray clayey silt of low plasticity (CL)														
16	4.50	209.270	SPT3			0	10	76	14										
	5.50	208.270	UDS2							33	22	11		1.79	1.58	13.5			
13	6.00	207.770	SPT4																
					(7.50m)														
16	7.50	206.270	SPT5		Light gray sandy silt (ML)	0	43	54	3	N	P	-	2.64						
	8.50	205.270	UDS3											1.84	1.63	12.9	DST	0.00	30
29	9.00	204.770	SPT6			0	9	74	17										
33	10.50	203.270	SPT7		Light gray clayey silt of medium plasticity (CI)														
	11.50	202.270	UDS4							44	24	20	2.70	1.91	1.65	15.9			
37	12.00	201.770	SPT8		(12.00m)														

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-04-2015

Table No. D-1

Location: Minor Bridge

Chainage (Km): 17+338

Reduced Level (m): 214.015

WATER TABLE (m) : Not Met

Date of Completion: 04-05-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.515	DS1																
8	1.50	212.515	SPT1		Dark gray sandy silt of low plasticity (CL)	0	16	71	13										
	2.50	211.515	UDS1							33	22	10	2.68	1.67	1.51	10.7	UUT	0.40	10
					(3.00m)														
10	3.00	211.015	SPT2																
13	4.50	209.515	SPT3		Light gray clayey silt of low plasticity (CL)	1	12	73	14										
	5.50	208.515	UDS2							34	22	12		1.74	1.56	12.5			
					(6.00m)														
25	6.00	208.015	SPT4																
26	7.50	206.515	SPT5																
	8.50	205.515	UDS3							26	19	7		1.86	1.64	13.2	UUT	1.05	11
28	9.00	205.015	SPT6		Light gray sandy silt (ML-CL)	6	16	72	6										
32	10.50	203.515	SPT7																
	11.50	202.515	UDS4										2.66	1.88	1.66	13.5			
28	12.00	202.015	SPT8		(12.00m)	0	19	75	6										

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-05-2016

Table No. E-1

Location: Minor Bridge

Chainage (Km): 18+070

Reduced Level (m): 214.220

WATER TABLE (m) : Not Met

Date of Completion 04-06-2016

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.720	DS1		Light gray sandy silt (ML-CL)														
8	1.50	212.720	SPT1		(2.50m)	2	17	75	6	25	19	6							
	2.50	211.720	UDS1		Light gray sandy silt (ML)					N	P	-	2.64	1.72	1.53	12.5	DST	0.00	29
10	3.00	211.220	SPT2		(4.50m)	0	46	51	3										
16	4.50	209.720	SPT3																
	5.50	208.720	UDS2							34	22	12		1.80	1.58	14.2			
21	6.00	208.220	SPT4			4	6	77	13										
19	7.50	206.720	SPT5		Light Gray clayey silt of low plasticity (CL)														
	8.50	205.720	UDS3							33	22	11	2.68	1.84	1.60	14.8	UUT	1.04	10
18	9.00	205.220	SPT6																
23	10.50	203.720	SPT7		(11.50m)														
	11.50	202.720	UDS4		Light Gray find sand (SP-SM)														
24	12.00	202.220	SPT8		(12.00m)	0	90	10	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Muzaffarnagar Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-06-2015

Table No. F-1

Chainage (Km): 19+051

Reduced Level (m): 214.650

WATER TABLE (m) : Not Met

Date of Completion: 04-06-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	214.150	DS1			1	17	76	6										
7	1.50	213.150	SPT1		Light gray sandy silt (ML-CL)														
	2.50	212.150	UDS1			0	22	72	6	25	19	6	2.66	1.70	1.52	12.1	UUT	0.40	10
8	3.00	211.650	SPT2		(4.50m)														
15	4.50	210.150	SPT3		Light Gray silty sand (SM)	0	56	44	0										
	5.50	209.150	UDS2		(6.00m)					N	P	-	2.63	1.78	1.58	12.5	DST	0.00	30
20	6.00	208.650	SPT4																
22	7.50	207.150	SPT5			2	15	77	6										
	8.50	206.150	UDS3		Light gray sandy silt (ML-CL)					26	20	6		1.86	1.64	13.3	UUT	0.80	12
24	9.00	205.650	SPT6			0	22	72	6				2.66						
22	10.50	204.150	SPT7		(11.50m)														
	11.50	203.150	UDS4		Light Gray silty fine sand (SM)														
25	12.00	202.650	SPT8		(12.00m)	0	80	20	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-07-2015

Table No. G-1

Location: Minor Bridge

Chainage (Km): 19+955

Reduced Level (m): 214.234

WATER TABLE (m) : Not Met

Date of Completion: 04-07-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.734	DS1																
6	1.50	212.734	SPT1		Dark gray sandy silt (ML-CL)	0	19	75	6										
	2.50	211.734	UDS1							26	20	6	2.66	1.72	1.53	12.5	UUT	0.50	10
12	3.00	211.234	SPT2		(3.00m)														
16	4.50	209.734	SPT3			9	73	18	0	N	P	-							
	5.50	208.734	UDS2											1.77	1.50	10.9			
19	6.00	208.234	SPT4																
22	7.50	206.734	SPT5		Light gray silty fine sand with gravels (SM)	3	64	33	0	N	P	-							
	8.50	205.734	UDS3										2.63	1.81	1.63	11.2	DST	0.00	31
23	9.00	205.234	SPT6																
26	10.50	203.734	SPT7																
	11.50	202.734	UDS4																
30	12.00	202.234	SPT8		(12.000m)	0	78	22	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 2

Termination Depth (m): 12.00

Date of Start: 04-08-2015

Table No. G-2

Location: Minor Bridge

Chainage (Km): 19+955

Reduced Level (m): 214.234

WATER TABLE (m) : Not Met

Date of Completion: 04-08-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	213.734	DS1			0	38	56	6										
6	1.50	212.734	SPT1		lLight gray sandy silt (ML-CL)														
	2.50	211.734	UDS1			6	30	59	5	25	19	6	2.66	1.72	1.53	12.2	UUT	0.50	10
11	3.00	211.234	SPT2		(3.00m)														
13	4.50	209.734	SPT3			1	92	7	0	N	P	-							
	5.50	208.734	UDS2											1.76	1.58	11.3			
18	6.00	208.234	SPT4																
19	7.50	206.734	SPT5		Light gray silty fine sand (SP-SM)	0	91	9	0	N	P	-							
	8.50	205.734	UDS3										2.62	1.82	1.63	11.9	DST	0.00	32
26	9.00	205.234	SPT6																
34	10.50	203.734	SPT7																
	11.50	202.734	UDS4																
36	12.00	202.234	SPT8		(12.000m)	0	90	10	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Meerut Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-08-2015

Table No. H-1

Location: Minor Bridge

Chainage (Km): 20+935

Reduced Level (m): 215.001

WATER TABLE (m) : Not Met

Date of Completion 04-08-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	214.501	DS1			0	21	73	6										
12	1.50	213.501	SPT1																
	2.50	212.501	UDS1							25	19	6	2.66	1.72	1.53	12.2	UUT	0.50	10
10	3.00	212.001	SPT2			4	20	70	6										
14	4.50	210.501	SPT3		Light brown sandy silt (ML-CL)														
	5.50	209.501	UDS2											1.78	1.58	12.5			
18	6.00	209.001	SPT4																
18	7.50	207.501	SPT5			0	16	78	6										
	8.50	206.501	UDS3							26	20	6		1.86	1.63	14.2	UUT	0.80	12
					(9.00m)														
31	9.00	206.001	SPT6																
28	10.50	204.501	SPT7		Light Gray silty fine sand (SM)	4	72	24	0				2.64						
	11.50	203.501	UDS4											1.87	1.65	13.2	DST	0.00	31
34	12.00	203.001	SPT8		(12.00m)	0	76	24	0	N	P	-							

SOIL PROFILE

Project :Geotechnical Investigation for Hapur - Muzaffarnagar Section of DFCC Meerut

BH.No. 1

Termination Depth (m): 12.00

Date of Start: 04-09-2015

Table No. I-1

Chainage (Km): 22+200

Reduced Level (m): 216.485

WATER TABLE (m) : Not Met

Date of Completion: 04-09-2015

Job No. 201414

N-Value	Depth (m)	Reduced Level (m)	Sample No.	Symbol	SOIL DESCRIPTION	Grain Size Analysis				Atterberg Limits			Specific Gravity	Natural Density gms/cm^3	Dry Density gms/cm^3	Moisture Content %	Triaxial Test		
						Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index %					Type of Test	Cohesion Intercept Kg/cm^2	Angle of Internal Friction
	0.50	215.985	DS1																
8	1.50	214.985	SPT1		Light gray clayey silt of low plasticity (CL)	3	9	75	13										
	2.50	213.985	UDS1		(3.00m)					33	22	11	2.67	1.74	1.54	13.3	UUT	0.50	10
14	3.00	213.485	SPT2																
12	4.50	211.985	SPT3			0	86	14	0	N	P	-							
	5.50	210.985	UDS2											1.78	1.58	12.4			
19	6.00	210.485	SPT4																
16	7.50	208.985	SPT5		Light gray silty fine sand (SM)	0	56	44	0				2.64						
	8.50	207.985	UDS3											1.84	1.62	13.5	DST	0.00	31
22	9.00	207.485	SPT6			0	73	27	0	N	P	-							
27	10.50	205.985	SPT7																
	11.50	204.985	UDS4																
32	12.00	204.485	SPT8		(12.00m)	0	75	25	0	N	P	-							

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : 24+920

Borehole dia : 150 mm

Co-ordinate: E:-758845.2131 N:-3189173.561

Ground Water Table : Nil m

Reduce Level: 215.810 m

Termination Depth : 12.45 m

Date : 19/04/2015 to 20/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Sandy SILT			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	11	15																								
3				ML	2.50-2.80	UDS-1			25	NP		0	49	48	3	2.8	1.85	1.8	2.71												
4		Medium Dense Silty SAND		SM	3.00-3.45	SPT-2	12	14				0	50	50	0											0	30				
5					4.50-4.95	SPT-3	16	16																								
6		Medium to Dense Fine SAND		SP	5.50-5.80	UDS-2						0	96	4	0	12	1.87	1.67	2.7							0	32.4	NIL	139.0	7.69	
7				SP	6.00-6.45	SPT-4	21	17				0	96	4	0											0	34.0				
8					7.50-7.95	SPT-5	22	17																								
9					9.00-9.45	SPT-6	26	18																								
10																														
11				SP-SM	10.50-10.95	SPT-7	28	18				0	91	9	0											0	34.0				
12					12.00-12.45	SPT-8	32	19																								
13		Borehole terminated at depth of 12.45m																												
14																														
15																														
16																														
17																														
18																														
19																														
20																														

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : 25+760

Borehole dia : 150 mm

Co-ordinate: E:- 758695.234 N:-3189993.911

Ground Water Table : 10.10 m

Reduce Level: 217.289 m

Termination Depth : 12.45 m

Date : 18/04/2015 to 18/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Sandy SILT			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	10	14																								
3				ML	2.50-2.80	UDS-1			33	NP		0	21	79	0	4.7	1.83	1.75	2.68												
		Medium Dense Silty SAND		SM	3.00-3.45	SPT-2	18	18				0	70	30	0											0	31.0				
4																															
5					4.50-4.95	SPT-3	17	16																							
6				SP-SM	5.50-5.80	UDS-2						0	93	7	0	7.5	1.87	1.74	2.71							0	33.3	NIL	129.07	7.94	
				SM	6.00-6.45	SPT-4	23	18				0	79	21	0											0	33.0				
7																															
8					7.50-7.95	SPT-5	22	17																							
9																															
10		Medium to Dense Fine SAND			9.00-9.45	SPT-6	26	18																							
11				SP	10.50-10.95	SPT-7	29	18				0	99	1	0											0	33.1				
12																															
					12.00-12.45	SPT-8	31	18																							
13		Borehole terminated at depth of 12.45m																													
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : 26+530

Borehole dia : 150 mm

Co-ordinate: E:-758555.4818 N:-3190758.323

Ground Water Table : 8.00 m

Reduce Level: 216.395 m

Termination Depth : 12.45 m

Date : 22/04/2015 to 22/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Very Loose to Loose Sandy SILT			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	2	3																								
3				ML	2.50-2.80	UDS-1			23	NP		0	41	59	0	12.3	1.92	1.71	2.72												
				ML	3.00-3.45	SPT-2	8	9				0	39	61	0											0	29.0				
4		Medium Dense Silty SAND																													
5					4.50-4.95	SPT-3	12	12																								
6				SP-SM	5.50-5.80	UDS-2						0	89	11	0	10.4	1.99	1.8	2.69									NIL	119.15	7.72	
				SM	6.00-6.45	SPT-4	20	17				0	74	26	0											0	31.5				
7																										0	32.0				
8					7.50-7.95	SPT-5	21	17																							
9		Medium to Dense Fine SAND																													
					9.00-9.45	SPT-6	26	18																							
10																															
11				SP-SM	10.50-10.95	SPT-7	30	19				0	92	8	0											0	32.4				
12																															
					12.00-12.45	SPT-8	34	20																							
13		Borehole terminated at depth of 12.45m																													
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : 27+290

Borehole dia : 150 mm

Co-ordinate: E:- 758421.4841 N:- 3191491.2589

Ground Water Table : 9.00 m

Reduce Level: 219.350

Termination Depth : 30.45 m

Date : 24/04/2015 to 24/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose Silty SAND			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	4	6																								
3				SM	2.50-2.80	UDS-1			24	NP		0	55	45	0	10.7	1.88	1.7								0	31				
				SM	3.00-3.45	SPT-2	7	8				1	59	40	0											0	31				
4																															
5					4.50-4.95	SPT-3	12	12																								
6		Medium Dense Sandy SILT		ML-CL	5.50-5.80	UDS-2			34	24	10	9	5	58	28	17.6	1.96	1.67	2.67					103	0							
					6.00-6.45	SPT-4	18	16																								
7																															
8					7.50-7.95	SPT-5	16	14																								
9																															
				ML	9.00-9.45	SPT-6	22	16				3	6	84	7											0	29.7				
10																															
11					10.50-10.95	SPT-7	26	17																								
12		Very Stiff Silty CLAY		CL	11.50-11.80	UDS-3			33	19	14	0	4	65	31	22	2.01	1.65	2.68					120	0							
					12.00-12.45	SPT-8	33	19																								
13																															
14					13.50-13.95	SPT-9	29	17																								
15																															
					15.00-15.45	SPT-10	39	20																								
16		Dense to Vey Dense Fine SAND																													
17				SP-SM	16.50-16.80	SPT-11	42	20				0	95	5	0											0	33.0				
18																															
					18.00-18.45	SPT-12	48	21																								
19																															
20					19.50-19.95	SPT-13	53	22																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : 27+290

Borehole dia : 150 mm

Co-ordinate: E:- 758421.4841 N:- 3191491.2589

Ground Water Table : 9.00 m

Reduce Level: 219.350

Termination Depth : 30.45 m

Date : 24/04/2015 to 24/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Vey Dense Fine SAND		SP-SM	21.00-21.45	SPT-14	47	20																							
22																															
23					22.50-22.95	SPT-15	57	22																							
24																															
25					24.00-24.45	SPT-16	68	24																							
26					25.50-25.95	SPT-17	77	25				0	88	12	0				2.68							0	34				
27																															
28					27.00-27.45	SPT-18	83	26																							
29					28.50-28.95	SPT-19	89	26																							
30					30.00-30.45	SPT-20	>100																								
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 2

Page 1 of 2

Location : 27+290

Borehole dia : 150 mm

Co-ordinate: E:-758417.0959 N:- 3191515.2611

Ground Water Table : 9.00 m

Reduce Level: 219.420 m

Termination Depth : 30.45 m

Date : 24/04/2015 to 24/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose to Medium Dnese Sandy SILT			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	6	8																								
3				ML	2.50-2.80	UDS-1						12	10	78	0	13.5	1.89	1.66														
				ML	3.00-3.45	SPT-2	10	12				1	13	81	5											0	29				
4																															
5					4.50-4.95	SPT-3	13	13																								
6		Stiff Silty CLAY		CL	5.50-5.80	UDS-2			25	18	7	19	3	64	14	20.6	1.96	1.63	2.70					68	0							
					6.00-6.45	SPT-4	14																									
7		Medium to Dense Sandy SILT																													
8					7.50-7.95	SPT-5	17	15																								
9				ML	8.50-8.80	UDS-3			23	17	6	1	24	72	3	18.5	2.08	1.76	2.65													
					9.00-9.45	SPT-6	26	18																								
10																															
11					10.50-10.95	SPT-7	26	17																								
12																															
				ML	12.00-12.45	SPT-8	31	18	23	NP		0	24	75	1																
13																															
14					13.50-13.95	SPT-9	36	20																								
15																															
					15.00-15.45	SPT-10	45	22																								
16																															
17		Dense to Very Dense Silty SAND		SM	16.50-16.80	SPT-11	48	22				0	87	13	0											0	33.7				
18																															
					18.00-18.45	SPT-12	52	22																								
19																															
20					19.50-19.95	SPT-13	53	22																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 2

Page 2 of 2

Location : 27+290

Borehole dia : 150 mm

Co-ordinate: E:-758417.0959 N:- 3191515.2611

Ground Water Table : 9.00 m

Reduce Level: 219.420 m

Termination Depth : 30.45 m

Date : 24/04/2015 to 24/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Very Dense Silty SAND		SM	21.00-21.45	SPT-14	40	18				0	77	23	0				2.69							0	32.2				
22																															
23					22.50-22.95	SPT-15	55	21																							
24																															
25					24.00-24.45	SPT-16	59	22																							
26					25.50-25.95	SPT-17	64	22																							
27																															
28					27.00-27.45	SPT-18	68	22																							
29				SP-SM	28.50-28.95	SPT-19	71	22				0	95	5	0											0	34.1				
30					30.00-30.45	SPT-20	77	23																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : 27+820

Borehole dia : 150 mm

Co-ordinate: E:- 758323.2688 N:-3192026.515

Ground Water Table : 9.60 m

Reduce Level: 218.004 m

Termination Depth : 12.45 m

Date : 24/04/2015 to 24/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Firm to Stiff Silty CLAY		CL	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	5																									
3					2.50-2.80	UDS-1			24	17	7	4	14	67	15	15	1.89	1.64	2.70					65	0							
					3.00-3.45	SPT-2	13																									
4																															
5					4.50-4.95	SPT-3	12																									
6				CL	5.50-5.80	UDS-2			33	19	14	1	24	60	15	15.8	1.96	1.69	2.64	0.752	0.2	140	0.016	68	0			NA	129.07	8		
		Medium Dense Sandy SILT			6.00-6.45	SPT-4	11	10																							
7																															
8				ML	7.50-7.95	SPT-5	15	13				0	7	90	3											0	31.2				
9																															
					9.00-9.45	SPT-6	14	11																							
10																															
11		Medium to Dense Silty SAND			10.50-10.95	SPT-7	25	17																							
12																															
				SM	12.00-12.45	SPT-8	31	18				0	72	28	0											0	31.8				
13		Borehole terminated at depth of 12.45m																													
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : 28+660

Borehole dia : 150 mm

Co-ordinate: E:- 758099.3974 N:-3192835.787

Ground Water Table : 9.00 m

Reduce Level: 217.975 m

Termination Depth : 12.45 m

Date : 25/04/2015 to 25/04/2015

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chemical Analysis of soil Chlorides mg/l	Chemical Analysis of soil pH Value	Chemical Analysis of soil Organic (%)
1		Firm Silty CLAY			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	7																								
3				CL	2.50-2.80	UDS-1			25	17	8	0	12	79	9	14.9	1.93	1.68	2.69	0.518	0.174	180	0.018	42	0							
		Medium Dense Sandy SILT		ML	3.00-3.45	SPT-2	10	12				9	20	71	0											0	32				
4																															
5					4.50-4.95	SPT-3	13	13																							
6				ML	5.50-5.80	UDS-2			27	NP		21	9	67	3	17.5	2.0	1.7	2.62					80	0							
7					6.00-6.45	SPT-4	16	15																							
8				ML	7.50-7.95	SPT-5	16	14	23	NP		14	16	70	0																
9																															
10					9.00-9.45	SPT-6	14	11																							
11		Medium to Dense Fine SAND		SP-SM	10.50-10.95	SPT-7	17	14				0	92	8	0											0	33				
12																															
13		Borehole terminated at depth of 12.45m			12.00-12.45	SPT-8	34	20																							
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Location : 28+880

Co-ordinate: E:- 758061 N:- 3192970

Reduce Level: 218.115

Method of Boring : Rotary

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.45 m

Borehole No. 1

Page 1 of 2

Date : 16/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.00-0.50	DS-1																									
1																															
					1.50-1.95	SPT-1	18	22																								
2				ML	2.00-2.50	UDS-1			29	NP		13	27	47	13	15.8	1.99	1.72	2.61					56	0			Nil	168.79	7.61	
3																															
					3.00-3.45	SPT-2	20	22																								
4																															
					4.50-4.95	SPT-3	17	18																								
5				ML	5.00-5.50	UDS-2						1	14	77	8												0	30.6				
					6.00-645	SPT-4	19	19																								
6																															
7																															
		Medium Dense Sandy SILT			7.50-7.95	SPT-5	20	18																								
8																															
9																															
					9.00-9.45	SPT-6	23	19																								
10																															
11					10.50-10.95	SPT-7	25	20																								
				ML	11.00-11.50	UDS-4			31	NP		7	8	71	14				2.60					53	0						
12																															
					12.00-12.45	SPT-8	22	18																								
13																															
					13.50-13.95	SPT-9	25	19																								
14																															
15																															
					15.00-15.45	SPT-10	28	20																								
16																															
17				SP	16.50-16.95	SPT-11	30	20				0	98	2																		
		Medium Dense to Dense Fine Sand																													
18																															
					18.00-18.45	SPT-12	28	19																								
19																															
					19.50-19.95	SPT-13	33	20																								
20																															

Prepared By:

Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : 28+880

Borehole dia : 150 mm

Co-ordinate: E:- 758061 N:- 3192970

Ground Water Table : 9.00 m

Reduce Level: 218.115

Termination Depth : 30.45 m

Date : 16/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense Fine SAND		SP	21.00-21.45	SPT-14	38	22				0	99	1					2.68							0	33.3				
22																															
23					22.50-22.95	SPT-15	43	23																							
24																															
25					24.00-24.45	SPT-16	42	22																							
26					25.50-26.00	SPT-17	49	24																							
27																															
		Dense To Very Dense Fine SAND		SP	27.00-27.45	SPT-18	53	25				0	98	2												0	34.0				
28																															
29					28.50-28.95	SPT-19	49	23																							
30																															
					30.00-30.45	SPT-20	55	25																							
31		Borehole terminated at depth of 30.45m																													
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 1

Location : 30+780

Co-ordinate: E:- 757499 N:- 3194869

Reduce Level: 219.061

Borehole dia : 150 mm

Ground Water Table : 7.00 m

Termination Depth : 12.45 m

Date : 15/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chemical Analysis of soil Chlorides mg/l	Chemical Analysis of soil pH Value	Chemical Analysis of soil Organic (%)
					0.00-0.50	DS-1																										
1																																
					1.50-1.95	SPT-1	14	23																									
				ML	2.00-2.50	UDS-1			28	NP		4	21	58	17	14.6	2.00	1.75						70	0			Nil	129.07	7.68		
2																																
					3.00-3.45	SPT-2	19	21																									
3																																
					4.50-4.95	SPT-3	21	21																									
				ML	5.00-5.50	UDS-2			32	NP		1	5	78	16	21.5	2.08	1.71	2.66					108	0							
4																																
		Medium Dense Sandy SILT			6.00-645	SPT-4	9	11																									
5																																
					7.50-7.95	SPT-5	12	13																									
6																																
				ML	9.00-9.45	SPT-6	16	16				0	32	66	2												0	32.4					
7																																
					10.50-10.95	SPT-7	15	15																									
8																																
				SM	12.00-12.45	SPT-8	24	19				0	60	40	0												0	33.6					
9																																
10		Borehole terminated at depth of 12.45m																														
11																																
12																																
13																																
14																																
15																																
16																																
17																																
18																																
19																																
20																																

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 2

Location : 33+050

Co-ordinate: E:- 756863 N:- 3197017

Reduce Level: 221.451

Borehole dia : 150 mm

Ground Water Table : 6.00 m

Termination Depth : 30.45 m

Date : 16/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.00-0.50	DS-1																									
1		Loose Sandy SILT																													
2					1.50-1.95	SPT-1	7	11																								
				ML	2.00-2.50	UDS-1			29	NP		2	16	70	12									87	0			Nil	148.93	7.31	
3																															
					3.00-3.45	SPT-2	14	20																								
4																															
		Medium Dense Sandy SILT																													
5					4.50-4.95	SPT-3	17	18																								
6																															
				SP	6.00-645	SPT-4	12	14				0	96	4													0	34.2				
7																															
					7.50-7.95	SPT-5	15	16																								
8																															
9					9.00-9.45	SPT-6	18	17																								
10																															
11					10.50-10.95	SPT-7	20	17																								
12																															
				SP	12.00-12.45	SPT-8	20	17				1	97	2																		
13		Medium Dense To Dense Fine SAND																													
14					13.50-13.95	SPT-9	21	17																								
15																															
					15.00-15.45	SPT-10	24	18																								
16																															
17				SP	16.50-16.95	SPT-11	26	18				0	97	3													0	34.0				
18																															
					18.00-18.45	SPT-12	29	19																								
19																															
20					19.50-19.95	SPT-13	31	20																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : 33+050

Co-ordinate: E:- 756863 N:- 3197017

Reduce Level: 221.451

Borehole dia : 150 mm

Ground Water Table : 6.00 m

Termination Depth : 30.45 m

Date : 16/01/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense Fine SAND		SW-SM	21.00-21.45	SPT-14	33	20				0	95	5																	
22																															
23					22.50-22.95	SPT-15	28	18																							
24																															
25					24.00-24.45	SPT-16	39	21																							
26																															
27					25.50-26.00	SPT-17	46	23																							
28				SP	27.00-27.45	SPT-18	44	22				0	99	1												0	35.0				
29		Very Dense Fine SAND			28.50-28.95	SPT-19	52	24																							
30																															
31		Borehole terminated at depth of 30.45m			30.00-30.45	SPT-20	53	24																							
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 2

Location : CH 34+360

Co-ordinate: E:- 756485.87 N:- 3198289.30

Reduce Level: 219.892

Borehole dia : 150 mm

Ground Water Table : 6.00 m

Termination Depth : 30.45 m

Date : 21/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose Sandy SILT		ML	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	7	11	34	NP		9	16	68	7											0	29				
3																															
					3.00-3.45	SPT-2	9	13																							
4																															
5					4.50-4.95	SPT-3	12	15																							
6																															
		Medium Dense Sandy SILT			6.00-6.45	SPT-4	14	16																							
7																															
8					7.50-7.95	SPT-5	17	17																							
9																															
				SW-SM	9.00-9.45	SPT-6	18	17				0	94	6											0	32.2	Nil	129.07	7.92		
10																															
					10.50-10.95	SPT-7	19	17																							
11																															
12																															
					12.00-12.45	SPT-8	21	17																							
13																															
					13.50-13.95	SPT-9	22	17																							
14																															
15		Medium Dense Fine SAND																													
					15.00-15.45	SPT-10	25	18																							
16																															
					16.50-16.95	SPT-11	27	19																							
17																															
18																															
					18.00-18.45	SPT-12	30	20																							
19																															
20					19.50-19.95	SPT-13	30	19																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : CH 34+360

Co-ordinate: E:- 756485.87 N:- 3198289.30

Reduce Level: 219.892

Borehole dia : 150 mm

Ground Water Table : 6.00 m

Termination Depth : 30.45 m

Date : 21/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
		Hard Silty CLAY		CI	20.00-20.50	UDS-7			45	23	22	0	7	67	26	21	1.98	1.64	2.64												
21					21.00-21.45	SPT-14	32	20																							
22																															
23					22.50-22.95	SPT-15	35	20																							
24																															
					24.00-24.45	SPT-16	38	21																							
25																															
		Medium Dense to Very Dense Fine SAND																													
26					25.50-25.95	SPT-17	46	23																							
27																															
				SW-SM	27.00-27.45	SPT-18	50	24				0	94		6											0	35.6				
28																															
29					28.50-28.95	SPT-19	55	25																							
30					30.00-30.45	SPT-20	61	27																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 2

Location : 34+986

Co-ordinate: E:- 756199 N:- 3198851

Reduce Level: 222.047

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 18/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.00-0.50	DS-1																									
1																															
					1.50-1.95	SPT-1	6	10																							
2		Loose Sandy SILT																													
				ML	2.00-2.50	UDS-1						0	96	4		15.3	2.01	1.75								0	27.6				
3																															
					3.00-3.45	SPT-2	10	14																							
4																															
5					4.50-4.95	SPT-3	21	21																							
6					6.00-645	SPT-4	25	22																							
7																															
8		Medium Dense Fine SAND		SP	7.50-7.95	SPT-5	29	23				0	97	3					2.6							0	30.7				
9					9.00-9.45	SPT-6	33	25																							
10																															
11					10.50-10.95	SPT-7	28	21																							
12																															
				SP	12.00-12.45	SPT-8	30	22				0	98	2																	
13																															
14					13.50-13.95	SPT-9	31	21																							
15																															
16		Dense Fine SAND			15.00-15.45	SPT-10	36	23																							
17					16.50-16.95	SPT-11	39	24																							
18																															
				SP	18.00-18.45	SPT-12	38	23				1	95	4					2.6							0	32.7				
19																															
20					19.50-19.95	SPT-13	43	24																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : 34+986

Co-ordinate: E:- 756199 N:- 3198851

Reduce Level: 222.047

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 18/01/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense Fine SAND		SP	21.00-21.45	SPT-14	38	22																							
22																															
23					22.50-22.95	SPT-15	39	22																							
24																															
25					24.00-24.45	SPT-16	42	22				2	96	2																	
26					25.50-26.00	SPT-17	40	21																							
27																															
28					27.00-27.45	SPT-18	45	23																							
29		Very Dense Fine SAND		SW-SM	28.50-28.95	SPT-19	54	25				0	94	6												0	34.3				
30																															
					30.00-30.45	SPT-20	61	27																							
31		Borehole terminated at depth of 30.45m																													
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 1 of 2

Location : 34+986

Co-ordinate: E:- 756198 N:- 3198847

Reduce Level: 222.047

Borehole dia : 150 mm

Ground Water Table : 3.50 m

Termination Depth : 30.45 m

Date : 18/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.00-0.50	DS-1																									
1																															
2		Medium Dense Silty SAND with Gravel			1.50-1.95	SPT-1	11	18																							
				SM					26	NP		16	42	31	11	25.2	2.04	1.63								0	31.8	Nil	119.15	7.33	
3																															
					3.00-3.45	SPT-2	6	8																							
4																															
					4.50-4.95	SPT-3	15	19																							
5																															
					6.00-645	SPT-4	19	19																							
6																															
					7.50-7.95	SPT-5	16	16				0	99	1					2.59												
7		Medium Dense Fine SAND		SP																											
					9.00-9.45	SPT-6	26	21																							
8																															
					10.50-10.95	SPT-7	30	22																							
9																															
					12.00-12.45	SPT-8	14		33	23	10	0	5	71	24																
10		Stiff Stiff Clay SILT		CL																											
					13.50-13.95	SPT-9	29	21																							
11																															
					15.00-15.45	SPT-10	35	23																							
12																															
					16.50-16.95	SPT-11	38	23				0	98	2					2.59								0	33.3				
13		Dense Fine SAND		SP																											
					18.00-18.45	SPT-12	32	20																							
14																															
					19.50-19.95	SPT-13	40	23																							
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 2 of 2

Location : 34+986

Co-ordinate: E:- 756198 N:- 3198847

Reduce Level: 222.047

Borehole dia : 150 mm

Ground Water Table : 3.50 m

Termination Depth : 30.45 m

Date : 18/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense To Very Dense Fine SAND		SP	21.00-21.45	SPT-14	38	22				0	98	2																	
22																															
23					22.50-22.95	SPT-15	38	21																							
24																															
25					24.00-24.45	SPT-16	43	23																							
26					25.50-26.00	SPT-17	47	24																							
27																															
28				SP	27.00-27.45	SPT-18	46	23				0	98	2												0	35				
29					28.50-28.95	SPT-19	49	23																							
30																															
31		Borehole terminated at depth of 30.45m			30.00-30.45	SPT-20	57	26																							
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 2

Location : 35+549

Co-ordinate: E:- 755865 N:- 3199300

Reduce Level: 221.929

Borehole dia : 150 mm

Ground Water Table : 3.75 m

Termination Depth : 30.45 m

Date : 19/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.00-0.50	DS-1																									
1																															
		Medium Dense Silty SAND & gravel																													
2					1.50-1.95	SPT-1	12	20																							
				SM	2.00-2.50	UDS-1						0	73	24	3	12.6	2.07	1.84								0	30				
3																															
					3.00-3.45	SPT-2	14	20																							
4																															
5					4.50-4.95	SPT-3	17	18																							
6																															
					6.00-645	SPT-4	21	20																							
7																															
8		Medium Dense Fine SAND		SP	7.50-7.95	SPT-5	19	18				0	96	4					2.59							0	32.0				
9																															
					9.00-9.45	SPT-6	28	22																							
10																															
11					10.50-10.95	SPT-7	32	23																							
12																															
				SP	12.00-12.45	SPT-8	20	17				0	98	2																	
13																															
14					13.50-13.95	SPT-9	31	21																							
15																															
					15.00-15.45	SPT-10	37	24																							
16		Dense Fine SAND																													
17					16.50-16.95	SPT-11	38	23																							
18																															
				ML	18.00-18.45	SPT-12	35	22	31	26	5	3	5	73	19				2.61							0	32.6				
19		Dense Snady SILT																													
20					19.50-19.95	SPT-13	39	23																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Location : 35+549

Co-ordinate: E:- 755865 N:- 3199300

Reduce Level: 221.929

Borehole dia : 150 mm

Ground Water Table : 3.75 m

Termination Depth : 30.45 m

Date : 19/01/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense Fine SAND			21.00-21.45	SPT-14	38	22																							
22																															
23					22.50-22.95	SPT-15	42	23																							
24				SP	24.00-24.45	SPT-16	45	23				0	99	1																	
25																															
26					25.50-26.00	SPT-17	52	25																							
27																															
28					27.00-27.45	SPT-18	49	24																							
29				SP	28.50-28.95	SPT-19	58	26				0	98	2													0	33.2				
30																															
31		Borehole terminated at depth of 30.45m			30.00-30.45	SPT-20	61	27																							
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 1 of 2

Location : 35+549

Co-ordinate: E:- 755862 N:- 3199298

Reduce Level: 221.929

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 19/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chemical Analysis of soil Chlorides mg/l	Chemical Analysis of soil pH Value	Chemical Analysis of soil Organic (%)
					0.00-0.50	DS-1																										
1																															
		Medium Dense Sandy SILT																													
2				ML	1.50-1.95	SPT-1	12	20				0	46	50	4											0	30.1	Nil	139	7.3		
3																															
					3.00-3.45	SPT-2	13	18																								
4																															
5					4.50-4.95	SPT-3	17	18																								
6																															
					6.00-645	SPT-4	22	20																								
7																															
		Medium Dense Fine SAND																													
8				SP	7.50-7.95	SPT-5	26	22				0	98	2					2.65							0	33.1					
9																															
					9.00-9.45	SPT-6	33	25																								
10																															
11					10.50-10.95	SPT-7	29	22																								
12																															
				SP	12.00-12.45	SPT-8	34	23				0	99	1																		
13																															
14					13.50-13.95	SPT-9	40	26																								
15																															
					15.00-15.45	SPT-10	38	24																								
16		Dense Fine SAND																													
17					16.50-16.95	SPT-11	39	24																								
18																															
				SP	18.00-18.45	SPT-12	43	25				1	97	2					2.65							0	34.5					
19																															
20					19.50-19.95	SPT-13	41	23																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 2 of 2

Location : 35+549

Co-ordinate: E:- 755862 N:- 3199298

Reduce Level: 221.929

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 19/01/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense Fine SAND		SP	21.00-21.45	SPT-14	43	24																							
22																															
23					22.50-22.95	SPT-15	47	25																							
24																															
25					24.00-24.45	SPT-16	43	23				1	96	3																	
26					25.50-26.00	SPT-17	47	24																							
27																															
28					27.00-27.45	SPT-18	47	23																							
29		Very Dense Fine SAND		SP	28.50-28.95	SPT-19	53	25				0	96	4												0	34.7				
30																															
					30.00-30.45	SPT-20	59	26																							
31		Borehole terminated at depth of 30.45m																													
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 1

Location : 37+360

Co-ordinate: E:- 754806 N:- 3200772

Reduce Level: 220.751

Borehole dia : 150 mm

Ground Water Table : 2.00 m

Termination Depth : 12.45 m

Date : 16/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.00-0.50	DS-1																									
1		Loose Silty SAND																													
2					1.50-1.95	SPT-1	9	15																								
				SM	2.00-2.50	UDS-1						0	58	31	11	21.9	1.98	1.62								0	31.3	Nil	139	7.2	
3																															
					3.00-3.45	SPT-2	17	19																								
4		Medium Dense Silty SAND																													
5					4.50-4.95	SPT-3	19	20																								
6																															
				SW-SM	6.00-645	SPT-4	16	17				1	87	12												0	33.7				
7																															
					7.50-7.95	SPT-5	19	18																								
8																															
9		Medium Dense Fine SAND																													
				SM	9.00-9.45	SPT-6	21	18				2	80	18												0	33.3				
10																															
11					10.50-10.95	SPT-7	23	19																								
12																															
				SW-SM	12.00-12.45	SPT-8	25	19				0	95	5												0	34.3				
13		Borehole terminated at depth of 12.45m																													
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 2

Location : 38+580

Co-ordinate: E:- 754609 N:- 3201967

Reduce Level: 220.980

Borehole dia : 150 mm

Ground Water Table : 2.00 m

Termination Depth : 30.45 m

Date : 20/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chemical Analysis of soil Chlorides mg/l	Chemical Analysis of soil pH Value	Chemical Analysis of soil Organic (%)
					0.00-0.50	DS-1																										
1		Loose Silty SAND																														
2					1.50-1.95	SPT-1	9	15																									
				SM	2.00-2.50	UDS-1						0	68	29	3	22.3	1.95	1.59								0	29.8	Nil	129.07	7.26		
3																																
					3.00-3.45	SPT-2	15	21																									
4																																
5					4.50-4.95	SPT-3	17	18																									
6																																
					6.00-645	SPT-4	21	20																									
7																																
8				SP	7.50-7.95	SPT-5	20	18				0	98	2					2.63							0	32.0					
9		Medium Dense To Dense Fine SAND																														
					9.00-9.45	SPT-6	26	21																									
10																																
11					10.50-10.95	SPT-7	30	22																									
12																																
					12.00-12.45	SPT-8	28	21																									
13																																
14				SP	13.50-13.95	SPT-9	31	21				0	97	3												0	34					
15																																
					15.00-15.45	SPT-10	34	22																									
16																																
17					16.50-16.95	SPT-11	38	23																									
18		Dense Sandy SILT & gravel																														
				ML	18.00-18.45	SPT-12	35	22	28	NP		3	14	67	16																	
19																																
20					19.50-19.95	SPT-13	40	23																									

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : 38+580

Co-ordinate: E:- 754609 N:- 3201967

Reduce Level: 220.980

Borehole dia : 150 mm

Ground Water Table : 2.00 m

Termination Depth : 30.45 m

Date : 20/01/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense Fine SAND		SP	21.00-21.45	SPT-14	39	22																							
22																															
23					22.50-22.95	SPT-15	42	23																							
24																															
25					24.00-24.45	SPT-16	42	22				0	96	4											0	33.3					
26					25.50-26.00	SPT-17	50	25																							
27																															
28					27.00-27.45	SPT-18	49	24																							
29		Very Dense Fine SAND			28.50-28.95	SPT-19	57	26																							
30																															
31		Borehole terminated at depth of 30.45m		SP	30.00-30.45	SPT-20	60	27				0	96	4																	
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Location : 39+120

Co-ordinate: E:- 754572 N:- 3202506

Reduce Level: 223.383

Borehole dia : 150 mm

Ground Water Table : 0.60 m

Termination Depth : 30.45 m

Date : 20/01/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.00-0.50	DS-1																									
1																															
2				SP	1.50-1.95	SPT-1	10	16				0	96	4												0	31.7				
3		Loose To Medium Dense Silty SAND																													
					3.00-3.45	SPT-2	14	20																							
4																															
5					4.50-4.95	SPT-3	22	21																							
6																															
				ML	6.00-645	SPT-4	27	23	29	NP		3	6	79	12				2.59							0	33.5	Nil	129.07	7.43	
7																															
8					7.50-7.95	SPT-5	32	25																							
9		Medium Dense Sandy SILT																													
					9.00-9.45	SPT-6	26	21																							
10																															
11					10.50-10.95	SPT-7	30	22																							
12																															
				SP	12.00-12.45	SPT-8	33	23				0	97	3												0	33.0				
13																															
14					13.50-13.95	SPT-9	36	24																							
15		Dense Fine SAND																													
					15.00-15.45	SPT-10	39	24																							
16																															
17					16.50-16.95	SPT-11	42	25																							
18																															
				CL	18.00-18.45	SPT-12	35	22	33	20	13	0	7	72	21				2.64												
19		Hard Silty CLAY																													
20					19.50-19.95	SPT-13	38	22																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : 39+120

Co-ordinate: E:- 754572 N:- 3202506

Reduce Level: 223.383

Borehole dia : 150 mm

Ground Water Table : 0.60 m

Termination Depth : 30.45 m

Date : 20/01/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chemical Analysis of soil Chlorides mg/l	Chemical Analysis of soil pH Value	Chemical Analysis of soil Organic (%)
21		Dense Fine SAND		SP	21.00-21.45	SPT-14	40	23																							
22																															
23					22.50-22.95	SPT-15	44	24																							
24																															
25					24.00-24.45	SPT-16	46	24				0	96	4																	
26																															
27					25.50-26.00	SPT-17	48	24																							
28																															
29		Very Dense Fine SAND		SP	27.00-27.45	SPT-18	46	23																							
30																															
31		Borehole terminated at depth of 30.45m			28.50-28.95	SPT-19	51	24				0	100	0												0	34.7				
32																															
33					30.00-30.45	SPT-20	61	27																							
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 41+916

Co-ordinate: E:- 754838.12 N:-3205227.62

Reduce Level: 224.585

Borehole dia : 150 mm

Ground Water Table : 5.00 m

Termination Depth : 30.00 m

Date : 21-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Firm Silty CLAY			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	6																									
				CL	2.00-2.50	UDS-1			33	18	15	0	18	70	12	21.7	1.92	1.58	2.61						57							
3																															
		Stiff to Very Stiff Silty CLAY			3.00-3.45	SPT-2	14																								
4																															
5					4.50-4.95	SPT-3	15																								
6																															
7					6.00-6.45	SPT-4	20																								
8					7.50-7.95	SPT-5	24																								
				CL	8.00-8.50	UDS-3			27	20	7	0	12	74	14	18.4	2.02	1.71						143				NIL	139	8.02	
9					9.00-9.45	SPT-6	31																								
10																															
11					10.50-10.95	SPT-7	33																								
		Hard Silty CLAY		CL	11.00-11.50	UDS-4			26	19	7	1	5	82	12	22.1	2	1.64						133							
12					12.00-12.45	SPT-8	38																								
13																															
14					13.50-13.95	SPT-9	33																								
				ML	14.00-14.50	UDS-5			32	NP		3	10	81	6	37.1	1.98	1.44													
15					15.00-15.45	SPT-10	38	24																							
16																															
17		Dense Sandy SILT			16.50-16.95	SPT-11	41	25																							
18																															
19					18.00-18.45	SPT-12	34	21																							
20					19.50-19.95	SPT-13	37	22																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 41+916

Co-ordinate: E:- 754838.12 N:-3205227.62

Reduce Level: 224.585

Borehole dia : 150 mm

Ground Water Table : 5.00 m

Termination Depth : 30.00 m

Date : 21-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
				CL	20.00-20.50	UDS-7			27	19	8	2	15	68	15	20.8	1.98	1.61	2.64												
21		Hard Silty CLAY			21.00-21.45	SPT-14	42																								
22																															
23					22.50-22.95	SPT-15	44																								
				ML	23.00-23.50	UDS-8			28	NP		0	15	77	8	19.1	1.99	1.67								0	32.1				
24																															
					24.00-24.45	SPT-16	48	25																							
25																															
26					25.50-25.95	SPT-17	52	25																							
27		Dense to Very Dense Sandy SILT																													
					27.00-27.45	SPT-18	49	24																							
28																															
29					28.50-28.95	SPT-19	56	26																							
30					30.00-30.45	SPT-20	61	27																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 43+900

Co-ordinate: E:-755233.19 N:- 3207147.35

Reduce Level: 223.979

Borehole dia : 150 mm

Ground Water Table : 9.50 m

Termination Depth : 30.00 m

Date : 22-01-2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Very Stiff Silty CLAY			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	21																	80							
				CL	2.00-2.50	UDS-1			30	18	12	1	14	74	11	13.6	1.72	1.51													
3					3.00-3.45	SPT-2	25																								
4																															
5					4.50-4.95	SPT-3	22																								
		Medium Dense Sandy SILT		ML	5.00-5.50	UDS-2			30	NP		0	18	76	6	11.3	1.68	1.51	2.64									NIL	99.29	7.52	
6																															
7					6.00-6.45	SPT-4	18	18																							
8					7.50-7.95	SPT-5	14	15																							
				CL	8.00-8.50	UDS-3			33	20	13	0	16	73	11	19.1	1.9	1.6													
9																															
10					9.00-9.45	SPT-6	21																								
11					10.50-10.95	SPT-7	24																								
				CL	11.00-11.50	UDS-4			32	21	11	4	4	68	24	21.8	2.06	1.69						116							
12																															
13					12.00-12.45	SPT-8	25																								
		Very Stiff Silty CLAY																													
14					13.50-13.95	SPT-9	27																								
15																															
16					15.00-15.45	SPT-10	29																								
17					16.50-16.95	SPT-11	34																								
18																															
				SP	18.00-18.45	SPT-12	37	22				1	96	3					2.66								34.8				
19																															
		Dense Fine SAND																													
20					19.50-19.95	SPT-13	40	23																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 43+900

Co-ordinate: E:-755233.19 N:- 3207147.35

Reduce Level: 223.979

Borehole dia : 150 mm

Ground Water Table : 9.50 m

Termination Depth : 30.00 m

Date : 22-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7																									
21					21.00-21.45	SPT-14	42	23																							
22																															
23					22.50-22.95	SPT-15	40	22																							
24																															
25		Dense to Vey Dense Fine SAND			24.00-24.45	SPT-16	43	23																							
26				SP	25.50-25.95	SPT-17	47	24				0	98	2																	
27																															
28					27.00-27.45	SPT-18	52	25																							
29					28.50-28.95	SPT-19	57	26																							
30					30.00-30.45	SPT-20	64	28																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 46+362

Co-ordinate: E:- 755356.32 N:- 3209599.42

Reduce Level: 226.246

Borehole dia : 150 mm

Ground Water Table : 10.00 m

Termination Depth : 30.00 m

Date : 24-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Sandy SILT			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	11	18																								
				ML	2.00-2.50	UDS-1			29	NP		0	19	77	4	13.6	2.09	1.84														
3					3.00-3.45	SPT-2	12	17																								
4																															
5					4.50-4.95	SPT-3	18	19																								
				CL	5.00-5.50	UDS-2			30	18	12	6	11	70	13	19.5	1.89	1.58														
6					6.00-6.45	SPT-4	20																									
7		Very Stiff Silty CLAY																													
8					7.50-7.95	SPT-5	26																									
				CL	8.00-8.50	UDS-3			30	21	9	0	11	78	11	21.2	2.14	1.76	2.65										0.7	109.22	8.16	
9																															
					9.00-9.45	SPT-6	33																									
10																															
11					10.50-10.95	SPT-7	41																									
				CL	11.00-11.50	UDS-4			31	21	10	0	7	82	11	20.7	1.98	1.64							137							
12					12.00-12.45	SPT-8	47																									
13																															
14					13.50-13.95	SPT-9	65																									
				CL	14.00-14.50	UDS-5			29	18	11	2	8	79	11	26.3	1.91	1.51							115							
15		Hard Silty CLAY																													
					15.00-15.45	SPT-10	45																									
16																															
17					16.50-16.95	SPT-11	43																									
				CL	17.00-17.50	UDS-6			30	20	10	4	12	67	17	24.8	2.05	1.64							125							
18					18.00-18.45	SPT-12	48																									
19																															
20					19.50-19.95	SPT-13	58																									

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 46+362

Co-ordinate: E:- 755356.32 N:- 3209599.42

Reduce Level: 226.246

Borehole dia : 150 mm

Ground Water Table : 10.00 m

Termination Depth : 30.00 m

Date : 24-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7			30	19	11	0	11	75	14	19.4	2.04	1.71	2.65												
21																															
					21.00-21.45	SPT-14	59																								
22																															
23					22.50-22.95	SPT-15	56																								
				CL	23.00-23.50	UDS-8			29	20	9	0	12	76	12	23.7	2.02	1.63							230							
24		Hard Silty CLAY																													
					24.00-24.45	SPT-16	58																								
25																															
26					25.50-25.95	SPT-17	52																								
27																															
				SP	27.00-27.45	SPT-18	58	27				0	97	3												0	34.7				
28																															
		Very Dense Fine SAND																													
29					28.50-28.95	SPT-19	62	28																							
30					30.00-30.45	SPT-20	76	32																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Location : CH 48+122

Co-ordinate: E:- 755031.57 N:- 3211329.88

Reduce Level: 224.318

Method of Boring : Rotary

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.00 m

Borehole No. 1

Page 1 of 2

Date : 23-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Stiff Silty CLAY			0.50-1.00	DS-1																								
2					1.50-1.95	SPT-1	10																								
				CI	2.00-2.50	UDS-1			37	21	16	0	5	70	25	20.4	1.96	1.63							99						
3																														
					3.00-3.45	SPT-2	12																								
4																														
					4.50-4.95	SPT-3	15																								
5																														
6																														
				ML	6.00-6.45	SPT-4	18	18				0	9	86	5				2.60									NIL	99.29	6.67	
7																														
					7.50-7.95	SPT-5	20	18																							
8																														
					9.00-9.45	SPT-6	23	19																							
9																														
					10.50-10.95	SPT-7	25	20																							
10																														
		Medium Dense Sandy SILT		ML	11.00-11.50	UDS-4			29	NP		1	5	85	9	22.1	1.99	1.63								0	30				
11																														
					12.00-12.45	SPT-8	22	18																							
12																														
					13.50-13.95	SPT-9	25	19																							
13																														
				ML	14.00-14.50	UDS-5			28	NP		5	9	80	6	16.9	2	1.71													
14																														
					15.00-15.45	SPT-10	29	20																							
15																														
					16.50-16.95	SPT-11	30	20																							
16																														
		Hard Silty CLAY		CL	17.00-17.50	UDS-6			30	20	10	7	9	72	12	21.8	2.06	1.69	2.66						124						
17																														
					18.00-18.45	SPT-12	36																								
18																														
					19.50-19.95	SPT-13	32																								
19																														
20																														

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 48+122

Co-ordinate: E:- 755031.57 N:- 3211329.88

Reduce Level: 224.318

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.00 m

Date : 23-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
				CL	20.00-20.50	UDS-7			28	18	10	1	2	64	33	18.6	2.03	1.71							129							
21		Hard Silty CLAY			21.00-21.45	SPT-14	35																									
22																															
23					22.50-22.95	SPT-15	31																									
				ML	23.00-23.50	UDS-8			28	21	7	3	13	78	6	22.3	2.14	1.75														
24					24.00-24.45	SPT-16	34	20																								
25																															
26					25.50-25.95	SPT-17	32	19																								
27		Dense to Very Dense Sandy SILT																													
					27.00-27.45	SPT-18	43	22																								
28																															
29					28.50-28.95	SPT-19	52	24																								
30					30.00-30.45	SPT-20	65	28																								
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 2

Location : CH 48+400

Co-ordinate: E:- 754976.25 N:- 3211606.75

Reduce Level: 225.969

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 21/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Firm Silty CLAY			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	5																									
				CL	2.00-2.50	UDS-1			34	22	12	0	12	76	12	16.3	1.7	1.46	2.63						51			Nil	89.36	7.15	
3																															
		Stiff to Very Stiff Silty CLAY			3.00-3.45	SPT-2	9																								
4																															
5					4.50-4.95	SPT-3	11																								
					5.00-5.50	UDS-2																									
6																															
7					6.00-6.45	SPT-4	16																								
8					7.50-7.95	SPT-5	12																								
					8.00-8.50	UDS-3										17.5	1.85	1.58													
9																															
					9.00-9.45	SPT-6	17																								
10																															
11					10.50-10.95	SPT-7	28																								
					11.00-11.50	UDS-4																									
12		Very Stiff Silty CLAY																													
					12.00-12.45	SPT-8	31																								
13																															
14					13.50-13.95	SPT-9	35																								
				CI	14.00 -14.50	UDS-5			37	17	20	2	7	74	17	26	2.04	1.62						155							
15					15.00-15.45	SPT-10	26																								
16																															
17					16.50-16.95	SPT-11	32																								
		Very Stiff to Hard Silty CLAY		CI	17.00 -17.50	UDS-6			43	21	22	5	7	68	20	28.5	1.94	1.51													
18																															
					18.00-18.45	SPT-12	45																								
19																															
20					19.50-19.95	SPT-13	31																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : CH 48+400

Co-ordinate: E:- 754976.25 N:- 3211606.75

Reduce Level: 225.969

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 21/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7										20.7	2.02	1.68													
21					21.00-21.45	SPT-14	38																								
22																															
23					22.50-22.95	SPT-15	39																								
		Hard Silty CLAY		CI	23.00-23.50	UDS-8			39	20	19	0	6	77	17	30.5	1.99	1.53													
24																															
					24.00-24.45	SPT-16	41																								
25																															
26					25.50-25.95	SPT-17	36	20																							
					25.00-25.50	UDS-9																									
27																															
					27.00-27.45	SPT-18	43	22																							
28		Dense to Very Dense Fine SAND																													
29				SW-SM	28.50-28.95	SPT-19	49	23				1	93	6												0	34.1				
					29.00-29.50	UDS-10																									
30					30.00-30.45	SPT-20	58	26																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Location : CH 48+510

Co-ordinate: E:-754951.06 N:- 3211709.45

Reduce Level: 226.193

Method of Boring : Rotary

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.00 m

Borehole No. 1

Page 1 of 2

Date : 23-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose to Medium Dense Silty SAND			0.50-1.00	DS-1																								
2					1.50-1.95	SPT-1	7	11																								
				SM	2.00-2.50	UDS-1						0	76	24		7.8	1.85	1.72								0	30				
3					3.00-3.45	SPT-2	16	19																								
4																														
5					4.50-4.95	SPT-3	20	20																								
6					6.00-6.45	SPT-4	22	20																								
7																														
8					7.50-7.95	SPT-5	26	22																								
		Dense Sandy SILT		ML	8.00-8.50	UDS-3			29	NP		0	17	75	8	19.1	2.03	1.71	2.66									NIL	119.15	7.63	
9																														
10					9.00-9.45	SPT-6	36	26																								
11					10.50-10.95	SPT-7	37	26																								
		Hard Silty CLAY		CL	11.00-11.50	UDS-4			33	21	12	1	7	81	11	24.5	2.13	1.71													
12					12.00-12.45	SPT-8	40																									
13																														
14					13.50-13.95	SPT-9	38																									
		Dense Sandy SILT		ML	14.00-14.50	UDS-5			31	NP		0	8	84	8	23.9	2	1.61													
15					15.00-15.45	SPT-10	40	25																								
16																														
17					16.50-16.95	SPT-11	45	26																								
				ML	17.00-17.50	UDS-6			32	NP		6	13	75	6	20.3	2.06	1.71								0	31				
18					18.00-18.45	SPT-12	44	25																								
19																														
20					19.50-19.95	SPT-13	47	26																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 48+510

Co-ordinate: E:-754951.06 N:- 3211709.45

Reduce Level: 226.193

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.00 m

Date : 23-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
				ML	20.00-20.50	UDS-7			28	NP		1	16	74	9	22.4	2.01	1.64	2.65							0	32				
21																															
					21.00-21.45	SPT-14	49	26																								
22																															
23					22.50-22.95	SPT-15	54	27																								
				ML	23.00-23.50	UDS-8			27	NP		3	17	74	6	21.8	2.04	1.67														
24		Dense to Very Dense Sandy SILT																													
					24.00-24.45	SPT-16	47	24																								
25																															
26					25.50-25.95	SPT-17	52	25																								
27																															
				SP	27.00-27.45	SPT-18	51	25				0	98	2												0	33.3				
28																															
		Very Dense Fine SAND																													
29					28.50-28.95	SPT-19	55	25																								
30					30.00-30.45	SPT-20	63	27																								
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Location : CH 49+250

Co-ordinate: E: 754789.47 N: 3212462.03

Reduce Level: 223.921.

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 21/2/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Stiff Silty CLAY			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	11																									
				CI	2.00-2.50	UDS-1			46	23	23	1	7	71	21	18.2	2.1	1.78	2.64					63				Nil	99.29	7.6		
3																															
					3.00-3.45	SPT-2	9																									
4																															
5					4.50-4.95	SPT-3	12																									
					5.00-5.50	UDS-2																									
6																															
					6.00-6.45	SPT-4	14																									
7																															
8					7.50-7.95	SPT-5	16																									
					8.00-8.50	UDS-3																									
9																															
					9.00-9.45	SPT-6	14																									
10																															
11					10.50-10.95	SPT-7	18									21.8	2.09	1.71														
					11.00-11.50	UDS-4																										
12																															
					12.00-12.45	SPT-8	19																									
13		Very Stiff Silty CLAY																													
14					13.50-13.95	SPT-9	21																									
				CI	14.00 -14.50	UDS-5			45	22	23	1	6	72	21	18.2	2.16	1.83						111								
15																															
					15.00-15.45	SPT-10	24																									
16																															
17					16.50-16.95	SPT-11	25																									
					17.00 -17.50	UDS-6																										
18																															
					18.00-18.45	SPT-12	32																									
19		Hard Silty CLAY																													
20					19.50-19.95	SPT-13	34																									

Prepared By:

Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 2 of 2

Location : CH 49+250

Co-ordinate: E: 754789.47 N: 3212462.03

Reduce Level: 223.921.

Borehole dia : 150 mm

Ground Water Table : m

Termination Depth : 30.45 m

Date : 21/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7																								
21					21.00-21.45	SPT-14	38	22																							
22																														
23					22.50-22.95	SPT-15	40	22																							
				ML	23.00-23.50	UDS-8			30	NP		0	5	89	6	16	2	1.72													
24																														
					24.00-24.45	SPT-16	43	23																							
25		Dense to Very Dense Sandy SILT																												
26					25.50-25.95	SPT-17	47	24																							
				ML	26.00-26.50	UDS-9			33	NP		0	3	89	8	16.3	2.1	1.8								0	32.7				
27																														
					27.00-27.45	SPT-18	50	24																							
28																														
29					28.50-28.95	SPT-19	53	25																							
					29.00-29.50	UDS-10																									
30					30.00-30.45	SPT-20	58	26																							
		Borehole terminated at depth of 30.45m																												
31																														
32																														
33																														
34																														
35																														
36																														
37																														
38																														
39																														
40																														

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 1

Page 1 of 1

Location : CH 50+100

Borehole dia : 150 mm

Co-ordinate: E: 754701.65 N: 3213224.90

Ground Water Table : 7.00 m

Reduce Level: 223.870

Termination Depth : 12.45 m

Date : 22/2/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.50-1.00	DS-1																								
1		Loose Sandy SILT																												
					1.50-1.95	SPT-1	9	15																						
2				ML	2.00-2.50	UDS-1			26	NP		0	9	87	4	13.8	1.9	1.67								0	28.9	Nil	129.07	7.54	
3					3.00-3.45	SPT-2	14	20																						
4																														
5					4.50-4.95	SPT-3	20	20																						
		Medium Dense Sandy SILT			5.00-5.50	UDS-2																								
6																														
					6.00-6.45	SPT-4	22	20																						
7																														
																										0	35.3			
8				SW-SM	7.50-7.95	SPT-5	19	18				2	92	6																
					8.00-8.50	UDS-3																								
9																														
					9.00-9.45	SPT-6	25	20																						
10		Medium Dense Fine SAND																												
					10.50-10.95	SPT-7	28	21																						
11					11.00-11.50	UDS-4																								
12					12.00-12.45	SPT-8	22	18																						

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : CH 51+000

Borehole dia : 150 mm

Co-ordinate: E:- 755017.52 N:- 3214106.89

Ground Water Table : 8.00 m

Reduce Level: 224.623

Termination Depth : 12.00 m

Date : 24-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	Triaxial Test c (kPa)	Φ (o)	Direct Shear c (kPa)	Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Silty SAND		SM	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	11	18				6	47	47												0	34.7				
3																															
4					3.00-3.45	SPT-2	14	20																							
5					4.50-4.95	SPT-3	11	14																							
6																										0	34.6	NIL	89.36	7.76	
7		Medium Dense to Dense Fine SAND		SW-SM	6.00-6.45	SPT-4	17	17				0	94	6		2.64															
8					7.50-7.95	SPT-5	24	21																							
9																															
10					9.00-9.45	SPT-6	31	24																							
11				SW-SM	10.50-10.95	SPT-7	34	24				0	94	6												0	34.2				
12					12.00-12.45	SPT-8	37	25																							
		Borehole terminated at depth of 12.45m																													
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : CH 52+640

Co-ordinate: E:- 755883.9 N:- 3215499.75

Reduce Level: 226.035

Borehole dia : 150 mm

Ground Water Table : 8.50 m

Termination Depth : 12.00 m

Date : 27-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Sandy SILT		ML	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	12	20				0	20	77	3											0	30.6				
3					3.00-3.45	SPT-2	16	19																							
4																															
5					4.50-4.95	SPT-3	15	17																							
6					6.00-6.45	SPT-4	26	23				1	16	71	12											0	30.9	NIL	119.15	6.83	
7																															
8					7.50-7.95	SPT-5	24	21																							
9					9.00-9.45	SPT-6	29	23																							
10																															
11		Dense Fine SAND		SW-SM	10.50-10.95	SPT-7	34	24				1	92	7											0	34.0				
12					12.00-12.45	SPT-8	37	25																							
		Borehole terminated at depth of 12.45m																													
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 54+825

Co-ordinate: E:- 757028.54 N:- 3217365.04

Reduce Level: 226.301

Borehole dia : 150 mm

Ground Water Table : 9.50 m

Termination Depth : 30.45 m

Date : 26-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Sandy SILT		ML	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	13	21																								
					2.00-2.50	UDS-1			33	NP		4	10	78	8	19.5	2.07	1.73								0	29.4				
3																															
					3.00-3.45	SPT-2	17	19																								
4																															
5					4.50-4.95	SPT-3	17	18																								
6																															
					6.00-6.45	SPT-4	20	19																								
7																															
8		Medium Dense to Dense Silty SAND		SM	7.50-7.95	SPT-5	25	21				0	76	24														NIL	89.36	7.03	
9																															
					9.00-9.45	SPT-6	28	22																								
10																															
11					10.50-10.95	SPT-7	32	23																								
12																															
		Dense Fine SAND		SP	12.00-12.45	SPT-8	30	22				0	97	3													0	33.8				
13																															
					13.50-13.95	SPT-9	32	22																								
14																															
15					15.00-15.45	SPT-10	35	23																								
16																															
17					16.50-16.95	SPT-11	44	26																								
18																															
					18.00-18.45	SPT-12	38	23				0	99	1																		
19																															
20					19.50-19.95	SPT-13	42	24																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 54+825

Co-ordinate: E:- 757028.54 N:- 3217365.04

Reduce Level: 226.301

Borehole dia : 150 mm

Ground Water Table : 9.50 m

Termination Depth : 30.45 m

Date : 26-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense Fine SAND			21.00-21.45	SPT-14	39	22																						
22																														
23					22.50-22.95	SPT-15	41	22																						
24					24.00-24.45	SPT-16	44	23																						
25																														
26					25.50-25.95	SPT-17	49	24																						
				ML	26.00-26.50	UDS-9			31	NP		3	17	72	8	22.5	2.09	1.65							0	31.9				
27					27.00-27.45	SPT-18	51	25																						
28		Very Dense Sandy SILT																												
29					28.50-28.95	SPT-19	58	26																						
30					30.00-30.45	SPT-20	67	29																						
		Borehole terminated at depth of 30.45m																												
31																														
32																														
33																														
34																														
35																														
36																														
37																														
38																														
39																														
40																														

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 1 of 2

Location : CH 54+825

Borehole dia : 150 mm

Co-ordinate: E:- 757028.54 N:- 3217365.04

Ground Water Table : m

Reduce Level: 226.301

Termination Depth : 30.45 m

Date : 24/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					0.50-1.00	DS-1																								
1																														
					1.50-1.95	SPT-1	14	23																						
2				ML	2.00-2.50	UDS-1			30	NP		0	43	50	7	10.7	1.95	1.76	2.6							0	28.8	Nil	89.36	7.38	
3					3.00-3.45	SPT-2	16	19																						
4																														
5					4.50-4.95	SPT-3	22	21																						
					5.00-5.50	UDS-2																								
6																														
		Medium Dense Sandy SILT			6.00-6.45	SPT-4	23	21																						
7																														
8					7.50-7.95	SPT-5	23	20																						
					8.00-8.50	UDS-3																								
9																														
					9.00-9.45	SPT-6	24	20																						
10																														
11					10.50-10.95	SPT-7	21	18																						
					11.00-11.50	UDS-4																								
12																														
				SW-SM	12.00-12.45	SPT-8	25	19				0	95	5																
13																														
14					13.50-13.95	SPT-9	27	20																						
					14.00 -14.50	UDS-5																								
15																														
					15.00-15.45	SPT-10	29	20																						
16																														
		Medium Dense to Dense Fine SAND																												
17					16.50-16.95	SPT-11	32	21																						
					17.00 -17.50	UDS-6																								
18																														
					18.00-18.45	SPT-12	33	21																						
19																														
20					19.50-19.95	SPT-13	35	21																						

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 2 of 2

Location : CH 54+825

Borehole dia : 150 mm

Co-ordinate: E:- 757028.54 N:- 3217365.04

Ground Water Table : m

Reduce Level: 226.301

Termination Depth : 30.45 m

Date : 24/2/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7																									
21					21.00-21.45	SPT-14	37	21																							
22																															
23				SW-SM	22.50-22.95	SPT-15	41	22				1	94	5												0	33.4				
					23.00-23.50	UDS-8																									
24																															
25		Dense to Very Dense Fine SAND			24.00-24.45	SPT-16	45	23																							
26					25.50-25.95	SPT-17	51	25																							
					25.00-25.50	UDS-9																									
27					27.00-27.45	SPT-18	57	27																							
28																															
29					28.50-28.95	SPT-19	60	27																							
30					30.00-30.45	SPT-20	62	27																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 55+850

Co-ordinate: E:- 757566.43 N:- 3218233.90

Reduce Level: 225.699

Borehole dia : 150 mm

Ground Water Table : 12.00 m

Termination Depth : 30.45 m

Date : 26-01-2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Sandy SILT		ML	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	16	21																							
					2.00-2.50	UDS-1			31	NP		0	25	63	12	11.4	1.83	1.65								0	30				
3																															
					3.00-3.45	SPT-2	12	17																							
4																															
5					4.50-4.95	SPT-3	18	19																							
6																															
					6.00-6.45	SPT-4	21	20																							
7																															
8		Medium Dense Fine SAND		SW-SM	7.50-7.95	SPT-5	23	20				0	92	8					2.63									NIL	89.36	7.96	
9																															
					9.00-9.45	SPT-6	29	23																							
10																															
11					10.50-10.95	SPT-7	23	19																							
12																															
					12.00-12.45	SPT-8	30	22																							
13																															
14		Dense Fine SAND		SP	13.50-13.95	SPT-9	35	23				0	95	5												0	35.6				
15																															
					15.00-15.45	SPT-10	45	27																							
16																															
17					16.50-16.95	SPT-11	30	20																							
18																															
					18.00-18.45	SPT-12	34	21																							
19																															
20				SP	19.50-19.95	SPT-13	38	22				0	96	4																	

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 55+850

Co-ordinate: E:- 757566.43 N:- 3218233.90

Reduce Level: 225.699

Borehole dia : 150 mm

Ground Water Table : 12.00 m

Termination Depth : 30.45 m

Date : 26-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Very Dense Fine SAND		SP	21.00-21.45	SPT-14	39	22																							
22																															
23					22.50-22.95	SPT-15	41	22																							
24																															
25					24.00-24.45	SPT-16	44	23																							
26					25.50-25.95	SPT-17	56	27																							
27																															
28					27.00-27.45	SPT-18	54	26				0	96	4												0	36.5				
29					28.50-28.95	SPT-19	60	27																							
30					30.00-30.45	SPT-20	68	29																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 56+780

Co-ordinate: E:- 758055.09 N:- 3219023.09

Reduce Level: 228.358

Borehole dia : 150 mm

Ground Water Table : 7.00 m

Termination Depth : 30.45 m

Date : 26-01-2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose to Medium Dense Sandy SILT			0.50-1.00	DS-1																									
2				ML	1.50-1.95	SPT-1	6	10				11	14	64	11																
3																															
4					3.00-3.45	SPT-2	13	18																							
5					4.50-4.95	SPT-3	17	18																							
6																															
7					6.00-6.45	SPT-4	19	19																							
8		Medium Dense Fine SAND		SP	7.50-7.95	SPT-5	20	18				0	97	3											0	32.7				
9																															
10					9.00-9.45	SPT-6	22	19																							
11					10.50-10.95	SPT-7	26	20																							
12																															
13					12.00-12.45	SPT-8	27	20																							
14					13.50-13.95	SPT-9	30	21																							
15		Dense to Very Dense Sandy SILT		ML	14.00-14.50	UDS-5			29	NP		3	6	82	9	23.6	2.18	1.76								0	30	NIL	109.22	7.59	
15					15.00-15.45	SPT-10	34	22																							
16																															
17					16.50-16.95	SPT-11	37	23																							
18																															
19					18.00-18.45	SPT-12	42	24																							
20					19.50-19.95	SPT-13	52	28																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 56+780

Co-ordinate: E:- 758055.09 N:- 3219023.09

Reduce Level: 228.358

Borehole dia : 150 mm

Ground Water Table : 7.00 m

Termination Depth : 30.45 m

Date : 26-01-2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Vey Dense Fine SAND		SW-SM	21.00-21.45	SPT-14	57	29				1	92	7																	
22																															
23					22.50-22.95	SPT-15	62	30																							
24																															
25					24.00-24.45	SPT-16	49	25																							
26					25.50-25.95	SPT-17	65	30																							
27																															
28				SP	27.00-27.45	SPT-18	62	28				1	98	1												0	33.3				
29					28.50-28.95	SPT-19	69	30																							
30					30.00-30.45	SPT-20	75	31																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 57+555

Co-ordinate: E:- 758457.09 N:- 3219680.76

Reduce Level: 228.935

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.45 m

Date : 26-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Sandy SILT			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	12	20																								
				ML	2.00-2.50	UDS-1			29	NP		2	17	72	9	16.3	2.1	1.81														
3					3.00-3.45	SPT-2	13	18																								
4																															
5					4.50-4.95	SPT-3	17	18																								
				ML	5.00-5.50	UDS-2			28	NP		1	12	86	1	15.6	1.74	1.51								0	30				
6																															
					6.00-6.45	SPT-4	13	15																								
7																															
8					7.50-7.95	SPT-5	18	20																								
9																															
		Medium Dense to Dense Fine SAND		SW-SM	9.00-9.45	SPT-6	33	25				0	92	8					2.64									NIL	89.36	7.03	
10																															
11					10.50-10.95	SPT-7	38	26																								
12																															
					12.00-12.45	SPT-8	38	25																								
13																															
14					13.50-13.95	SPT-9	41	26																								
15																															
				SW-SM	15.00-15.45	SPT-10	42	26				0	95	5												0	31.6				
16																															
17					16.50-16.95	SPT-11	41	25																								
18																															
					18.00-18.45	SPT-12	52	28																								
19																															
20					19.50-19.95	SPT-13	54	29																								

Prepared By: Checked By:

BORE LOG

Borehole No. 1

Page 2 of 2

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Location : CH 57+555

Borehole dia : 150 mm

Co-ordinate: E:- 758457.09 N:- 3219680.76

Ground Water Table : 9.00 m

Reduce Level: 228.935

Termination Depth : 30.45 m

Date : 26-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Vey Dense Fine SAND		SW-SM	21.00-21.45	SPT-14	55	28				1	93	6					2.66												
22																															
23					22.50-22.95	SPT-15	59	29																							
24																															
25					24.00-24.45	SPT-16	57	28																							
26					25.50-25.95	SPT-17	52	25																							
27																															
28				SW-SM	27.00-27.45	SPT-18	59	27				0	95	5												0	32.5				
29					28.50-28.95	SPT-19	63	28																							
30					30.00-30.45	SPT-20	76	32																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 58+400

Co-ordinate: E:- 758903.29 N:- 3220405.84

Reduce Level: 226.841

Borehole dia : 150 mm

Ground Water Table : 10.00 m

Termination Depth : 30.45 m

Date : 27-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Very Stiff Silty CLAY			0.50-1.00	DS-1																								
2					1.50-1.95	SPT-1	15																								
				CL	2.00-2.50	UDS-1			32	20	12	2	8	74	16	17.7	2.18	1.85						63							
3																														
					3.00-3.45	SPT-2	17																								
4																														
5					4.50-4.95	SPT-3	16																								
6																														
					6.00-6.45	SPT-4	18																								
7																														
8		Medium Dense Silty SAND		SM	7.50-7.95	SPT-5	21	19				0	64	36					2.62												
9																														
					9.00-9.45	SPT-6	22	19																							
10																														
11					10.50-10.95	SPT-7	26	20																							
		Medium Dense to Dense Sandy SILT		ML	11.00-11.50	UDS-4			28	NP		1	15	76	8	19.7	2.09	1.75								0	31.1				
12																														
					12.00-12.45	SPT-8	28	21																							
13																														
14					13.50-13.95	SPT-9	30	21																							
				ML	14.00-14.50	UDS-5			33	NP		2	20	66	12	18.7	2.07	1.74										NIL	99.29	7.4	
15																														
					15.00-15.45	SPT-10	32	21																							
16																														
17					16.50-16.95	SPT-11	34	22																							
18																														
					18.00-18.45	SPT-12	35	22																							
19																														
20					19.50-19.95	SPT-13	38	22																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 58+400

Co-ordinate: E:- 758903.29 N:- 3220405.84

Reduce Level: 226.841

Borehole dia : 150 mm

Ground Water Table : 10.00 m

Termination Depth : 30.45 m

Date : 27-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Vey Dense Fine SAND		SP	21.00-21.45	SPT-14	40	23				0	96	4					2.65												
22																															
23					22.50-22.95	SPT-15	42	23																							
24																															
25					24.00-24.45	SPT-16	44	23																							
26					25.50-25.95	SPT-17	51	25																							
27																															
28				SP	27.00-27.45	SPT-18	55	26				0	96	4												0	35.7				
29					28.50-28.95	SPT-19	65	29																							
30					30.00-30.45	SPT-20	65	28																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Location : CH 59+305

Co-ordinate: E:- 759335.53 N:- 3221198.37

Reduce Level: 227.556

Method of Boring : Rotary

Borehole dia : 150 mm

Ground Water Table : 10.00 m

Termination Depth : 12.00 m

Borehole No. 1

Page 1 of 1

Date : 29-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Stiff Silty CLAY		CL	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	8																								
					2.00-2.50	UDS-1			28	19	9	0	17	71	12	21.7	2.06	1.69						50							
3																															
					3.00-3.45	SPT-2	12																								
4																															
5		Medium Dense Silty SAND		SM	4.50-4.95	SPT-3	18	19				0	71	29																	
6																															
					6.00-6.45	SPT-4	24	22																							
7																															
8					7.50-7.95	SPT-5	31	25																							
		Hard Silty CLAY		CI	8.00-8.50	UDS-3			48	28	20	0	2	65	33	38.8	1.88	1.35	2.63					131				NIL	109.22	7.88	
9																															
					9.00-9.45	SPT-6	33																								
10																															
11					10.50-10.95	SPT-7	31																								
				CL	11.00-11.50	UDS-4			31	20	11	0	35	56	9	12.7	1.91	1.7													
12					12.00-12.45	SPT-8	26																								
		Borehole terminated at depth of 12.45m																													
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 1

Location : CH 62+160

Co-ordinate: E:- 760599.52 N:- 3223695.02

Reduce Level: 230.384

Borehole dia : 150 mm

Ground Water Table : 10.50 m

Termination Depth : 12.00 m

Date : 29-01-2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose Sandy SILT		ML	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	8	13				0	60	40												0	30				
3					2.00-2.50	UDS-1																									
4					3.00-3.45	SPT-2	9	13																							
5		Medium Dense Fine SAND		SW-SM	4.50-4.95	SPT-3	15	17				0	91	9												0	33	NIL	119.15	7.28	
6					6.00-6.45	SPT-4	22	20																							
7					7.50-7.95	SPT-5	21	19																							
8		Dense Sandy SILT		ML	8.00-8.50	UDS-3						0	13	78	9	21.2	2.09	1.73	2.61											
9					9.00-9.45	SPT-6	30	23																							
10					10.50-10.95	SPT-7	34	24																							
11				ML	11.00-11.50	UDS-4						6	11	73	10	18.7	2.1	1.77								0	33				
12					12.00-12.45	SPT-8	38	25																							
		Borehole terminated at depth of 12.45m																													
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Location : CH 63+570

Co-ordinate: E:- 761700.97 N:- 3224570.96

Reduce Level: 228.732

Method of Boring : Rotary

Borehole dia : 150 mm

Ground Water Table : 7.00 m

Termination Depth : 30.45 m

Borehole No. 1

Page 1 of 2

Date : 29-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Firm Silty CLAY		CL	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	5																									
3					2.00-2.50	UDS-1			28	18	10	0	36	49	15	21	2.06	1.7						46								
4					3.00-3.45	SPT-2	6																									
5		Very Stiff Silty CLAY			4.50-4.95	SPT-3	18																									
6					6.00-6.45	SPT-4	17																									
7																															
8		Medium Dense Fine SAND		SP	7.50-7.95	SPT-5	21	19				0	97	3					2.65							0	32.0				
9																															
10					9.00-9.45	SPT-6	25	20																								
11					10.50-10.95	SPT-7	26	20																								
12																															
13					12.00-12.45	SPT-8	28	21																								
14				SP	13.50-13.95	SPT-9	29	21				0	93	4															NIL	79.43	7.18	
15																															
16		Dense Fine SAND			15.00-15.45	SPT-10	31	21																								
17					16.50-16.95	SPT-11	33	21																								
18																															
19					18.00-18.45	SPT-12	35	22																								
20				SP	19.50-19.95	SPT-13	40	23				0	99	1					2.61							0	34				

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 63+570

Co-ordinate: E:- 761700.97 N:- 3224570.96

Reduce Level: 228.732

Borehole dia : 150 mm

Ground Water Table : 7.00 m

Termination Depth : 30.45 m

Date : 29-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Very Dense Fine SAND		SP	21.00-21.45	SPT-14	45	24																							
22																															
23					22.50-22.95	SPT-15	55	28																							
24																															
25					24.00-24.45	SPT-16	56	27																							
26					25.50-25.95	SPT-17	60	28				0	96	4																	
27																															
28					27.00-27.45	SPT-18	65	29																							
29					28.50-28.95	SPT-19	66	29																							
30					30.00-30.45	SPT-20	71	30																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 1 of 2

Location : CH 63+570

Co-ordinate: E:- 761700.97 N:- 3224570.96

Reduce Level: 228.732

Borehole dia : 150 mm

Ground Water Table : m

Termination Depth : 30.45 m

Date : 24/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Firm to Stiff Silty CLAY			0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	7																									
				CI	2.00-2.50	UDS-1			46	18	28	0	16	62	22	19.4	2.01	1.69	2.66					49				Nil	89.36	7.28		
3																															
					3.00-3.45	SPT-2	8																									
4																															
5					4.50-4.95	SPT-3	12																									
					5.00-5.50	UDS-2																									
6																															
					6.00-6.45	SPT-4	15																									
7		Very Stiff Silty CLAY																													
					7.50-7.95	SPT-5	21																									
8					8.00-8.50	UDS-3																										
9																															
					9.00-9.45	SPT-6	16																									
10																															
11					10.50-10.95	SPT-7	20																									
					11.00-11.50	UDS-4																										
12																															
		Medium Dense Fine SAND		SW-SM	12.00-12.45	SPT-8	23	18				1	94	5																	
13																															
					13.50-13.95	SPT-9	27	20																								
14					14.00 -14.50	UDS-5																										
15																															
					15.00-15.45	SPT-10	31	21																								
16																															
17					16.50-16.95	SPT-11	26	18																								
					17.00 -17.50	UDS-6																										
18																															
					18.00-18.45	SPT-12	31	20																								
19																															
20					19.50-19.95	SPT-13	30	19																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 2 of 2

Location : CH 63+570

Co-ordinate: E:- 761700.97 N:- 3224570.96

Reduce Level: 228.732

Borehole dia : 150 mm

Ground Water Table : m

Termination Depth : 30.45 m

Date : 24/2/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7																									
21					21.00-21.45	SPT-14	35	21																							
22																															
23					22.50-22.95	SPT-15	41	22																							
					23.00-23.50	UDS-8																									
24																															
				SW-SM	24.00-24.45	SPT-16	46	24				0	91	9												0	34.4				
25		Dense to Very Dense Fine SAND																													
26					25.50-25.95	SPT-17	49	24																							
					25.00-25.50	UDS-9																									
27																															
					27.00-27.45	SPT-18	55	26																							
28																															
29					28.50-28.95	SPT-19	60	27																							
30					30.00-30.45	SPT-20																									
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 64+270

Borehole dia : 150 mm

Co-ordinate: E:- 762250.34 N:- 3225008.95

Ground Water Table : 7.00 m

Reduce Level: 230.375

Termination Depth : 30.45 m

Date : 29-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	Triaxial Test c (kPa)	Triaxial Test Φ (o)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Medium Dense Silty SAND			0.50-1.00	DS-1																									
2				SM	1.50-1.95	SPT-1	14	23				0	78	22												0	31				
3					3.00-3.45	SPT-2	15	18																							
4																															
5					4.50-4.95	SPT-3	18	19																							
6																															
7				SW-SM	6.00-6.45	SPT-4	17	17				0	94	6																	
8					7.50-7.95	SPT-5	20	18																							
9																															
10					9.00-9.45	SPT-6	19	17																							
11					10.50-10.95	SPT-7	22	18																							
				ML	11.00-11.50	UDS-4			30	NP		6	10	75	9	21.6	2.11	1.73	2.65							0	31	NIL	89.36	7.98	
12					12.00-12.45	SPT-8	25	19																							
13																															
14					13.50-13.95	SPT-9	27	20																							
15																															
		Medium Dense to Dense Sandy SILT			15.00-15.45	SPT-10	29	20																							
16																															
17					16.50-16.95	SPT-11	33	21																							
18																															
19					18.00-18.45	SPT-12	35	22																							
20		Dense Fine SAND		SW-SM	19.50-19.95	SPT-13	37	22				0	91	9																	

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 64+270

Co-ordinate: E:- 762250.34 N:- 3225008.95

Reduce Level: 230.375

Borehole dia : 150 mm

Ground Water Table : 7.00 m

Termination Depth : 30.45 m

Date : 29-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	Triaxial Test c (kPa)	Φ (o)	Direct Shear c (kPa)	Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Vey Dense Fine SAND		SP	21.00-21.45	SPT-14	41	23																							
22																															
23					22.50-22.95	SPT-15	43	23																							
24																															
25					24.00-24.45	SPT-16	45	23																							
26					25.50-25.95	SPT-17	51	25				0	98	2											0	35				
27																															
28					27.00-27.45	SPT-18	55	26																							
29					28.50-28.95	SPT-19	62	28																							
30					30.00-30.45	SPT-20	66	28																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 1 of 2

Location : CH 64+270

Borehole dia : 150 mm

Co-ordinate: E:- 762250.34 N:- 3225008.95

Ground Water Table : 4.00 m

Reduce Level: 230.375

Termination Depth : 30.45 m

Date : 23/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose Sandy SILT		ML	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	6	10	22	NP		0	43	51	6											0	28.9	Nil	89.36	7.12	
					2.00-2.50	UDS-1																									
3																															
					3.00-3.45	SPT-2	7	10																							
4																															
5					4.50-4.95	SPT-3	9	11																							
					5.00-5.50	UDS-2																									
6																															
		Medium Dense Sandy SILT			6.00-6.45	SPT-4	17	17																							
7																															
8					7.50-7.95	SPT-5	19	18																							
					8.00-8.50	UDS-3																									
9																															
					9.00-9.45	SPT-6	18	17																							
10																															
11					10.50-10.95	SPT-7	21	18																							
					11.00-11.50	UDS-4																									
12																															
		Medium Dense to Dense Fine SAND		SW-SM	12.00-12.45	SPT-8	25	19				1	94	5					2.7												
13																															
14					13.50-13.95	SPT-9	27	20																							
					14.00 -14.50	UDS-5																									
15																															
					15.00-15.45	SPT-10	29	20																							
16																															
17					16.50-16.95	SPT-11	31	20																							
					17.00 -17.50	UDS-6																									
18																															
					18.00-18.45	SPT-12	32	20																							
19																															
20					19.50-19.95	SPT-13	34	21																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 2 of 2

Location : CH 64+270

Borehole dia : 150 mm

Co-ordinate: E:- 762250.34 N:- 3225008.95

Ground Water Table : m

Reduce Level: 230.375

Termination Depth : 30.45 m

Date : 23/2/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7																									
21					21.00-21.45	SPT-14	37	21																							
22																															
23				SW-SM	22.50-22.95	SPT-15	38	22				0	94	6												0	34.1				
					23.00-23.50	UDS-8																									
24																															
25		Dense to Very Dense Fine SAND			24.00-24.45	SPT-16	40	24																							
26					25.50-25.95	SPT-17	45	24																							
					25.00-25.50	UDS-9																									
27					27.00-27.45	SPT-18	55	26																							
28																															
29					28.50-28.95	SPT-19	56	26																							
30					30.00-30.45	SPT-20																									
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 1 of 2

Location : CH 65+740

Co-ordinate: E:- 763150.90 N:- 3226148.71

Reduce Level: 231.699

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.45 m

Date : 28-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	Triaxial Test c (kPa)	Φ (o)	Direct Shear c (kPa)	Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Loose Sandy SILT		ML	0.50-1.00	DS-1																									
2					1.50-1.95	SPT-1	4	7																								
					2.00-2.50	UDS-1			30	NP		0	28	68	4	18.2	1.92	1.62								0	28.1				
3																															
					3.00-3.45	SPT-2	8	11																								
4																															
5		Medium Dense Sandy SILT			4.50-4.95	SPT-3	13	16																							
6																															
					6.00-6.45	SPT-4	18	18																								
7																															
8					7.50-7.95	SPT-5	22	20																								
9																															
					9.00-9.45	SPT-6	28	22																								
10																															
11					10.50-10.95	SPT-7	36	25																								
				CI	11.00-11.50	UDS-4			46	27	19	0	2	65	33	31.2	1.98	1.51	2.6						133				NIL	109.22	7.87	
12																															
					12.00-12.45	SPT-8	21																									
13																															
14		Very Stiff to Hard CLAY			13.50-13.95	SPT-9	28																								
15																															
					15.00-15.45	SPT-10	32																									
16																															
17		Dense Silty SAND		SM	16.50-16.95	SPT-11	36	23				0	87	13																	
18																															
					18.00-18.45	SPT-12	41	24																								
19																															
20					19.50-19.95	SPT-13	45	25																								

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Rotary

Borehole No. 1

Page 2 of 2

Location : CH 65+740

Co-ordinate: E:- 763150.90 N:- 3226148.71

Reduce Level: 231.699

Borehole dia : 150 mm

Ground Water Table : 9.00 m

Termination Depth : 30.45 m

Date : 28-01-2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	PL	PI	Grain size Analysis (%) Gravel	Sand	Silt	Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Cc	Pc	Cr	Triaxial Test c (kPa)	Φ (o)	Direct Shear c (kPa)	Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
21		Dense to Very Dense Fine SAND		SW-SM	20.00-20.50	UDS-7																									
22					21.00-21.45	SPT-14	46	25																							
23					22.50-22.95	SPT-15	51	26				0	92	8											0	34				
24					24.00-24.45	SPT-16	55	27																							
25																															
26					25.50-25.95	SPT-17	60	28																							
27					27.00-27.45	SPT-18	62	28																							
28																															
29				SW-SM	28.50-28.95	SPT-19	59	27				0	95	5																	
30					30.00-30.45	SPT-20	67	29																							
		Borehole terminated at depth of 30.45m																													
31																															
32																															
33																															
34																															
35																															
36																															
37																															
38																															
39																															
40																															

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 1 of 2

Location : CH 65+740

Co-ordinate: E:- 763150.90 N:- 3226148.71

Reduce Level: 231.699

Borehole dia : 150 mm

Ground Water Table : 4.00 m

Termination Depth : 30.45 m

Date : 23/2/2016

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil: Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
1		Stiff to Very Stiff Silty CLAY			0.50-1.00	DS-1																								
2					1.50-1.95	SPT-1	10																								
				CI	2.00-2.50	UDS-1			44	23	21	0	24	56	20	14.3	2.01	1.76	2.65					58							
3																														
					3.00-3.45	SPT-2	11																								
4																														
5					4.50-4.95	SPT-3	14																								
					5.00-5.50	UDS-2																								
6																														
					6.00-6.45	SPT-4	16																								
7																														
8					7.50-7.95	SPT-5	20																								
					8.00-8.50	UDS-3																								
9		Very Stiff to Hard Silty CLAY																												
					9.00-9.45	SPT-6	22																								
10																														
11					10.50-10.95	SPT-7	35																								
				ML	11.00-11.50	UDS-4						0	5	88	7	21.2	1.96	1.61										Nil	109.22	7.89	
12																														
					12.00-12.45	SPT-8	26	20																							
13																														
14					13.50-13.95	SPT-9	29	19																							
					14.00 -14.50	UDS-5																									
15																														
					15.00-15.45	SPT-10	33	22																							
16		Medium Dense to Dense Sandy SILT																												
17					16.50-16.95	SPT-11	37	23																							
					17.00 -17.50	UDS-6																									
18																														
					18.00-18.45	SPT-12	40	24																							
19																														
20					19.50-19.95	SPT-13	33	20																							

Prepared By: Checked By:

BORE LOG

Project : Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

Method of Boring : Shell & Auger

Borehole No. 2

Page 2 of 2

Location : CH 65+740

Co-ordinate: E:- 763150.90 N:- 3226148.71

Reduce Level: 231.699

Borehole dia : 150 mm

Ground Water Table : m

Termination Depth : 30.45 m

Date : 23/2/2016

XPLORER CONSULTANCY SERVICES (P) LTD.

Depth (m)	R.L. (m)	Strata Description	Legend	IS Classification	Sample Depth (m)	Sample Type	SPT N - value (Obs.)	SPT N - value (Corr.)	Atterberg Limit (%) LL	Atterberg Limit (%) PL	Atterberg Limit (%) PI	Grain size Analysis (%) Gravel	Grain size Analysis (%) Sand	Grain size Analysis (%) Silt	Grain size Analysis (%) Clay	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Specific Gravity	Consolidation Test e_0	Consolidation Test Cc	Consolidation Test Pc	Consolidation Test Cr	UU c (kPa)	UC c (kPa)	Direct Shear c (kPa)	Direct Shear Φ (o)	Chemical Analysis of soil Sulphates mg/l	Chlorides mg/l	pH Value	Organic (%)
					20.00-20.50	UDS-7																								
21																														
				SP	21.00-21.45	SPT-14	38	22				0	97	3												0	34.2				
22																														
23					22.50-22.95	SPT-15	40	22																						
					23.00-23.50	UDS-8																								
24																														
					24.00-24.45	SPT-16	44	23																						
25		Dense to Very Dense Fine SAND																												
26					25.50-25.95	SPT-17	32	19																						
					25.00-25.50	UDS-9																								
27																														
					27.00-27.45	SPT-18	45	23																						
28																														
29					28.50-28.95	SPT-19	56	26																						
30					30.00-30.45	SPT-20																								
		Borehole terminated at depth of 30.45m																												
31																														
32																														
33																														
34																														
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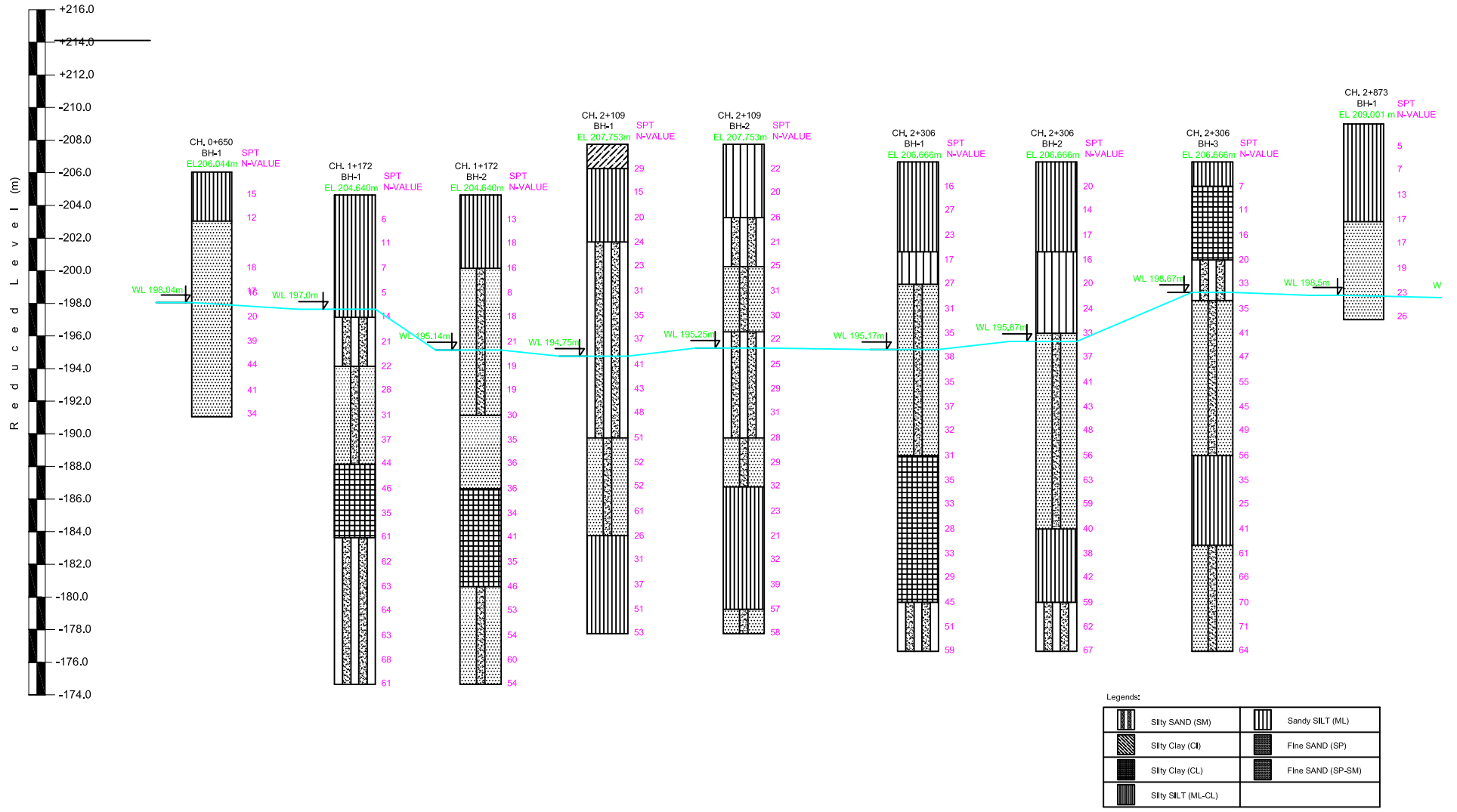
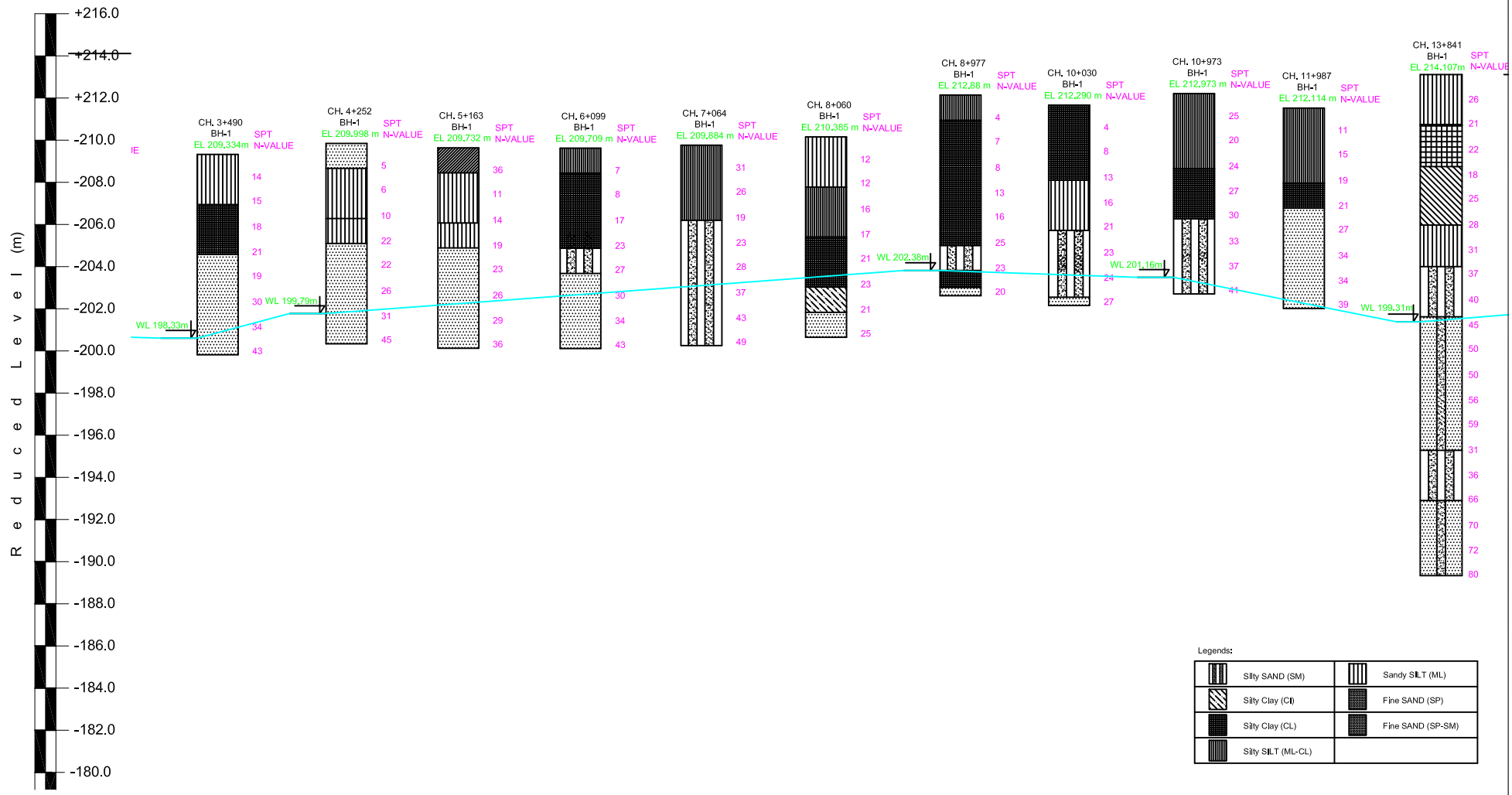
36																														
37																														
38																														
39																														
40																														

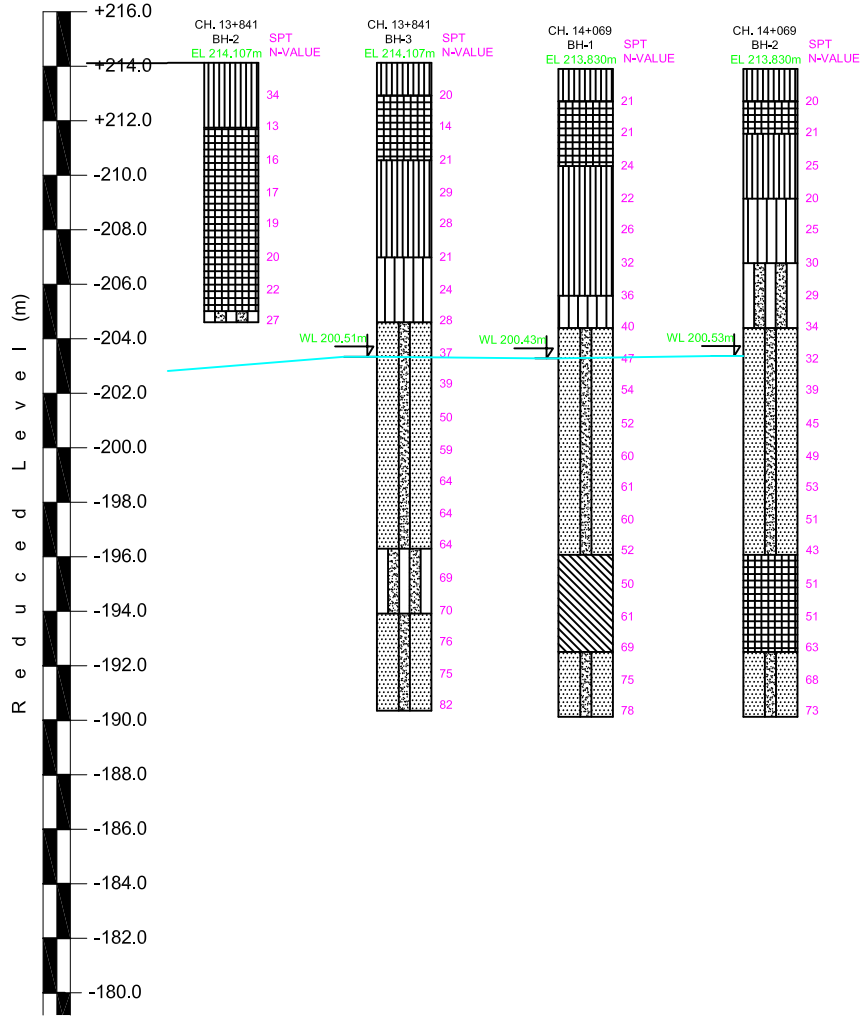
Prepared By: Checked By:



CLIENT:	PROJECT:	DRAWING TITLE:	AGENCY:	DRG. NO. PWD/PROFILE/01
skylark Designer and Engineers (P) Limited	Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut	Soil Profile	XPLORER CONSULTANCY SERVICES (P) LTD. explore. engineer. deliver Xplorer Consultancy Services Pvt. Ltd. Plot No. 3, First Floor, Sector- 18, Opp. HIPA, Sarhaul, Gurgaon-122001, Haryana, India Tel: +91-124-4388659, Fax: +91-124-4241962 Email: xplorer@xplorer.in, Website: www.xplorer.in	January, 2016



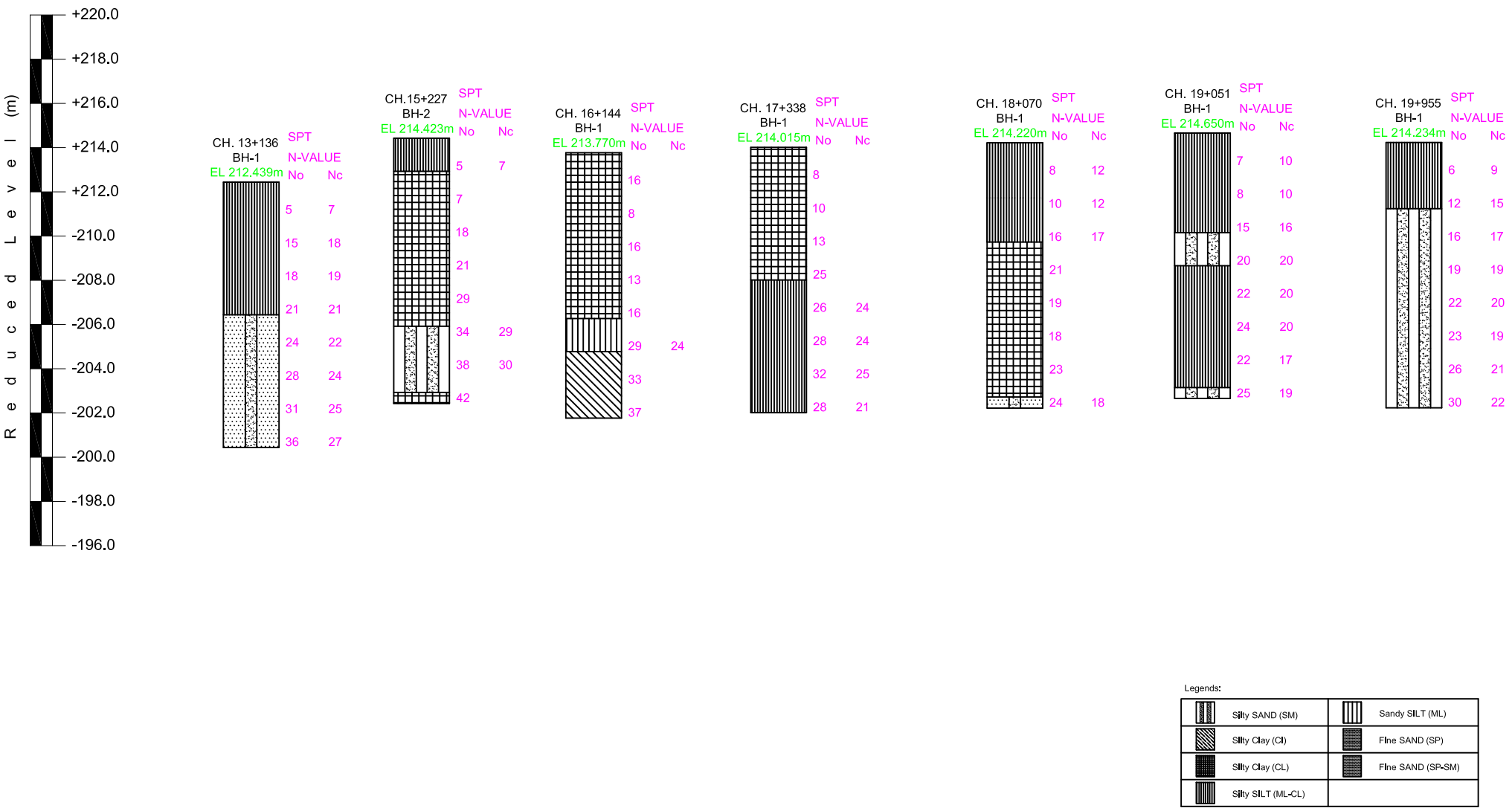
CLIENT:	PROJECT:	DRAWING TITLE:	AGENCY:	DRG. NO. PWD/PROFILE/01
skylark Designer and Engineers (P) Limited	Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut	Soil Profile	XPLORER CONSULTANCY SERVICES (P) LTD. explore. engineer. deliver Xplorer Consultancy Services Pvt. Ltd. Plot No. 3, First Floor, Sector- 18, Opp. HIPA, Sarhaul, Gurgaon-122001, Haryana, India Tel: +91-124-4388659, Fax: +91-124-4241962 Email: xplorer@xplorer.in, Website: www.xplorer.in	January, 2016



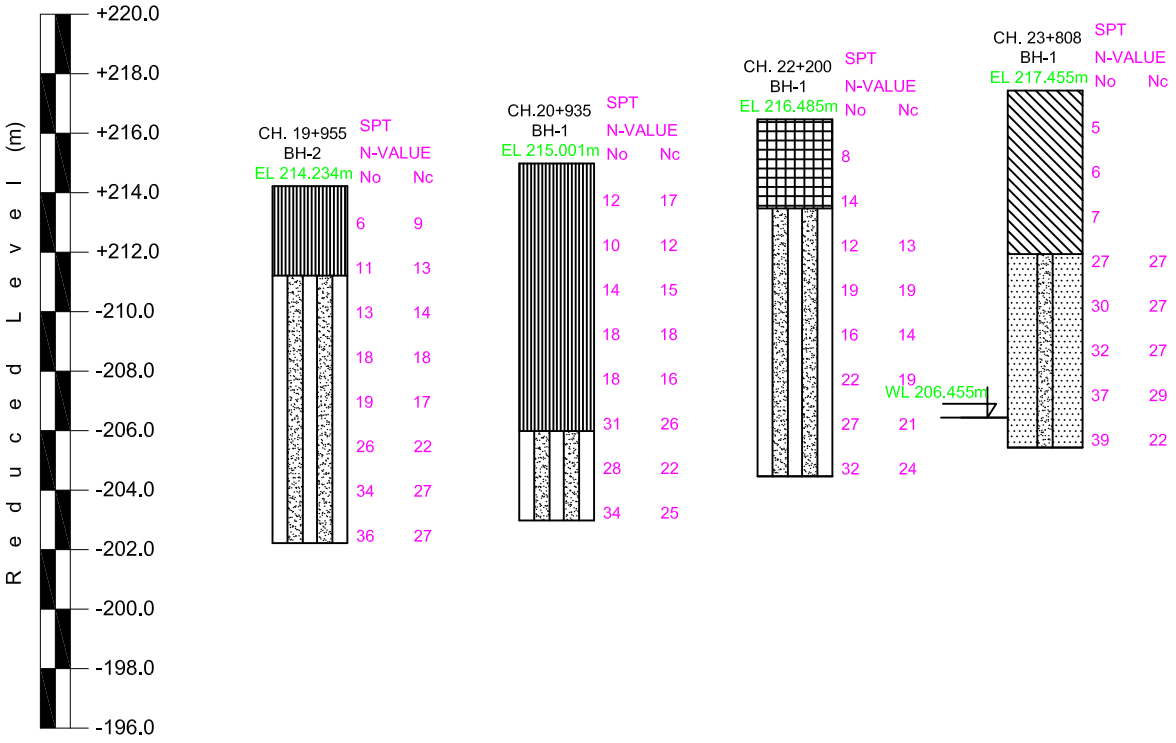
Legends:

Silty SAND (SM)	Sandy SILT (ML)
Silty Clay (CI)	Fine SAND (SP)
Silty Clay (CL)	Fine SAND (SP-SM)
Silty SILT (ML-CL)	

CLIENT: skylark Designer and Engineers (P) Limited	PROJECT: Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut	DRAWING TITLE: Soil Profile	AGENCY: XPLORER CONSULTANCY SERVICES (P) LTD. explore. engineer. deliver Xplorer Consultancy Services Pvt. Ltd. Plot No. 3, First Floor, Sector- 18, Opp. HIPA, Sarhaul, Gurgaon-122001, Haryana, India Tel: +91-124-4388659, Fax: +91-124-4241962 Email: xplorer@xplorer.in, Website: www.xplorer.in	DRG. NO. PWD/PROFILE/01 January, 2016



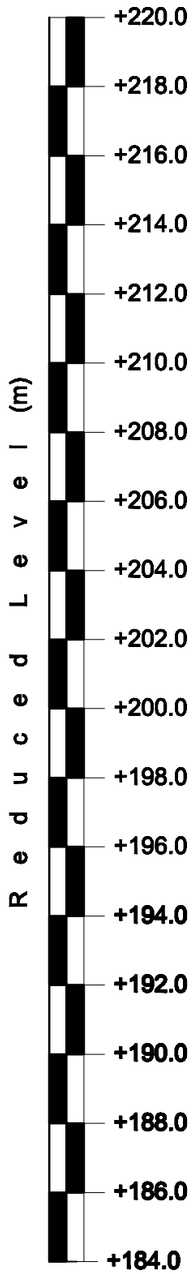
CLIENT:	PROJECT:	DRAWING TITLE:	AGENCY:	DRG. NO. PWD/PROFILE/01
skylark Designer and Engineers (P) Limited	Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut	Soil Profile	XPLORER CONSULTANCY SERVICES (P) LTD. explore. engineer. deliver Xplorer Consultancy Services Pvt. Ltd. Plot No. 3, First Floor, Sector- 18, Opp. HIPA, Sarhaul, Gurgaon-122001, Haryana, India Tel: +91-124-4388659, Fax: +91-124-4241962 Email: xplorer@xplorer.in, Website: www.xplorer.in	March, 2016

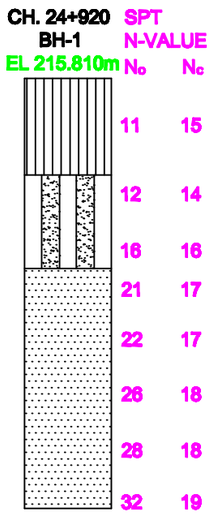


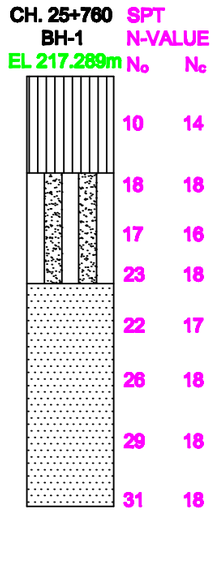
Legends:

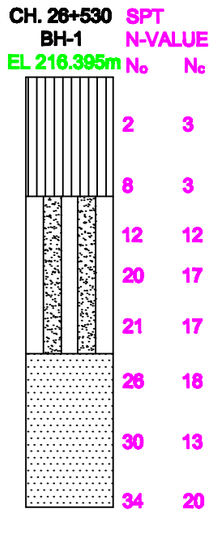
Silty SAND (SM)	Sandy SILT (ML)
Silty Clay (CI)	Fine SAND (SP)
Silty Clay (CL)	Fine SAND (SP-SM)
Silty SILT (ML-CL)	

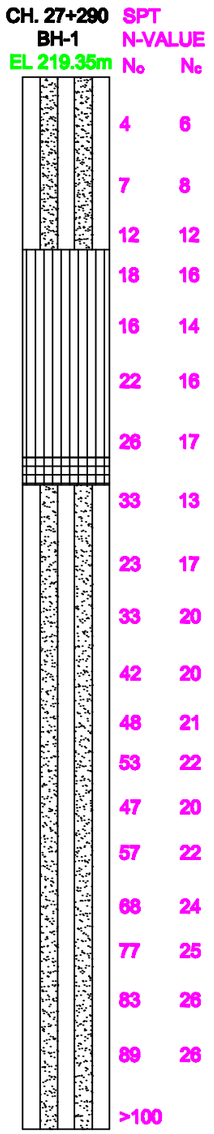
CLIENT: skylark Designer and Engineers (P) Limited	PROJECT: Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut	DRAWING TITLE: Soil Profile	AGENCY: XPLORER CONSULTANCY SERVICES (P) LTD. explore. engineer. deliver Xplorer Consultancy Services Pvt. Ltd. Plot No. 3, First Floor, Sector- 18, Opp. HIPA, Sarhaul, Gurgaon-122001, Haryana, India Tel: +91-124-4388659, Fax: +91-124-4241962 Email: xplorer@xplorer.in, Website: www.xplorer.in	DRG. NO. PWD/PROFILE/01 March, 2016

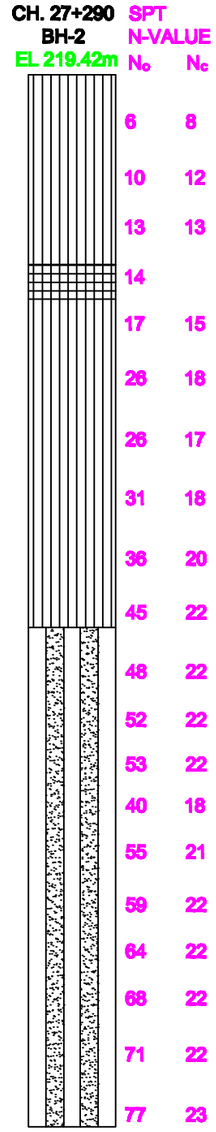


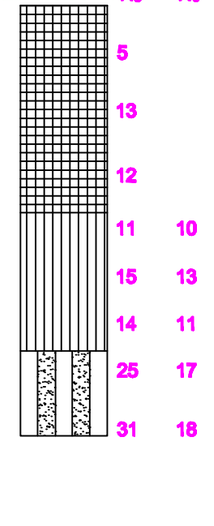


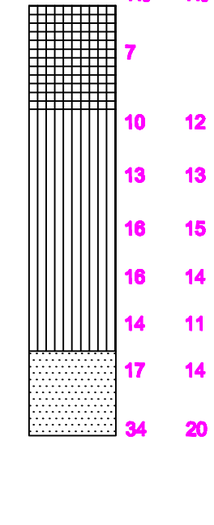


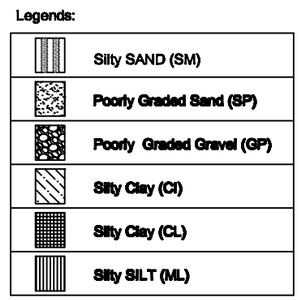




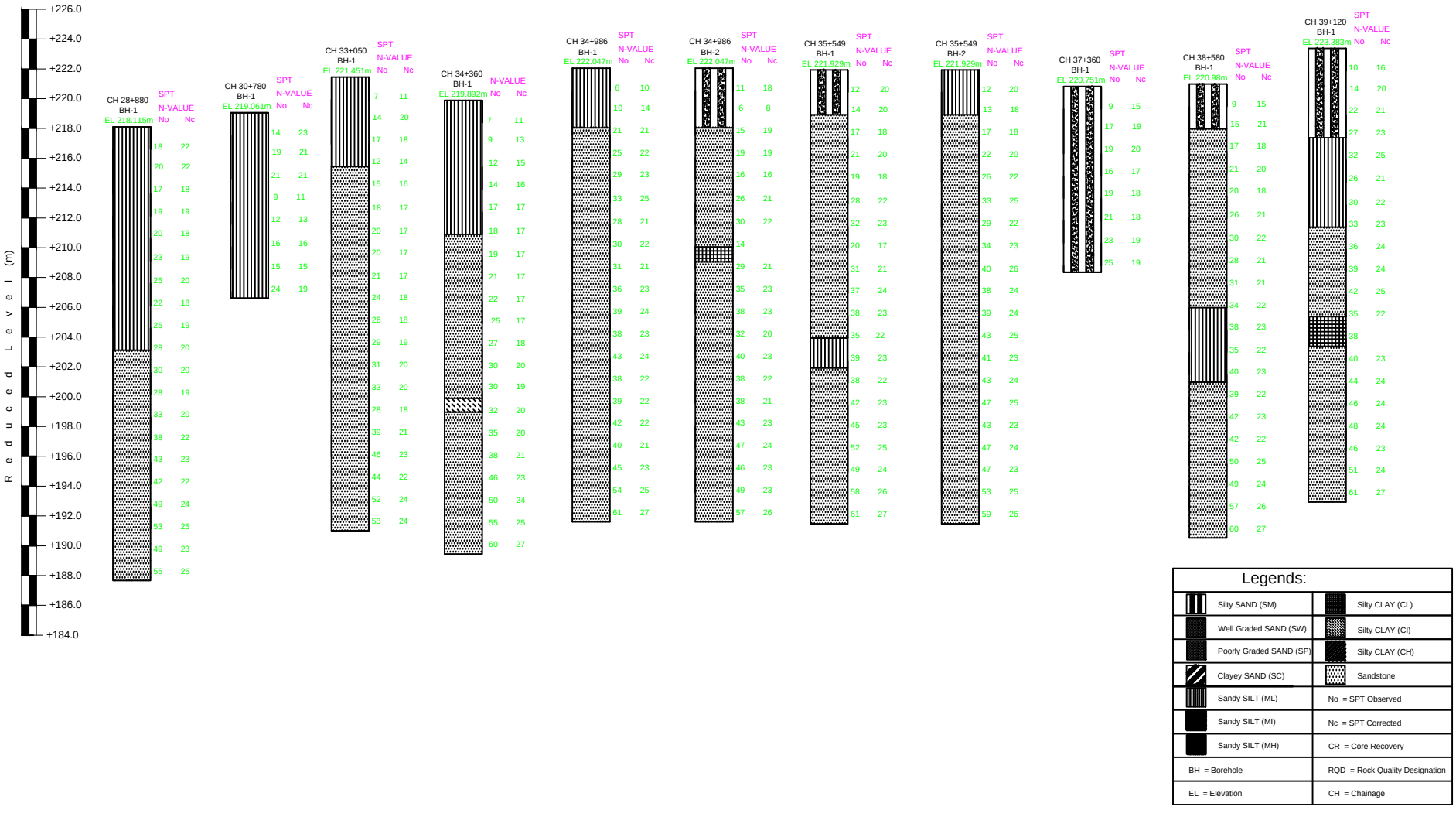








CLIENT: skylark Designer and Engineers (P) Limited	**PROJECT:** Geotechnical Investigation Works at Khurja-Dadri Section of DFCC Meerut	**DRAWING TITLE:** Soil Profile	**AGENCY:** XPLORER CONSULTANCY SERVICES (P) LTD. explore. engineer. deliver Xplorer Consultancy Services Pvt. Ltd. Plot No. 3, First Floor, Sector- 18, Opp. HIPA, Sarhaul, Gurgaon-122001, Haryana, India Tel: +91-124-4388659, Fax: +91-124-4241962 Email: xplorer@xplorer.in, Website: www.xplorer.in	DRG. NO. PWD/PROFILE/01 July, 2015



CLIENT: skylark Designer and Engineers (P) Limited

PROJECT: Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

DRAWING TITLE: Soil Profile

AGENCY: XPLORER CONSULTANCY SERVICES (P) LTD. explore engineer deliver

Xplorer Consultancy Services Pvt. Ltd.
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Gurgaon-122001, Haryana, India
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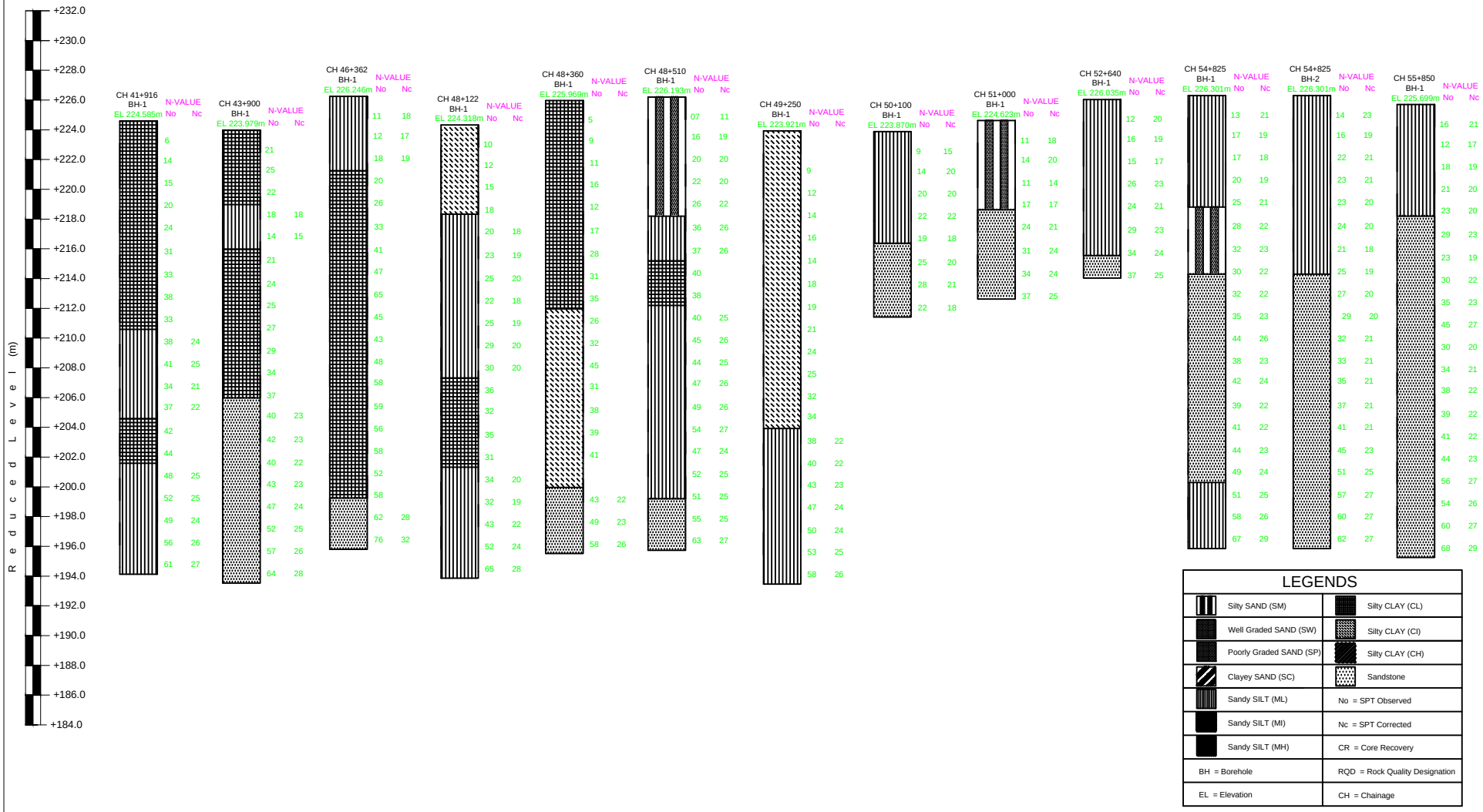
DRG. NO. SKYLARK/PROFILE/01

February, 2016



CLIENT: skylark Designer and Engineers (P) Limited

PROJECT: Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

DRAWING TITLE: Soil Profile

AGENCY: XPLORER CONSULTANCY SERVICES (P) LTD. explore. engineer. deliver

Xplorer Consultancy Services Pvt. Ltd.
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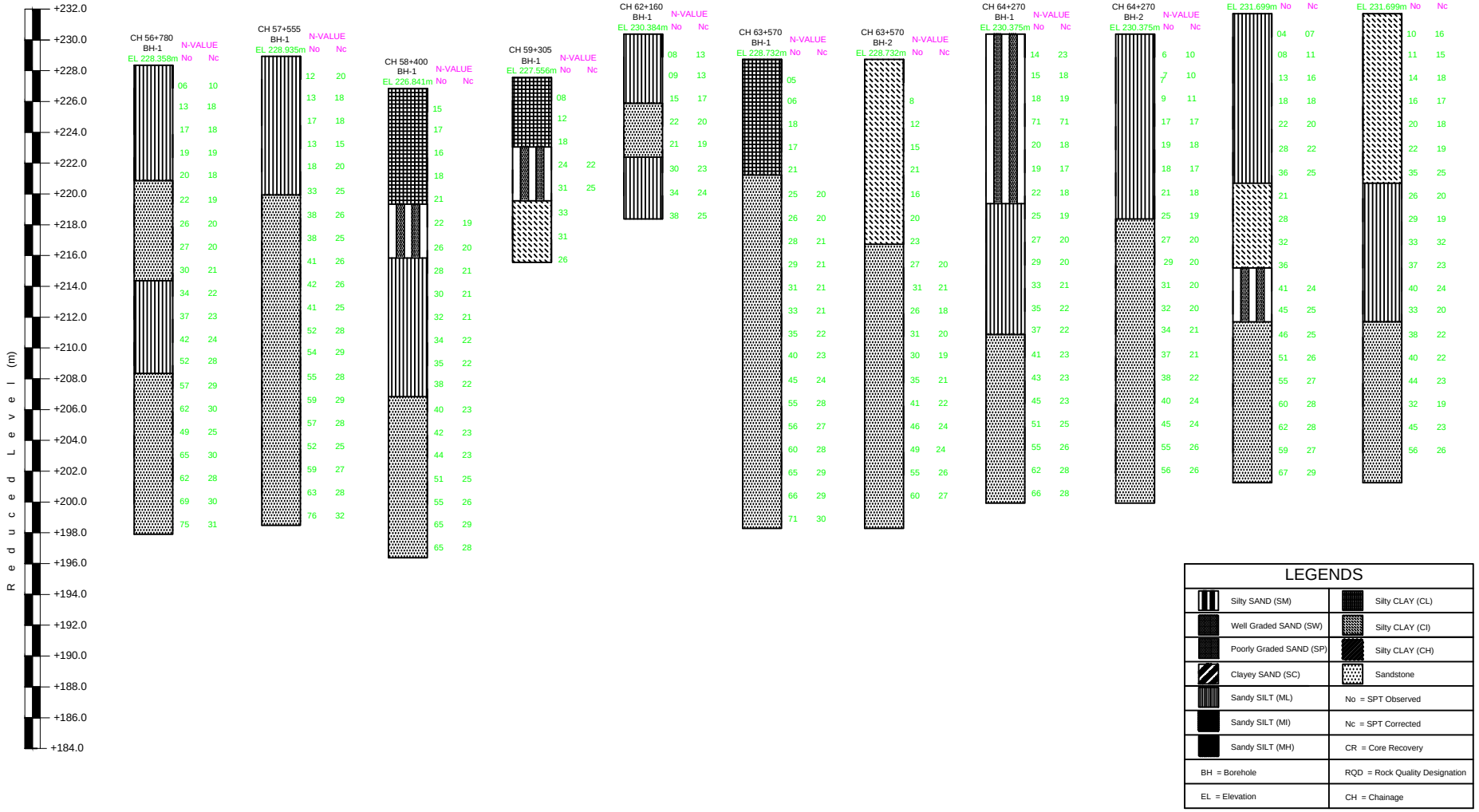
Tel: +91-124-4388659, Fax: +91-124-4241962
Email: xplorer@xplorer.in, Website: www.xplorer.in

DRG. NO. SKYLARK/PROFILE/01

March, 2016



CLIENT:

skylark
Designer and Engineers (P) Limited

PROJECT:

Geotechnical Investigation Works at Hapur-Meerut Section of DFCC Meerut

DRAWING TITLE:

Soil Profile

AGENCY:

XPLORER
CONSULTANCY SERVICES (P) LTD.
explore. engineer. deliver

Xplorer Consultancy Services Pvt. Ltd.
Plot No. 3, First Floor, Sector- 18, Opp. HIPA, Sarhaul,
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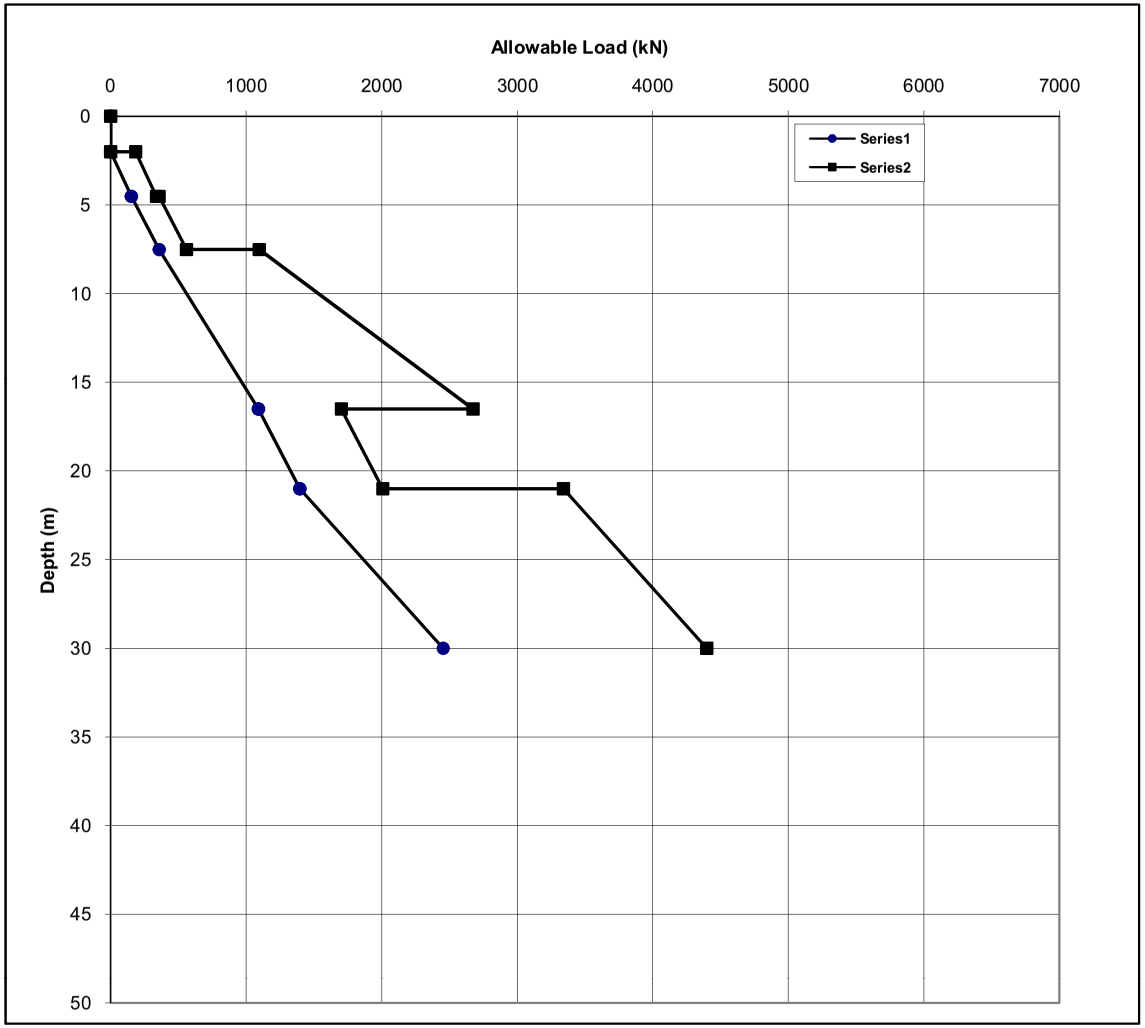
Tel: +91-124-4388659, Fax: +91-124-4241962
Email: xplorer@xplorer.in, Website: www.xplorer.in

DRG. NO. SKYLARK/PROFILE/02

March, 2016

ANNEXURE B- BEARING CAPACITY AND PILE CAPACITY CALCULATIONS



Allowable Pile Capacity at Major Bridge Ch. 1+172 km

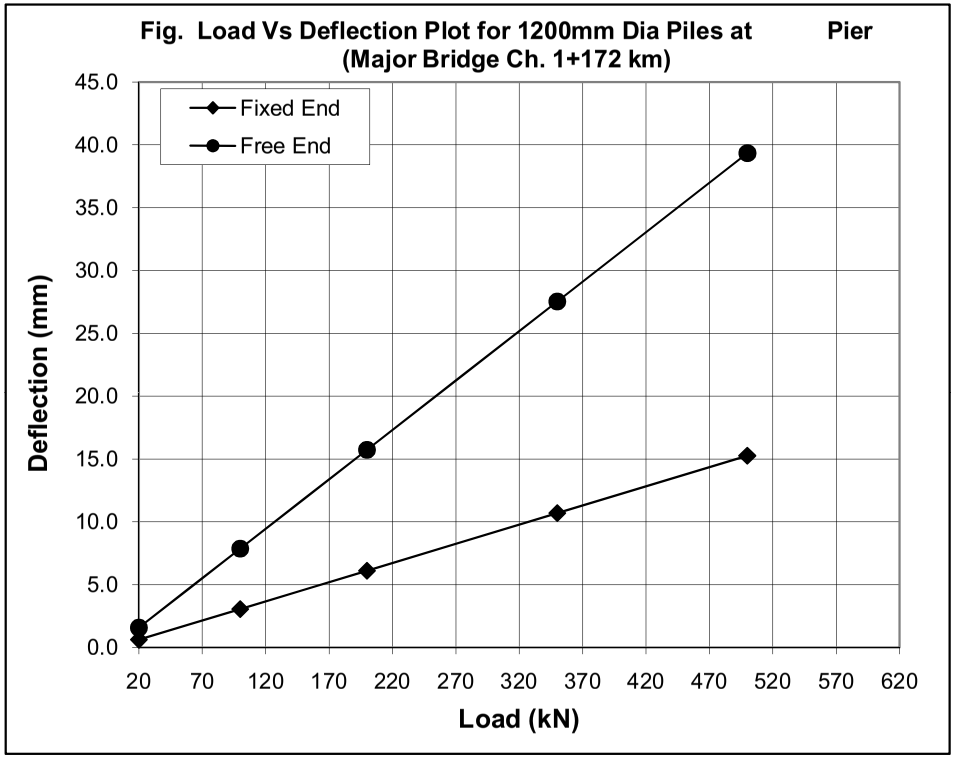
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT Pier (Major Bridge Ch.1+172km) (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.140	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

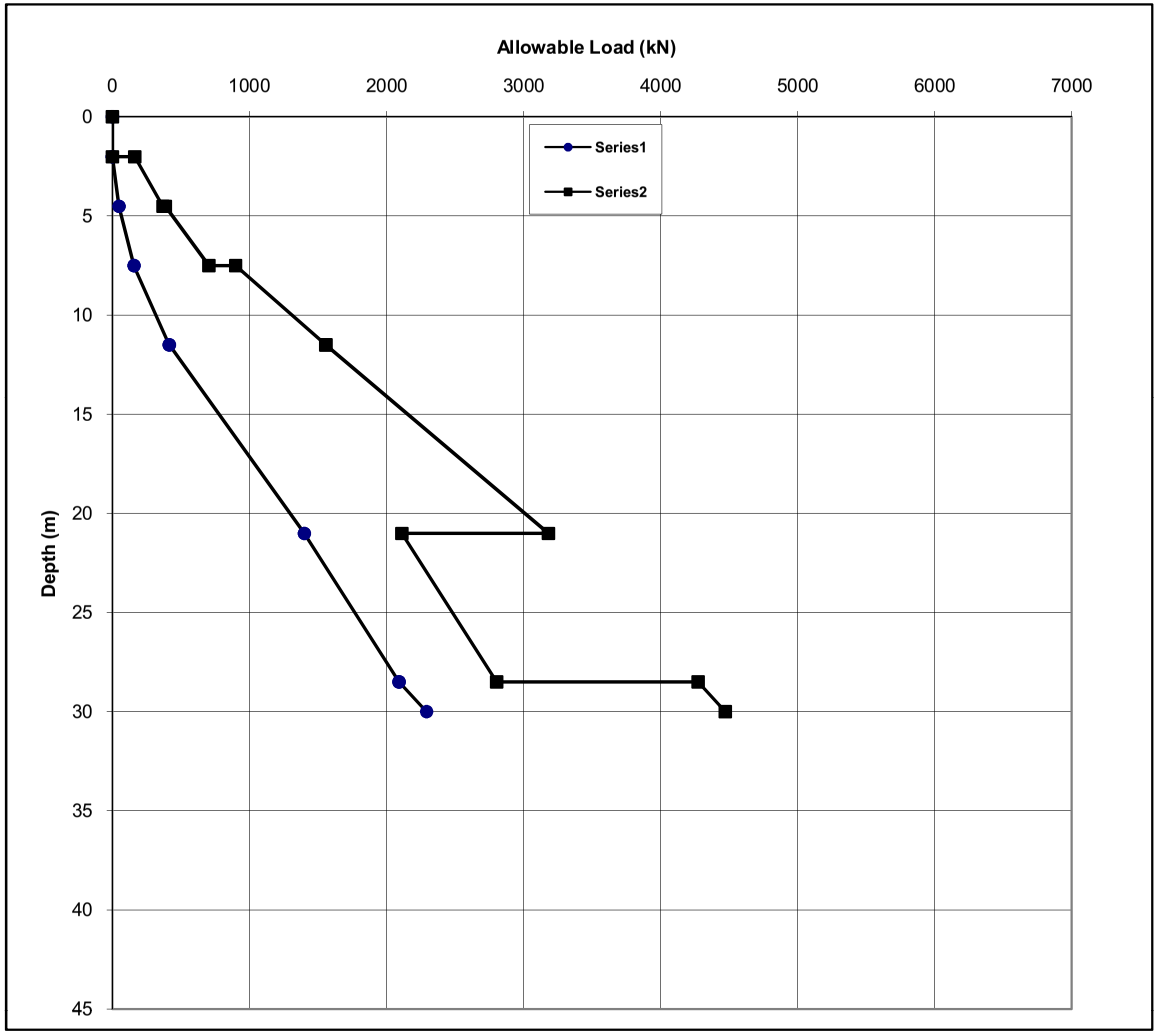
T=	(EI/ηh)^0.2	
	455.60	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1002.33	cm
L_f/T=	1.9	Free
L_f (Free)=	865.64	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	0.61	1.57
100	3.05	7.87
200	6.11	15.74
350	10.69	27.54
500	15.27	39.34



Hence lateral capacity (load corresponding =12mm deflection)

= 380kN (for fixed head condition)
= 150kN (for free head condition)



Allowable Pile Capacity for Major Bridge, Chainage-2+109 km

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

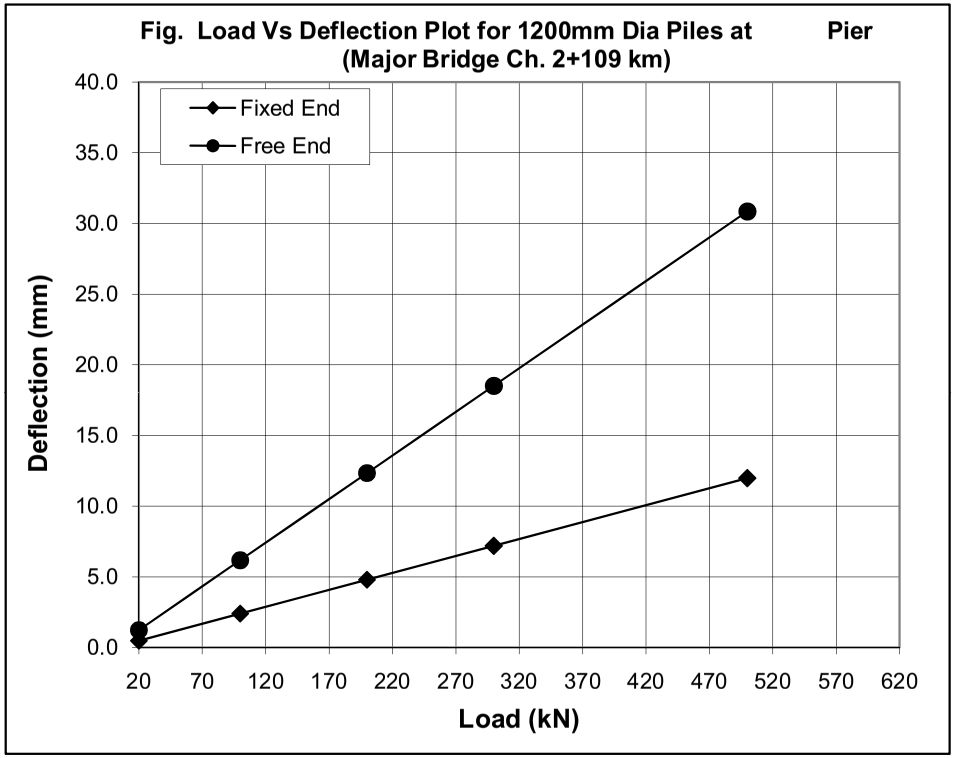
LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT Pier (Major Bridge Ch.2+109km) (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.210	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

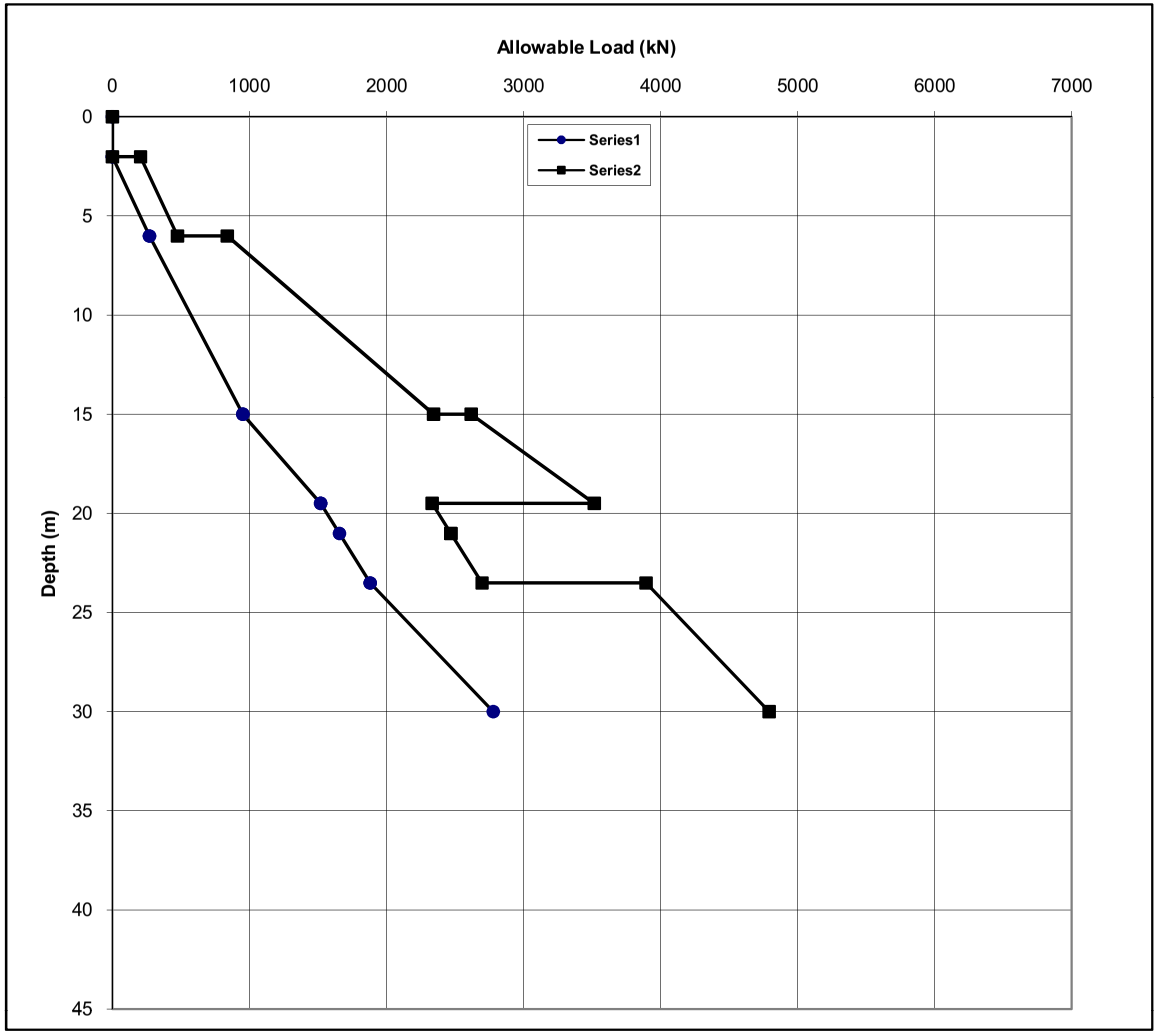
T=	(EI/ηh)^0.2	
	420.11	
L_f/T=	2.2	Fixed
L_f (Fixed)=	924.25	cm
L_f/T=	1.9	Free
L_f (Free)=	798.22	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	0.48	1.23
100	2.39	6.17
200	4.79	12.34
300	7.18	18.51
500	11.97	30.84

Hence lateral capacity (load corresponding =12mm deflection)



= 500kN (for fixed head condition)
= 190kN (for free head condition)



Allowable Pile Capacity for Major Bridge, Chainage-2+306 km

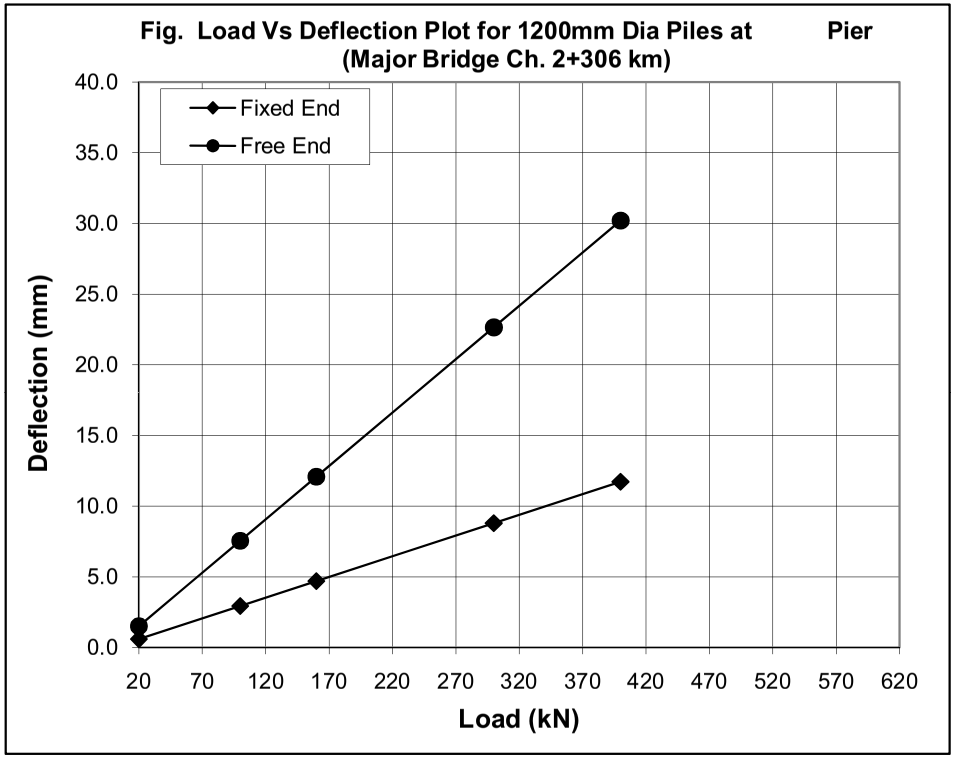
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT Major Bridge Ch.2+306km (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.150	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	449.36	
L_f/T=	2.2	Fixed
L_f (Fixed)=	988.59	cm
L_f/T=	1.9	Free
L_f (Free)=	853.78	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	0.59	1.51
100	2.93	7.55
160	4.69	12.08
300	8.79	22.65
400	11.72	30.19



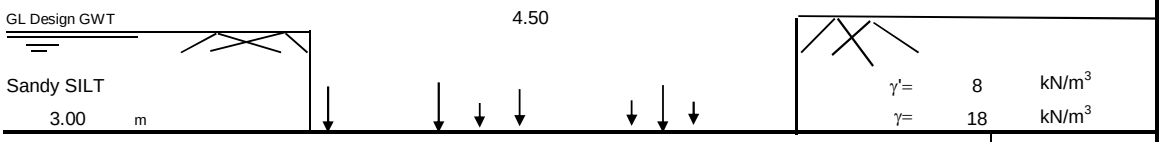
Hence lateral capacity (load corresponding =12mm deflection)

= 400kN (for fixed head condition)
= 160kN (for free head condition)

Calculation for Bearing Capacity at Minor Bridge CH 2+873 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I

	Silty	CLAY	
N_{av}=	8		
ϕ_{av}=	0	degree	
c_{av}=	45	kPa	
γ_{av}=	8	kN/m^3	

Z_1

6.00 m

Layer - II

	Silty	SAND	
N_{av}=	20		
ϕ_{av}=	31	degree	
c_{av}=	0	kPa	
γ_{av}=	9	kN/m^3	

.....Z_2

12.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 122.1 kPa

Design Bearing Capacity= **120 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00015 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 — 1st layer I = 0.88

p_o= 15 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_1 (mm)= 21.82

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 100.0 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

p_o= 75 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 14.57

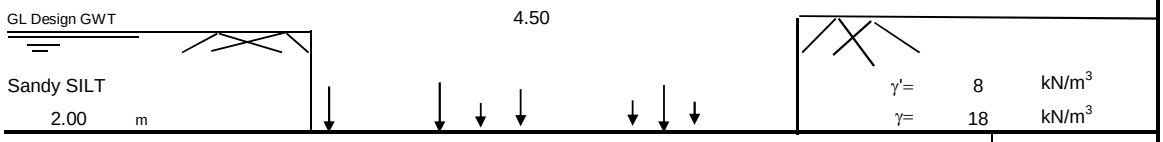
Total settlement = 36.39 mm

Allowable Bearing capacity for 25mm settlement= 83.8 KPa

Calculation for Bearing Capacity at Minor Bridge CH 3+490 km

Footing Size: 5.5x4.5 m

Depth : 2.00 m



Layer - I (7.50 m)

	Silty	CLAY	
N_{av}=		17	
ϕ_{av}=		0	degree
c_{av}=		60	kPa
γ_{av}=		8	kN/m^3

Z_1

Layer - II (12.00 m)

	Silty	SAND	
N_{av}=		31	
ϕ_{av}=		33	degree
c_{av}=		0	kPa
γ_{av}=		9	kN/m^3

.....Z_2

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

$Q(safe)= (cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.09		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.04		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 156.4 kPa

Design Bearing Capacity= **150 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.0001 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

$C=1.5*(C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 — 1st layer I = 0.64

p_o= 24 p= 150.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_1 (mm)= 26.02

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 144.9 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.2

p_o= 80.25 p= 150.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_2 (mm)= 6.95

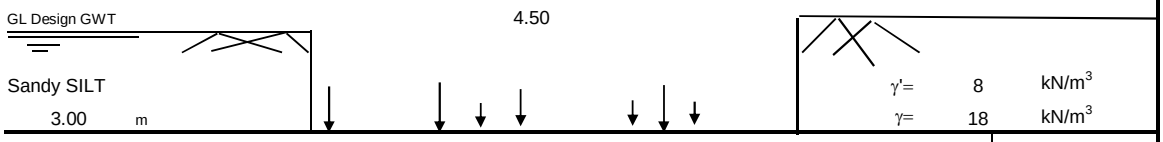
Total settlement = 32.97 mm

Allowable Bearing capacity for 25mm settlement= 118.6 KPa

Calculation for Bearing Capacity at Minor Bridge CH 4+252 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I		Silty	SILT		Z_1
		N_{av}=	7		
		ϕ_{av}=	30	degree	
		c_{av}=	0	kPa	
		γ_{av}=	8	kN/m^3	
6.00	m				
		Silty	SAND		
Layer - II		N_{av}=	29		……Z_2
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	9	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 30 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	16	N_q=	7.25		N_γ=	7.59	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.23		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.12		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**124.1**	**kPa**				

Design Bearing Capacity= **120** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 175.0 C_{kd}/N= 250 KN/m^2 1st layer I = 0.88

p_o= 15 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_1 (mm)= 23.44

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 174.0 C_{kd}/N= 300 KN/m^2 2nd layer I = 0.28

p_o= 75 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 8.37

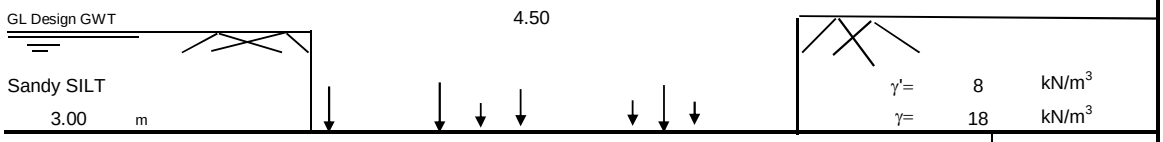
Total settlement = 31.81 mm

Allowable Bearing capacity for 25mm settlement= 97.5 KPa

Calculation for Bearing Capacity at Minor Bridge CH 5+163 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I

	Silty	CLAY	
N_{av}=		12	
ϕ_{av}=		0	degree
c_{av}=		45	kPa
γ_{av}=		8	kN/m^3

4.50 m

Z_1

Layer - II

	Silty	SAND	
N_{av}=		26	
ϕ_{av}=		31	degree
c_{av}=		0	kPa
γ_{av}=		9	kN/m^3

12.00 m

.....Z_2

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 122.1 kPa

Design Bearing Capacity= **120 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00014 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 1st layer I = 1

p_o= 9 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_1 (mm)= 11.57

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 139.8 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

p_o= 69.75 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 13.84

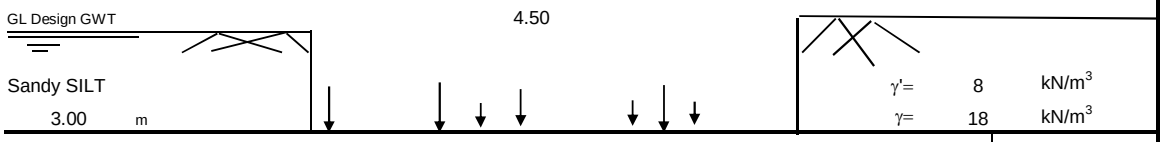
Total settlement = 25.41 mm

Allowable Bearing capacity for 25mm settlement= 120.0 KPa

Calculation for Bearing Capacity at Minor Bridge CH 7+064 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I

	Silty	CLAY	
N_{av}=		28	
ϕ_{av}=		0	degree
c_{av}=		45	kPa
γ_{av}=		8	kN/m^3

Z_1

4.50 m

Layer - II

	Silty	SAND	
N_{av}=		33	
ϕ_{av}=		32	degree
c_{av}=		0	kPa
γ_{av}=		9	kN/m^3

.....Z_2

12.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 122.1 kPa

Design Bearing Capacity= **120 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00006 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 1st layer I = 1

p_o= 9 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_1 (mm)= 4.96

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 177.4 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

p_o= 69.75 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 10.90

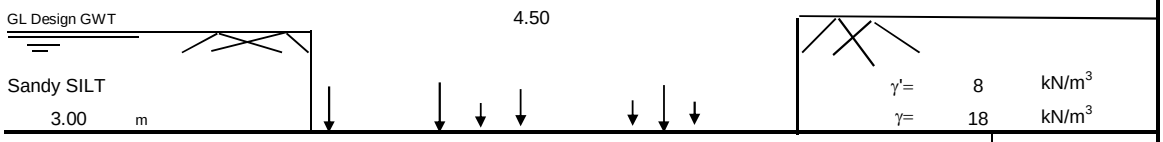
Total settlement = 15.86 mm

Allowable Bearing capacity for 25mm settlement= 120.0 KPa

Calculation for Bearing Capacity at Major **Bridge CH 8+977 km**

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I (6.00 m)

	Silty	CLAY	
N_{av}=		8	
ϕ_{av}=		0	degree
c_{av}=		45	kPa
γ_{av}=		8	kN/m^3

Z_1

Layer - II (12.00 m)

	Silty	CLAY	
N_{av}=		19	
ϕ_{av}=		0	degree
c_{av}=		65	kPa
γ_{av}=		9	kN/m^3

……Z_2

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 122.1 kPa

Design Bearing Capacity= **120 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.0002 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 — 1st layer I = 0.88

p_o= 15 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_1 (mm)= 29.09

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= 0.00008 m2/kN μ_g= 0.7

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o+\Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 2nd layer I = 0.28

p_o= 75 p= 120.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 7.41

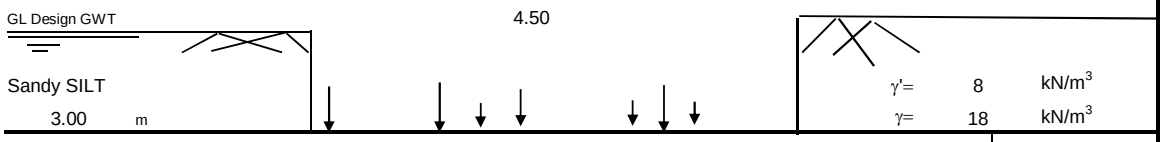
Total settlement = 36.50 mm

Allowable Bearing capacity for 25mm settlement= 83.6 KPa

Calculation for Bearing Capacity at Minor Bridge CH 10+030 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I (5.00 m) — Silty CLAY — Z_1

N_{av}=	8	
ϕ_{av}=	0	degree
c_{av}=	50	kPa
γ_{av}=	8	kN/m^3

Layer - II (12.00 m) — Silty SAND — ……Z_2

N_{av}=	22	
ϕ_{av}=	31	degree
c_{av}=	0	kPa
γ_{av}=	9	kN/m^3

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 135.6 kPa

Design Bearing Capacity= **135 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00015 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

$C=1.5*(C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 — 1st layer I = 0.94

p_o= 11 p= 135.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_1 (mm)= 17.48

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 115.4 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

p_o= 71.5 p= 135.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 16.89

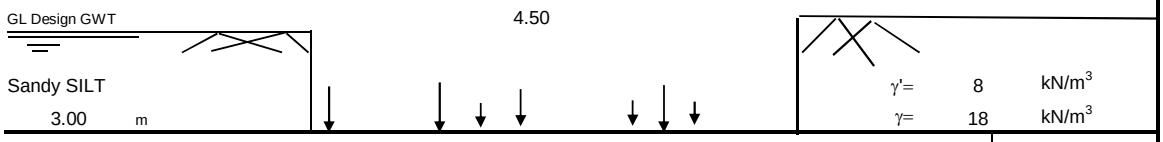
Total settlement = 34.37 mm

Allowable Bearing capacity for 25mm settlement= 98.6 KPa

Calculation for Bearing Capacity at Major **Bridge CH 10+973 km**

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I (7.50 m)

	Silty	CLAY	
N_{av}=	24		
ϕ_{av}=	0	degree	
c_{av}=	65	kPa	
γ_{av}=	8	kN/m^3	

Z_1

Layer - II (12.00 m)

	Silty	SAND	
N_{av}=	35		
ϕ_{av}=	32	degree	
c_{av}=	0	kPa	
γ_{av}=	9	kN/m^3	

……Z_2

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 176.3 kPa

Design Bearing Capacity= **175 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00007 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 — 1st layer I = 0.98

p_o= 21 p= 175.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_1 (mm)= 24.81

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 163.6 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.2

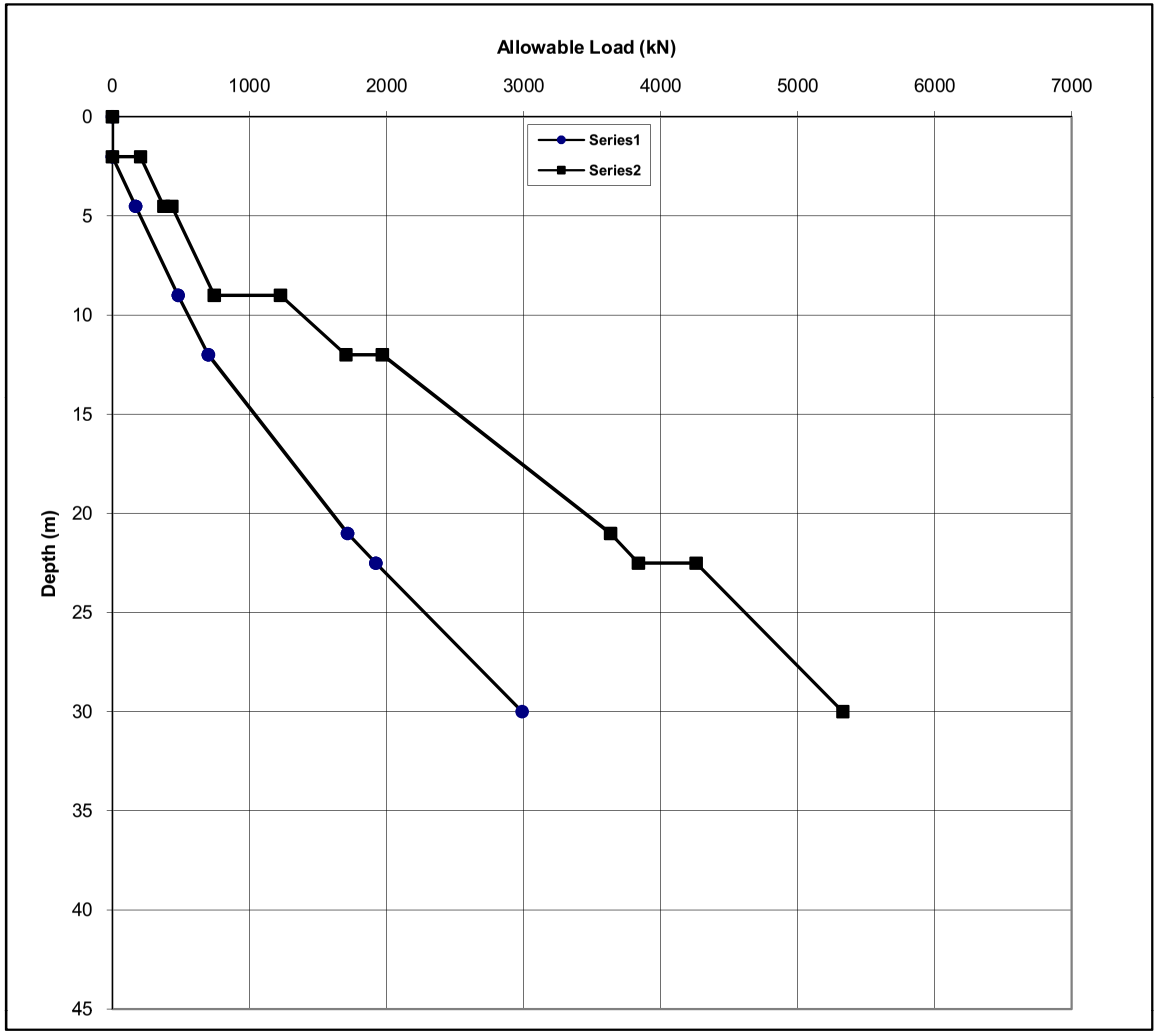
p_o= 80.25 p= 175.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 6.53

Total settlement = 31.34 mm

Allowable Bearing capacity for 25mm settlement= 140.6 KPa



Allowable Pile Capacity for Major Bridge, Chainage-13+841 km

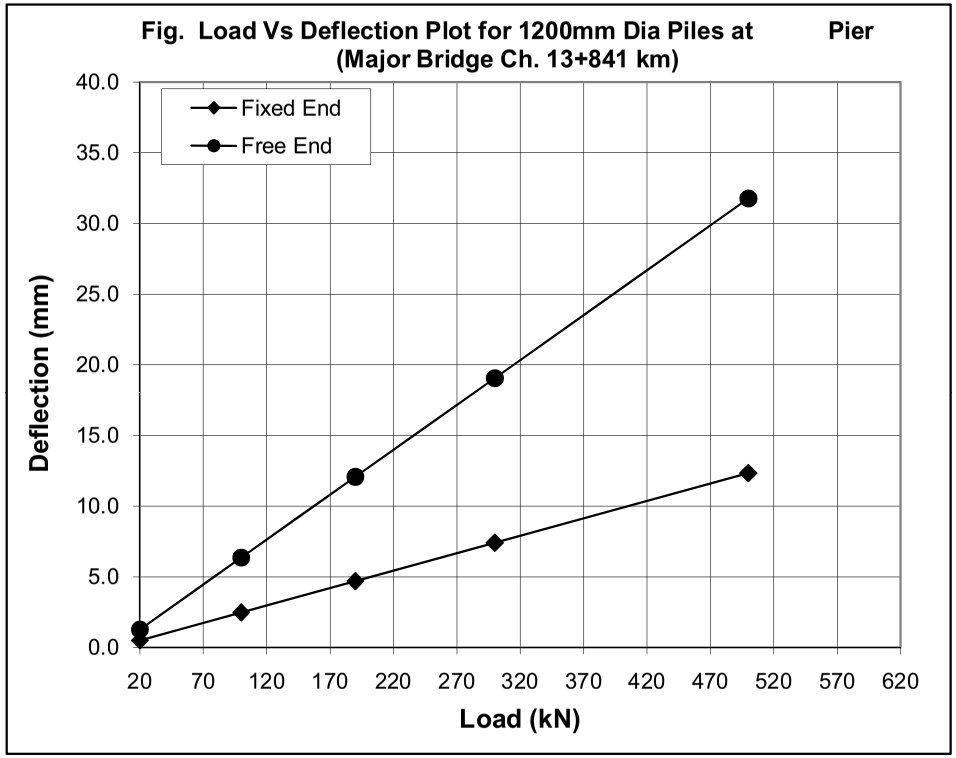
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT Major Bridge Ch.13+841km (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.200	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

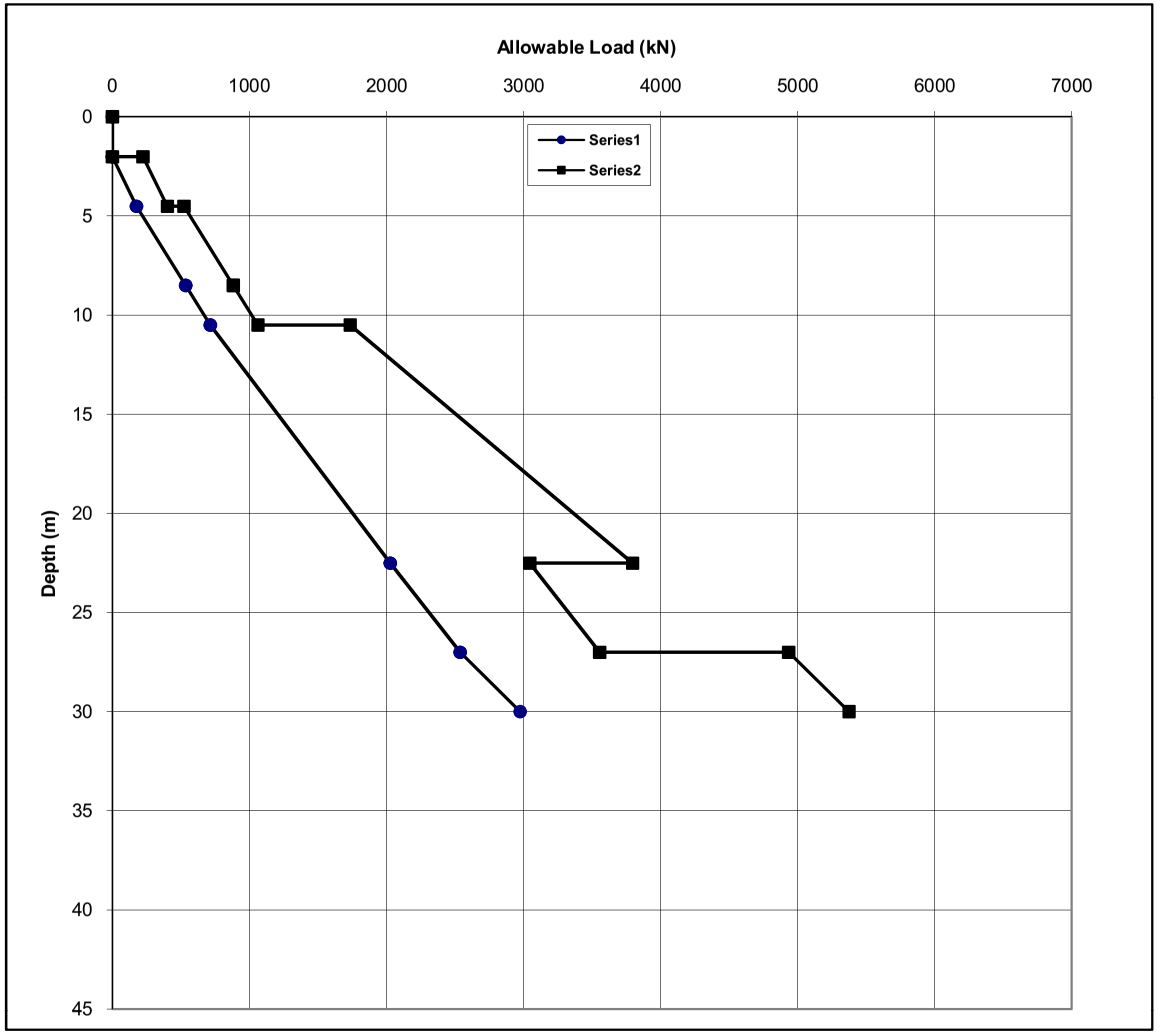
T=	(EI/ηh)^0.2	
	424.23	
L_f/T=	2.2	Fixed
L_f (Fixed)=	933.32	cm
L_f/T=	1.9	Free
L_f (Free)=	806.05	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	0.49	1.27
100	2.47	6.35
190	4.68	12.07
300	7.40	19.06
500	12.33	31.76



Hence lateral capacity (load corresponding =12mm deflection)

= 500kN (for fixed head condition)
= 190kN (for free head condition)



Allowable Pile Capacity for Major Bridge, Chainage-13+841 km

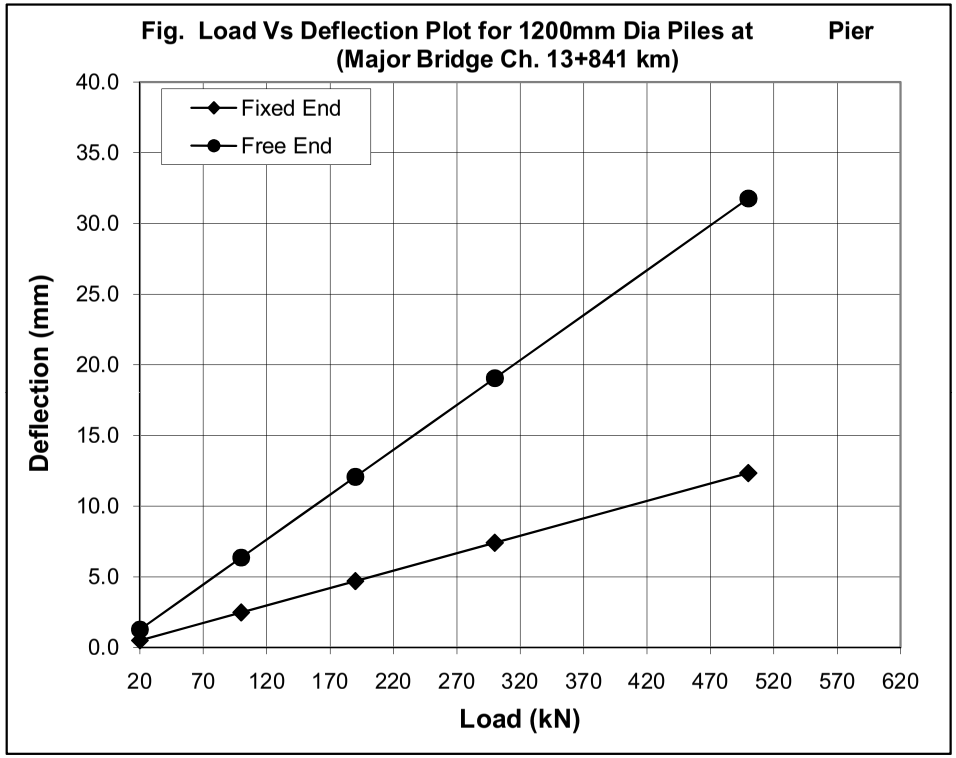
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT Pier (Major Bridge Ch.13+841km) (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.200	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	424.23	
L_f/T=	2.2	Fixed
L_f (Fixed)=	933.32	cm
L_f/T=	1.9	Free
L_f (Free)=	806.05	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
20	0.49	1.27
100	2.47	6.35
190	4.68	12.07
300	7.40	19.06
500	12.33	31.76



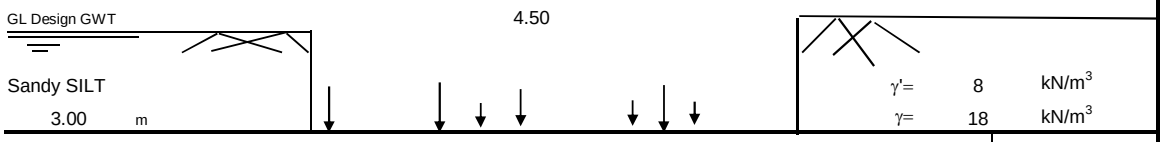
Hence lateral capacity (load corresponding =12mm deflection)

= 500kN (for fixed head condition)
= 190kN (for free head condition)

Calculation for Bearing Capacity at Minor Bridge CH 13+136 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I		Silty	CLAY		Z_1
		N_{av}=	12		
		ϕ_{av}=	0	degree	
		c_{av}=	60	kPa	
		γ_{av}=	8	kN/m^3	
6.00	m				
		Silty	SAND		
Layer - II		N_{av}=	28		……Z_2
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	8.5	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**162.7**	**kPa**				

Design Bearing Capacity= **160** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00012 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

$C=1.5*(C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 1st layer I = 0.9

p_o= 15 p= 160.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 24.39

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 142.9 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

p_o= 73.5 p= 160.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 13.43

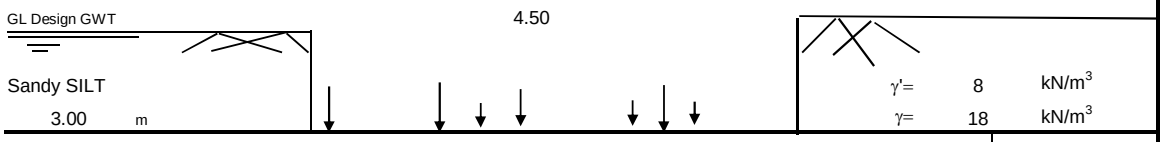
Total settlement = 37.82 mm

Allowable Bearing capacity for 25mm settlement= 107.6 KPa

Calculation for Bearing Capacity at Minor Bridge CH 15+227 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I (8.50 m)

	Silty	CLAY	
N_{av}=		16	
ϕ_{av}=		0	degree
c_{av}=		60	kPa
γ_{av}=		8	kN/m^3

Z_1

Layer - II (12.00 m)

	Silty	SAND	
N_{av}=		38	
ϕ_{av}=		31	degree
c_{av}=		0	kPa
γ_{av}=		9	kN/m^3

Z_2

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

$Q(safe)= (cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 162.7 kPa

Design Bearing Capacity= **160 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00008 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

$C=1.5*(C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 — 1st layer I = 0.64

p_o= 25 p= 160.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 21.19

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 170.1 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.2

p_o= 83.75 p= 160.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 4.47

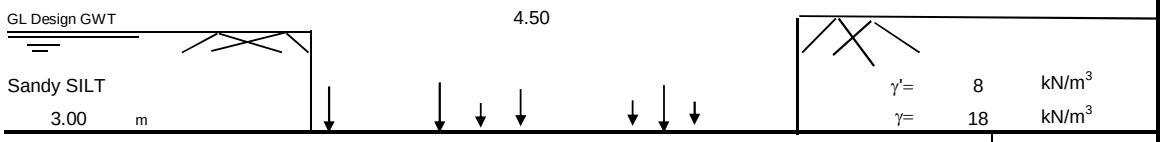
Total settlement = 25.67 mm

Allowable Bearing capacity for 25mm settlement= 158.5 KPa

Calculation for Bearing Capacity at Minor Bridge CH 16+144 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I

	Silty	CLAY	
N_{av}=		14	
ϕ_{av}=		0	degree
c_{av}=		60	kPa
γ_{av}=		8	kN/m^3

Z_1

7.50 m

Layer - II

	Silty	SAND	
N_{av}=		33	
ϕ_{av}=		30	degree
c_{av}=		0	kPa
γ_{av}=		9	kN/m^3

.....Z_2

12.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 162.7 kPa

Design Bearing Capacity= **160 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00012 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 — 1st layer I = 0.74

p_o= 21 p= 160.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 30.08

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 154.2 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.2

p_o= 80.25 p= 160.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 6.58

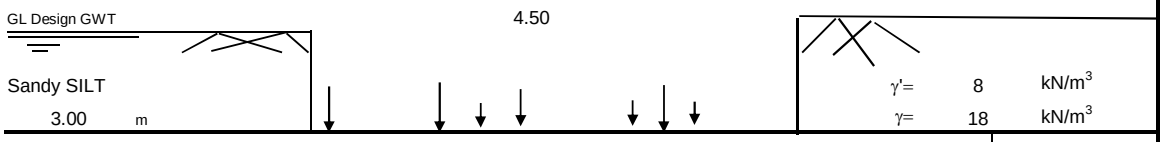
Total settlement = 36.66 mm

Allowable Bearing capacity for 25mm settlement= 111.0 KPa

Calculation for Bearing Capacity at Minor Bridge CH 17+338 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I		Silty	CLAY		Z_1
		N_{av}=	10		
		ϕ_{av}=	0	degree	
		c_{av}=	40	kPa	
		γ_{av}=	8	kN/m^3	
6.00	m				
		Silty	SAND		
Layer - II		N_{av}=	28		……Z_2
		ϕ_{av}=	0	degree	
		c_{av}=	105	kPa	
12.00	m	γ_{av}=	9	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**108.5**	**kPa**				

Design Bearing Capacity= **105.0** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= 0.00014 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

$C=1.5*(C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 1st layer I = 0.9

p_o= 15 p= 105.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 18.67

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 140.0 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

p_o= 75 p= 105.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 9.53

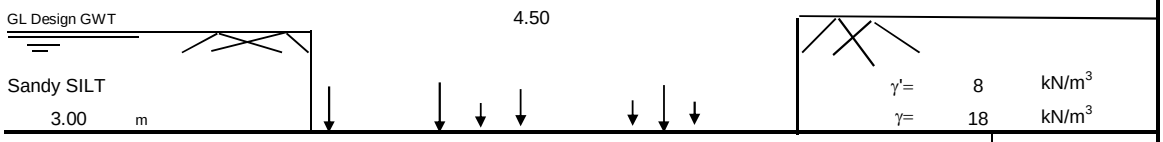
Total settlement = 28.20 mm

Allowable Bearing capacity for 25mm settlement= 96.2 KPa

Calculation for Bearing Capacity at Minor Bridge CH 17+338 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I		Silty	SAND		Z_1
		N_{av}=	9		
		ϕ_{av}=	29	degree	
		c_{av}=	0	kPa	
		γ_{av}=	8	kN/m^3	
4.50	m				
		Silty	CLAY		
Layer - II		N_{av}=	20		……Z_2
		ϕ_{av}=	0	degree	
		c_{av}=	104	kPa	
12.00	m	γ_{av}=	8.5	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 29 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5			
N_c=	15.5	N_q=	6.88		N_γ=	6.65	Local shear failure	
S_c=	1.164	S_q=	1.164		S_γ=	0.67		
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.23			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.11			
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0	
Q_{safe-I}=		**113.5**	**kPa**					

Design Bearing Capacity= **113** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 300.0 C_{kd}/N= 200 KN/m^2 1st layer I = 1

p_o= 9 p= 113.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 8.76

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= 0.00009 m2/kN μ_g= 0.7

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 2nd layer I = 0.28

p_o= 67.875 p= 113.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 10.05

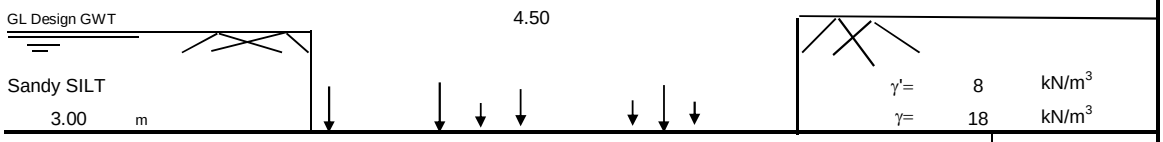
Total settlement = 18.81 mm

Allowable Bearing capacity for 25mm settlement= 113.0 KPa

Calculation for Bearing Capacity at Minor Bridge CH 19+955 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I

	Silty SAND		
N_{av}=	22		
ϕ_{av}=	31	degree	
c_{av}=	0	kPa	
γ_{av}=	8	kN/m^3	

12.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ= 31 degree

For Layer - I

As ϕ is 31° Intermediate shear failure is considered

$Q(safe) = (cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS= 2.5 w= 0.5

N_c=	33.34	N_q=	21.38	N_γ=	27.54	General shear failure
N_c=	17.19	N_q=	8.1	N_γ=	7.59	Local shear failure
N_c=	19.88	N_q=	10.31	N_γ=	10.92	Intermediate condition
S_c=	1.164	S_q=	1.164	S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=		1.24			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)		1.12			
ic=iq=	(1-α/90)^2= 1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 182.8 kPa

Design Bearing Capacity= **180.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 211.5 C_{kd}/N= 250 KN/m^2 1st layer I = 0.36

p_o= 39 p= 180.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

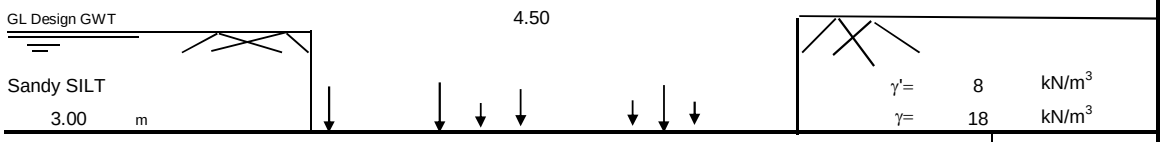
δ_1 (mm)= 27.99

Total settlement	**=**	**27.99 mm**	
Allowable Bearing capacity for 25mm settlement=			**163.3 KPa**

Calculation for Bearing Capacity at Minor Bridge CH 20+935 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I

	Silty	CLAY	
N_{av}=		14	
ϕ_{av}=		0	degree
c_{av}=		50	kPa
γ_{av}=		8	kN/m^3

Z_1

9.00 m

Layer - II

	Silty	SAND	
N_{av}=		31	
ϕ_{av}=		31	degree
c_{av}=		0	kPa
γ_{av}=		9	kN/m^3

Z_2

12.00 m

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 135.6 kPa

Design Bearing Capacity= **135.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00013 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

$C=1.5*(C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 1st layer I = 0.6

p_o= 27 p= 135.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 29.72

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 136.0 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.2

p_o= 85.5 p= 135.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 4.07

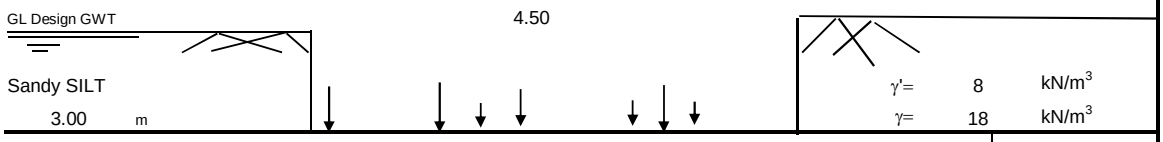
Total settlement = 33.79 mm

Allowable Bearing capacity for 25mm settlement= 100.3 KPa

Calculation for Bearing Capacity at Minor Bridge CH 23+808 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I		Silty	CLAY		Z_1
		N_{av}=	5		
		ϕ_{av}=	0	degree	
		c_{av}=	40	kPa	
		γ_{av}=	8	kN/m^3	
5.50	m				
		Silty	SAND		
Layer - II		N_{av}=	33		……Z_2
		ϕ_{av}=	32	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	8.5	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.13		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.07		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**108.5**	**kPa**				

Design Bearing Capacity= **105.0** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00023 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

$C=1.5*(C_{kd}/p_o)$= 0.0 C_{kd}/N= KN/m^2 1st layer I = 0.9

p_o= 13 p= 105.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 25.56

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}$(p_o+Δp)/p_o)]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 172.8 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

p_o= 71.625 p= 105.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 8.69

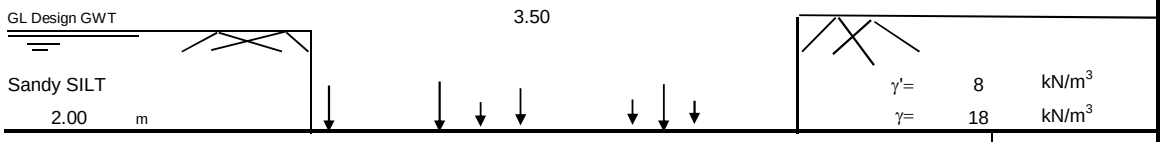
Total settlement = 34.26 mm

Allowable Bearing capacity for 25mm settlement= 79.2 KPa

Calculation for Bearing Capacity at Minor Bridge CH 24+920

Footing Size: 5.5x3.5 m

Depth : 2.00 m



Layer - I		Sandy	SILT		Z_1
		N_{av}=	11		
		ϕ_{av}=	30	degree	
		c_{av}=	0	kPa	
		γ_{av}=	8	kN/m^3	
3.00	m				
		Silty	SAND		
Layer - II		N_{av}=	14		……Z_2
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
6.00	m	γ_{av}=	9	kN/m^3	
		Fine	SAND		
Layer - III		N_{av}=	26		Z_3
		ϕ_{av}=	33	degree	
		c_{av}=	0	kPa	
9.00	m	γ_{av}=	9.5	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 30 degree

For Layer - I

As ϕ is 30° local failure is considered

$Q(safe) = (cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	16	N_q=	7.25		N_γ=	7.59	Local shear failure
S_c=	1.127	S_q=	1.127		S_γ=	0.75	
dc=	1+0.2*(D/B)*tan(45+φ/2)=			1.20			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)			1.10			
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**128.9**	**kPa**				

Design Bearing Capacity= **128** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

$C=1.5*(C_{kd}/p_o)$= 550.0 C_{kd}/N= 200 KN/m^2 1st layer I = 1

p_o= 6 p= 128.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_1 (mm)= 3.89

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 112.0 C_{kd}/N= 200 KN/m^2 2nd layer I = 0.6

p_o= 37.5 p= 128.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_2 (mm)= 20.54

Settlement for Layer-III

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 149.4 C_{kd}/N= 250 KN/m^2 3RD layer I = 0.22

p_o= 65.25 p= 128.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_3 (mm)= 4.96

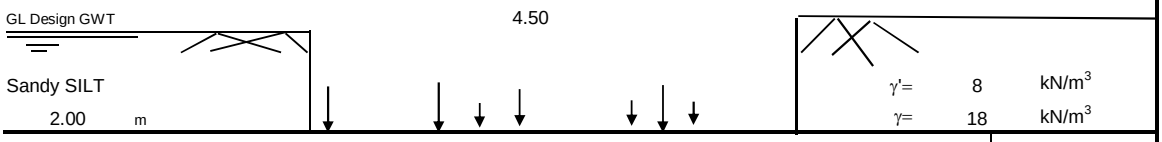
Total settlement = 29.38 mm

Allowable Bearing capacity for 25mm settlement= 109.7 KPa

Calculation for Bearing Capacity at Minor Bridge CH 25+760

Footing Size: 5.5x4.5 m

Depth : 2.00 m



Layer - I		Sandy	SILT		Z_1
		N_{av}=	10		
		ϕ_{av}=	30	degree	
		c_{av}=	0	kPa	
		γ_{av}=	8	kN/m3	
3.00	m				
		Silty	SAND		
Layer - II		N_{av}=	17		……Z_2
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
6.00	m	γ_{av}=	9	kN/m3	
		Fine	SAND		
Layer - III		N_{av}=	26		Z_3
		ϕ_{av}=	33	degree	
		c_{av}=	0	kPa	
10.00	m	γ_{av}=	9.5	kN/m3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 30 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	16	N_q=	7.25		N_γ=	7.59	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.15		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.08		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 132.6 kPa

Design Bearing Capacity= **132 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 500.0 C_{kd}/N= 200 KN/m2 1st layer I = 1

p_o= 6 p= 132.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_1 (mm)= 4.41

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 136.0 C_{kd}/N= 200 KN/m^2 2nd layer I = 0.68

p_o= 37.5 p= 132.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_2 (mm)= 18.98

Settlement for Layer-III

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 139.3 C_{kd}/N= 250 KN/m^2 3RD layer I = 0.28

p_o= 70 p= 132.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_3 (mm)= 8.57

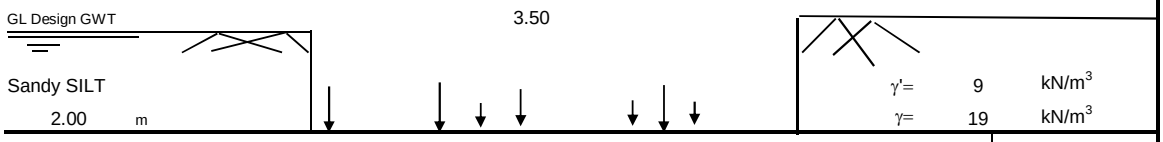
Total settlement = 31.96 mm

Allowable Bearing capacity for 25mm settlement= 103.7 KPa

Calculation for Bearing Capacity at Minor Bridge CH 26+530

Footing Size: 5.5x3.5 m

Depth : 2.00 m



Layer - I		Sandy	SILT		
		N_{av}=	17		
		ϕ_{av}=	30	degree	
		c_{av}=	0	kPa	
		γ_{av}=	9	kN/m^3	
8.00	m				
		Silty	SAND		
Layer - II		N_{av}=	30		……Z_2
		ϕ_{av}=	33	degree	
		c_{av}=	0	kPa	
10.00	m	γ_{av}=	9.5	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 30 degree

For Layer - I

As ϕ is 29° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	16	N_q=	7.25		N_γ=	7.59	Local shear failure
S_c=	1.127	S_q=	1.127		S_γ=	0.75	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.20		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.10		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**137.2**	**kPa**				

Design Bearing Capacity= **137** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 175.9 C_{kd}/N= 200 KN/m^2 1st layer I = 0.52

p_o= 29 p= 137.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_1 (mm)= 29.11

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 110.4 C_{kd}/N= 200 KN/m^2 2nd layer I = 0.2

p_o= 81.5 p= 137.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_2 (mm)= 3.61

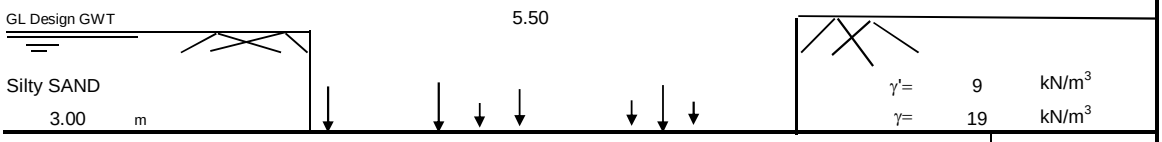
Total settlement = 32.72 mm

Allowable Bearing capacity for 25mm settlement= 104.8 KPa

Calculation for Bearing Capacity at Major Bridge CH 27+290

Footing Size: 5.5x5.5 m

Depth : 3.00 m



Layer - I		SANDY	silt		Z_1
		N_{av}=	18		
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
		γ_{av}=	9	kN/m^3	
12.00	m				
		silty	SAND		
Layer - II		N_{av}=	39		……Z_2
		ϕ_{av}=	33	degree	
		c_{av}=	0	kPa	
14.00	m	γ_{av}=	9.5	kN/m^3	
		Silty	SAND		
Layer - III		N_{av}=	60		Z_3
		ϕ_{av}=	34	degree	
		c_{av}=	0	kPa	
30.00	m	γ_{av}=	10	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 31 degree

For Layer - I

As ϕ is 31° intermediate shear failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	33.34	N_q=	21.38		N_γ=	27.54	General shear failure
N_c=	17.19	N_q=	8.1		N_γ=	7.59	Local shear failure
N_c=	19.88	N_q=	10.31		N_γ=	10.92	Intermediate condition
S_c=	1.300	S_q=	1.200		S_γ=	0.80	
dc=	1+0.2*(D/B)*tan(45+φ/2)=			1.19			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)			1.10			
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**326.8**	**kPa**				

Design Bearing Capacity= **300** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 155.2 C_{kd}/N= 250 KN/m^2 1st layer I = 0.42

p_o= 43.5 p= 300.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.76

δ_1 (mm)= 47.96

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= 0.00013 μ_g= 0.7

δ (mm)= [2.303*(H/C)*$\log_{10}$(p_o+Δp)/p_o)]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 149.4 C_{kd}/N= 300 KN/m^2 2nd layer I = 0.152

p_o= 117.5 p= 300.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.76

δ_2 (mm)= 2.67

δ_3 (mm)= 2.19

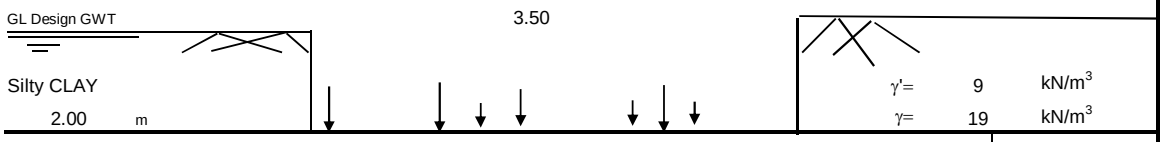
Total settlement = 50.63 mm

Allowable Bearing capacity for 25mm settlement= 161.3 KPa

Calculation for Bearing Capacity at Minor Bridge CH 27+820

Footing Size: 5.5x3.5 m

Depth : 2.00 m



Layer - I			Silty	CLAY		Z_1
	Mv (Lab) =		N_{av}=	5		
	Mv (Correl.) =	0.26 m2/MN	ϕ_{av}=	0	degree	
	Design Mv =	0.26 m2/MN	c_{av}=	45	kPa	
	Cdesign = (C1*d1 + C2*d2)/2		Cdesign=	56.25		
			γ_{av}=	9	kN/m^3	
3.00	m					
			Silty	CLAY		
Layer - II	Mv (Lab) =	0.20 m2/MN	N_{av}=	12		……Z_2
	Mv (Correl.) =	0.13 m2/MN	ϕ_{av}=	0	degree	
	Design Mv =	0.16 m2/MN	c_{av}=	60	kPa	
6.00	m		γ_{av}=	9	kN/m^3	
			Sandy	SILT		
Layer - III			N_{av}=	13		Z_3
			ϕ_{av}=	31	degree	
			c_{av}=	0	kPa	
9.00	m		γ_{av}=	9	kN/m^3	

Safe Bearing Capacity from Shear Failure

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.127	S_q=	1.127		S_γ=	0.75	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.11		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.06		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 145.2 kPa

Design Bearing Capacity= **145 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.00018 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 1st layer I = 1

p_o= 6.5 p= 145.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_1 (mm)= 12.57

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) — for clay

m_v= 0.00016 m2/kN — μ_g= 0.7

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) — for sand — IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 0.0 — C_{kd}/N= — KN/m^2 — 2nd layer I = 0.6

p_o= 40.5 — p= 145.0 kPa

Rigidity factor= 0.8 — Depth Factor, d_f= — 0.86

δ_2 (mm)= 20.11

Settlement for Layer-III

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) — for clay

m_v= m2/kN — μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) — for sand — IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 72.2 — C_{kd}/N= — 250 KN/m^2 — 3RD layer I = 0.22

p_o= 67.5 — p= 145.0 kPa

Rigidity factor= 0.8 — Depth Factor, d_f= — 0.86

δ_3 (mm)= 11.06

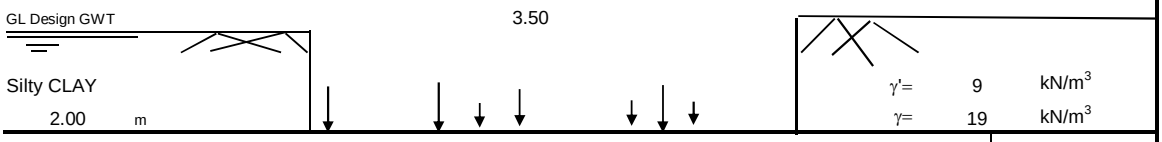
Total settlement = 43.74 mm

Allowable Bearing capacity for 25mm settlement= 83.0 KPa

Calculation for Bearing Capacity at Minor Bridge CH 28+660

Footing Size: 5.5x3.5 m

Depth : 2.00 m



Layer - I			Silty	CLAY		Z_1
	Mv (Lab) =	0.18 m2/MN	N_{av}=	7		
	Mv (Correl.) =	0.19 m2/MN	ϕ_{av}=	0	degree	
	Design Mv =	0.185 m2/MN	c_{av}=	42	kPa	
			γ_{av}=	9	kN/m3	
3.00	m					
			Sandy	SILT		……Z_2
Layer - II			N_{av}=	14		
			ϕ_{av}=	31	degree	
			c_{av}=	0	kPa	
6.00	m		γ_{av}=	9.5	kN/m3	
			silty	SAND		Z_3
Layer - III			N_{av}=	25		
			ϕ_{av}=	33	degree	
			c_{av}=	0	kPa	
9.00	m		γ_{av}=	10	kN/m3	

Safe Bearing Capacity from Shear Failure

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.127	S_q=	1.127		S_γ=	0.75	
dc=	1+0.2*(D/B)*tan(45+φ/2)=			1.11			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)			1.06			
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 108.4 kPa

Design Bearing Capacity= **108 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= 0.000185 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)=		323.1		C_{kd}/N=		200 KN/m²	1st layer I = 1
p_o=	6.5	p=	108.0	kPa			
Rigidity factor=	0.8		Depth Factor, d_f=			0.86	

δ_1 (mm)= 9.62

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g= 0.7

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 101.8 C_{kd}/N= 200 KN/m^2 2nd layer I = 0.592

p_o= 41.25 p= 108.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_2 (mm)= 18.98

Settlement for Layer-III

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 106.4 C_{kd}/N= 200 KN/m^2 3RD layer I = 0.22

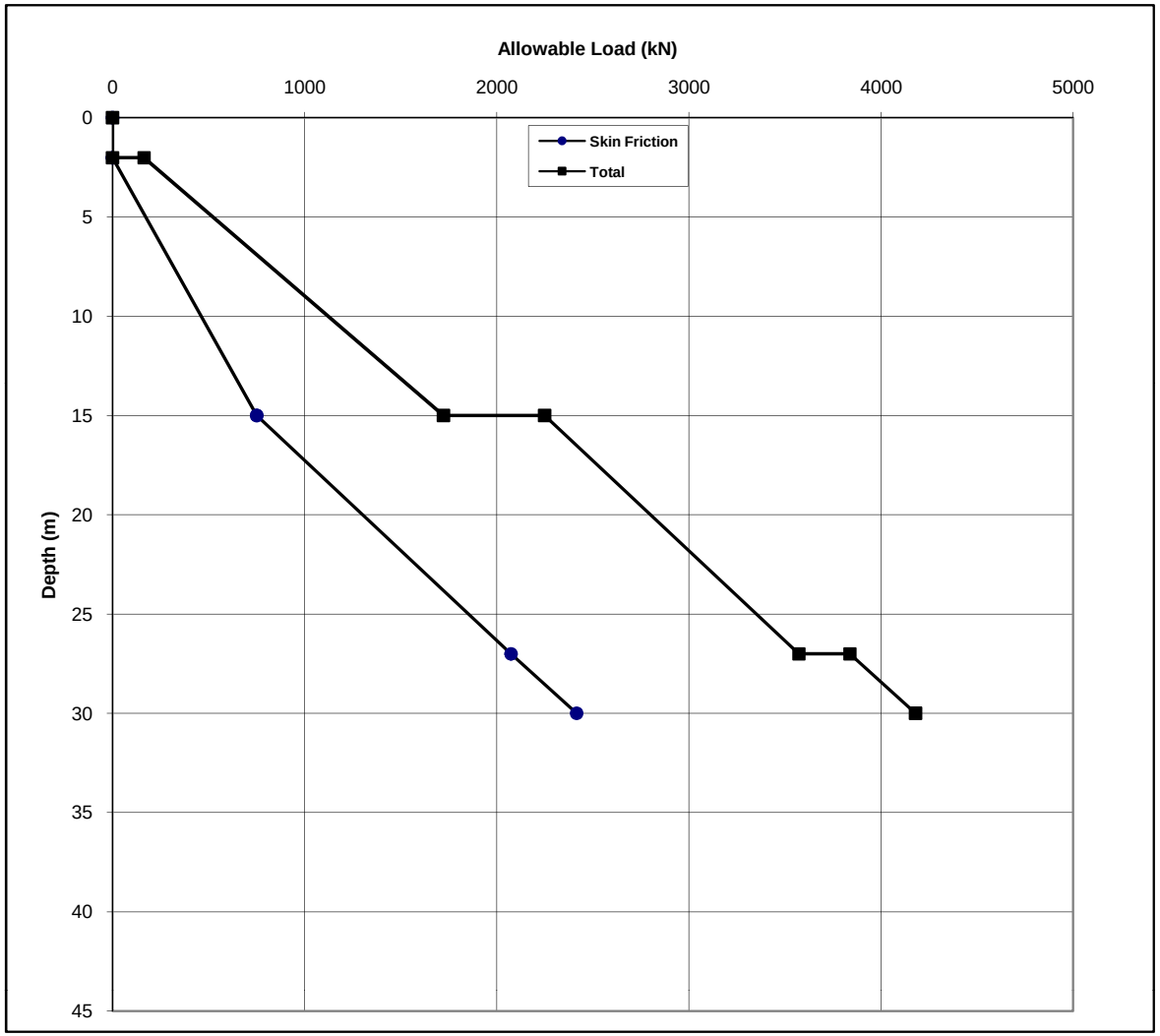
p_o= 70.5 p= 108.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.86

δ_3 (mm)= 5.64

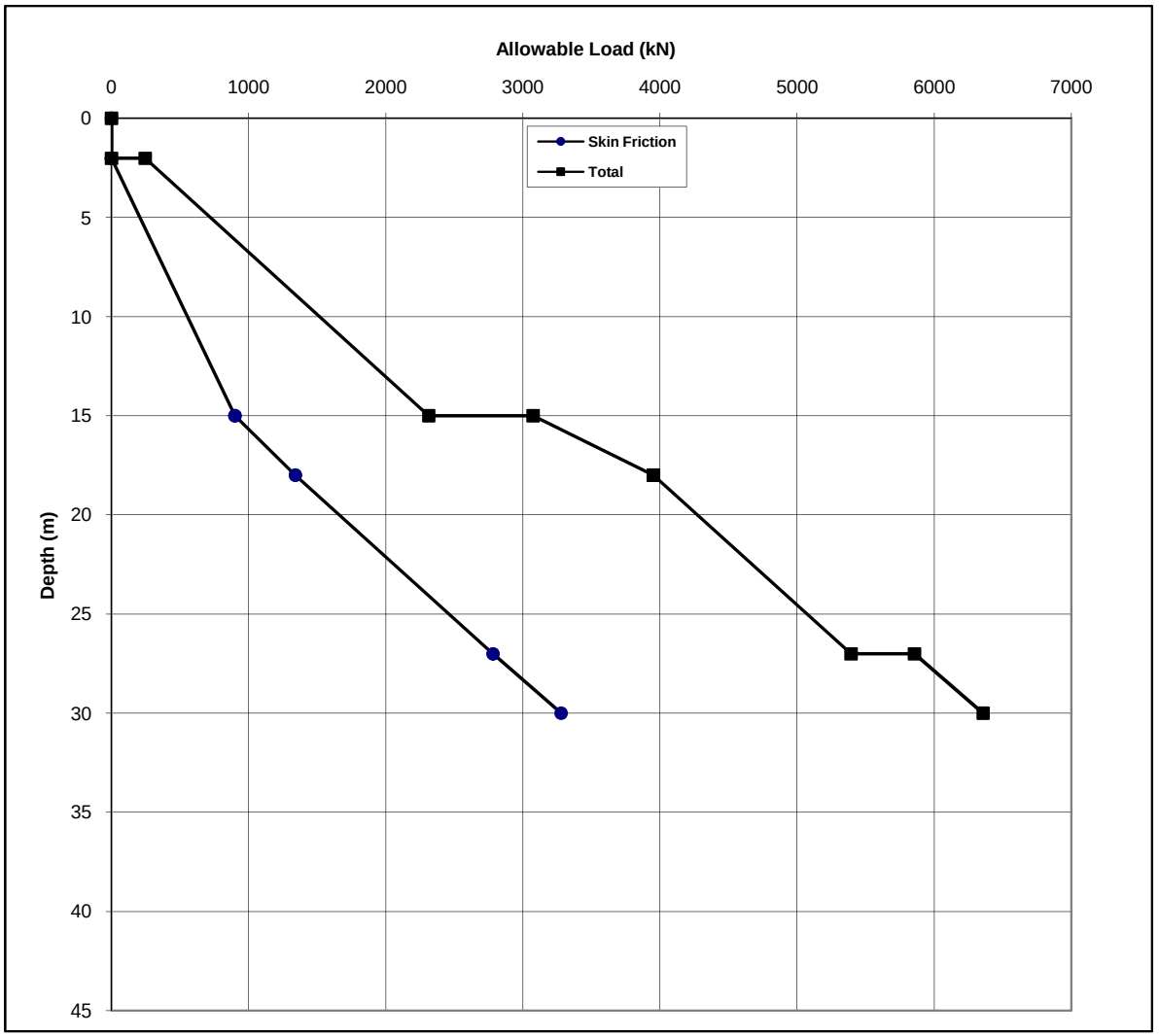
Total settlement = 34.23 mm

Allowable Bearing capacity for 25mm settlement= 79.2 KPa



Allowable Pile Capacity at Major Bridge Ch. 28+880

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity at Major Bridge Ch. 28+880

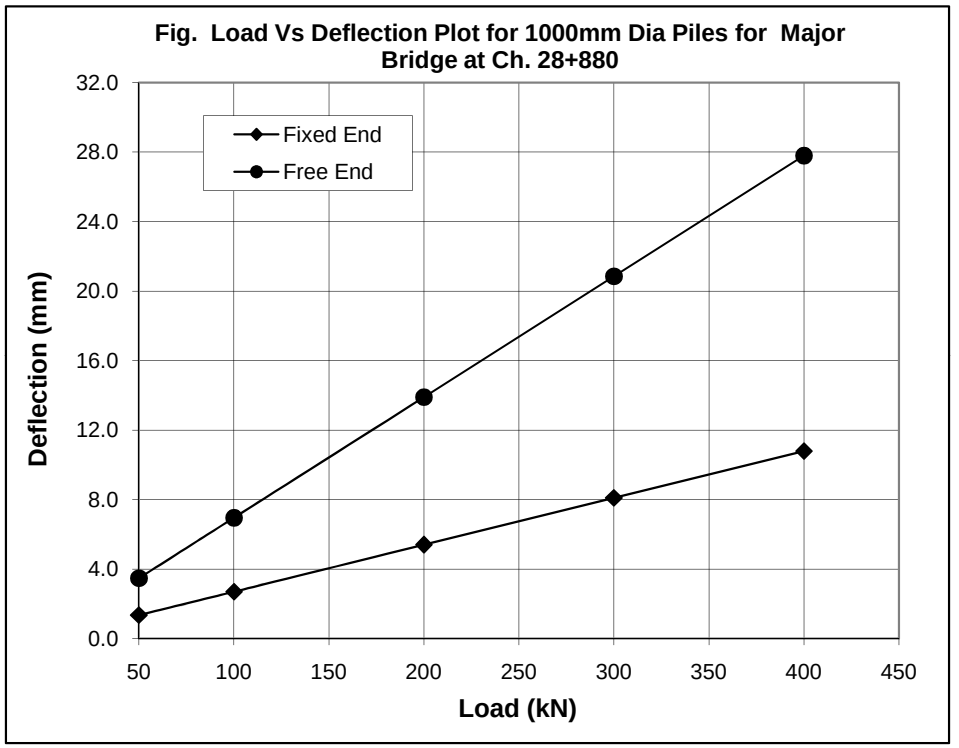
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 28+880 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	342.80	
L_f/T=	2.2	Fixed
L_f (Fixed)=	754.15	cm
L_f/T=	1.9	Free
L_f (Free)=	651.31	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.35	3.47
100	2.70	6.95
200	5.39	13.90
300	8.09	20.85
400	10.79	27.80



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 370kN (for fixed head condition)

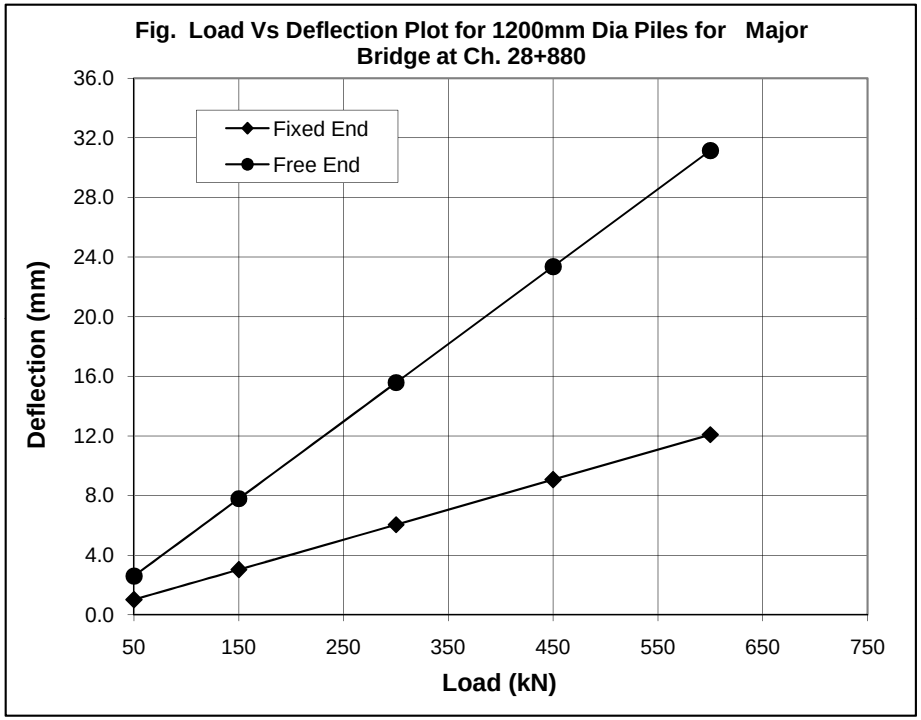
= 140 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 28+880 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	396.63	
L_f/T=	2.2	Fixed
L_f (Fixed)=	872.58	cm
L_f/T=	1.9	Free
L_f (Free)=	753.59	cm
L_1=	0	cm
d=	Q(L_1+L_f)^3/12EI	Fixed
	Q(L_1+L_f)^3/3EI	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.01	2.60
150	3.02	7.79
300	6.04	15.57
450	9.07	23.36
600	12.09	31.14



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

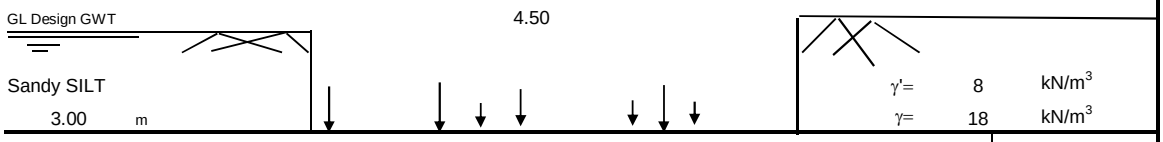
= 600kN (for fixed head condition)

= 220kN (for free head condition)

Calculation for Bearing Capacity at Minor Bridge CH 30+780

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I		Sandy	SILT		Z_1
		N_{av}=	16		
		ϕ_{av}=	30	degree	
		c_{av}=	0	kPa	
		γ_{av}=	8	kN/m^3	
9.00	m				
		Sandy	SILT		
Layer - II		N_{av}=	18		……Z_2
		ϕ_{av}=	32	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	9	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 30 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	16	N_q=	7.25		N_γ=	7.59	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.23		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.12		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**195.8**	**kPa**				

Design Bearing Capacity= **195** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 222.2 C_{kd}/N= 250 KN/m^2 1st layer I = 0.6

p_o= 27 p= 195.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 30.37

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 78.9 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.2

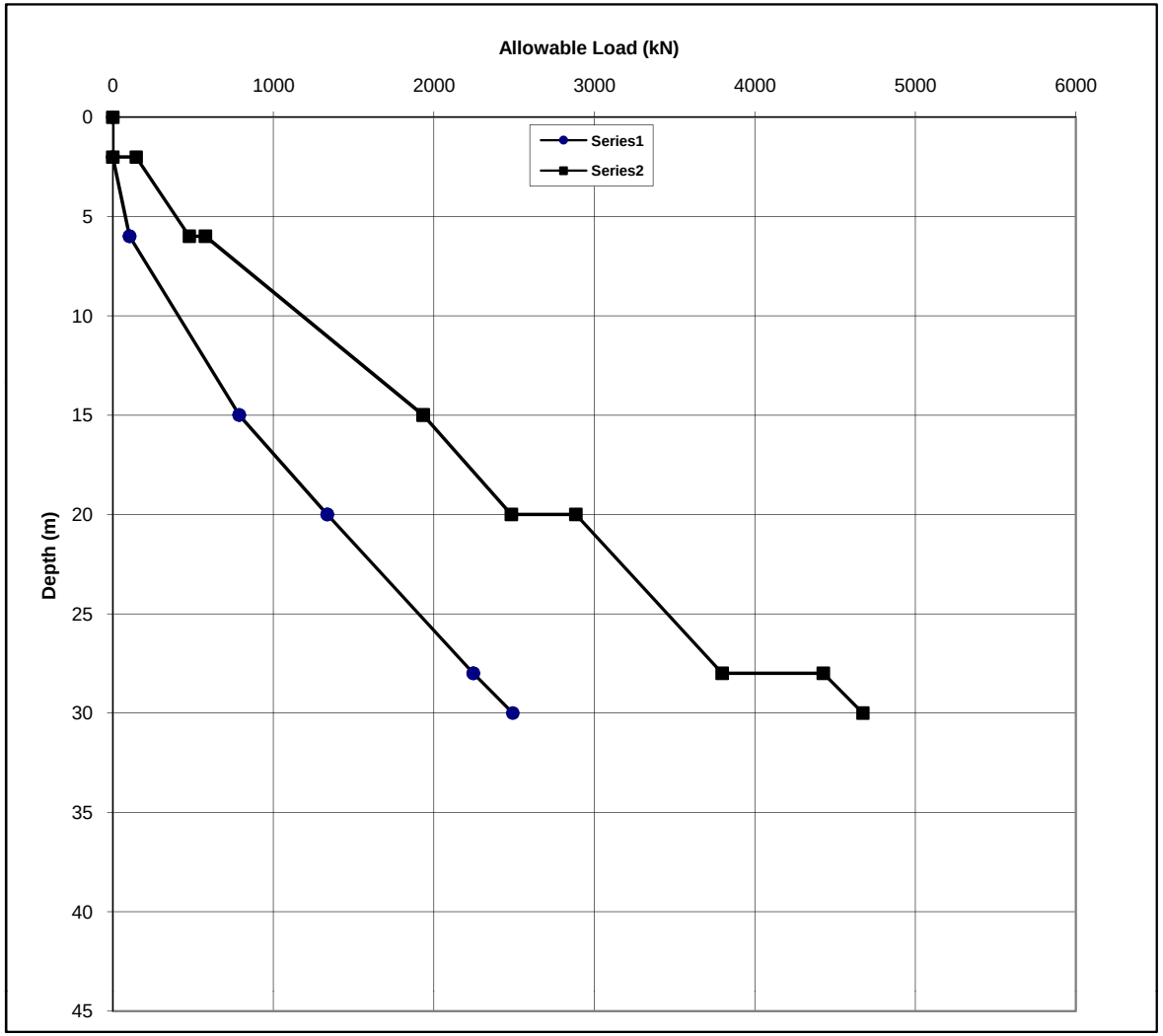
p_o= 85.5 p= 195.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 9.60

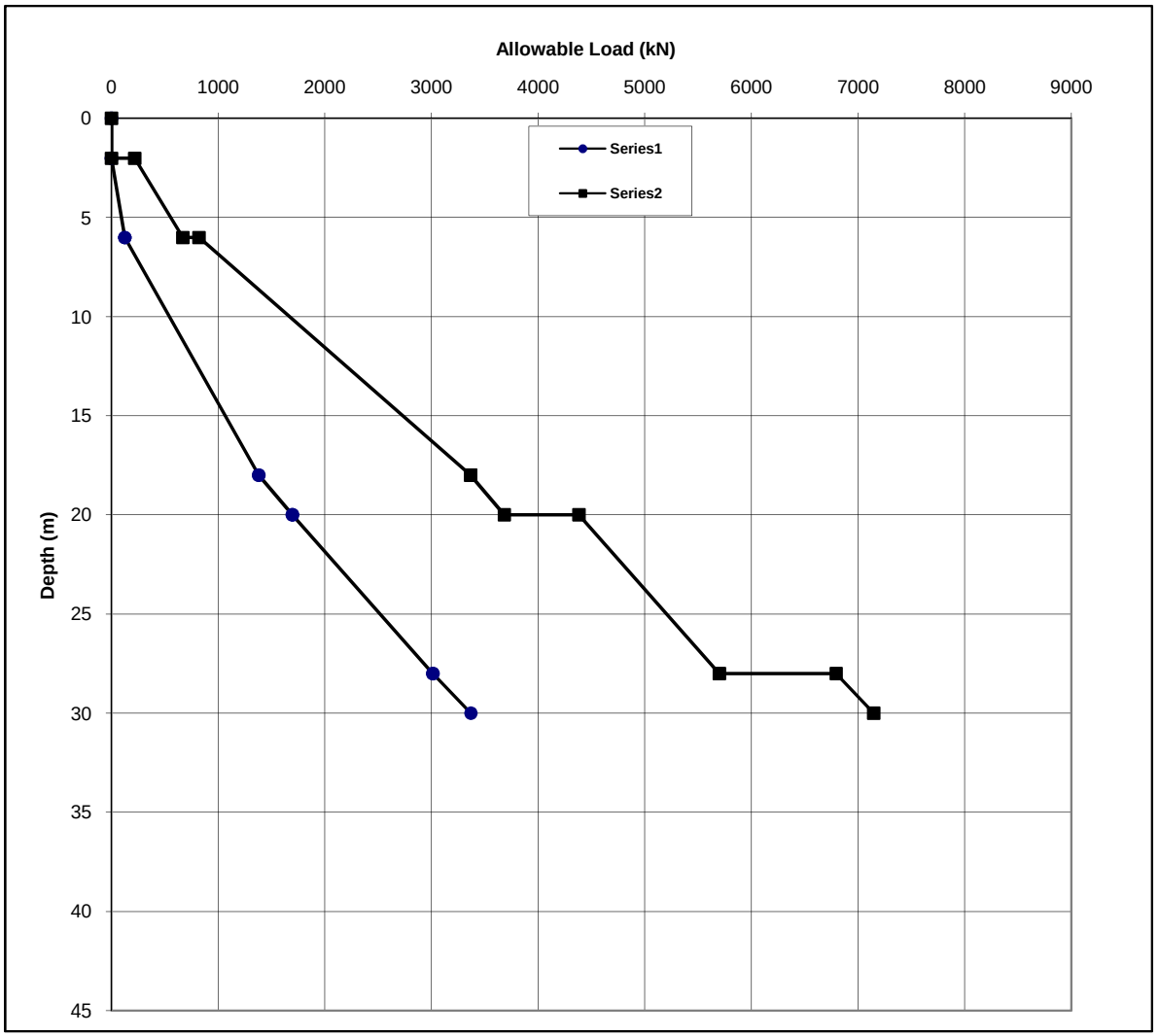
Total settlement = 39.97 mm

Allowable Bearing capacity for 25mm settlement= 122.5 KPa



Allowable Pile Capacity at Major Bridge Ch. 33+050

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



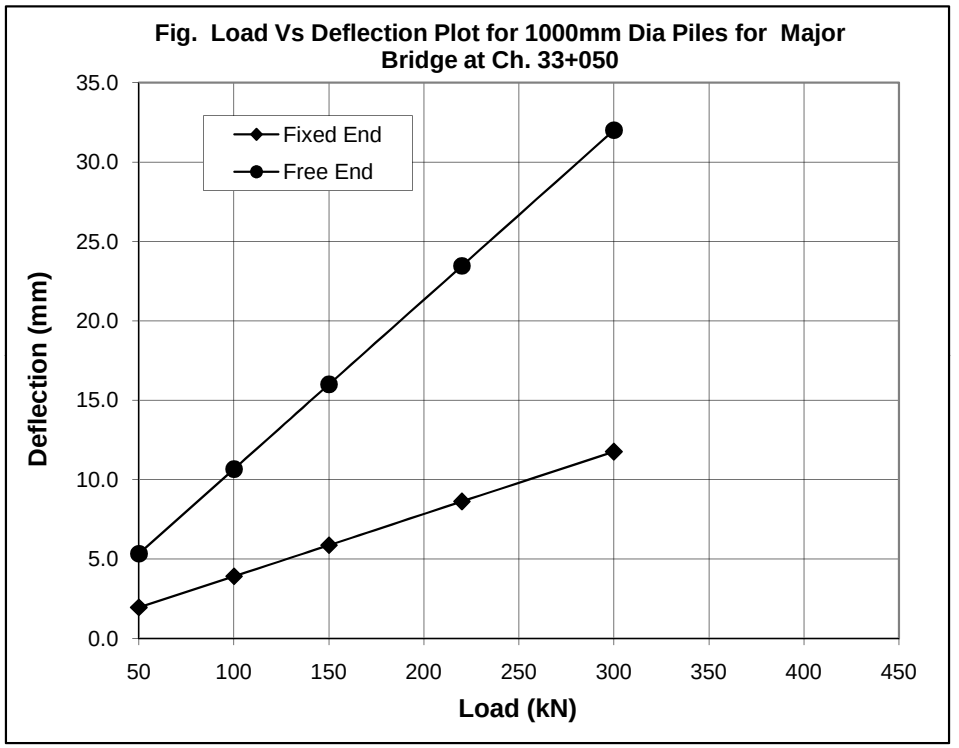
Allowable Pile Capacity at Major Bridge Ch. 33+050

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 33+050 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	342.80	
L_f/T=	2.2	Fixed
L_f (Fixed)=	754.15	cm
L_f/T=	1.9	Free
L_f (Free)=	651.31	cm
L_1=	100	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free



Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.96	5.33
100	3.92	10.67
150	5.88	16.00
220	8.62	23.47
300	11.75	32.00

Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 250kN (for fixed head condition)

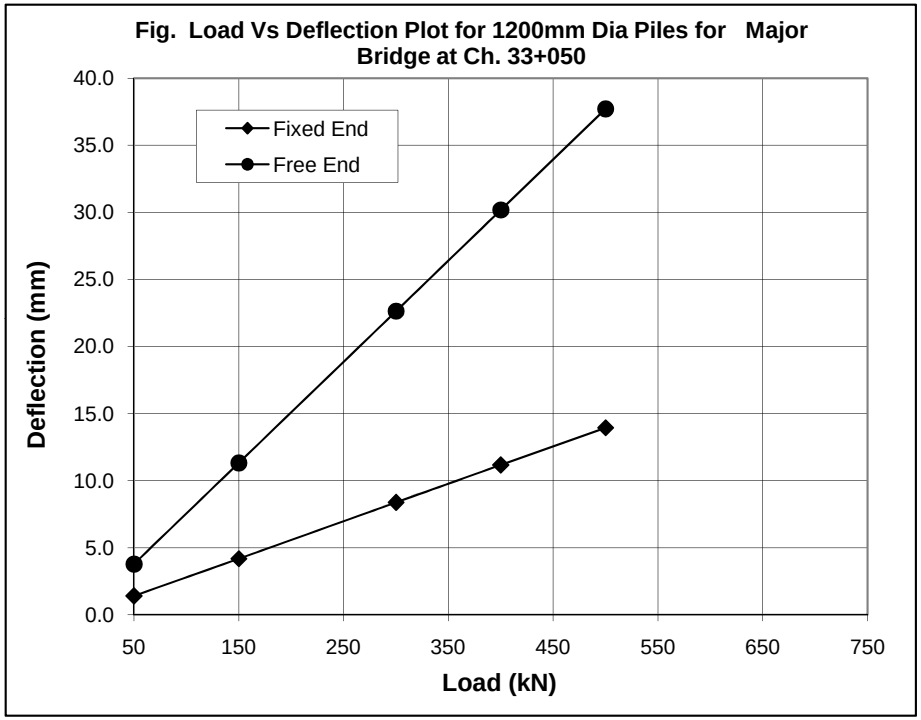
= 90 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 33+050 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	396.63	
L_f/T=	2.2	Fixed
L_f (Fixed)=	872.58	cm
L_f/T=	1.9	Free
L_f (Free)=	753.59	cm
L_1=	100	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

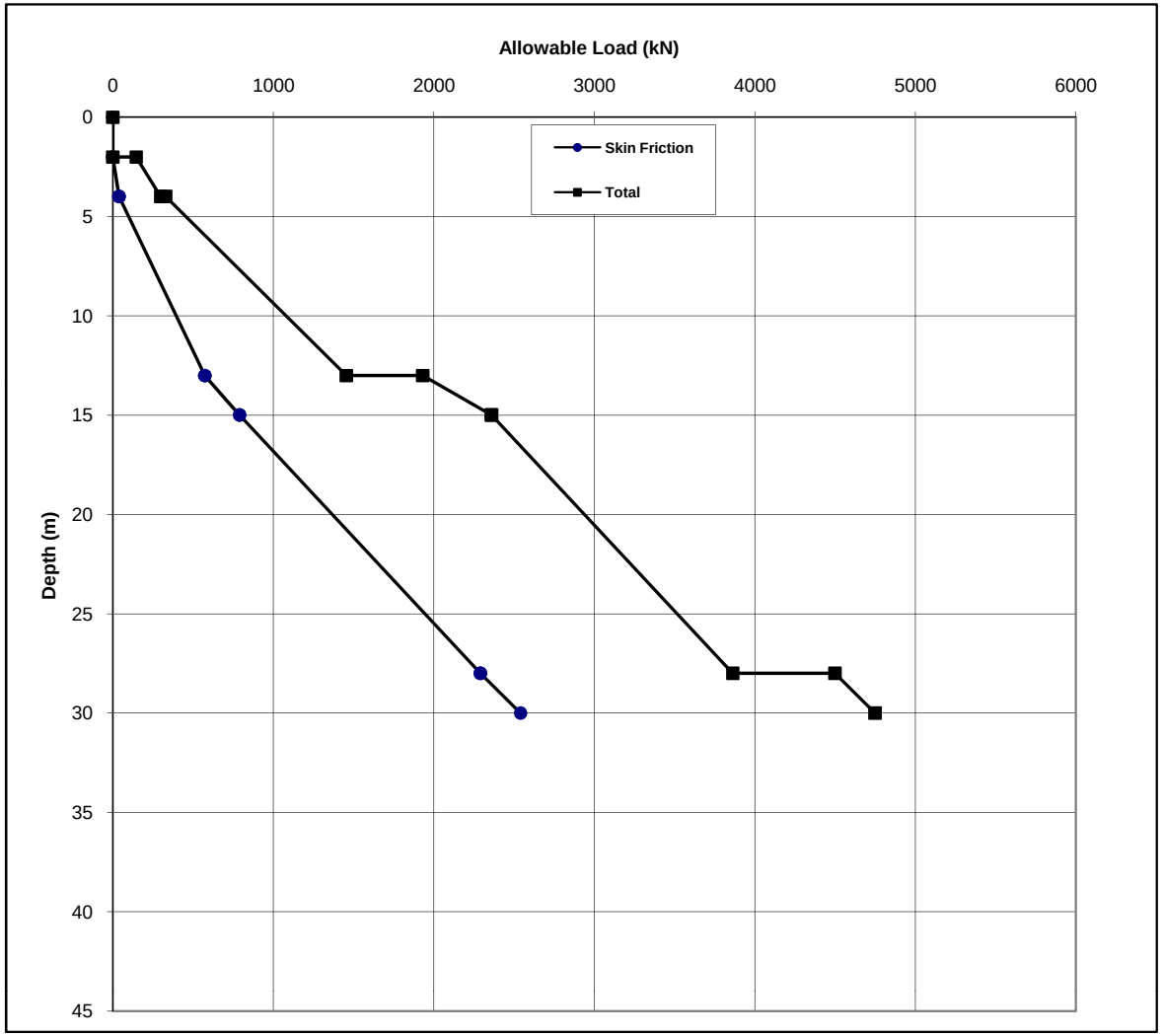
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.39	3.77
150	4.18	11.32
300	8.37	22.63
400	11.16	30.17
500	13.95	37.72



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

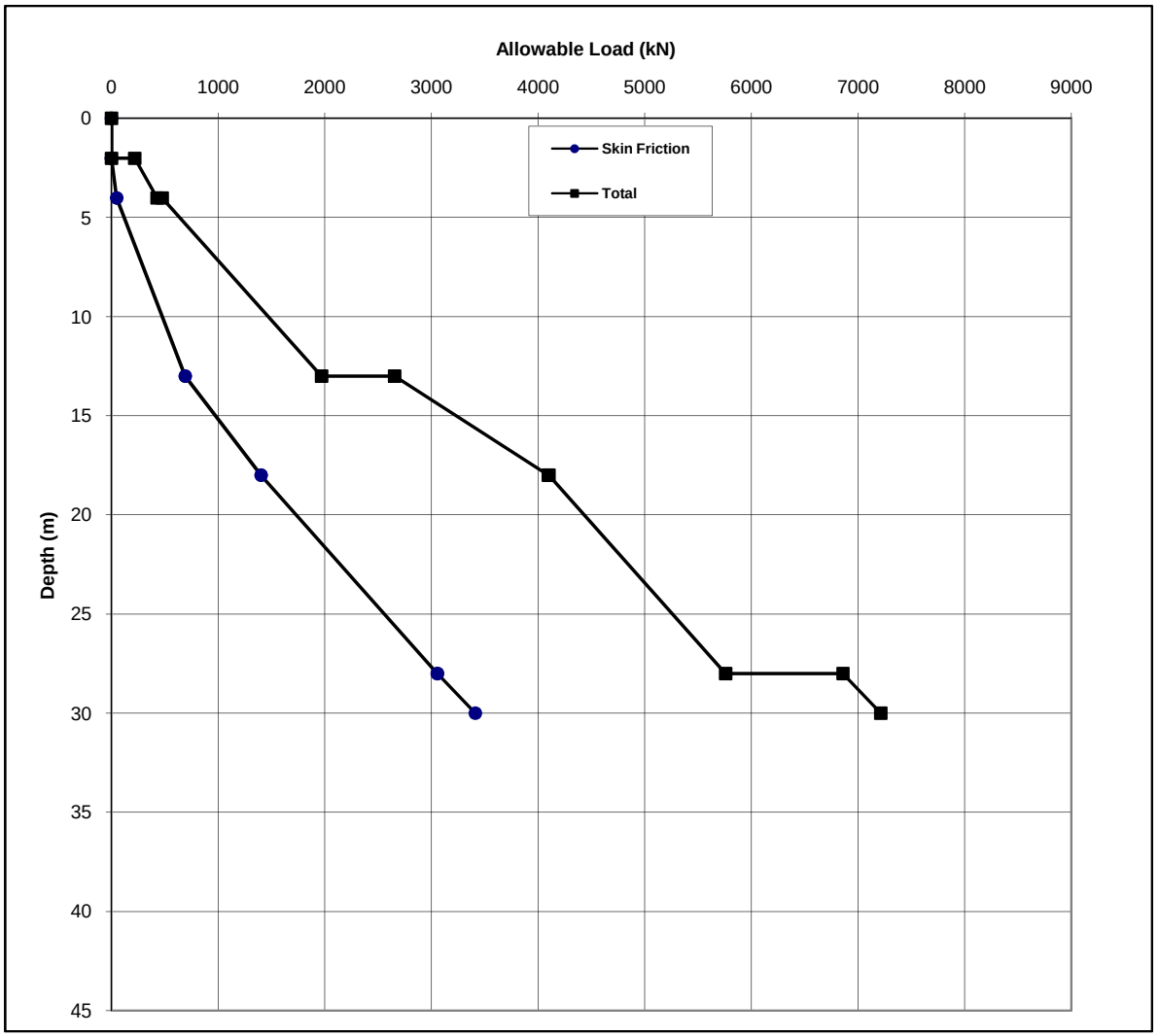
= 420kN (for fixed head condition)

= 160kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 34+986

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity at Major Bridge Ch. 34+986

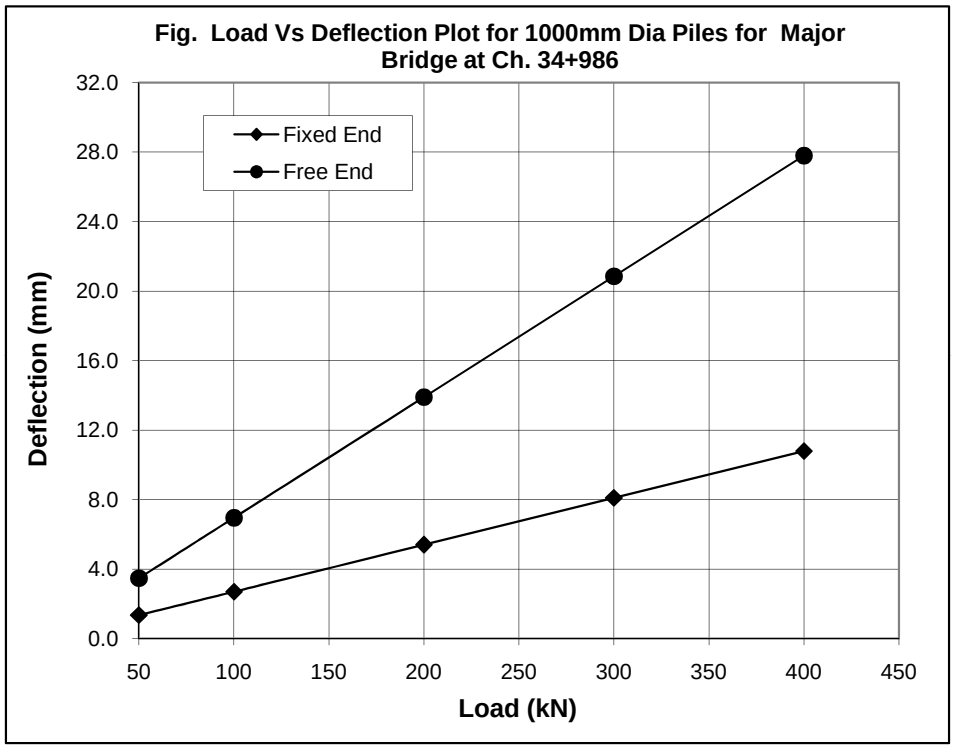
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 34+986 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	342.80	
L_f/T=	2.2	Fixed
L_f (Fixed)=	754.15	cm
L_f/T=	1.9	Free
L_f (Free)=	651.31	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.35	3.47
100	2.70	6.95
200	5.39	13.90
300	8.09	20.85
400	10.79	27.80



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 370kN (for fixed head condition)

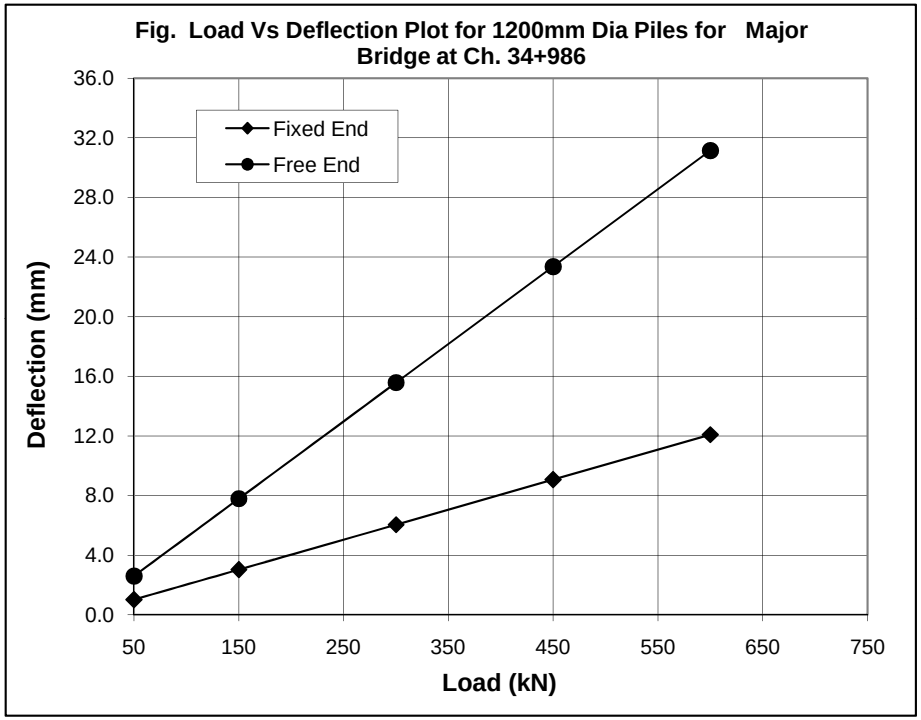
= 140 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 34+986 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	396.63	
L_f/T=	2.2	Fixed
L_f (Fixed)=	872.58	cm
L_f/T=	1.9	Free
L_f (Free)=	753.59	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

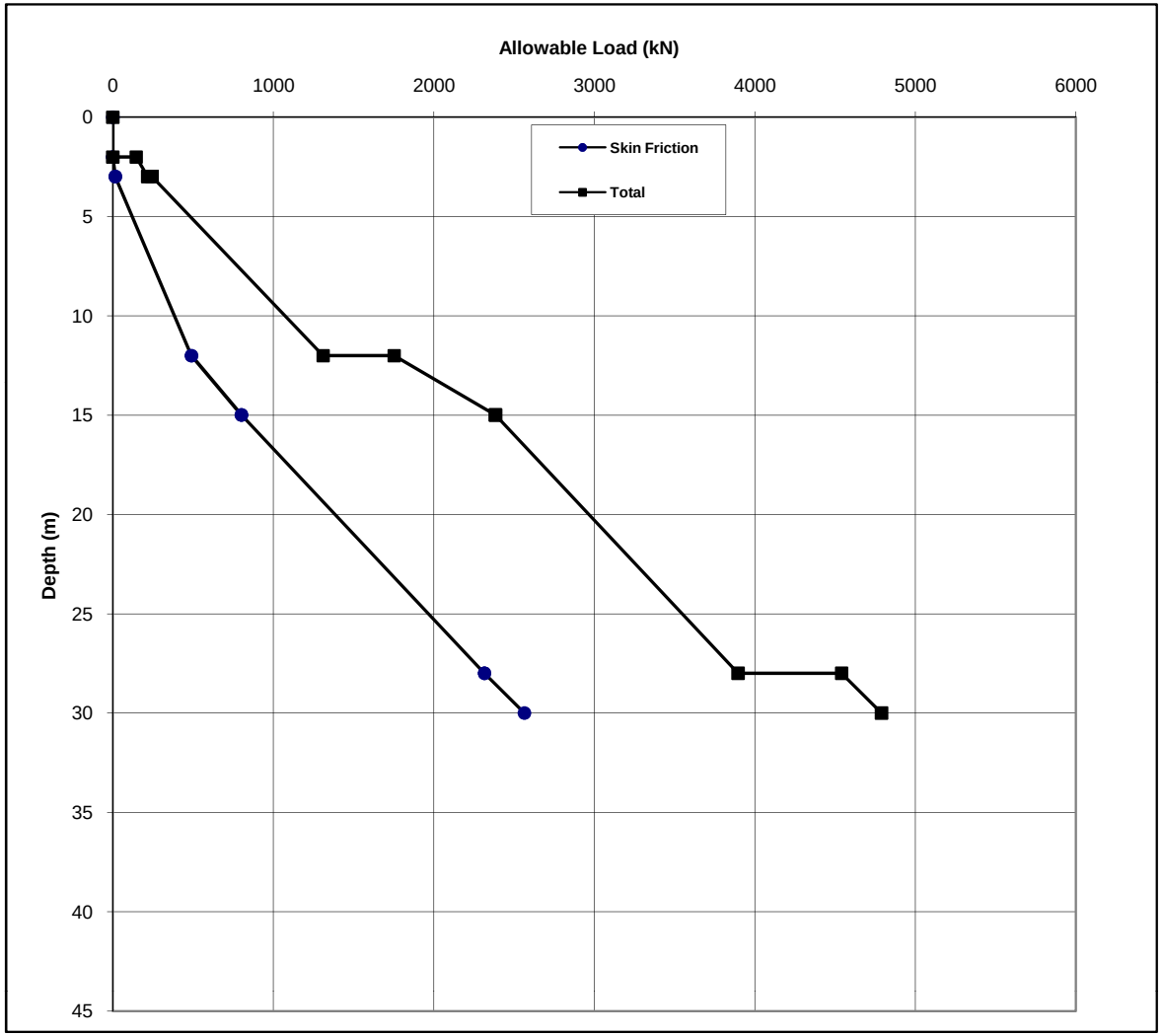
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.01	2.60
150	3.02	7.79
300	6.04	15.57
450	9.07	23.36
600	12.09	31.14



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

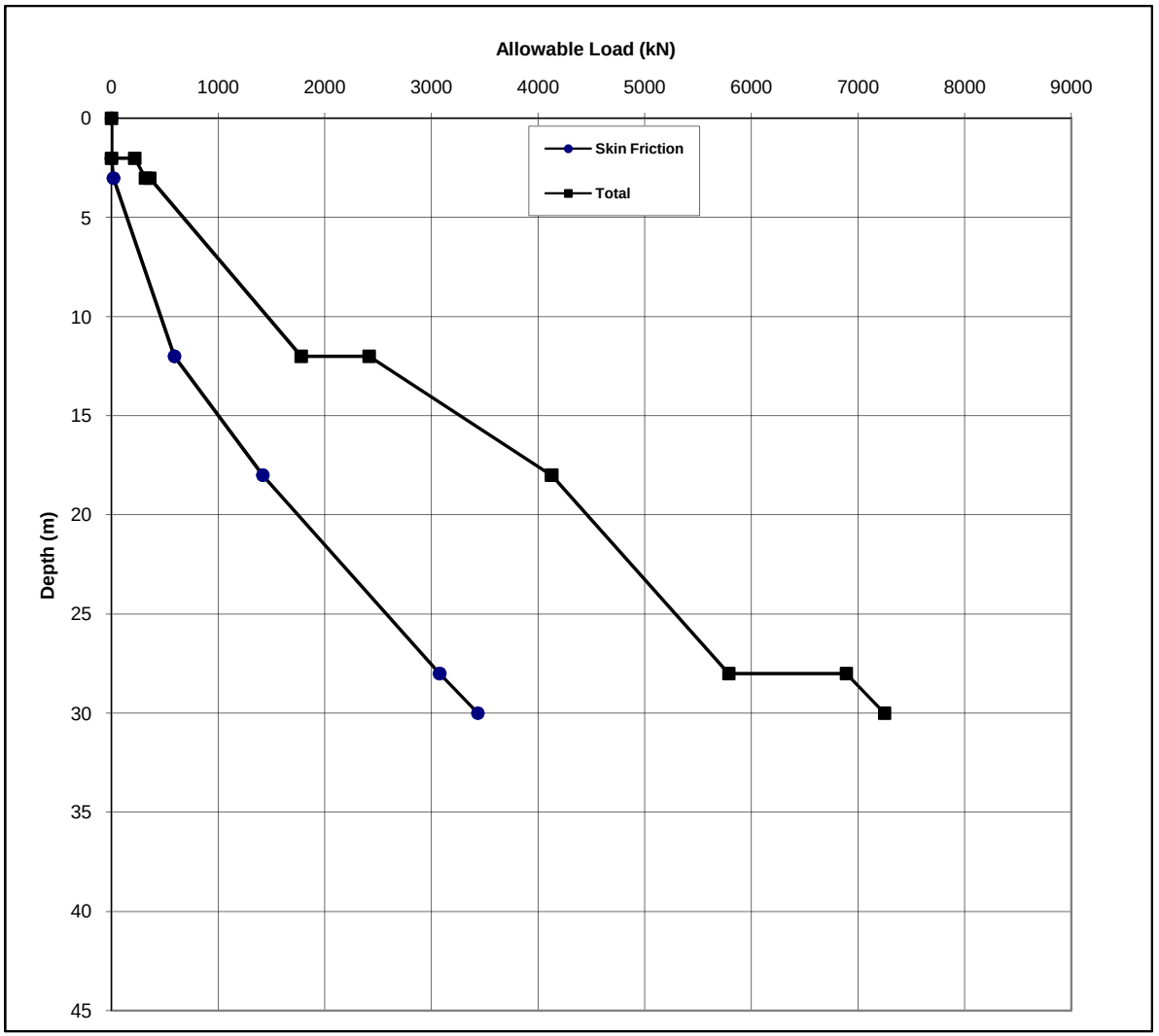
= 600kN (for fixed head condition)

= 220kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 35+549

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity at Major Bridge Ch. 35+549

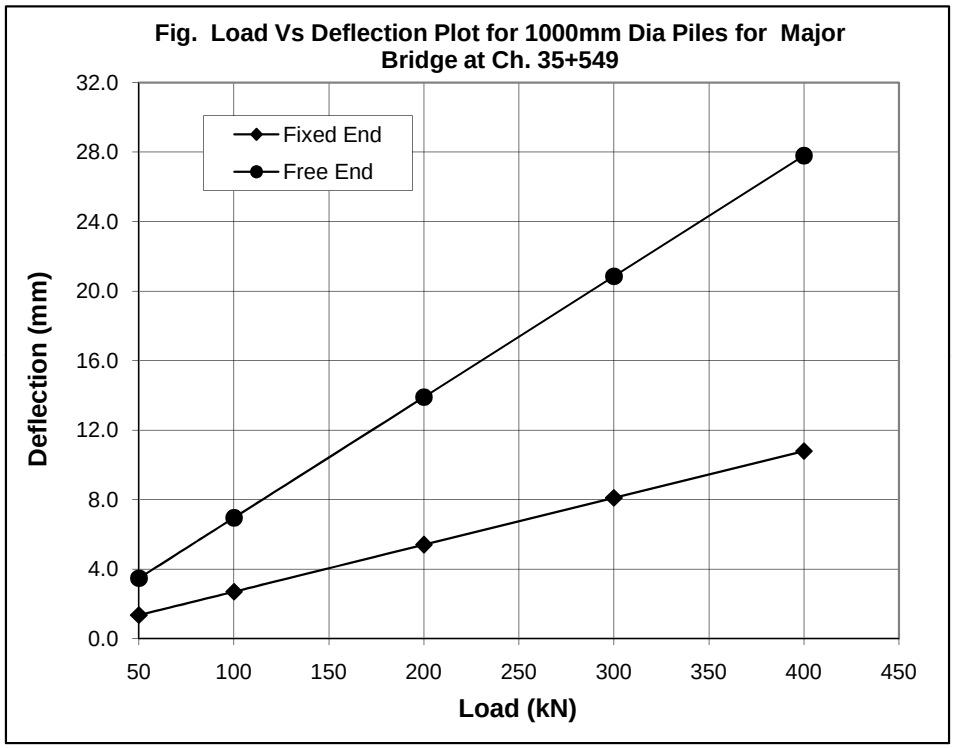
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 35+549 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	342.80	
L_f/T=	2.2	Fixed
L_f (Fixed)=	754.15	cm
L_f/T=	1.9	Free
L_f (Free)=	651.31	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.35	3.47
100	2.70	6.95
200	5.39	13.90
300	8.09	20.85
400	10.79	27.80



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 370kN (for fixed head condition)

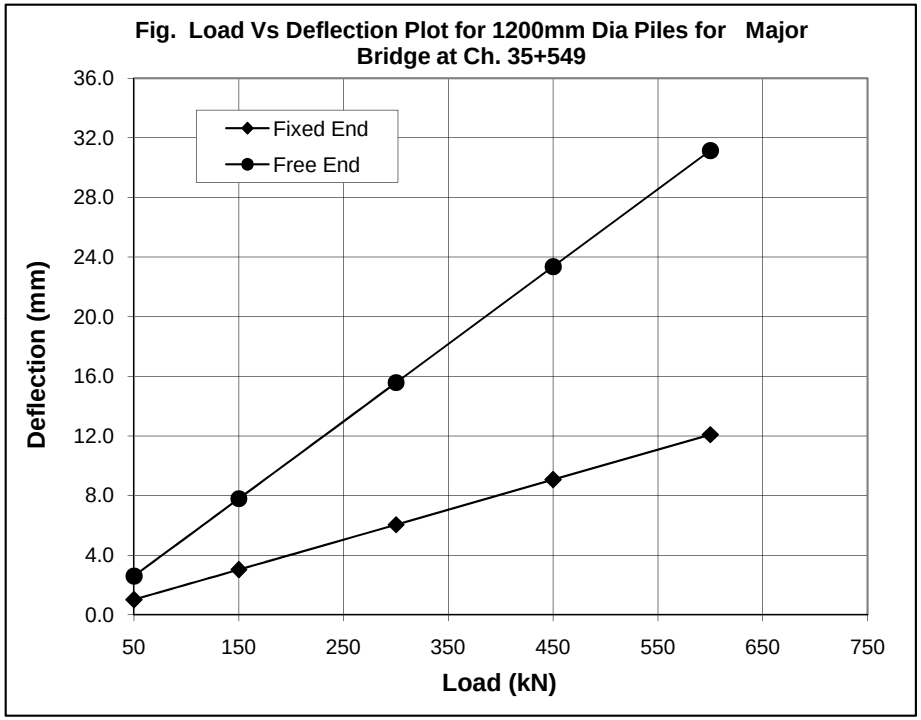
= 140 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 35+549 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	396.63	
L_f/T=	2.2	Fixed
L_f (Fixed)=	872.58	cm
L_f/T=	1.9	Free
L_f (Free)=	753.59	cm
L_1=	0	cm
d=	Q(L_1+L_f)^3/12EI	Fixed
	Q(L_1+L_f)^3/3EI	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.01	2.60
150	3.02	7.79
300	6.04	15.57
450	9.07	23.36
600	12.09	31.14



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

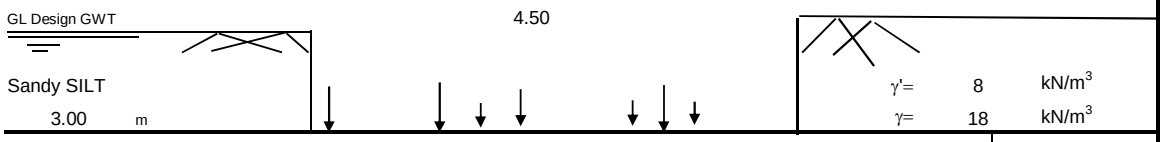
= 600kN (for fixed head condition)

= 220kN (for free head condition)

Calculation for Bearing Capacity at Minor Bridge CH 37+360

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I (5.00 m)

	Silty	SAND	
N_{av}=		18	
ϕ_{av}=		31	degree
c_{av}=		0	kPa
γ_{av}=		8	kN/m^3

Z_1

Layer - II (12.00 m)

	Silty	SAND	
N_{av}=		21	
ϕ_{av}=		33	degree
c_{av}=		0	kPa
γ_{av}=		9	kN/m^3

Z_2

Safe Bearing Capacity from Shear Failure

Design ϕ= 31 degree

For Layer - I

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS= 2.5 w= 0.5

N_c=	33.34	N_q=	21.38	N_γ=	27.54	General shear failure
N_c=	17.19	N_q=	8.1	N_γ=	7.59	Local shear failure
N_c=	19.88	N_q=	10.31	N_γ=	10.92	Intermediate condition
S_c=	1.164	S_q=	1.164	S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=			1.24		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)			1.12		
ic=iq=	(1-α/90)^2=	1.00	ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 291.3 kPa

Design Bearing Capacity= **290.0 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 613.6 C_{kd}/N= 250 KN/m^2 1st layer I = 0.952

p_o= 11 p= 290.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_1 (mm)= 7.14

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}$(p_o+Δp)/p_o)]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 110.1 C_{kd}/N= 250 KN/m^2 2nd layer I = 0.28

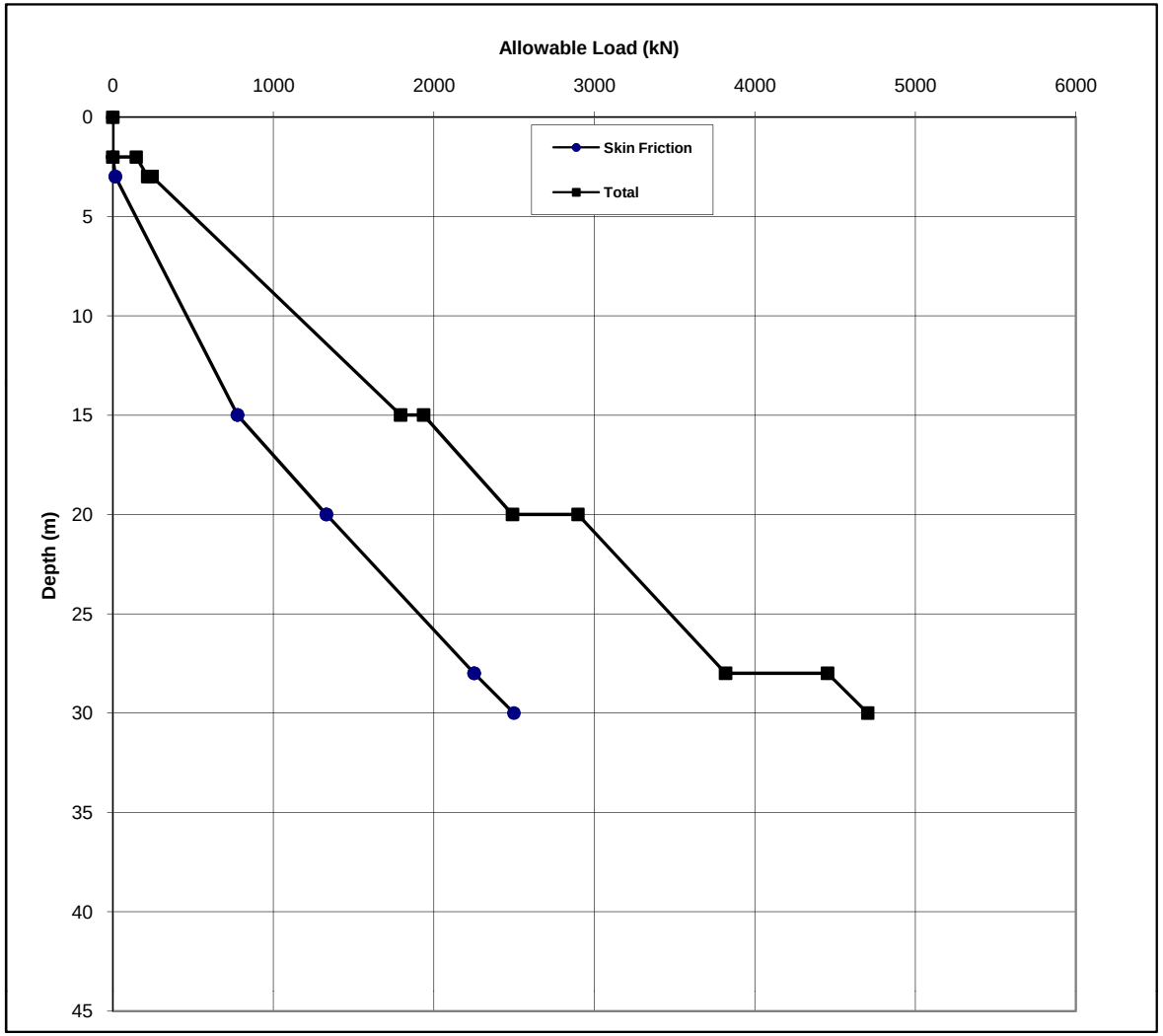
p_o= 71.5 p= 290.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.84

δ_2 (mm)= 32.41

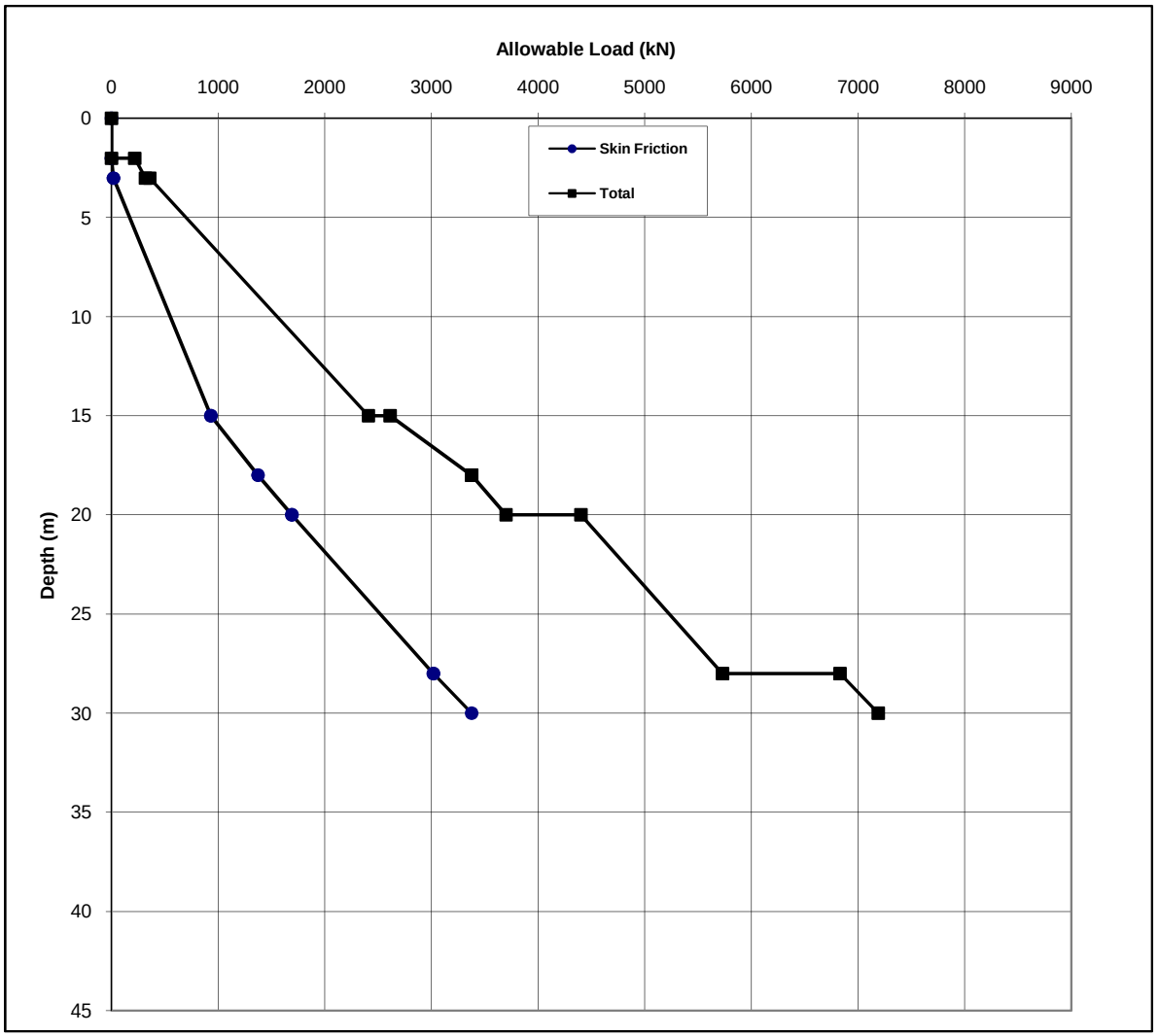
Total settlement = 39.55 mm

Allowable Bearing capacity for 25mm settlement= 184.1 KPa



Allowable Pile Capacity at Major Bridge Ch. 38+580

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity at Major Bridge Ch. 38+580

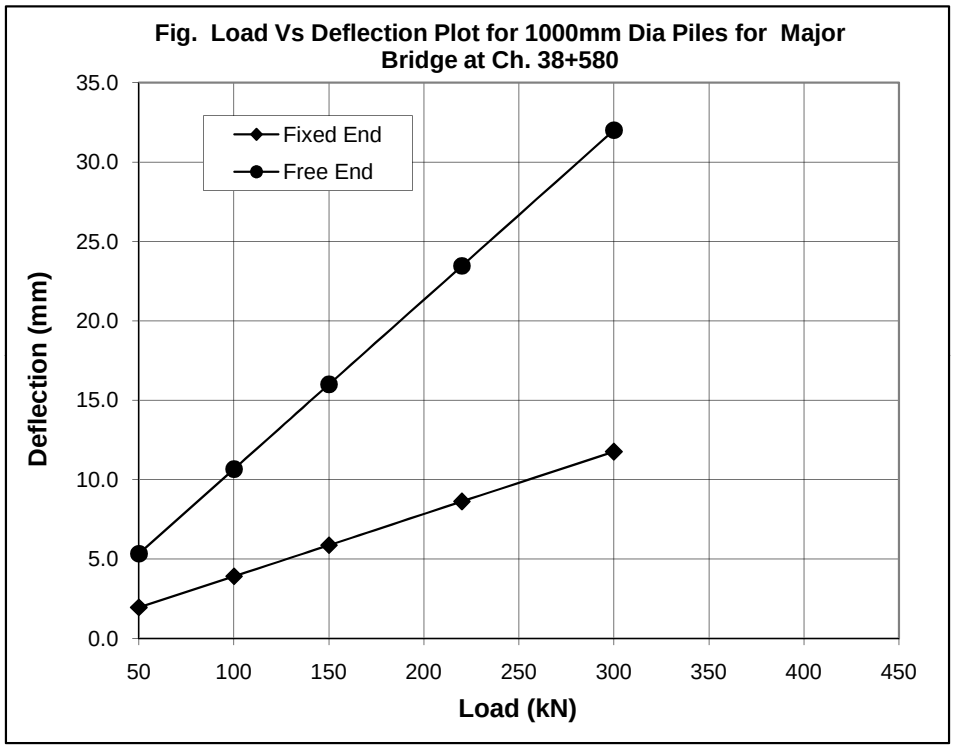
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 38+580 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	342.80	
L_f/T=	2.2	Fixed
L_f (Fixed)=	754.15	cm
L_f/T=	1.9	Free
L_f (Free)=	651.31	cm
L_1=	100	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.96	5.33
100	3.92	10.67
150	5.88	16.00
220	8.62	23.47
300	11.75	32.00



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 250kN (for fixed head condition)

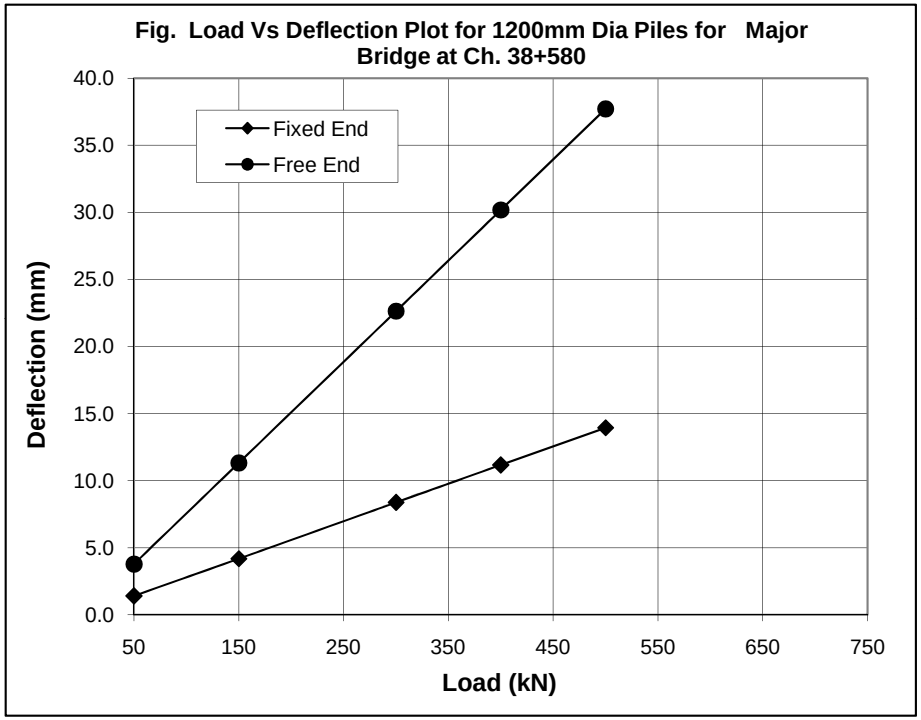
= 90 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 38+580 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	396.63	
L_f/T=	2.2	Fixed
L_f (Fixed)=	872.58	cm
L_f/T=	1.9	Free
L_f (Free)=	753.59	cm
L_1=	100	cm
d=	Q(L_1+L_f)^3/12EI	Fixed
	Q(L_1+L_f)^3/3EI	Free

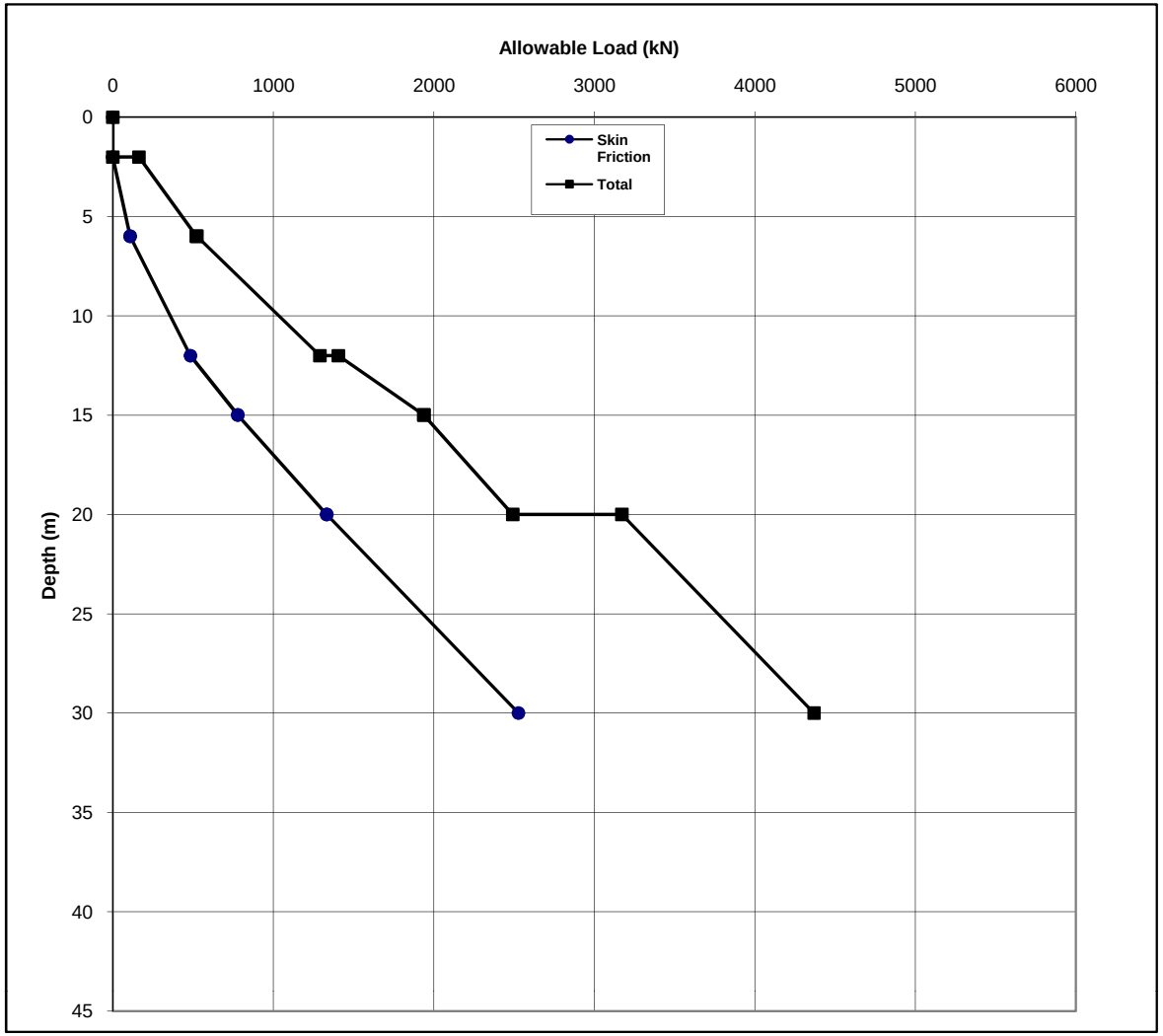
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.39	3.77
150	4.18	11.32
300	8.37	22.63
400	11.16	30.17
500	13.95	37.72



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

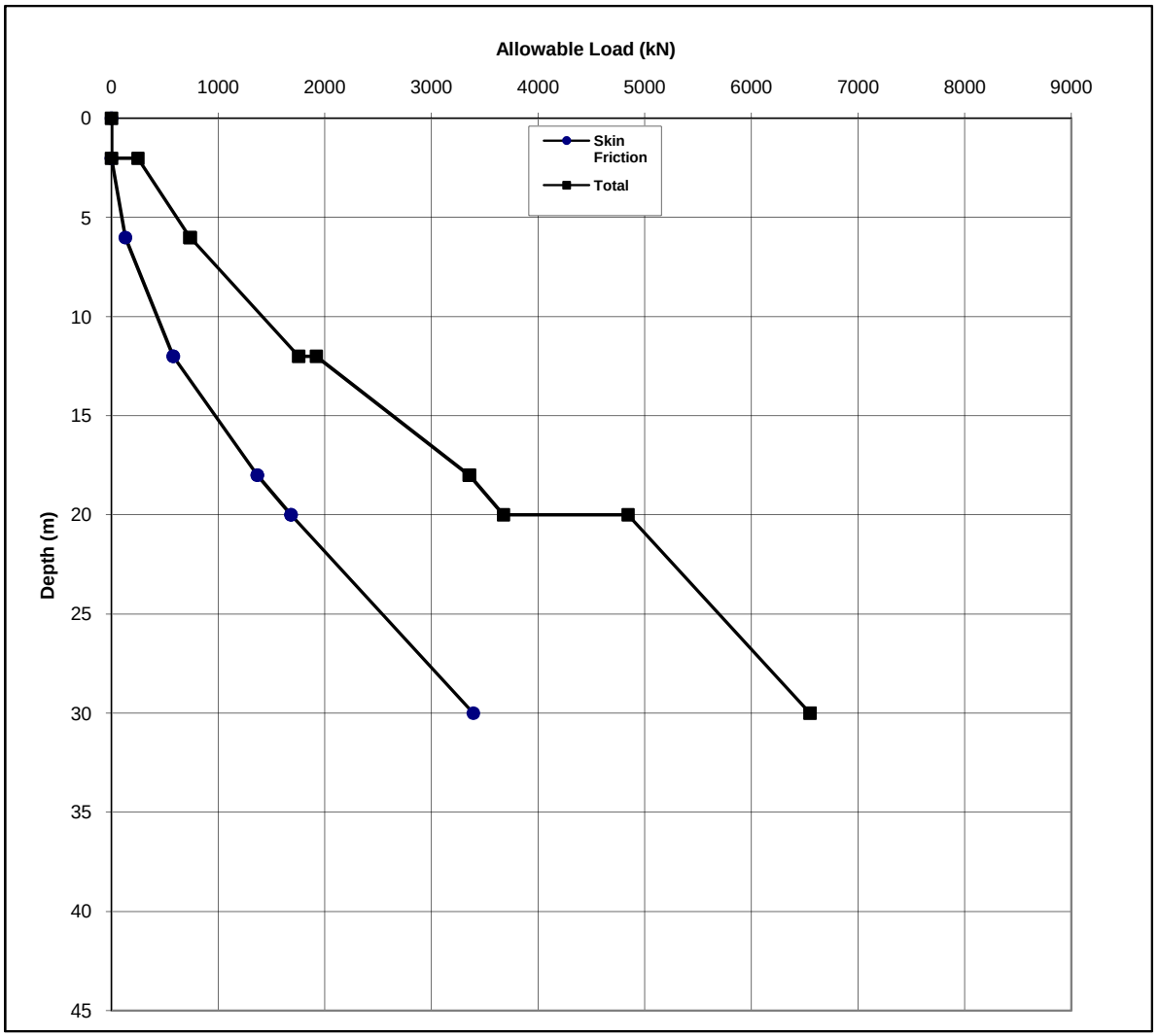
= 420kN (for fixed head condition)

= 160kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 39+120

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity at Major Bridge Ch. 39+120

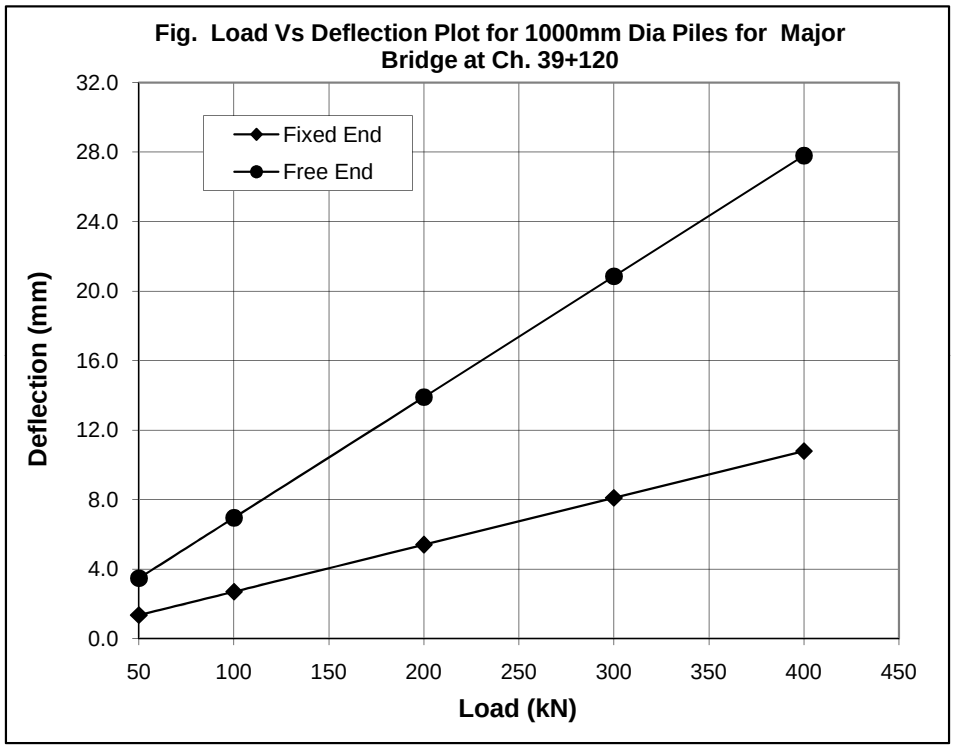
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 39+120 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	342.80	
L_f/T=	2.2	Fixed
L_f (Fixed)=	754.15	cm
L_f/T=	1.9	Free
L_f (Free)=	651.31	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.35	3.47
100	2.70	6.95
200	5.39	13.90
300	8.09	20.85
400	10.79	27.80



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 370kN (for fixed head condition)

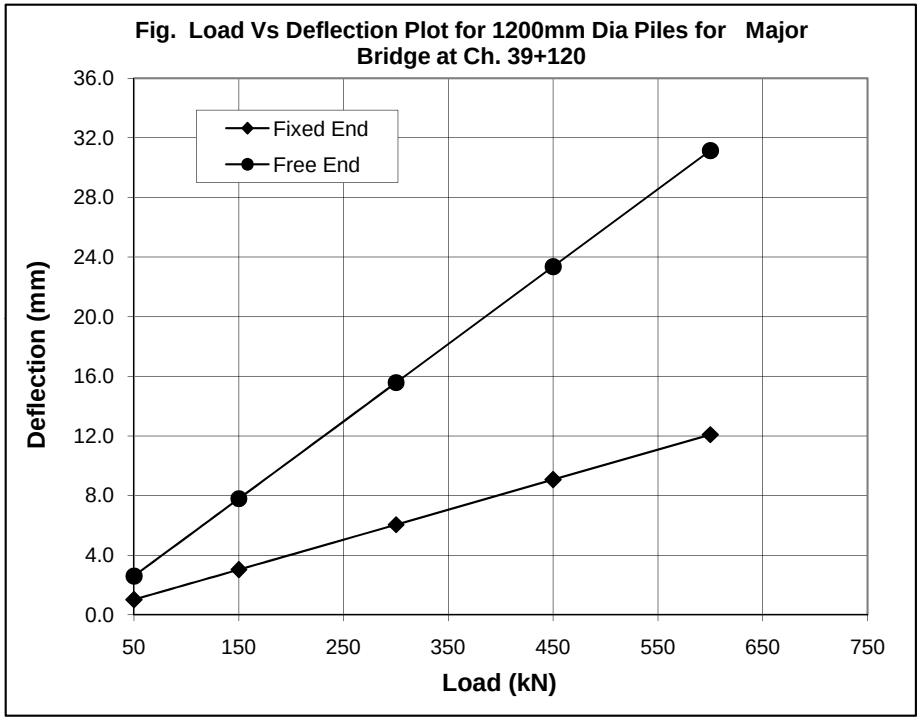
= 140 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 39+120 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.280	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	396.63	
L_f/T=	2.2	Fixed
L_f (Fixed)=	872.58	cm
L_f/T=	1.9	Free
L_f (Free)=	753.59	cm
L_1=	0	cm
d=	Q(L_1+L_f)^3/12EI	Fixed
	Q(L_1+L_f)^3/3EI	Free

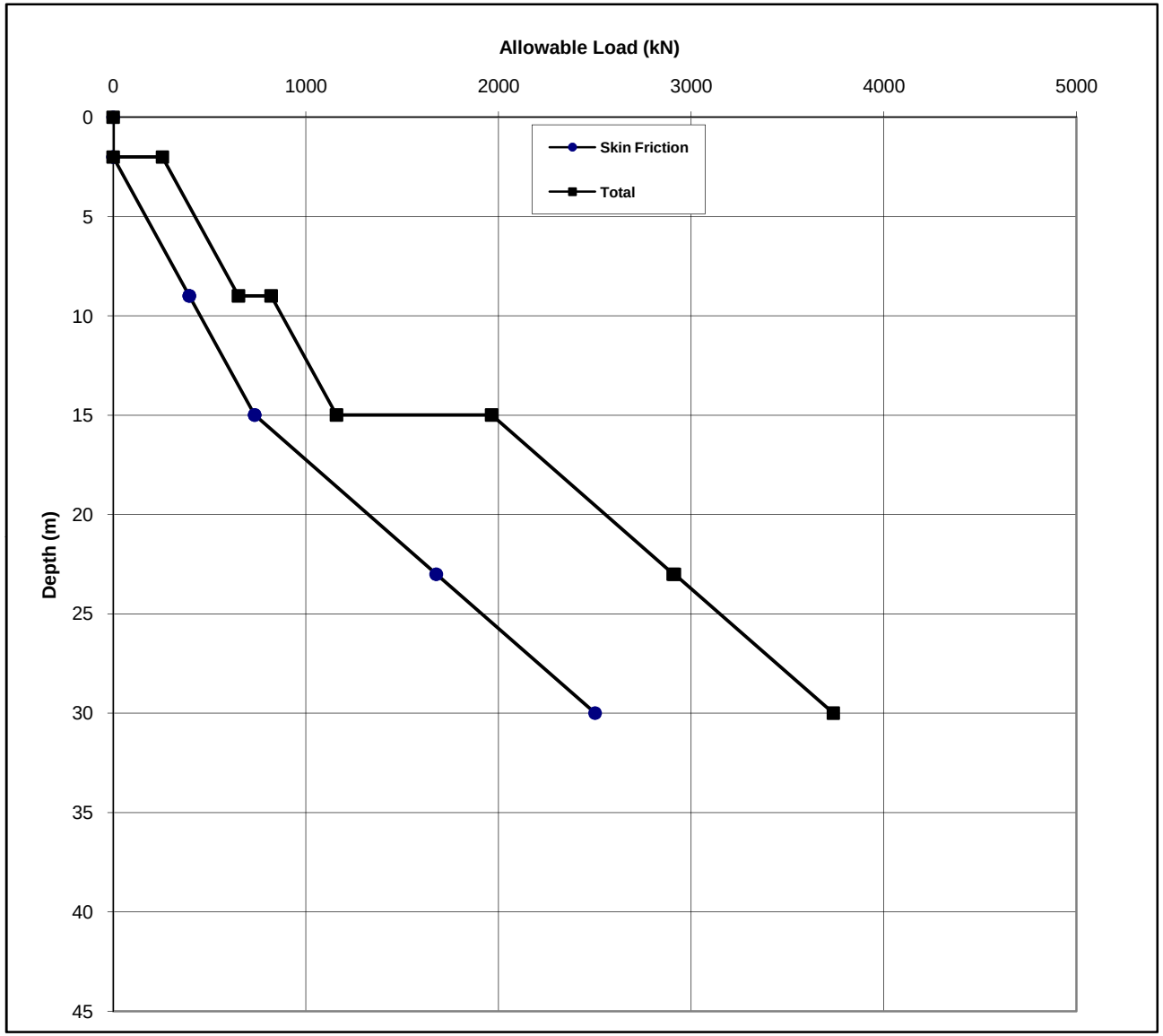
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.01	2.60
150	3.02	7.79
300	6.04	15.57
450	9.07	23.36
600	12.09	31.14



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

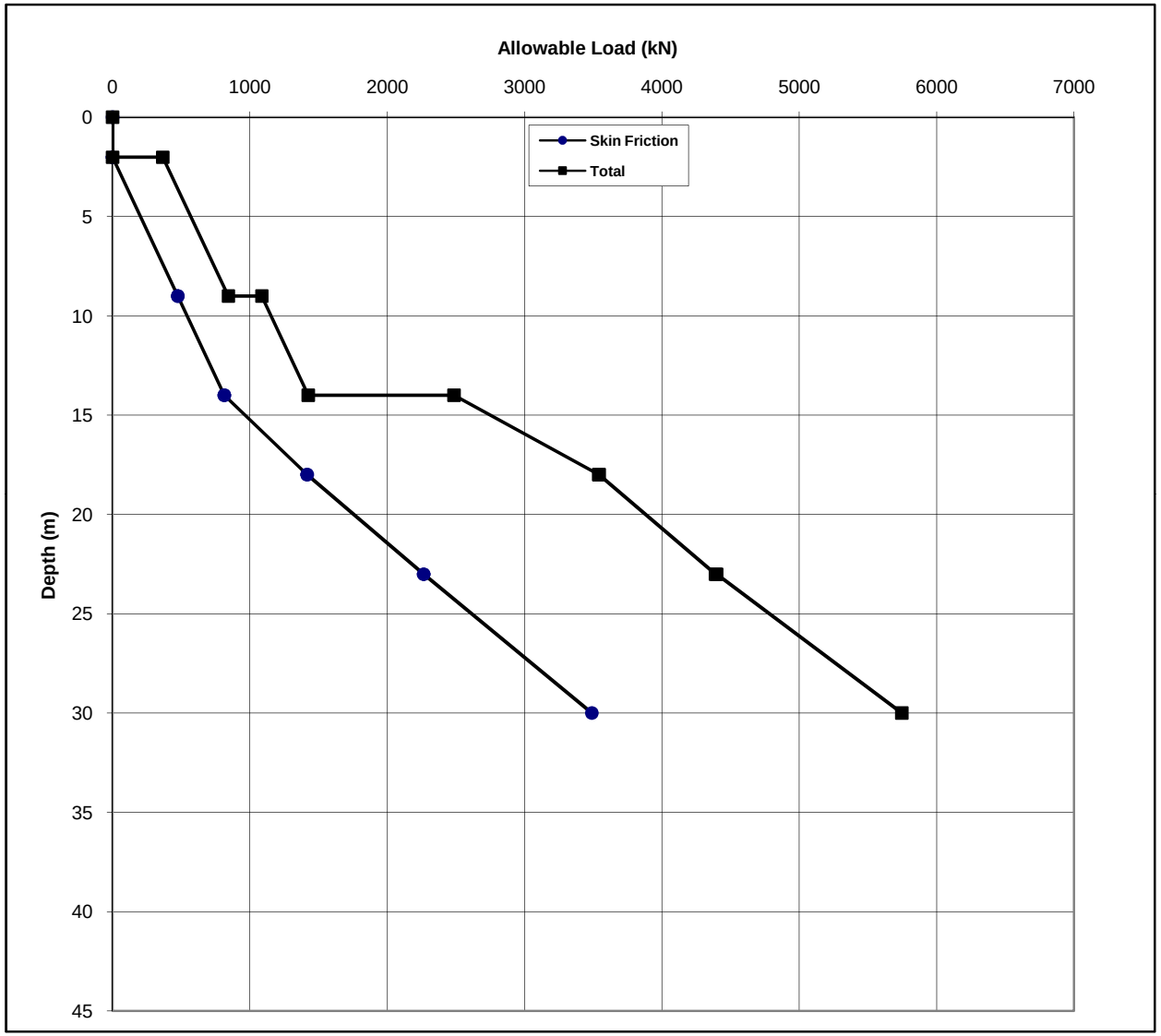
= 600kN (for fixed head condition)

= 220kN (for free head condition)



Allowable Pile Capacity Major Bridge at Chainage 41+916

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

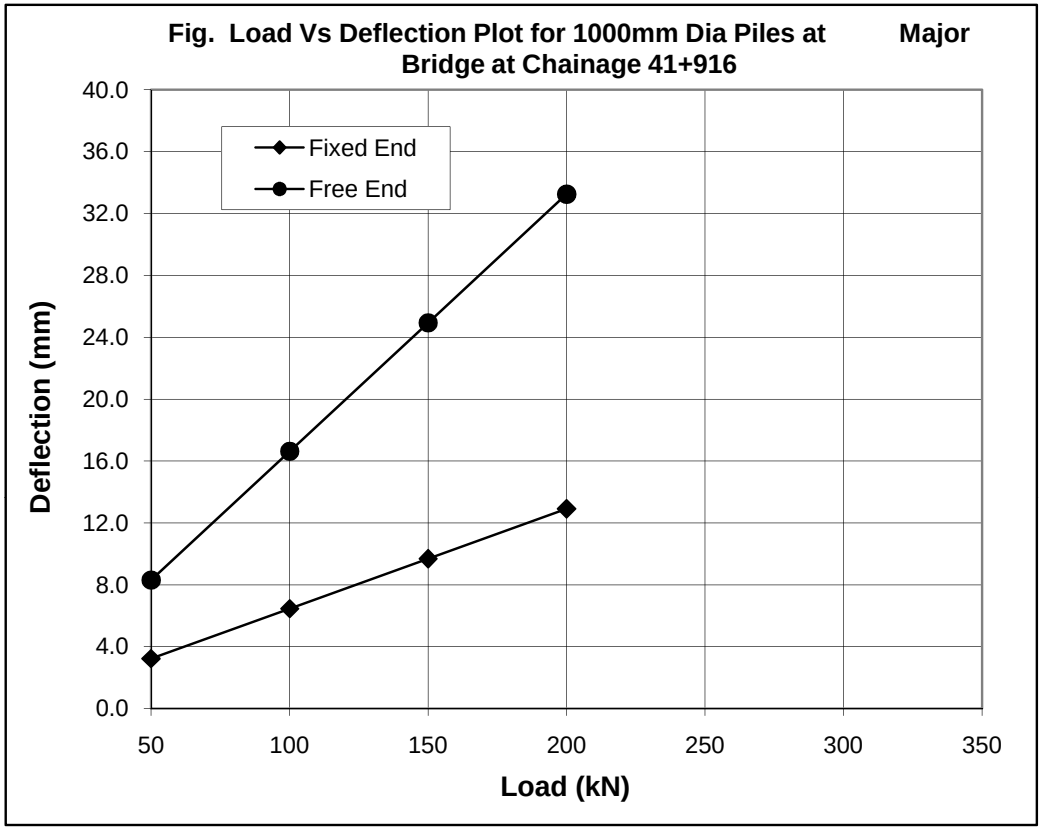


Allowable Pile Capacity Major Bridge at Chainage 41+916

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.3	kg/cm^3

T=	(EI/KB)^0.25	
	458.46	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1008.62	cm
L_f/T=	1.9	Free
L_f (Free)=	871.08	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free



Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.23	8.31
100	6.45	16.62
150	9.68	24.93
200	12.90	33.25

Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 150kN (for fixed head condition)

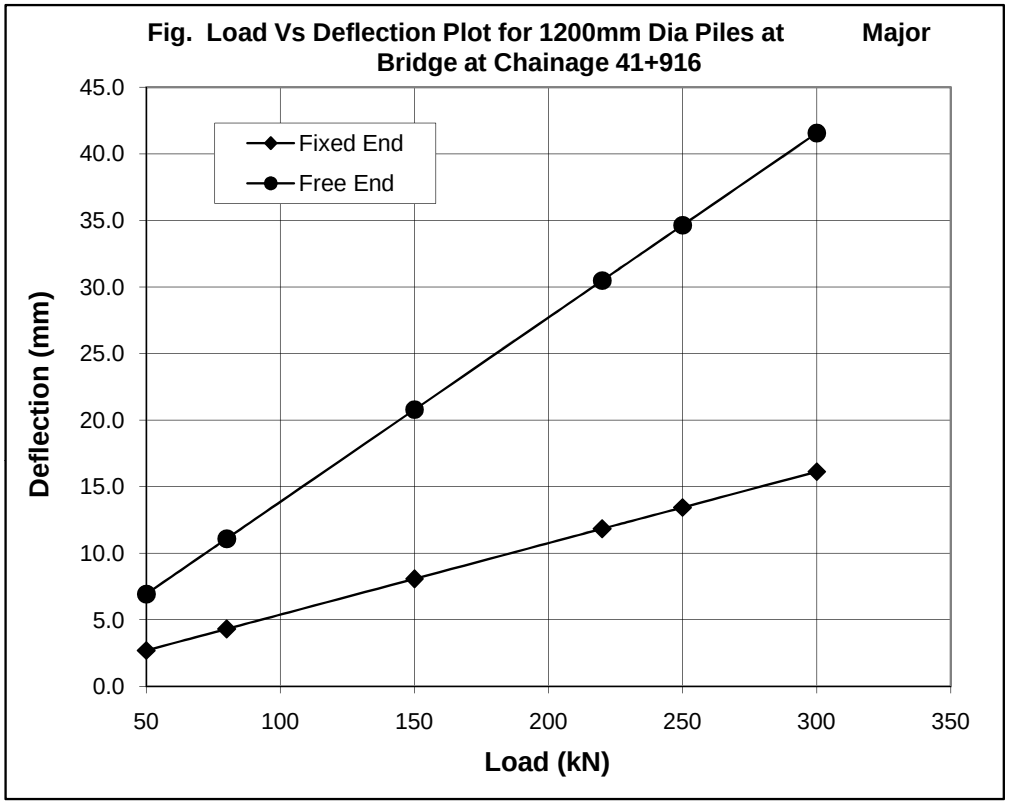
= 60 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 41+916 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.25	kg/cm^3

T=	(EI/KB)^0.25	
	550.15	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1210.34	cm
L_f/T=	1.9	Free
L_f (Free)=	1045.29	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

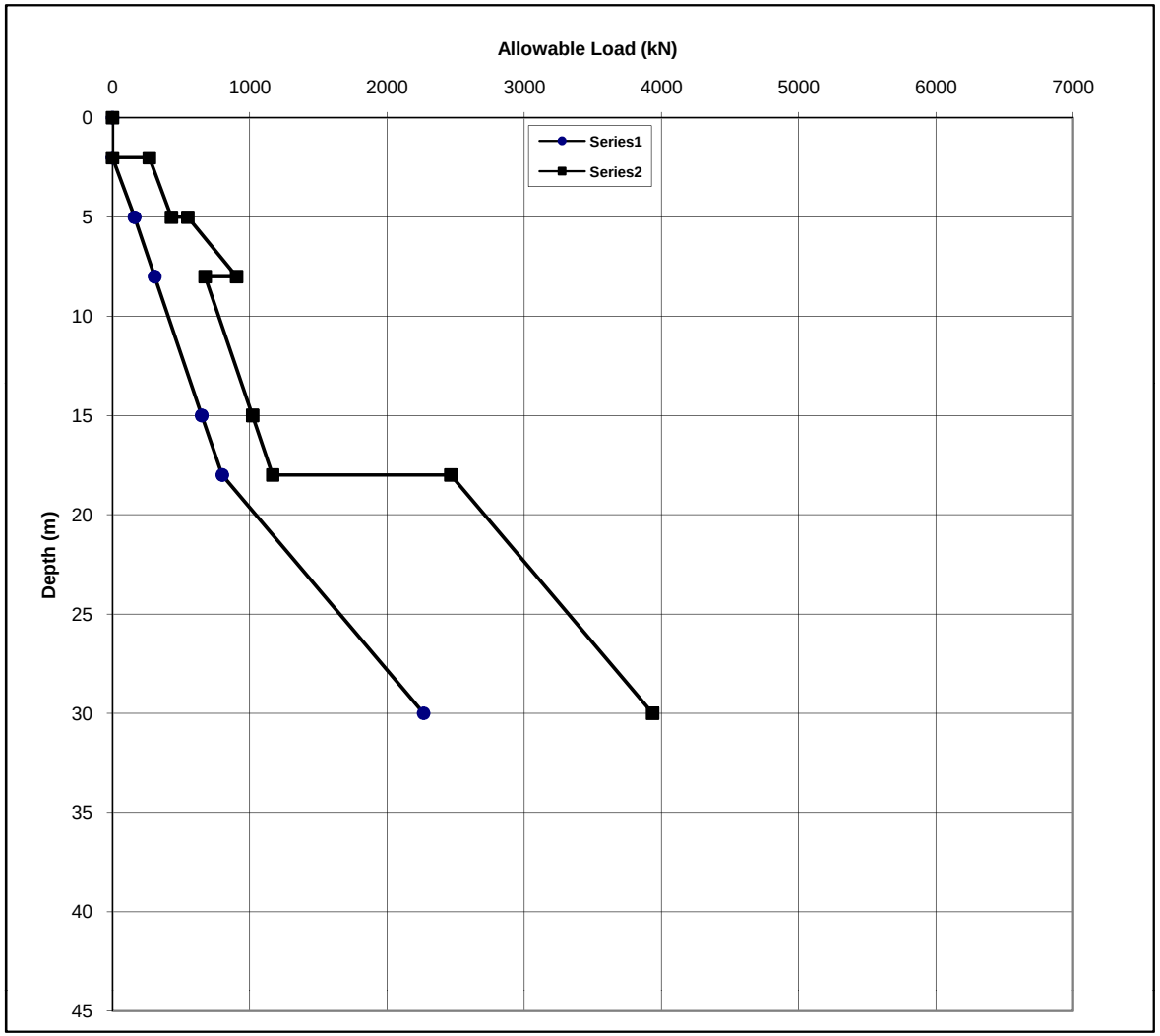
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	2.69	6.93
80	4.30	11.08
150	8.06	20.78
220	11.83	30.48
250	13.44	34.63
300	16.13	41.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

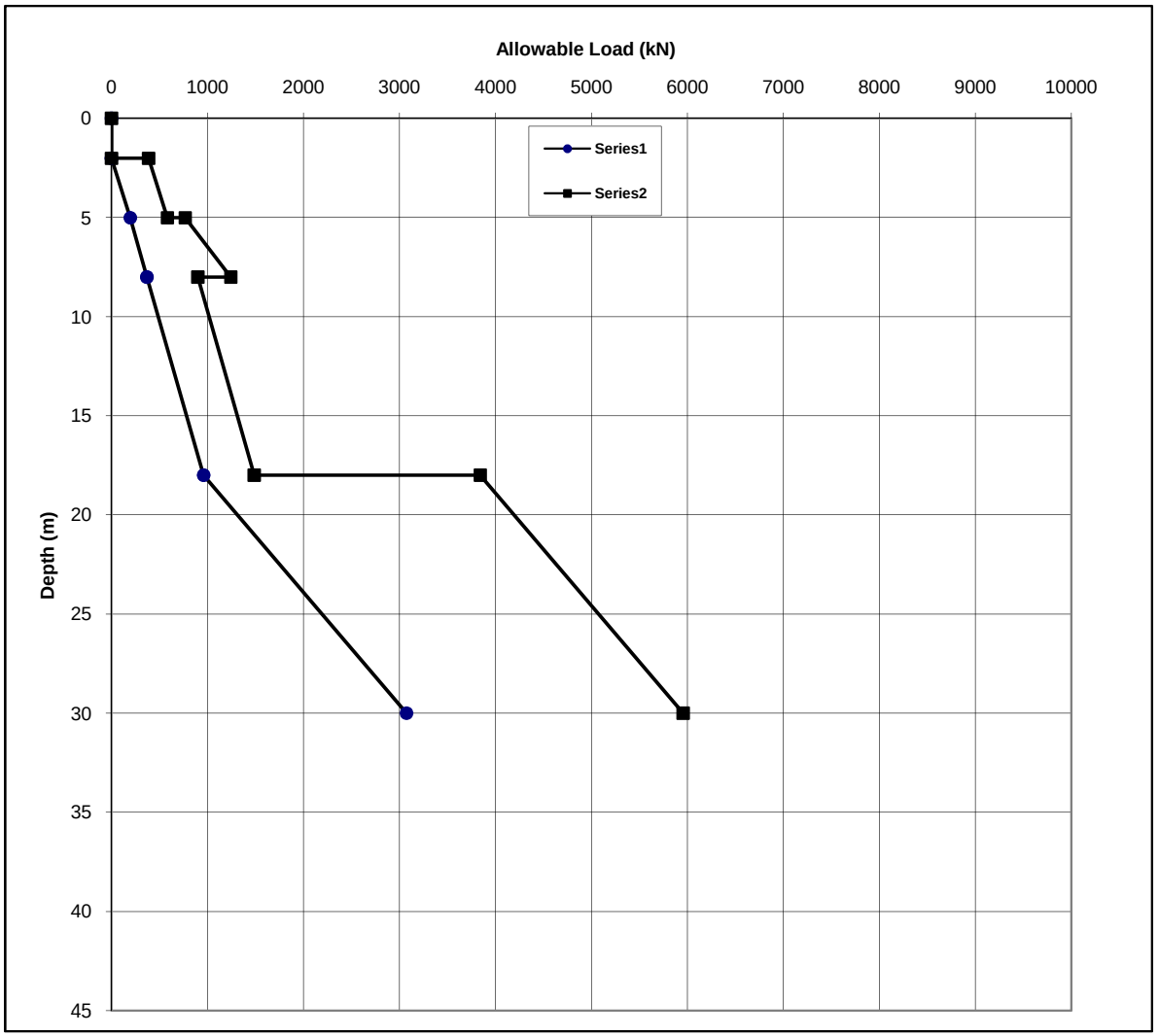
= 220kN (for fixed head condition)

= 90kN (for free head condition)



Allowable Pile Capacity Major Bridge at Chainage 43+900

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity Major Bridge at Chainage 43+900

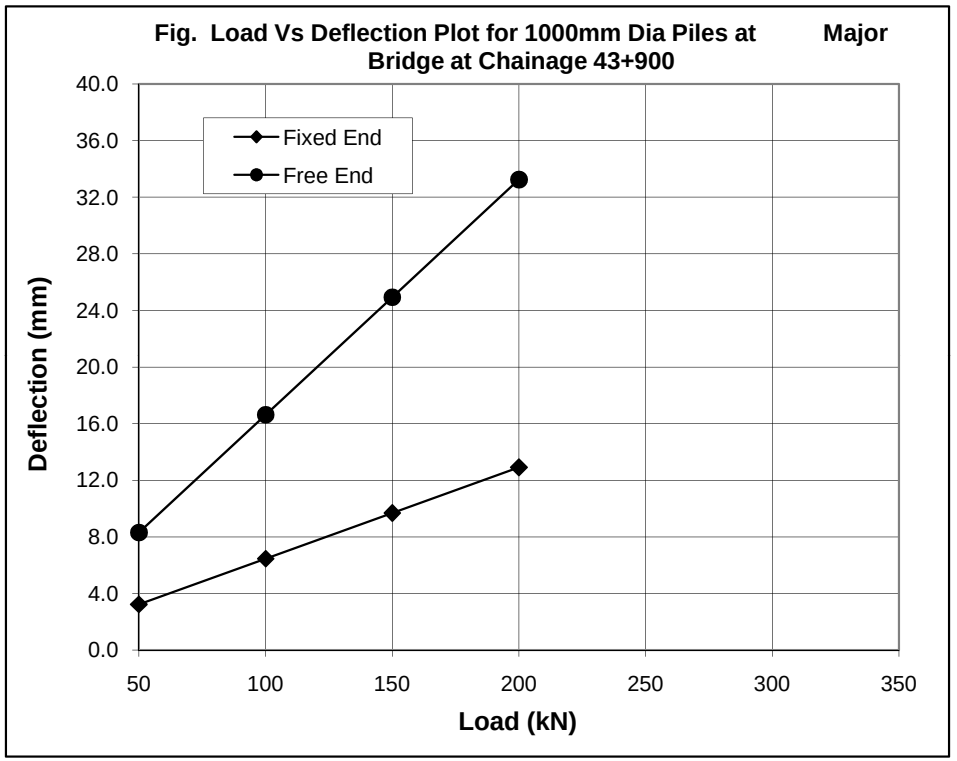
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 43+900 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.3	kg/cm^3

T=	(EI/KB)^0.25	
	458.46	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1008.62	cm
L_f/T=	1.9	Free
L_f (Free)=	871.08	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.23	8.31
100	6.45	16.62
150	9.68	24.93
200	12.90	33.25



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 150kN (for fixed head condition)

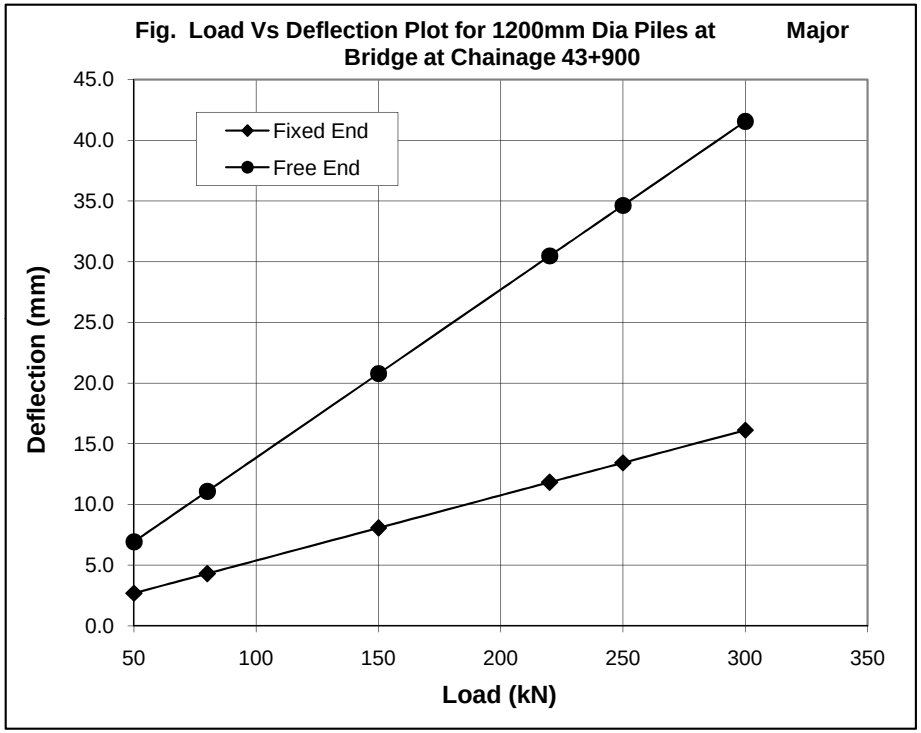
= 60 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 43+900 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.25	kg/cm^3

T=	(EI/KB)^0.25	
	550.15	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1210.34	cm
L_f/T=	1.9	Free
L_f (Free)=	1045.29	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

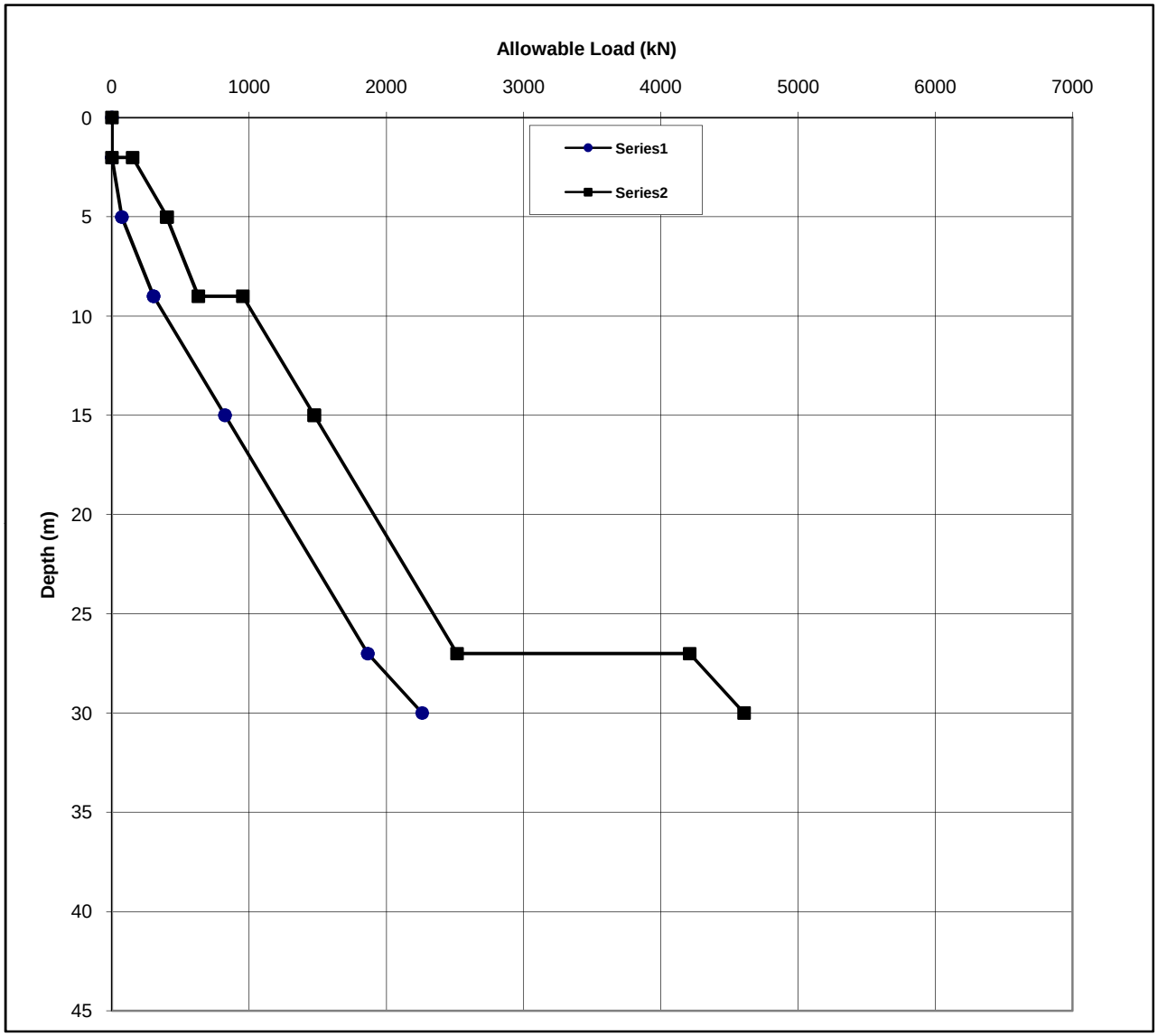
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	2.69	6.93
80	4.30	11.08
150	8.06	20.78
220	11.83	30.48
250	13.44	34.63
300	16.13	41.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

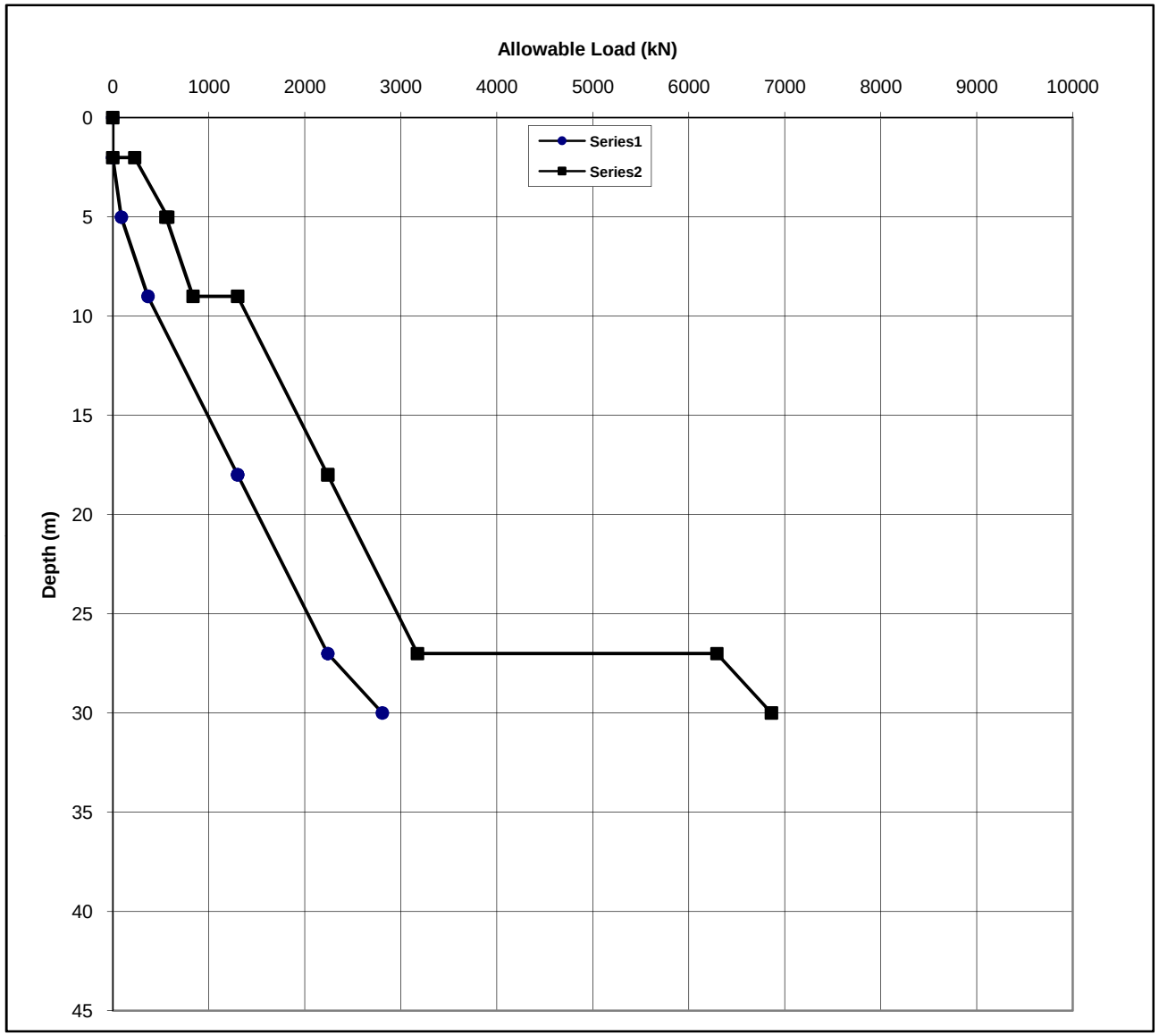
= 220kN (for fixed head condition)

= 90kN (for free head condition)



Allowable Pile Capacity Major Bridge at Chainage 46+362

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



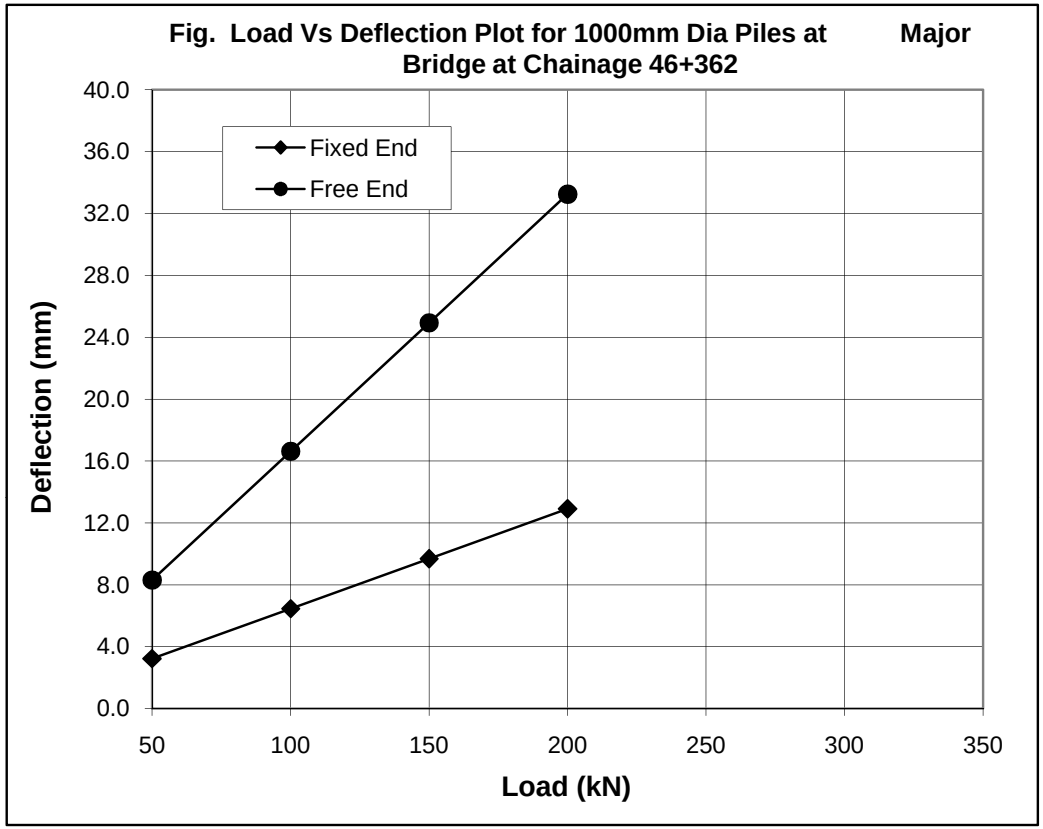
Allowable Pile Capacity Major Bridge at Chainage 46+362

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.3	kg/cm^3

T=	(EI/KB)^0.25	
	458.46	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1008.62	cm
L_f/T=	1.9	Free
L_f (Free)=	871.08	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.23	8.31
100	6.45	16.62
150	9.68	24.93
200	12.90	33.25



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 150kN (for fixed head condition)

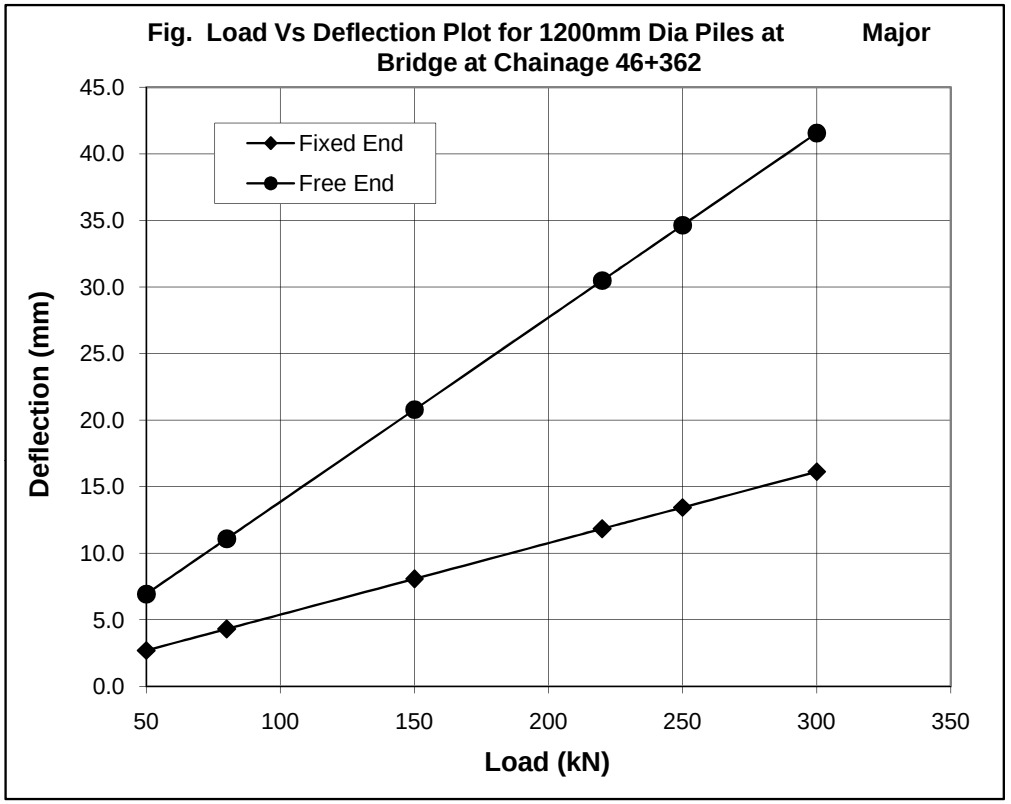
= 60 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 46+362 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.25	kg/cm^3

T=	(EI/KB)^0.25	
	550.15	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1210.34	cm
L_f/T=	1.9	Free
L_f (Free)=	1045.29	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

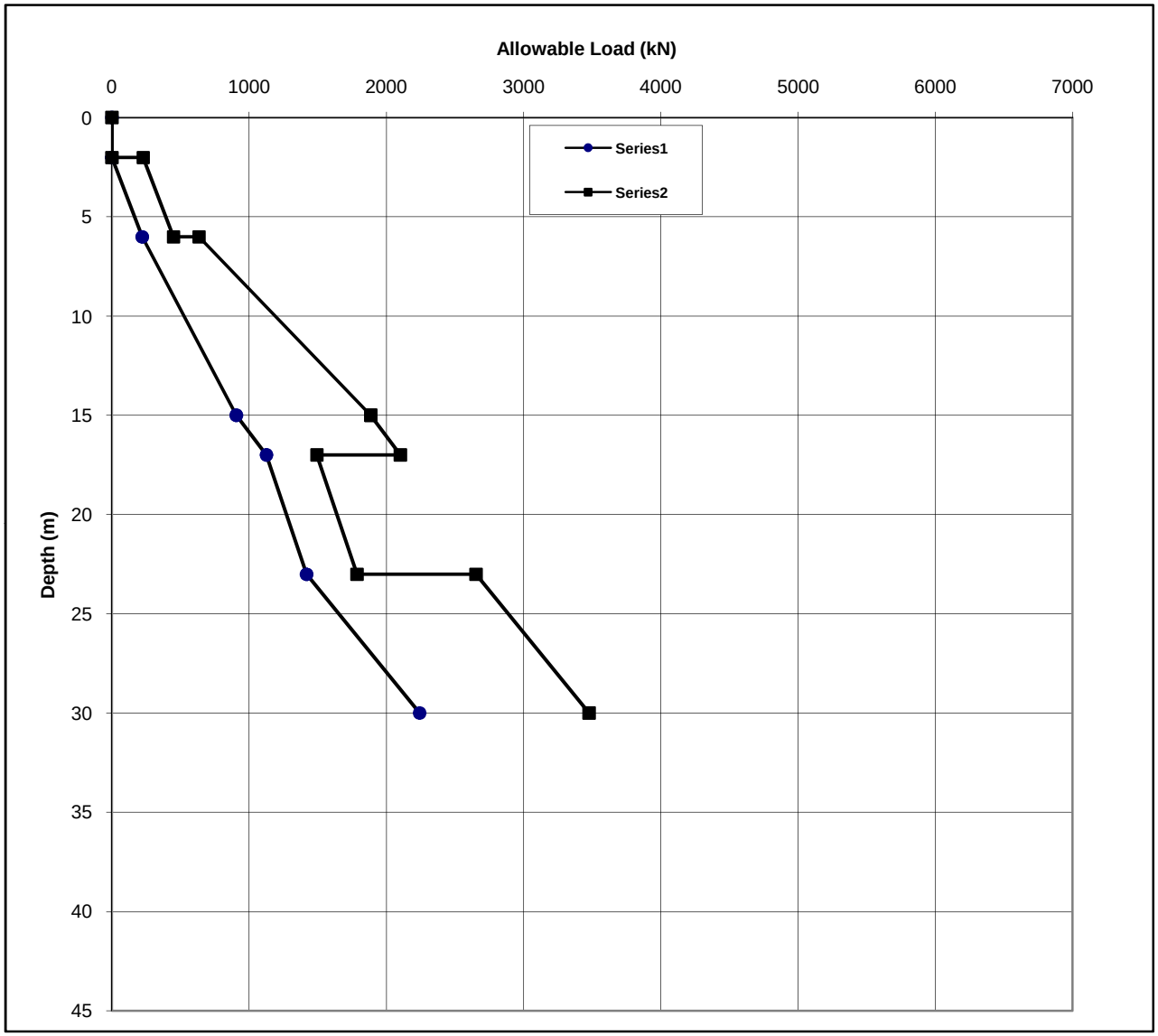
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	2.69	6.93
80	4.30	11.08
150	8.06	20.78
220	11.83	30.48
250	13.44	34.63
300	16.13	41.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

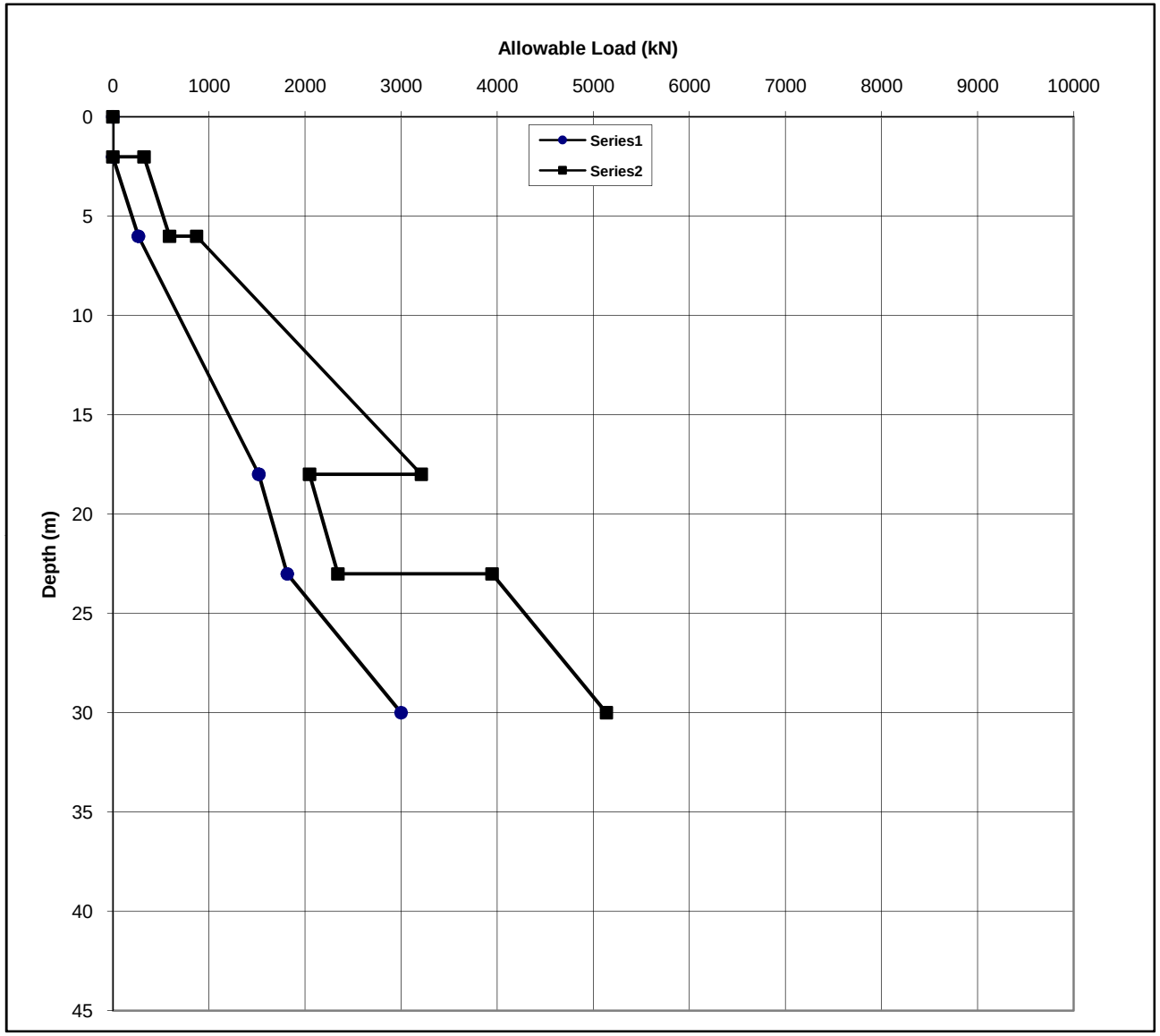
= 220kN (for fixed head condition)

= 90kN (for free head condition)



Allowable Pile Capacity Major Bridge at Chainage 48+122

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



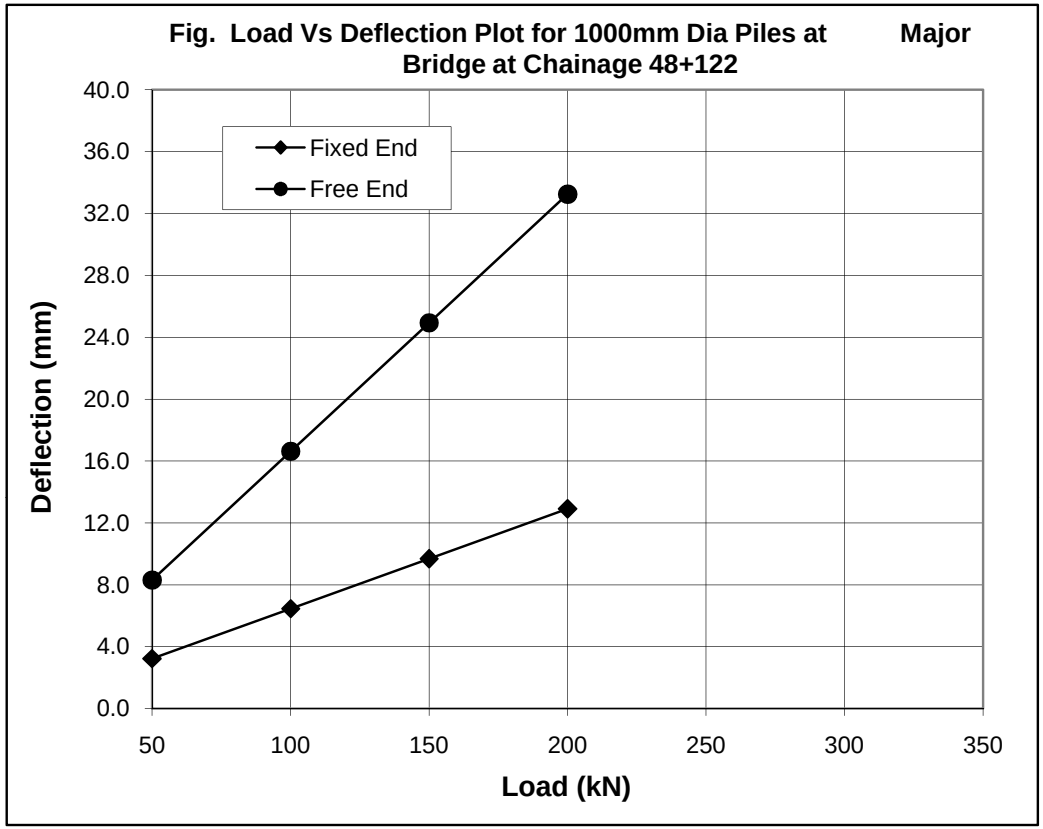
Allowable Pile Capacity Major Bridge at Chainage 48+122

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.3	kg/cm^3

T=	(EI/KB)^0.25	
	458.46	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1008.62	cm
L_f/T=	1.9	Free
L_f (Free)=	871.08	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.23	8.31
100	6.45	16.62
150	9.68	24.93
200	12.90	33.25



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 150kN (for fixed head condition)

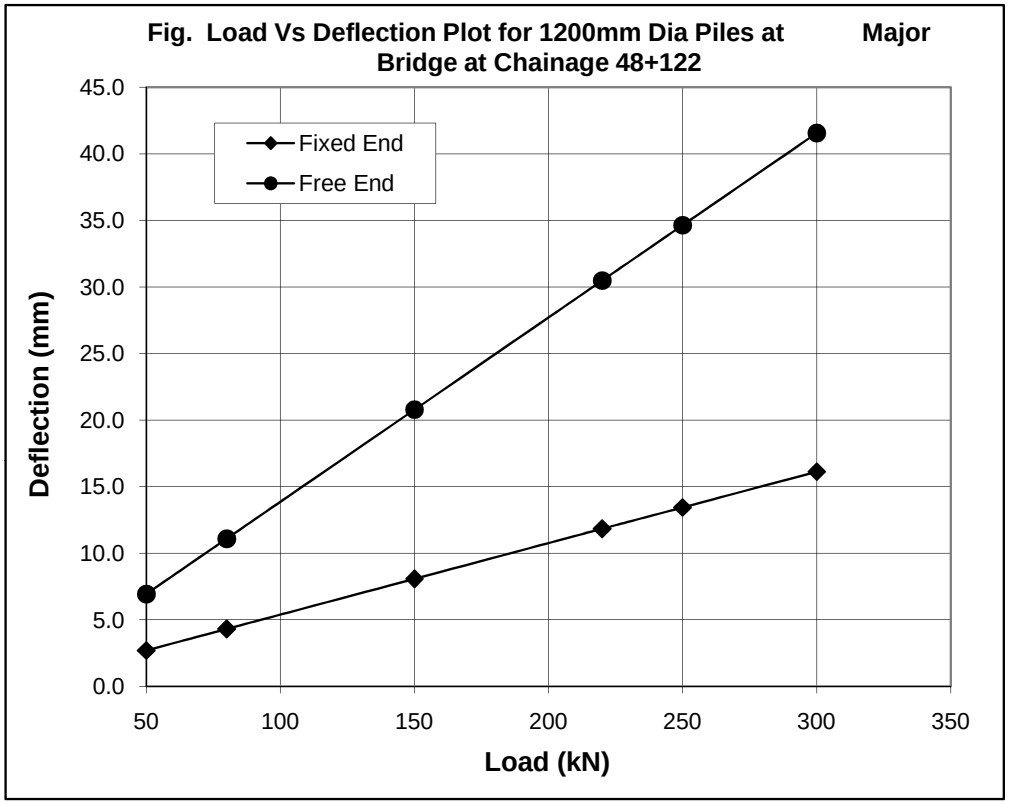
= 60 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 48+122 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.500	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2
K=(K1*0.3)/(1.5B)	0.25	kg/cm^3

T=	(EI/KB)^0.25	
	550.15	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1210.34	cm
L_f/T=	1.9	Free
L_f (Free)=	1045.29	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

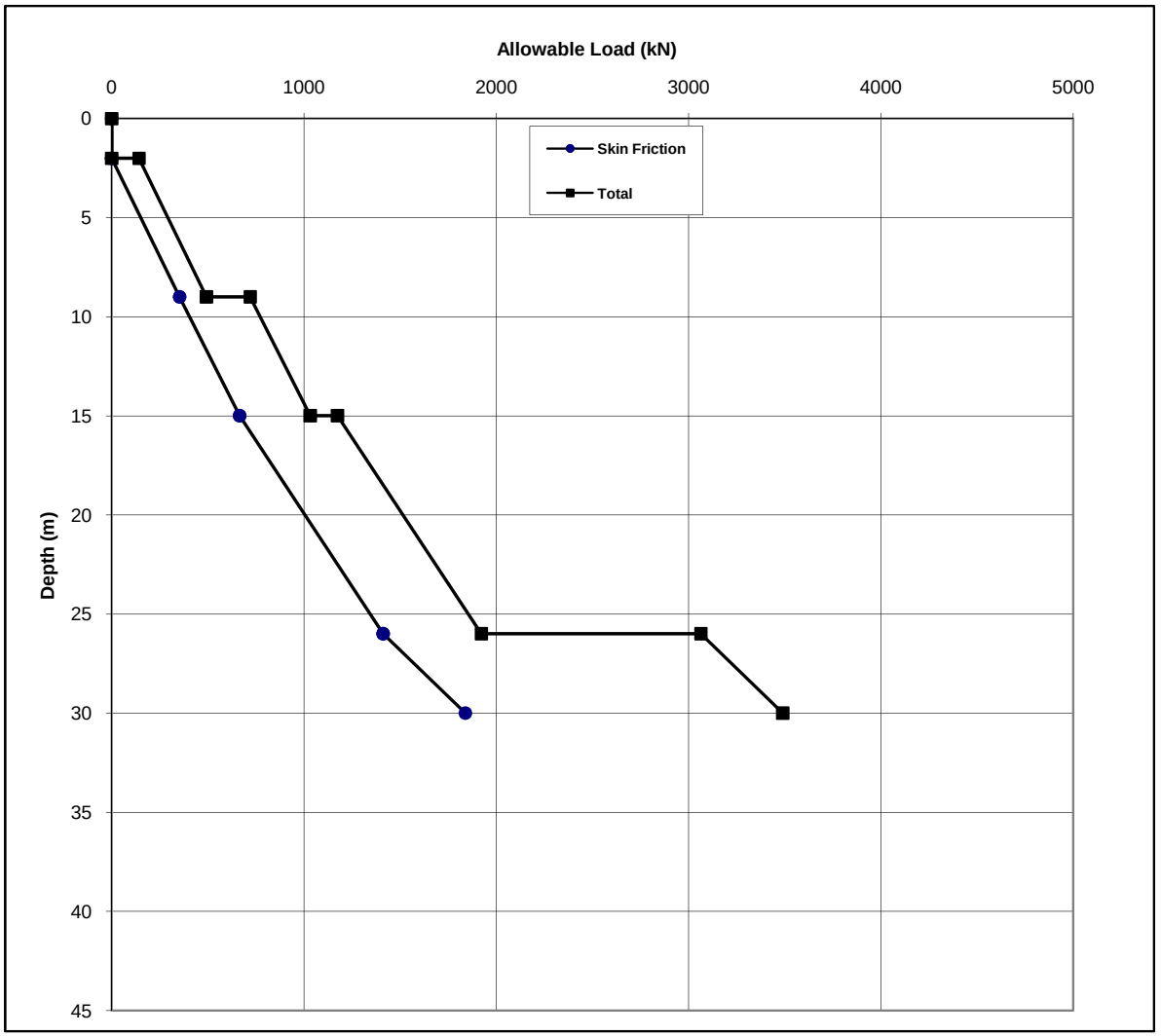
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	2.69	6.93
80	4.30	11.08
150	8.06	20.78
220	11.83	30.48
250	13.44	34.63
300	16.13	41.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

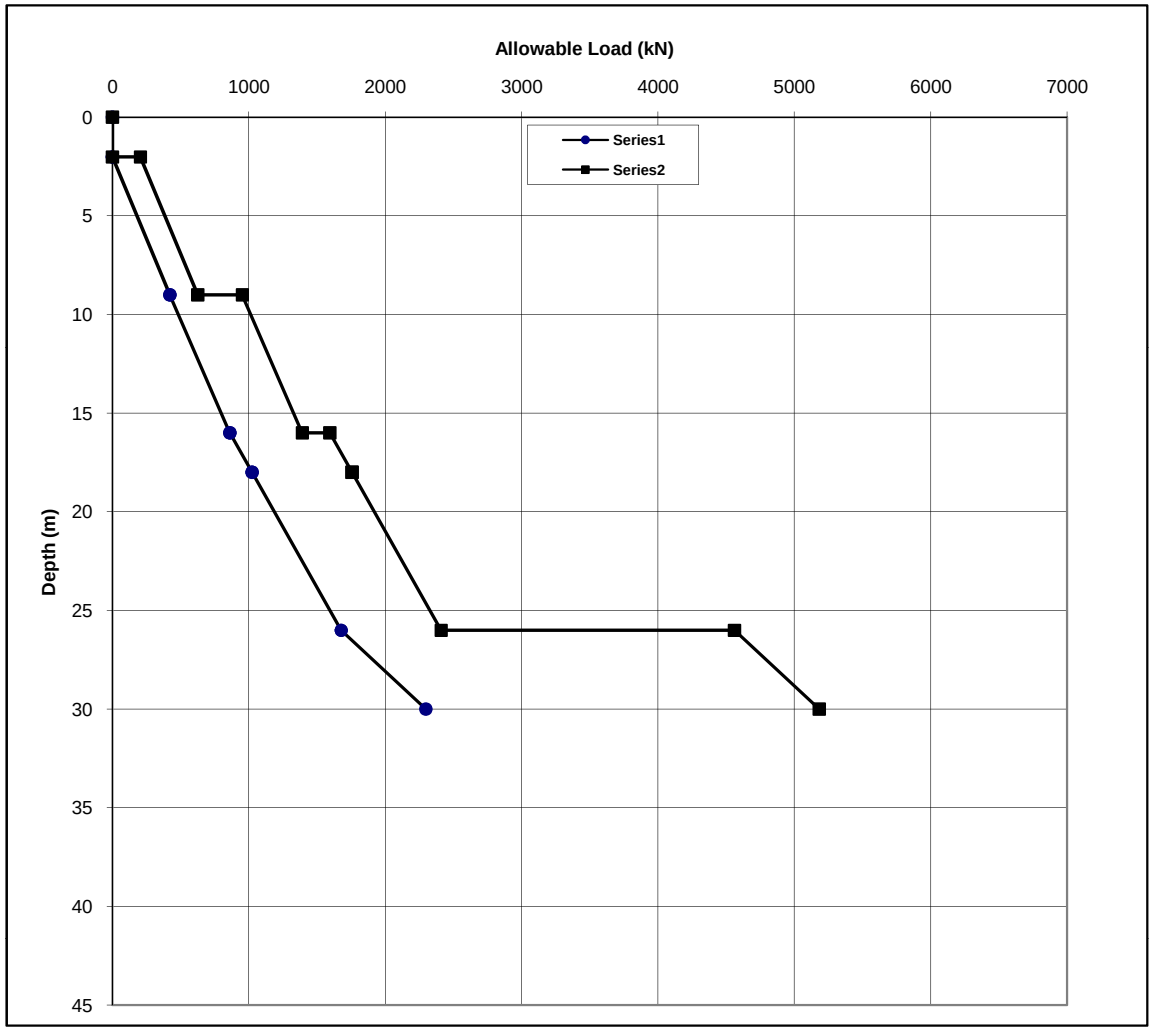
= 220kN (for fixed head condition)

= 90kN (for free head condition)



Allowable Pile Capacity Major Bridge at Chainage 48+400

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity Major Bridge at Chainage 48+400

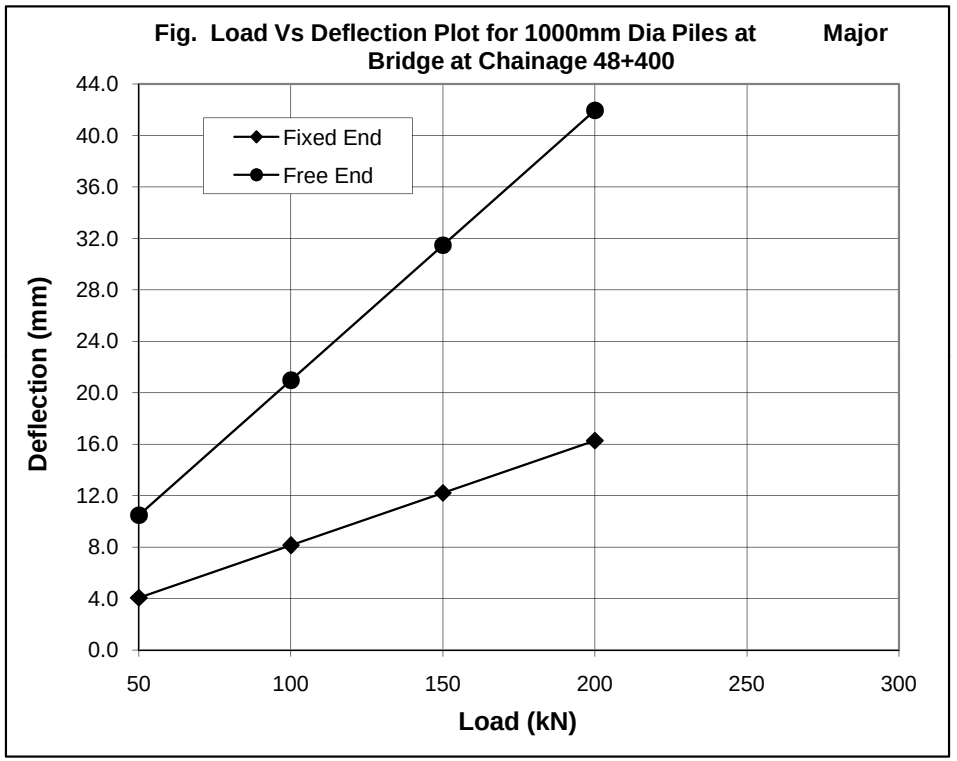
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 48+400 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
K_1	1.100	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.22	kg/cm^3

T=	(EI/KB)^0.25	
	495.42	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1089.93	cm
L_f/T=	1.9	Free
L_f (Free)=	941.31	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	4.07	10.49
100	8.14	20.98
150	12.21	31.47
200	16.28	41.95



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 120kN (for fixed head condition)

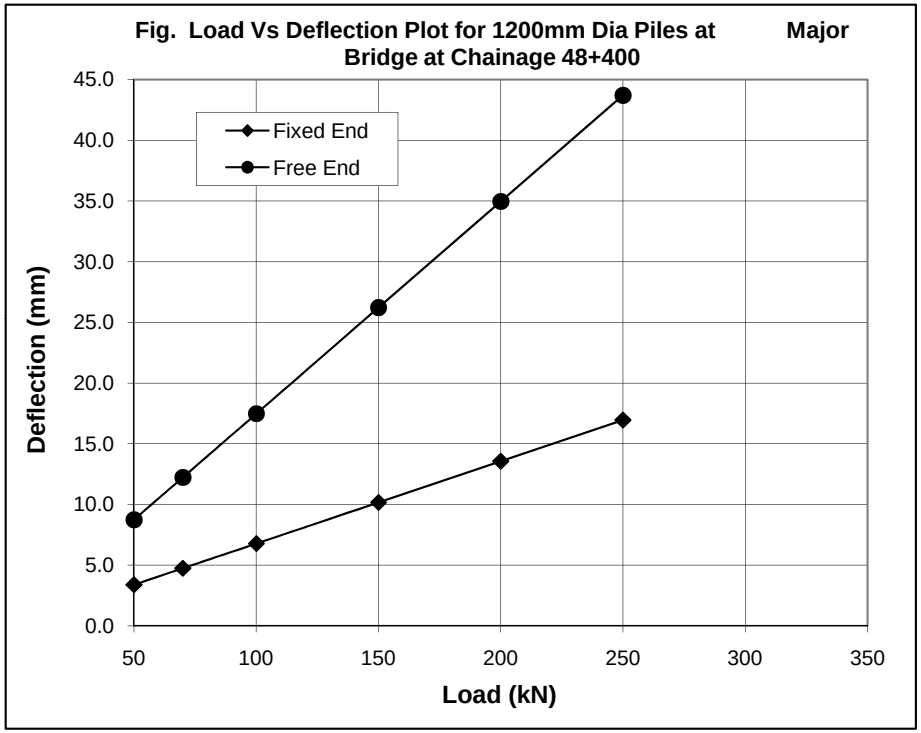
= 50 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 48+400 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.100	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.183333333	kg/cm^3

T=	(EI/KB)^0.25	
	594.51	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1307.92	cm
L_f/T=	1.9	Free
L_f (Free)=	1129.57	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

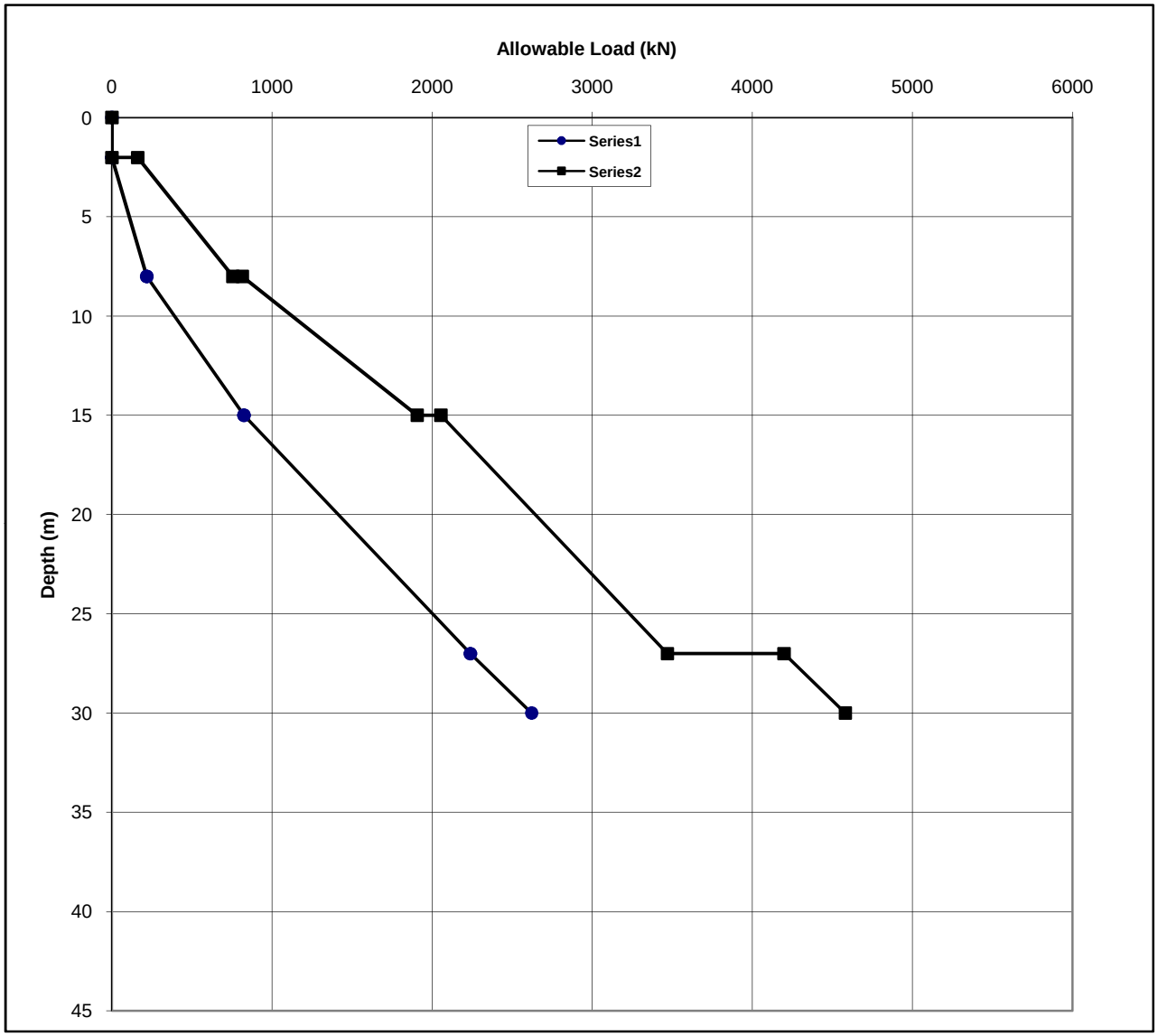
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.39	8.74
70	4.75	12.24
100	6.78	17.48
150	10.18	26.22
200	13.57	34.96
250	16.96	43.70



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

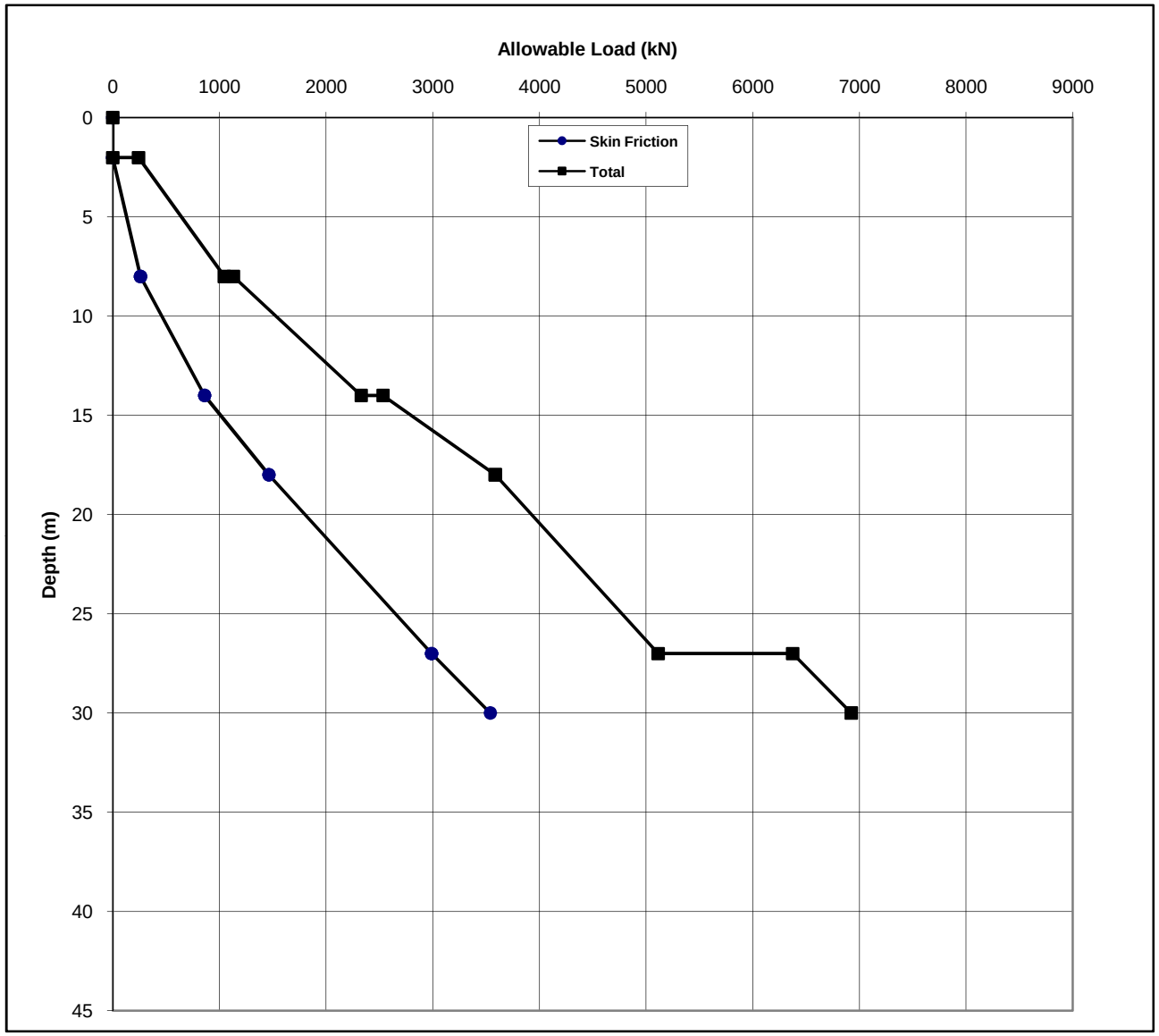
= 170kN (for fixed head condition)

= 70kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 48+510

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



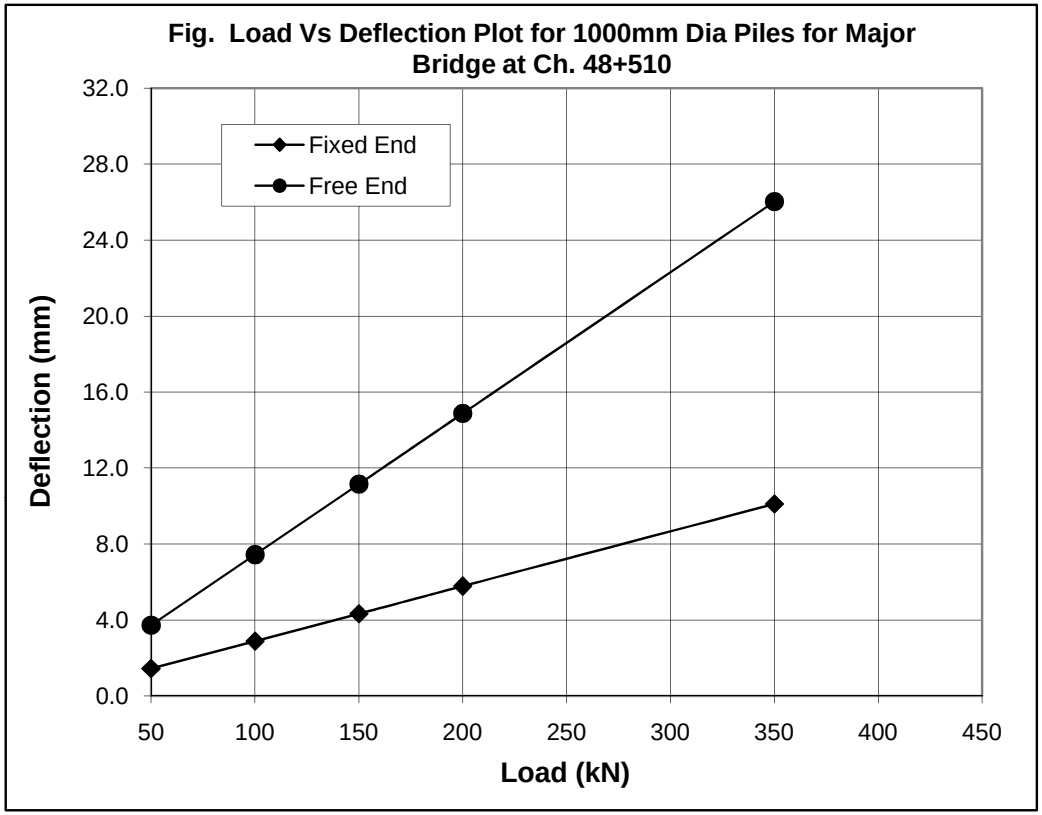
Allowable Pile Capacity at Major Bridge Ch. 48+510

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	350.65	
L_f/T=	2.2	Fixed
L_f (Fixed)=	771.44	cm
L_f/T=	1.9	Free
L_f (Free)=	666.24	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.44	3.72
100	2.89	7.44
150	4.33	11.16
200	5.77	14.88
350	10.10	26.03



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

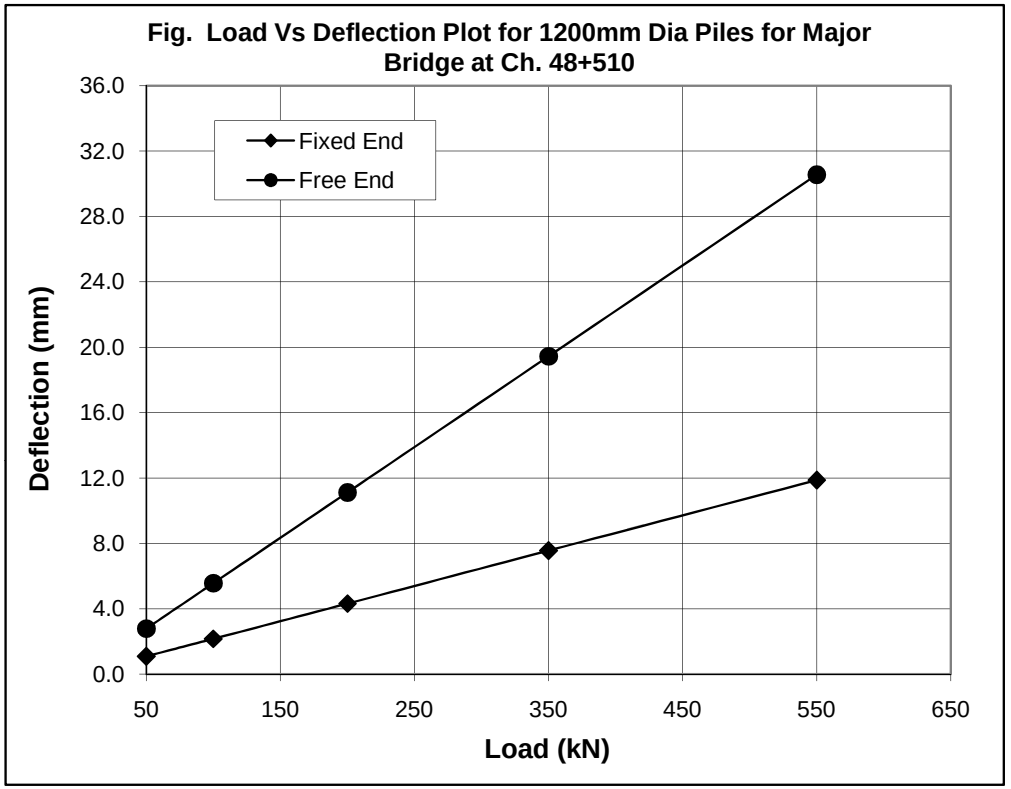
= 350kN (for fixed head condition)

= 130 kN (for free head condition)

D=	**120**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	405.72	
L_f/T=	2.2	Fixed
L_f (Fixed)=	892.58	cm
L_f/T=	1.9	Free
L_f (Free)=	770.86	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

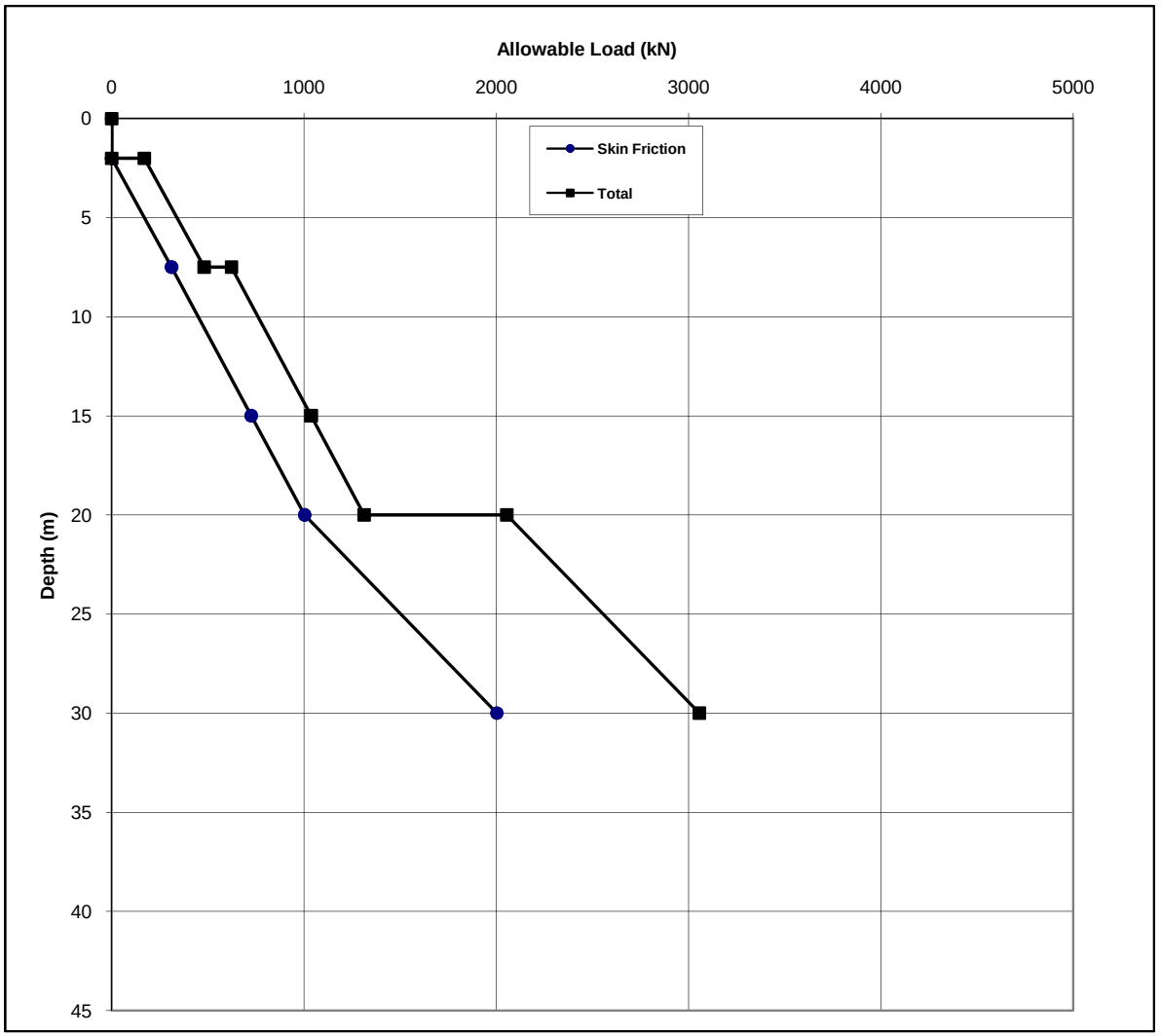
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.08	2.78
100	2.16	5.56
200	4.31	11.11
350	7.55	19.45
550	11.86	30.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

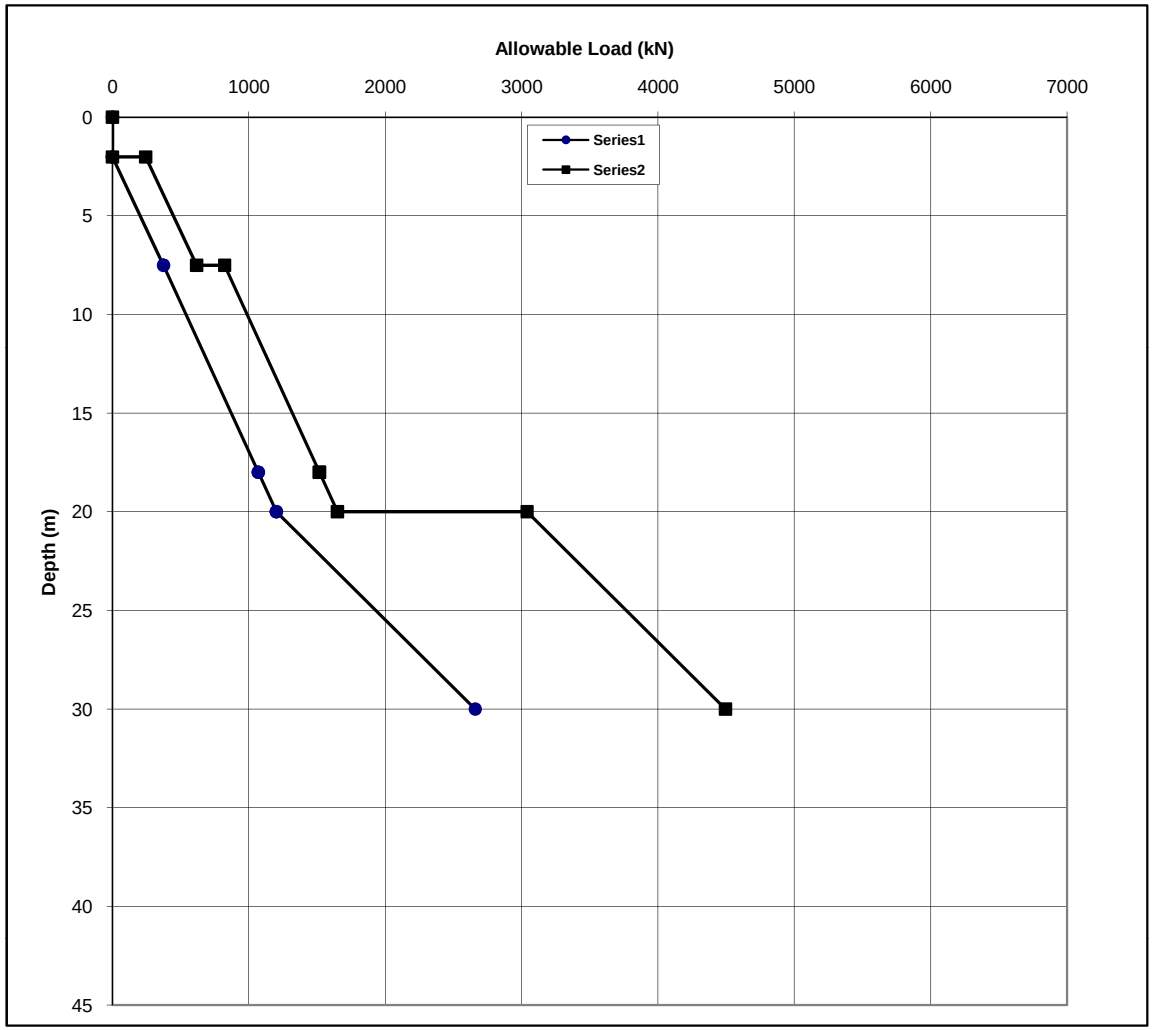
= 550kN (for fixed head condition)

= 210kN (for free head condition)



Allowable Pile Capacity Major Bridge at Chainage 49+250

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity Major Bridge at Chainage 49+250

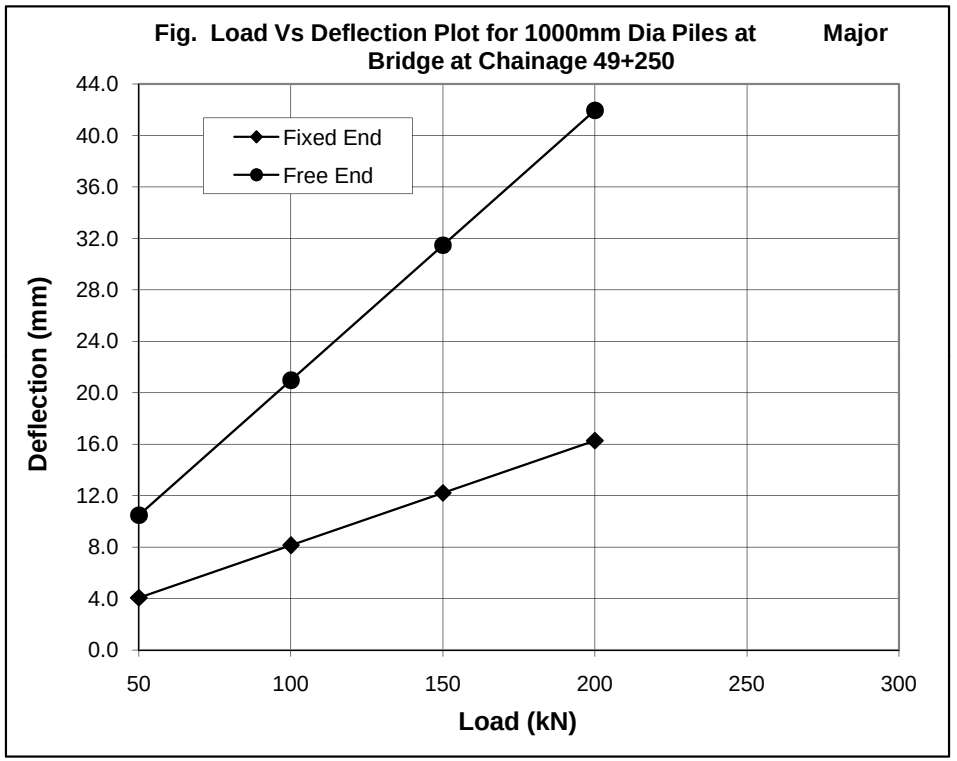
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 49+250 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
K_1	1.100	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.22	kg/cm^3

T=	(EI/KB)^0.25	
	495.42	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1089.93	cm
L_f/T=	1.9	Free
L_f (Free)=	941.31	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	4.07	10.49
100	8.14	20.98
150	12.21	31.47
200	16.28	41.95



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 120kN (for fixed head condition)

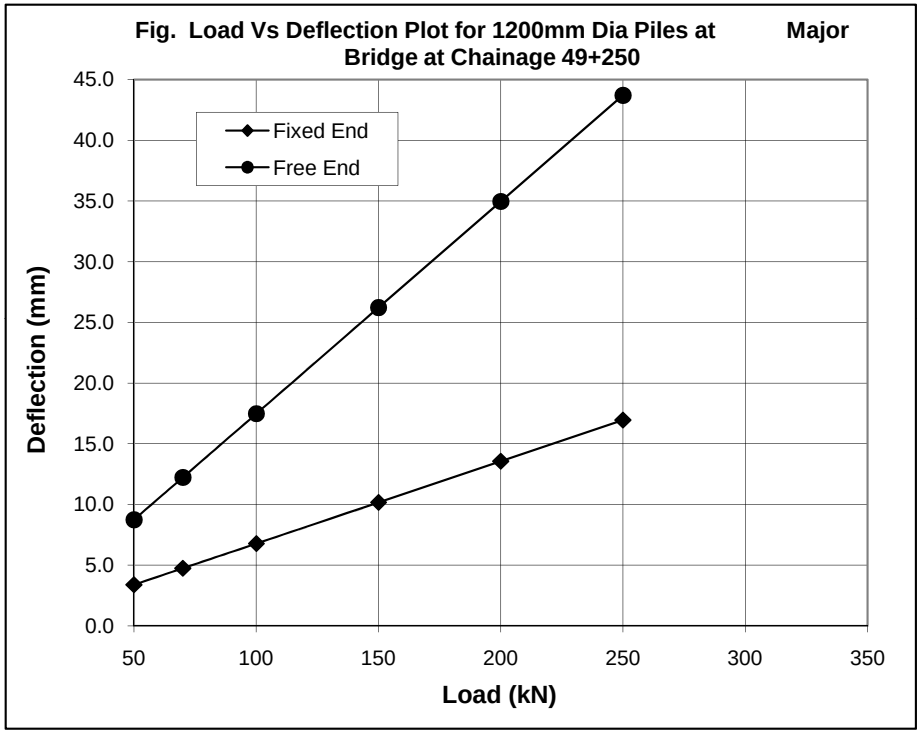
= 50 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 49+250 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.100	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.183333333	kg/cm^3

T=	(EI/KB)^0.25	
	594.51	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1307.92	cm
L_f/T=	1.9	Free
L_f (Free)=	1129.57	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.39	8.74
70	4.75	12.24
100	6.78	17.48
150	10.18	26.22
200	13.57	34.96
250	16.96	43.70



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

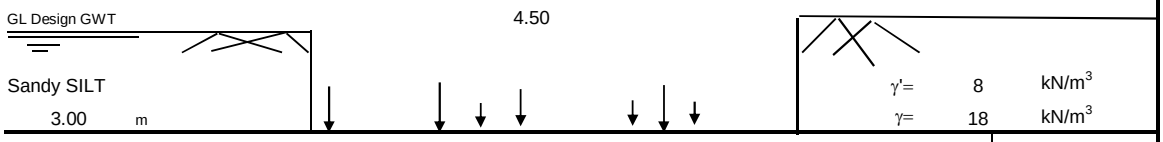
= 170kN (for fixed head condition)

= 70kN (for free head condition)

Calculation for Bearing Capacity at Minor Bridge CH 50+100 km

Footing Size: 5.5x4.5 m

Depth : 3.00 m



Layer - I		Silty	SILT		Z_1
		N_{av}=	16		
		ϕ_{av}=	29	degree	
		c_{av}=	0	kPa	
		γ_{av}=	8	kN/m^3	
7.50	m				
		Silty	SAND		
Layer - II		N_{av}=	23		……Z_2
		ϕ_{av}=	33	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	9	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 29 degree

For Layer - I

As ϕ is 29° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5			
N_c=	15.5	N_q=	6.88		N_γ=	6.65	Local shear failure	
S_c=	1.164	S_q=	1.164		S_γ=	0.67		
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.23			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.11			
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0	
Q_{safe-I}=		**113.5**	**kPa**					

Design Bearing Capacity= **110** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)=		285.7		C_{kd}/N=	250	KN/m^2	1st layer I = 0.74
p_o=	21	p=	110.0	kPa			
Rigidity factor=	0.8		Depth Factor, d_f=		0.82		

δ_1 (mm)= 16.37

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}$(p_o+Δp)/p_o)]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 129.0 C_{kd}/N= 300 KN/m^2 2nd layer I = 0.2

p_o= 80.25 p= 110.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.82

δ_2 (mm)= 5.55

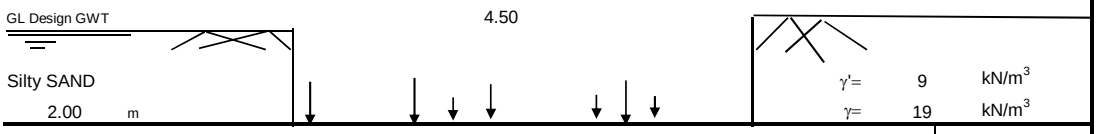
Total settlement = 21.91 mm

Allowable Bearing capacity for 25mm settlement= 110.0 KPa

Calculation for Bearing Capacity at Minor Bridge CH 51+100

Footing Size: 5.5x4.5 m

Depth : 2.00 m



Layer - I		Silty	SAND		Z_1
		N_{av}=	12		
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
		γ_{av}=	9	kN/m^3	
6.00	m				
		Silty	SAND		
Layer - II		N_{av}=	28		……Z_2
		ϕ_{av}=	33	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	10	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 31 degree

For Layer - I

As ϕ is 31° Intermediate shear failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS= 2.5 w= 0.5

N_c=	33.34	N_q=	21.38	N_γ=	27.54	General shear failure
N_c=	17.19	N_q=	8.1	N_γ=	7.59	Local shear failure
N_c=	19.88	N_q=	10.31	N_γ=	10.92	Intermediate condition
S_c=	1.164	S_q=	1.164	S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=			1.16		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)			1.08		
ic=iq=	(1-α/90)^2=	1.00	ig=	(1-α/φ)^2=	1.00	α=0

Q_{safe-I}= 151.9 kPa

Design Bearing Capacity= **150 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}\{(p_o+\Delta p)/p_o\}]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 225.0 C_{kd}/N= 250 KN/m^2 1st layer I = 0.78

p_o= 20 p= 150.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_1 (mm)= 24.08

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 150.0 C_{kd}/N= 300 KN/m^2 2nd layer I = 0.2

p_o= 84 p= 150.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_2 (mm)= 8.60

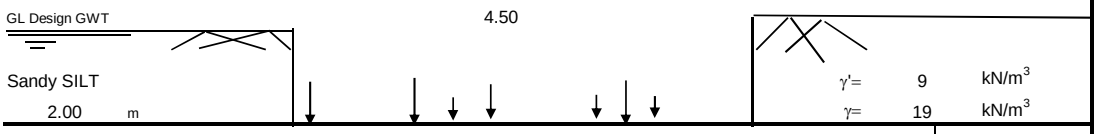
Total settlement = 32.68 mm

Allowable Bearing capacity for 25mm settlement= 116.2 KPa

Calculation for Bearing Capacity at Minor Bridge CH 52+640

Footing Size: 5.5x4.5 m

Depth : 2.00 m



Layer - I		Sandy	SILT		Z_1
		N_{av}=	20		
		ϕ_{av}=	30	degree	
		c_{av}=	0	kPa	
		γ_{av}=	9	kN/m^3	
10.50	m				
		Silty	SAND		
Layer - II		N_{av}=	35		……Z_2
		ϕ_{av}=	34	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	10	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 30 degree

For Layer - I

As ϕ is 30° local failure is considered

$Q(safe)= (cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5			
N_c=	16	N_q=	7.25			N_γ=	7.59	Local shear failure
S_c=	1.164	S_q=	1.164			S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.15			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.08			
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=		1.00	α=0

Q_{safe-I}= 103.4 kPa

Design Bearing Capacity= **100 kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) — for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}((p_o+\Delta p)/p_o)]*d_f$*Rigidity Factor (0.8) — for sand

C=1.5*(C_{kd}/p_o)= 186.3 C_{kd}/N= 250 KN/m^2 1st layer I = 0.36

p_o= 40.25 p= 100.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_1 (mm)= 20.52

Settlement for Layer-II

δ (mm) = $m_v * H * \Delta p * \mu_g * d_f$ * Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303 * (H/C) * \log_{10}\{(p_o + \Delta p)/p_o\}] * d_f$ * Rigidity Factor (0.8) for sand IS:8009 (Part I)

$C = 1.5 * (C_{kd}/p_o)$= 154.4 C_{kd}/N= 300 KN/m^2 2nd layer I = 0.1

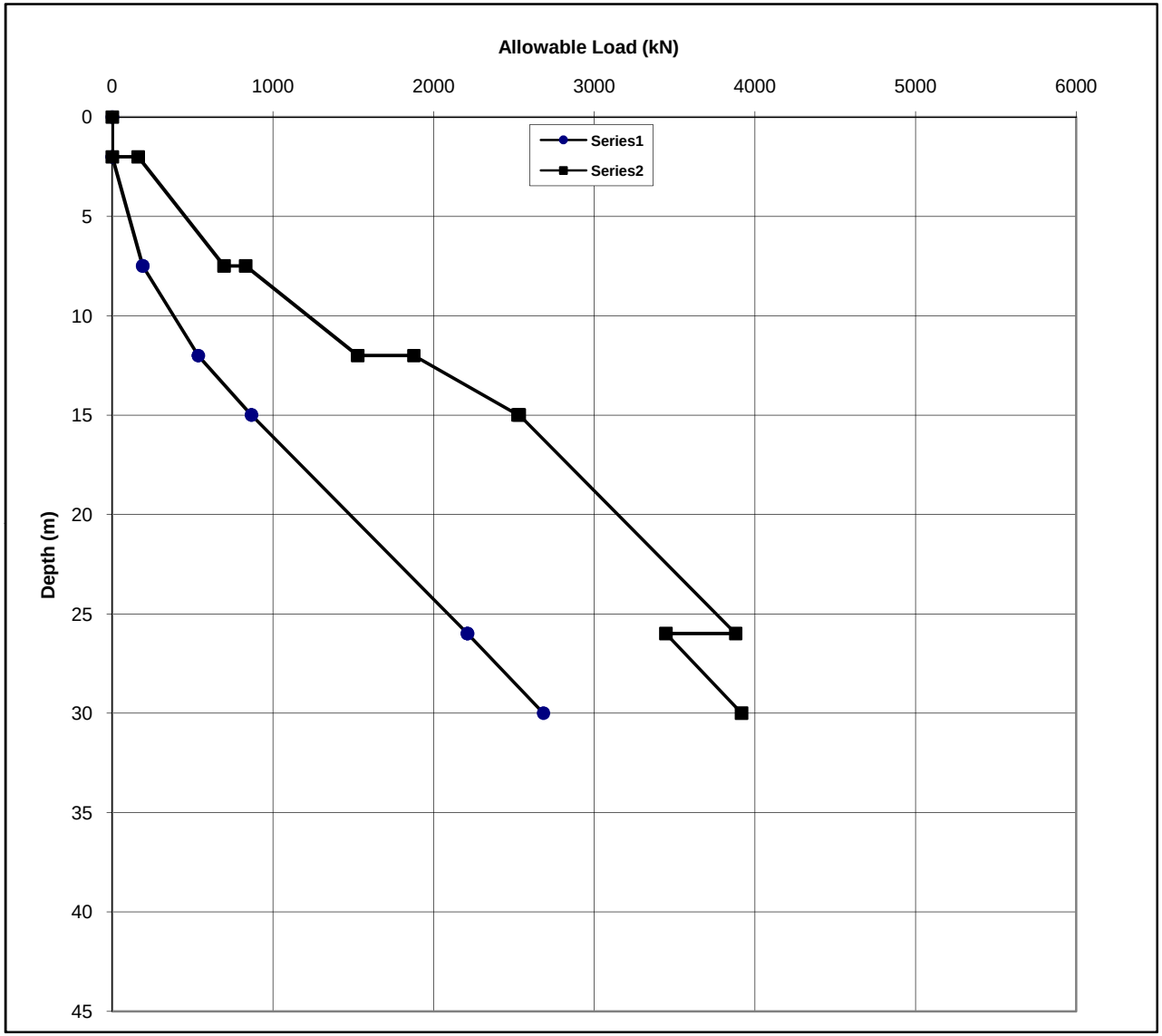
p_o= 102 p= 100.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_2 (mm)= 0.64

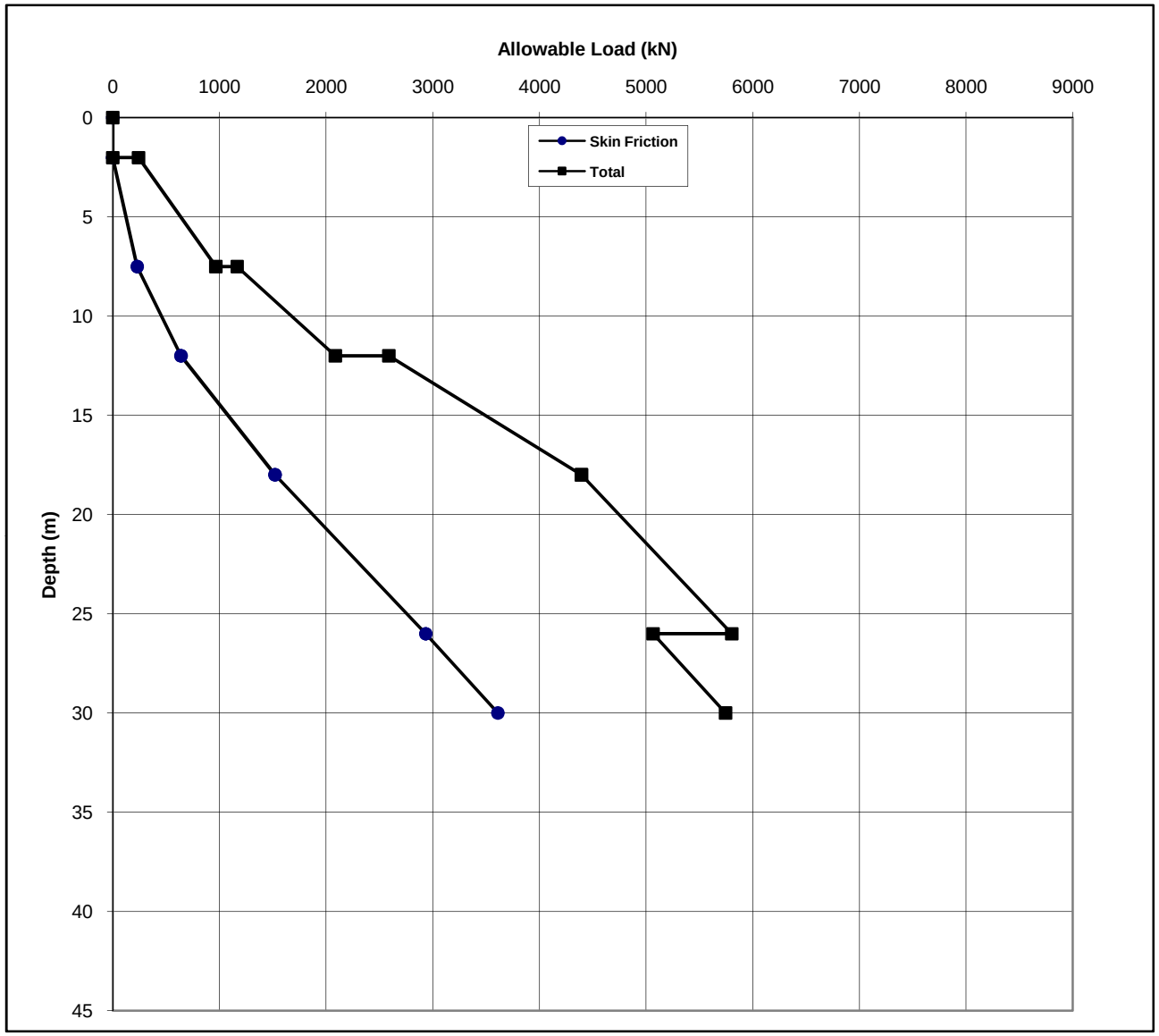
Total settlement = 21.16 mm

Allowable Bearing capacity for 25mm settlement= 100.0 KPa



Allowable Pile Capacity at Major Bridge Ch. 54+825

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



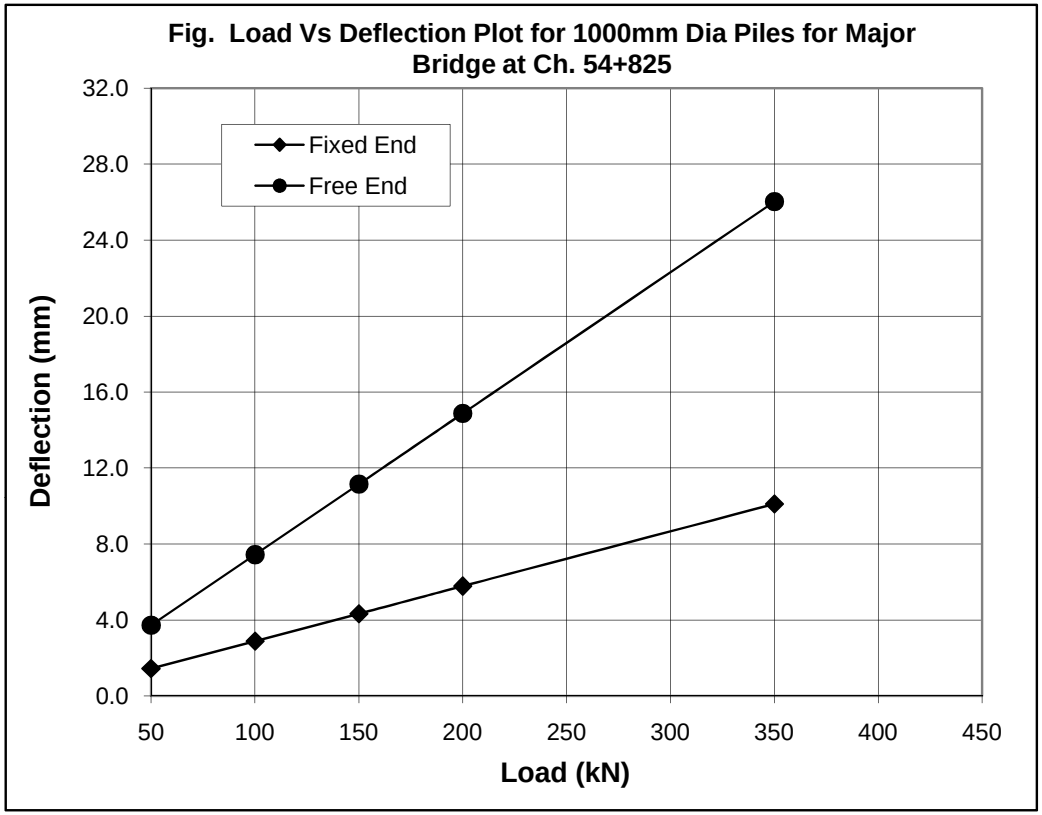
Allowable Pile Capacity at Major Bridge Ch. 54+825

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	350.65	
L_f/T=	2.2	Fixed
L_f (Fixed)=	771.44	cm
L_f/T=	1.9	Free
L_f (Free)=	666.24	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.44	3.72
100	2.89	7.44
150	4.33	11.16
200	5.77	14.88
350	10.10	26.03



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 350kN (for fixed head condition)

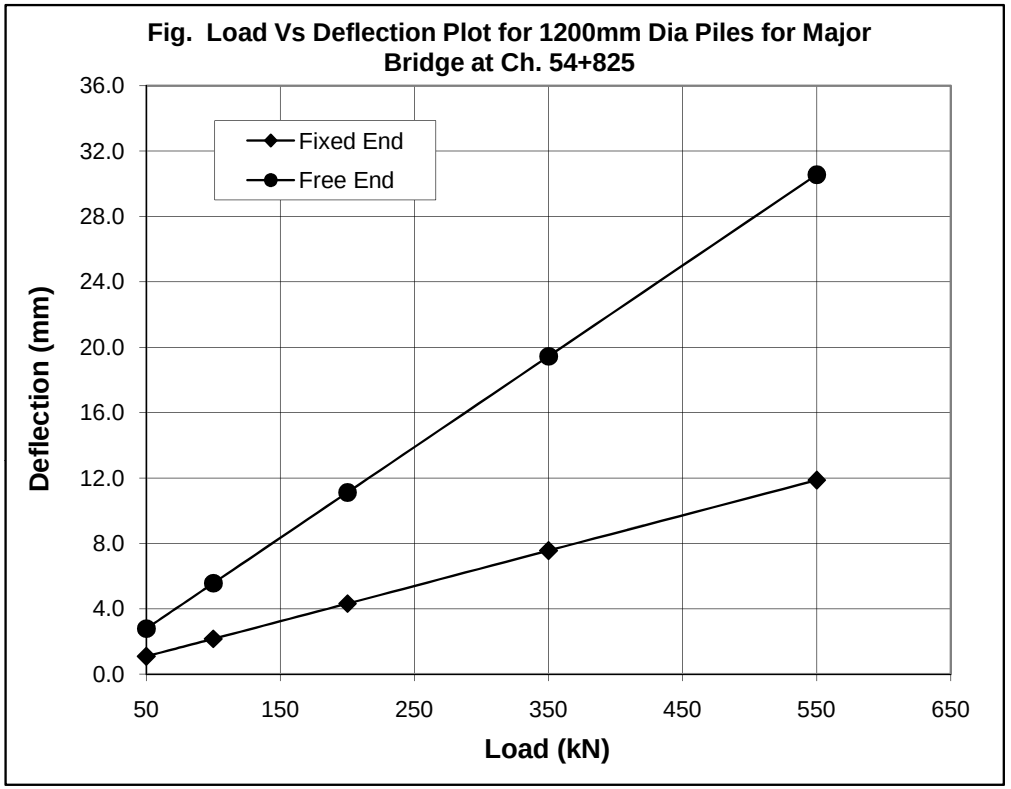
= 130 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 54+825 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	405.72	
L_f/T=	2.2	Fixed
L_f (Fixed)=	892.58	cm
L_f/T=	1.9	Free
L_f (Free)=	770.86	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

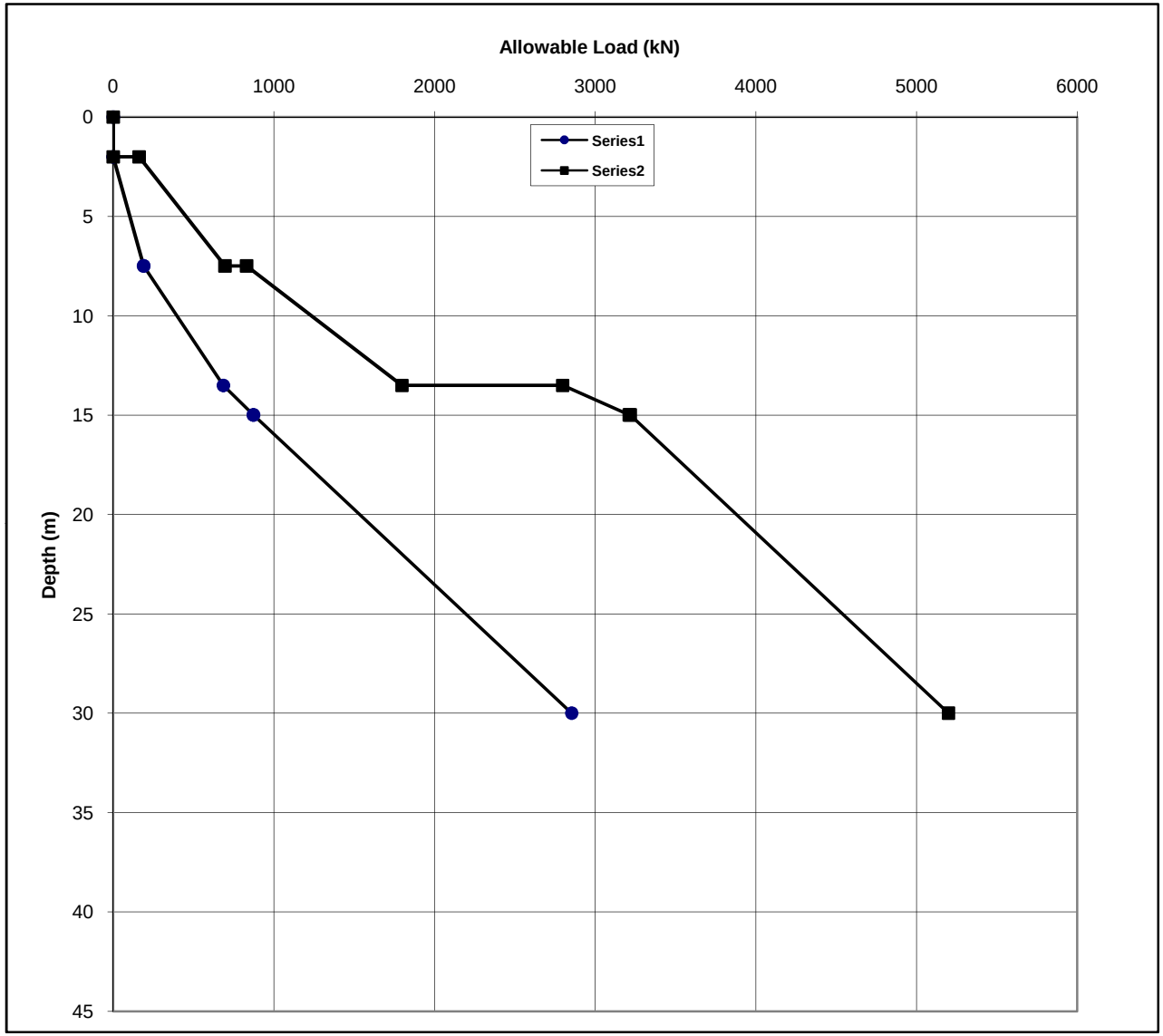
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.08	2.78
100	2.16	5.56
200	4.31	11.11
350	7.55	19.45
550	11.86	30.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

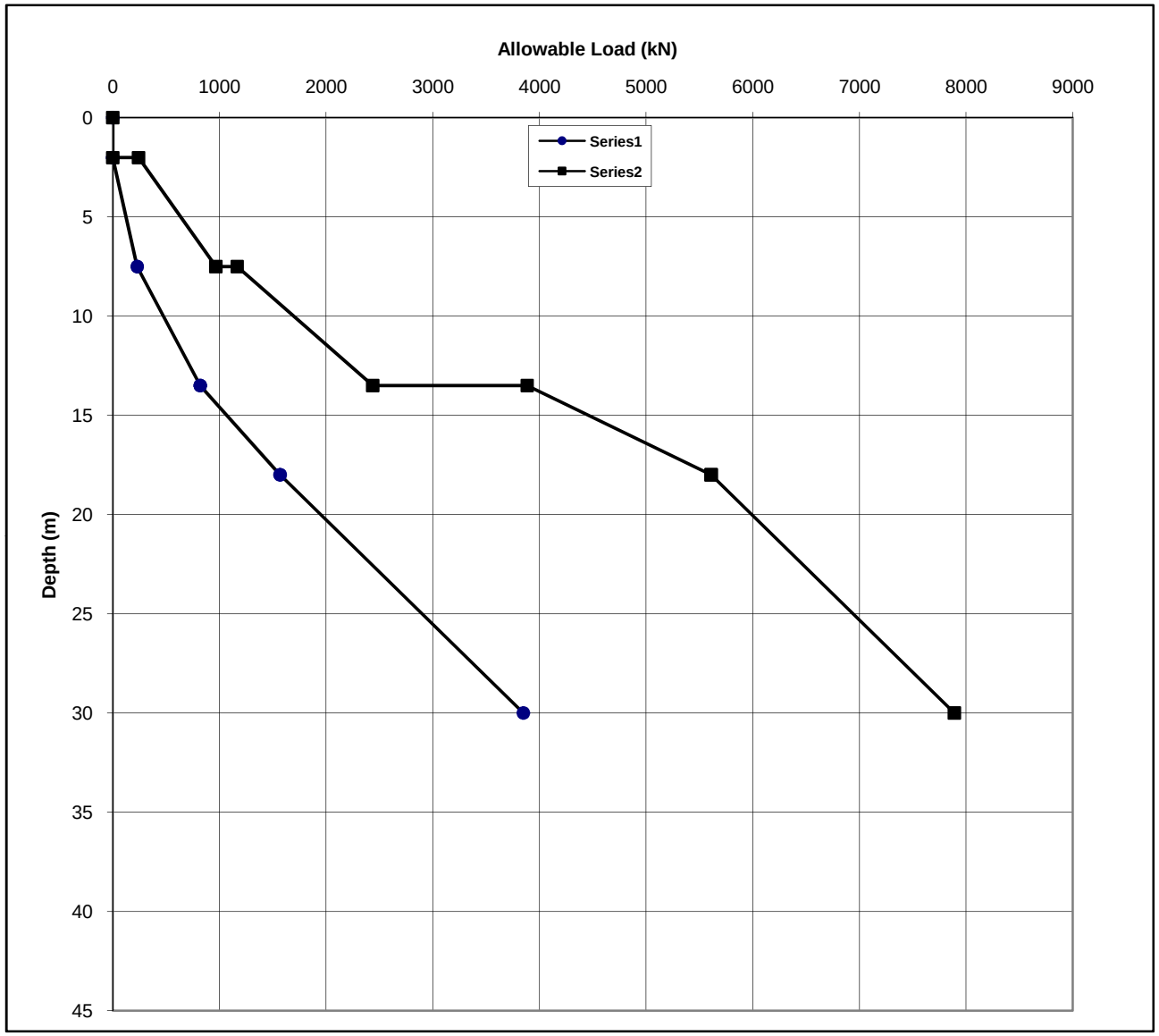
= 550kN (for fixed head condition)

= 210kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 55+850

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



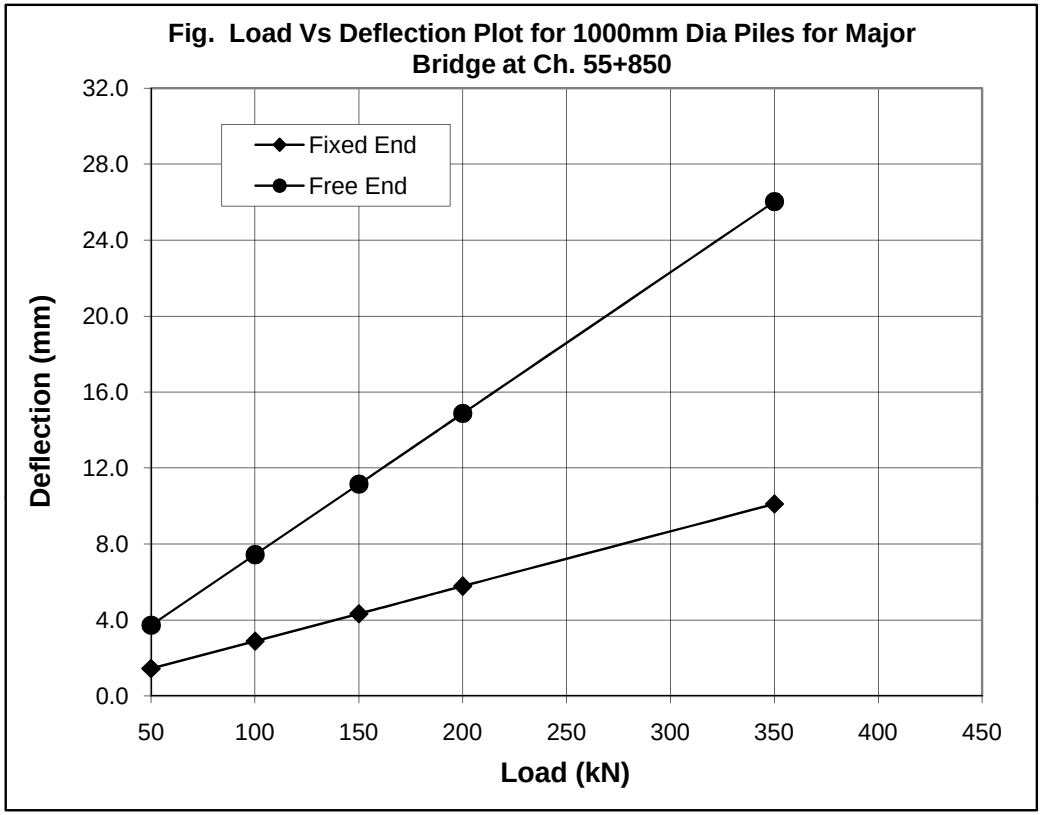
Allowable Pile Capacity at Major Bridge Ch. 55+850

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	350.65	
L_f/T=	2.2	Fixed
L_f (Fixed)=	771.44	cm
L_f/T=	1.9	Free
L_f (Free)=	666.24	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.44	3.72
100	2.89	7.44
150	4.33	11.16
200	5.77	14.88
350	10.10	26.03



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 350kN (for fixed head condition)

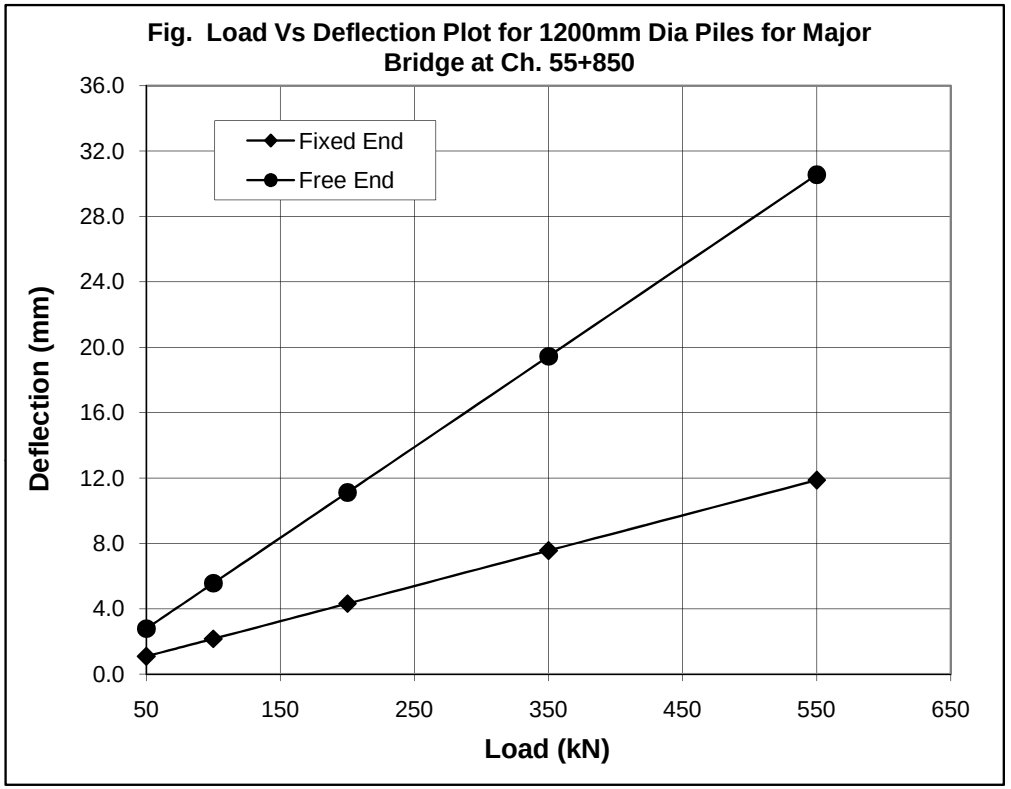
= 130 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 55+850 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	405.72	
L_f/T=	2.2	Fixed
L_f (Fixed)=	892.58	cm
L_f/T=	1.9	Free
L_f (Free)=	770.86	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

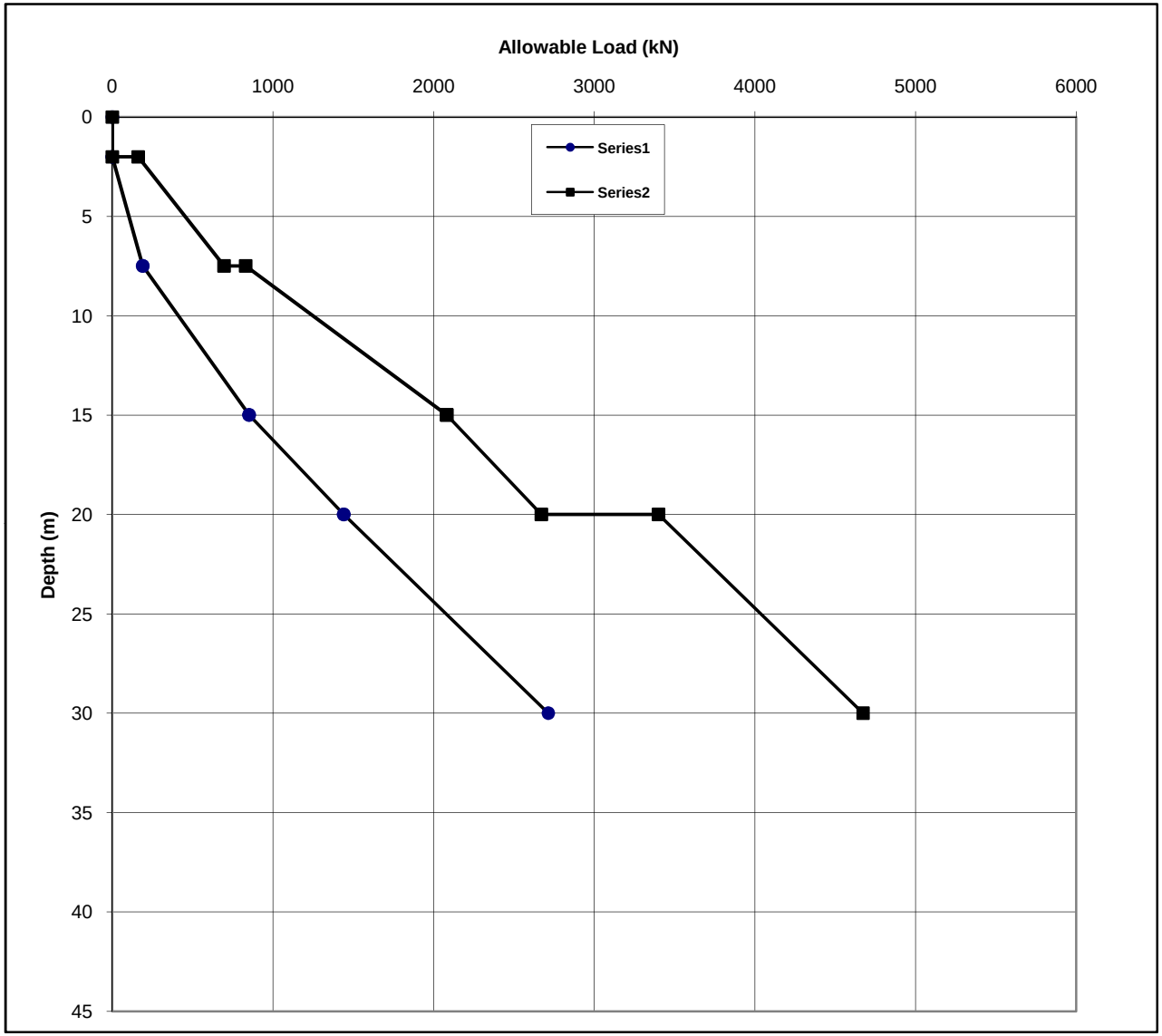
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.08	2.78
100	2.16	5.56
200	4.31	11.11
350	7.55	19.45
550	11.86	30.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

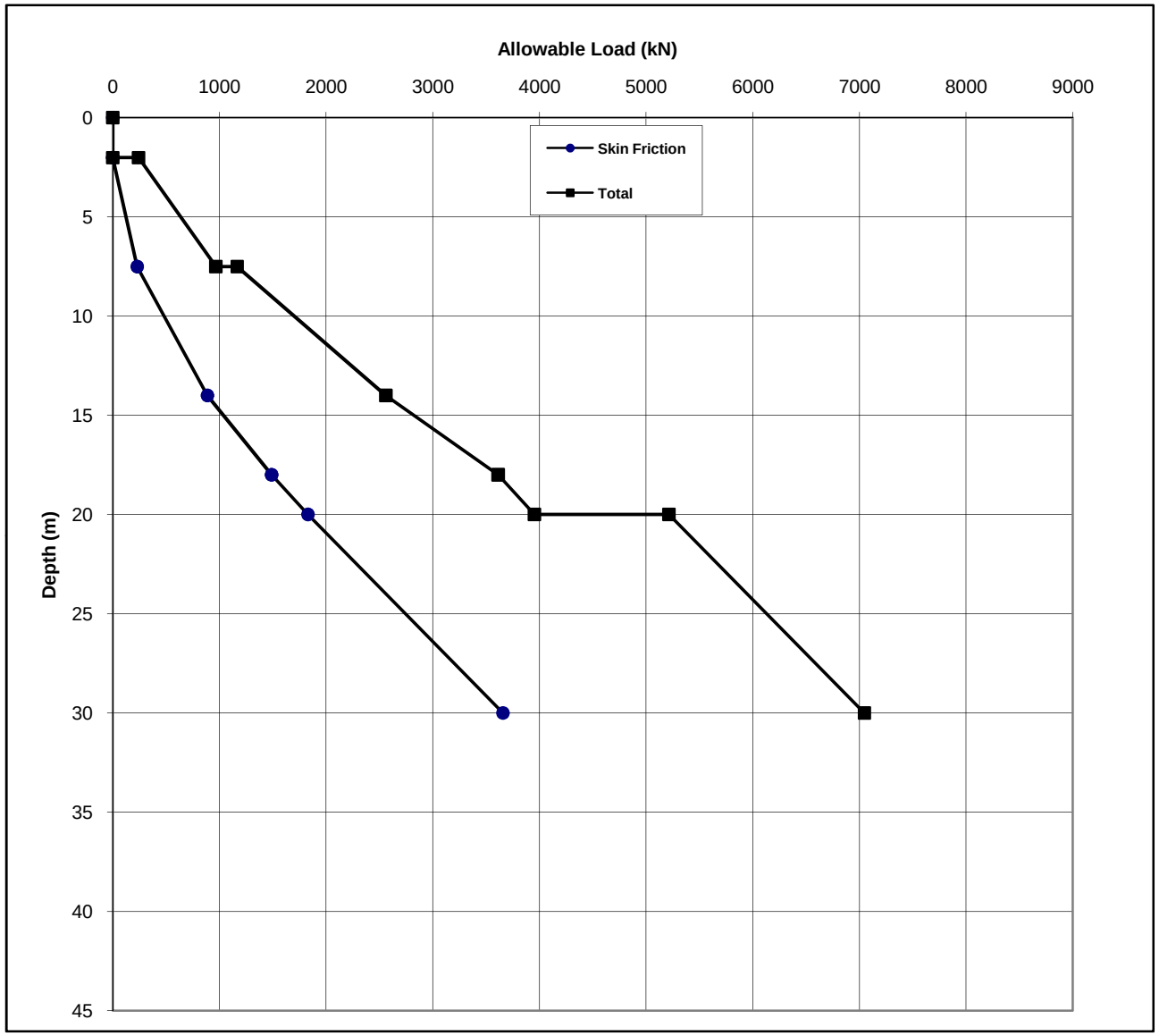
= 550kN (for fixed head condition)

= 210kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 56+780

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity at Major Bridge Ch. 56+780

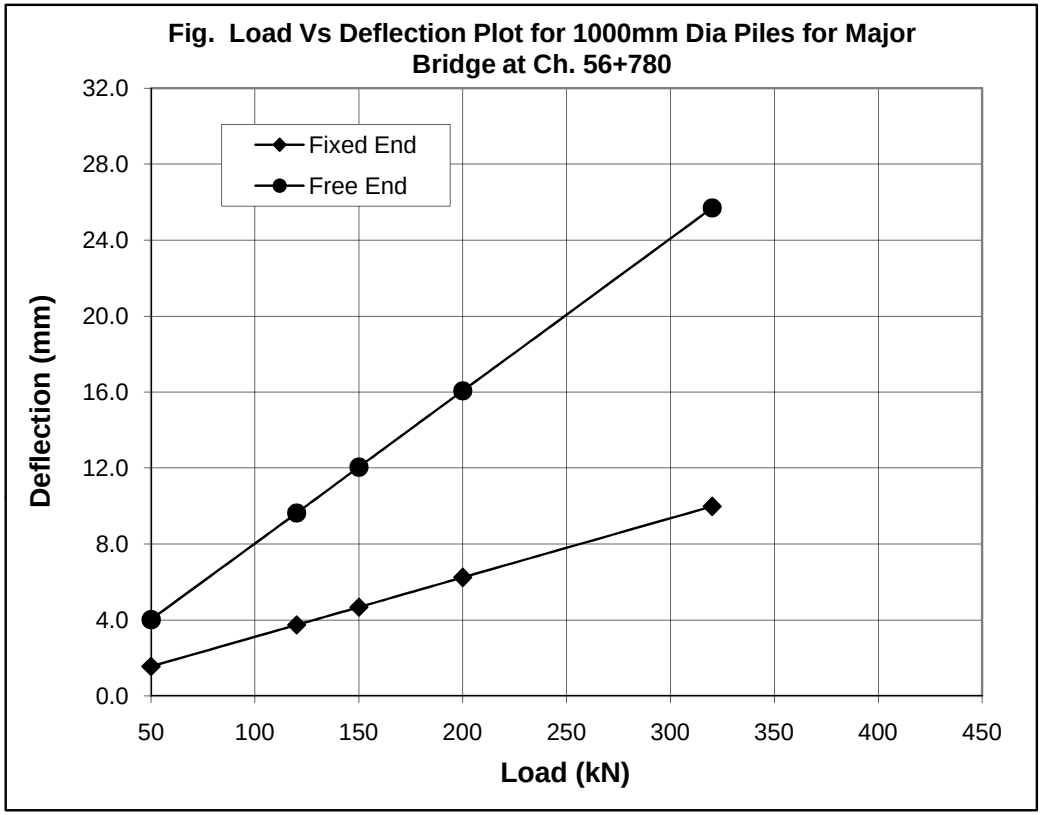
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE AT CH 56+780 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.220	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	359.73	
L_f/T=	2.2	Fixed
L_f (Fixed)=	791.42	cm
L_f/T=	1.9	Free
L_f (Free)=	683.50	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.56	4.02
120	3.74	9.64
150	4.68	12.05
200	6.23	16.06
320	9.97	25.70



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 320kN (for fixed head condition)

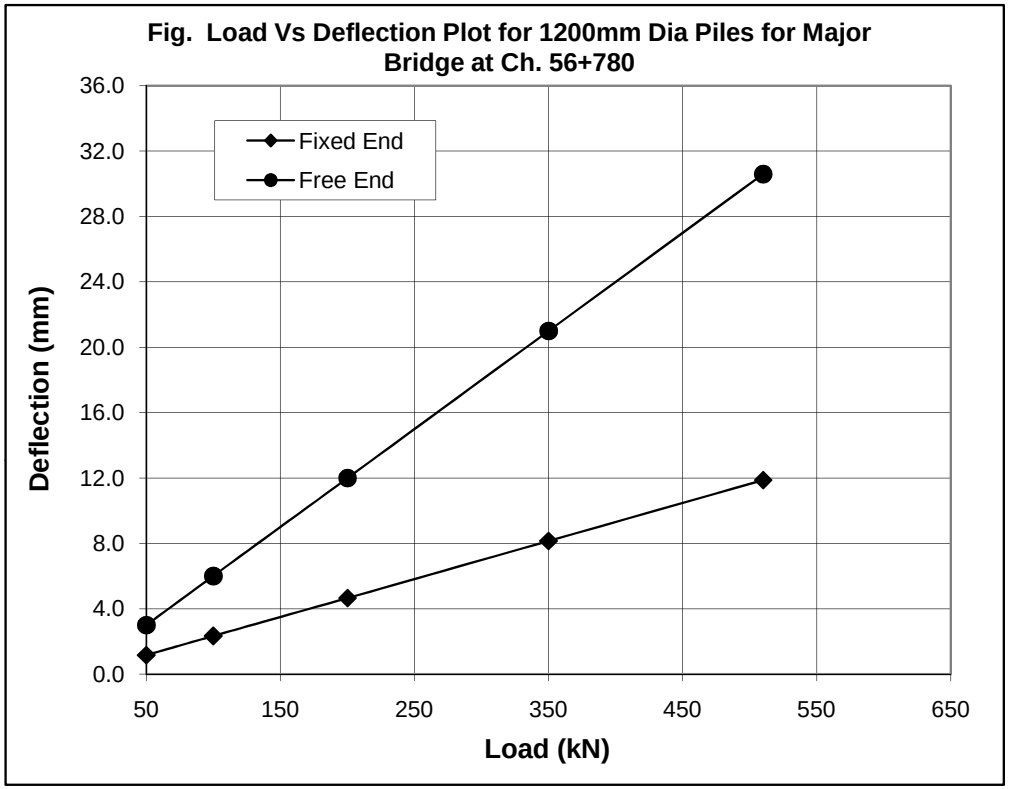
= 120 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 56+780 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.220	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	416.22	
L_f/T=	2.2	Fixed
L_f (Fixed)=	915.69	cm
L_f/T=	1.9	Free
L_f (Free)=	790.83	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

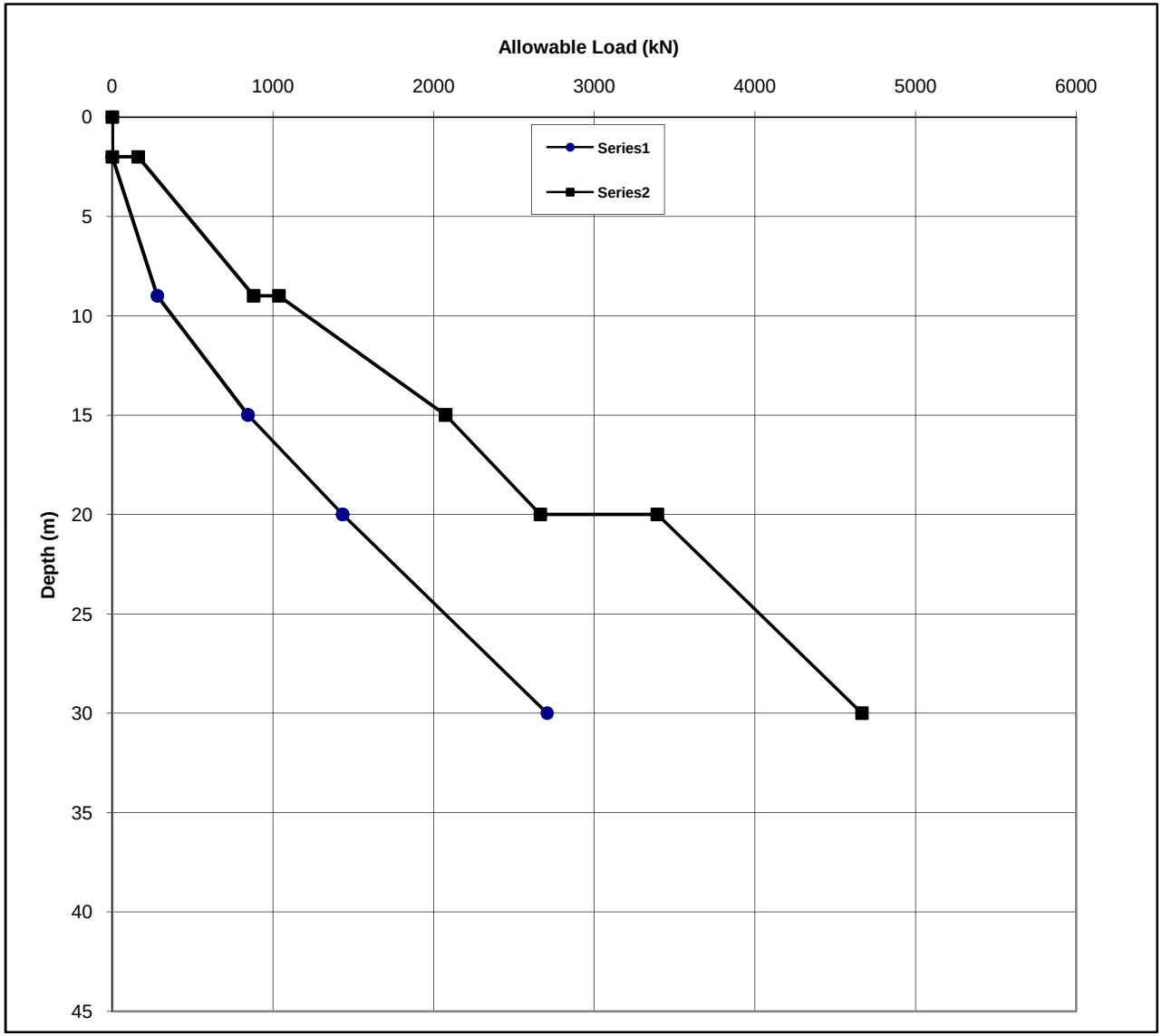
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.16	3.00
100	2.33	6.00
200	4.66	12.00
350	8.15	21.00
510	11.87	30.59



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

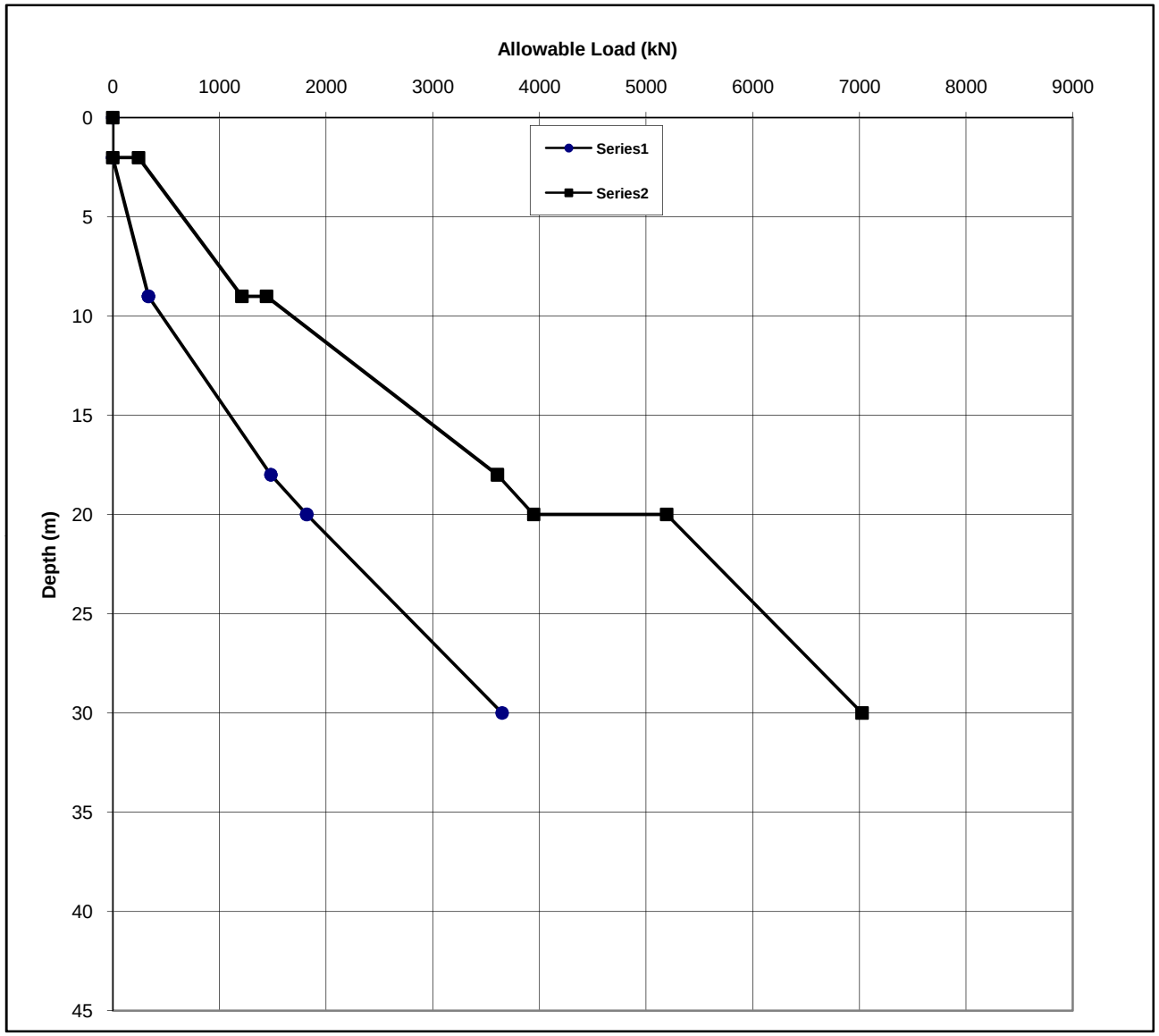
= 510kN (for fixed head condition)

= 200kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 57+555

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



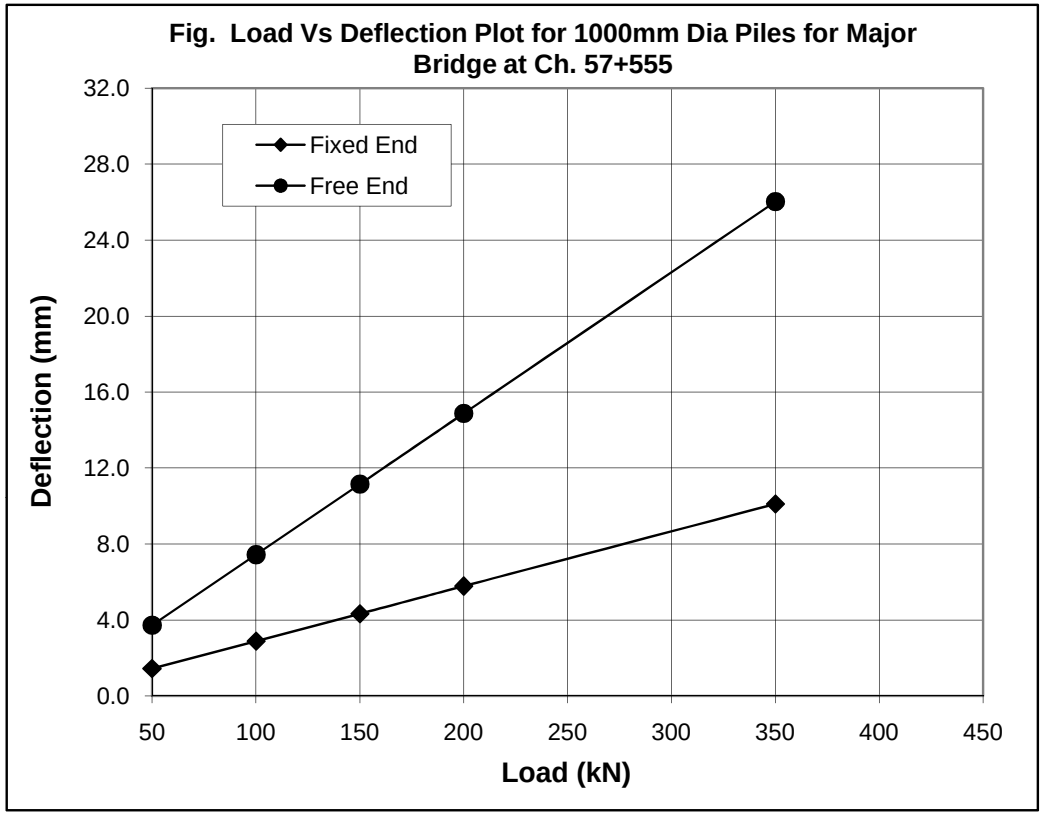
Allowable Pile Capacity at Major Bridge Ch. 57+555

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	350.65	
L_f/T=	2.2	Fixed
L_f (Fixed)=	771.44	cm
L_f/T=	1.9	Free
L_f (Free)=	666.24	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.44	3.72
100	2.89	7.44
150	4.33	11.16
200	5.77	14.88
350	10.10	26.03



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 350kN (for fixed head condition)

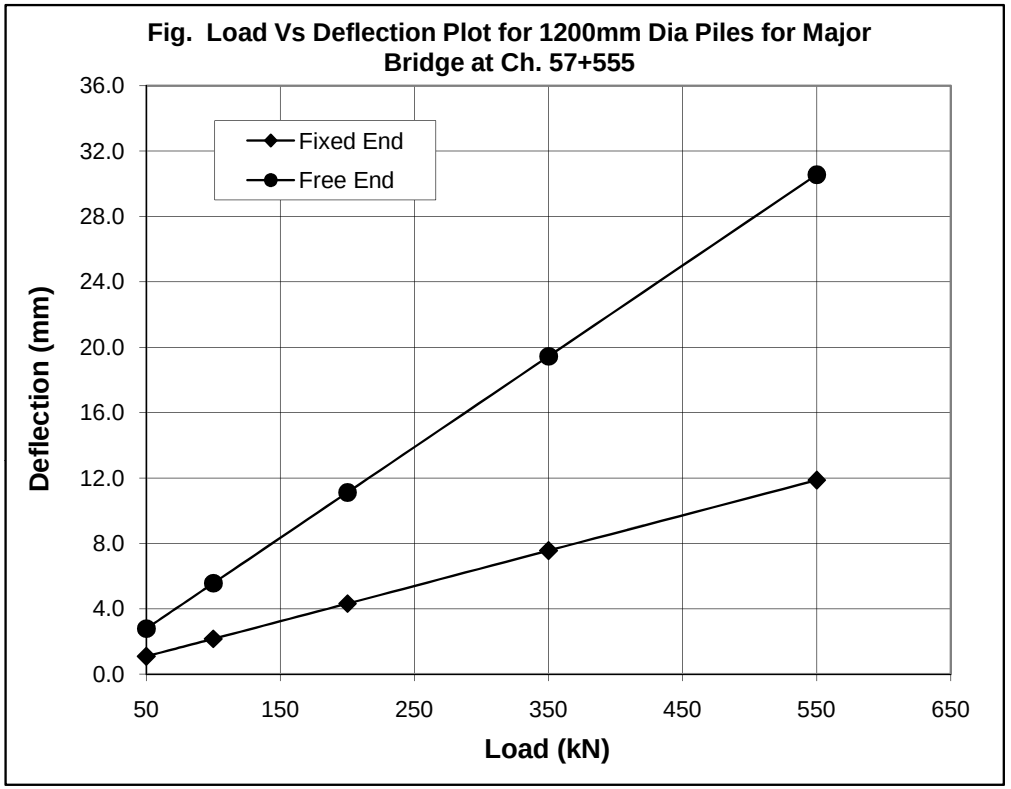
= 130 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 57+555 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	405.72	
L_f/T=	2.2	Fixed
L_f (Fixed)=	892.58	cm
L_f/T=	1.9	Free
L_f (Free)=	770.86	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

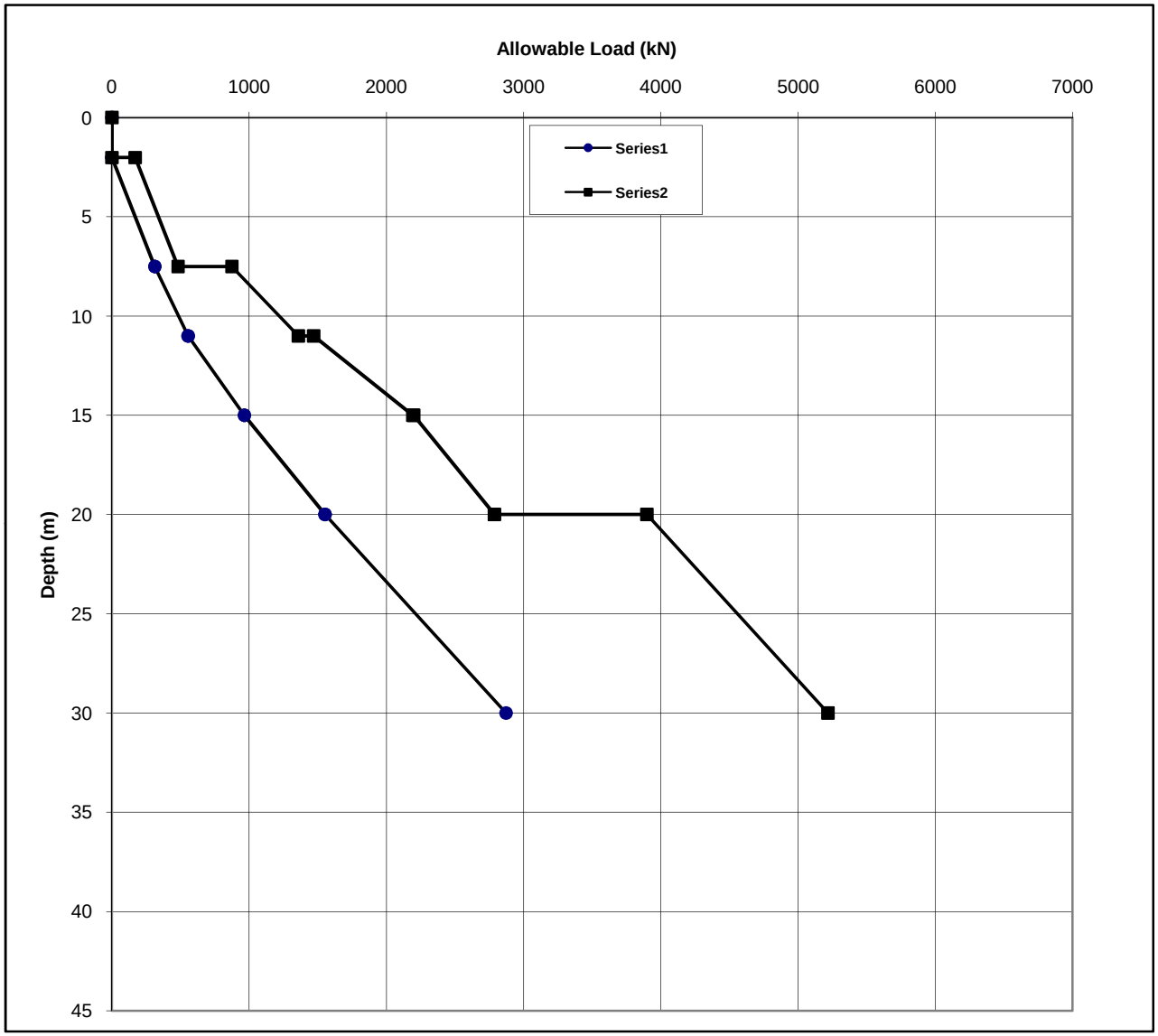
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.08	2.78
100	2.16	5.56
200	4.31	11.11
350	7.55	19.45
550	11.86	30.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

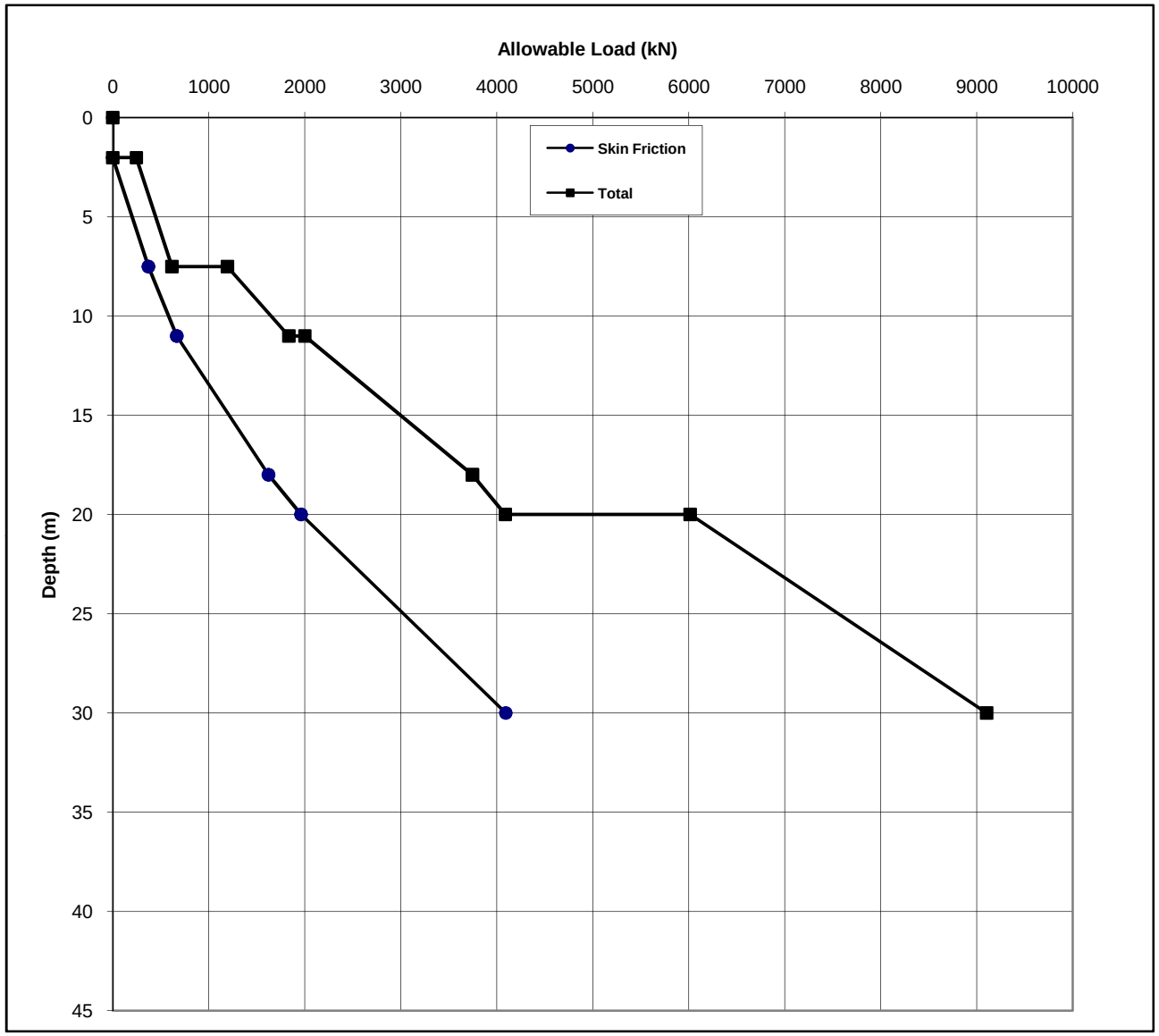
= 550kN (for fixed head condition)

= 210kN (for free head condition)



Allowable Pile Capacity Major Bridge at Chainage 58+400

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity Major Bridge at Chainage 58+400

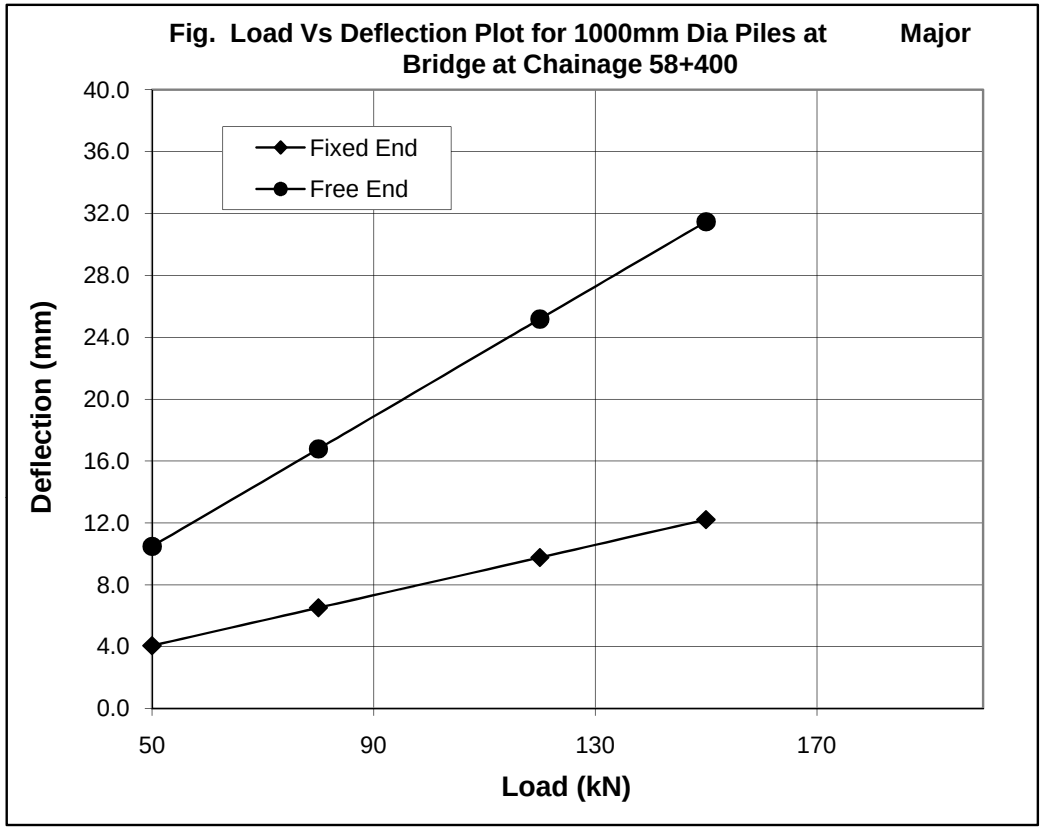
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 58+400 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
K_1	1.100	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.22	kg/cm^3

T=	(EI/KB)^0.25	
	495.42	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1089.93	cm
L_f/T=	1.9	Free
L_f (Free)=	941.31	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	4.07	10.49
80	6.51	16.78
120	9.77	25.17
150	12.21	31.47



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 120kN (for fixed head condition)

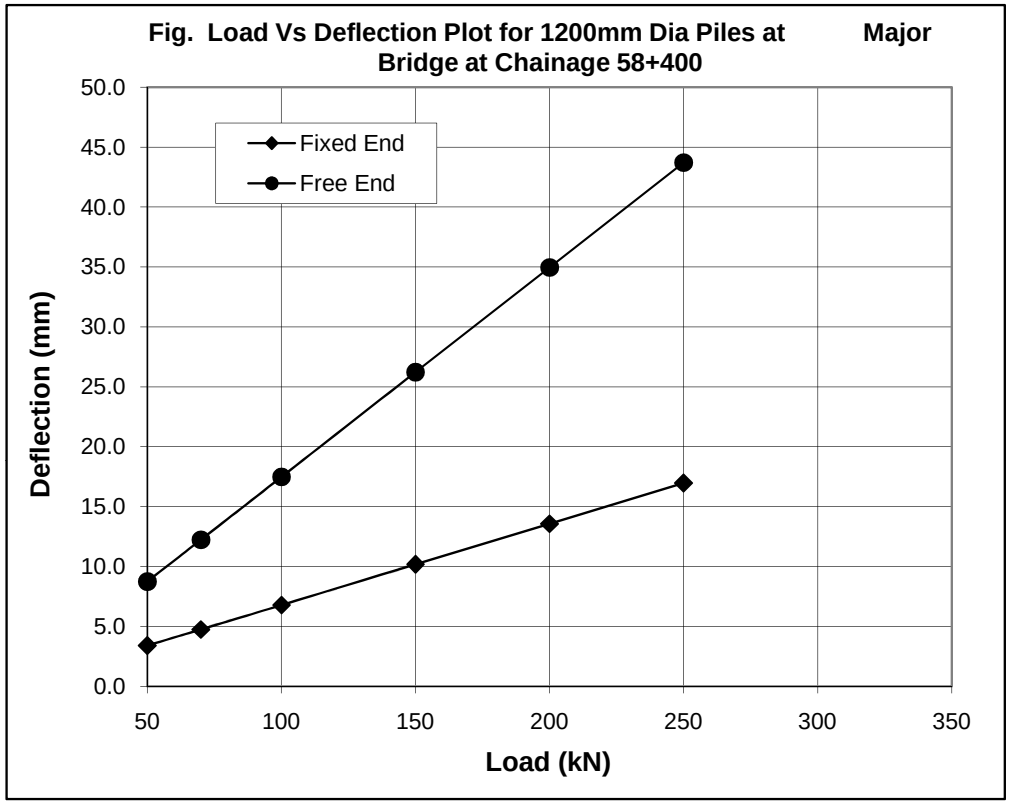
= 50 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 58+400 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.100	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.183333333	kg/cm^3

T=	(EI/KB)^0.25	
	594.51	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1307.92	cm
L_f/T=	1.9	Free
L_f (Free)=	1129.57	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.39	8.74
70	4.75	12.24
100	6.78	17.48
150	10.18	26.22
200	13.57	34.96
250	16.96	43.70



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

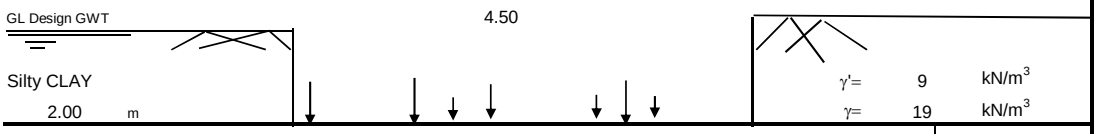
= 180kN (for fixed head condition)

= 70kN (for free head condition)

Calculation for Bearing Capacity at Minor Bridge CH 59+305

Footing Size: 5.5x4.5 m

Depth : 2.00 m



Layer - I		Silty	CLAY		Z_1
		N_{av}=	10		
		ϕ_{av}=	0	degree	
		c_{av}=	50	kPa	
		γ_{av}=	9	kN/m^3	
	4.50 m				
		Silty	SAND		
Layer - II		N_{av}=	24		……Z_2
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
	8.00 m	γ_{av}=	10	kN/m^3	
		silty	CLAY		
Layer - III		N_{av}=	30		Z_3
		ϕ_{av}=	0	degree	
		c_{av}=	130	kPa	
	12.00 m	γ_{av}=	10	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 0 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5		
N_c=	5.14	N_q=	1		N_γ=	0.00	Local shear failure
S_c=	1.164	S_q=	1.164		S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.09		
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.04		
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=	1.00	α=0
Q_{safe-I}=		**130.3**	**kPa**				

Design Bearing Capacity= **130** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= 0.00014 m2/kN μ_g= 0.7

δ (mm)= $[2.303*(H/C)*\log_{10}((p_o+\Delta p)/p_o)]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 0.0 C_{kd}/N= KN/m^2 1st layer I = 0.92

p_o= 13.25 p= 130.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_1 (mm)= 20.63

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) — for clay

m_v= m2/kN — μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) — for sand — IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 186.2 — C_{kd}/N= 300 KN/m^2 — 2nd layer I = 0.36

p_o= 58 — p= 130.0 kPa

Rigidity factor= 0.8 — Depth Factor, d_f= 0.88

δ_2 (mm)= 7.83

Settlement for Layer-III

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) — for clay

m_v= 0.00005 m2/kN — μ_g= 0.7

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) — for sand — IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 0.0 — C_{kd}/N= KN/m^2 — 3RD layer I = 0.152

p_o= 95.5 — p= 130.0 kPa

Rigidity factor= 0.8 — Depth Factor, d_f= 0.88

δ_3 (mm)= 1.95

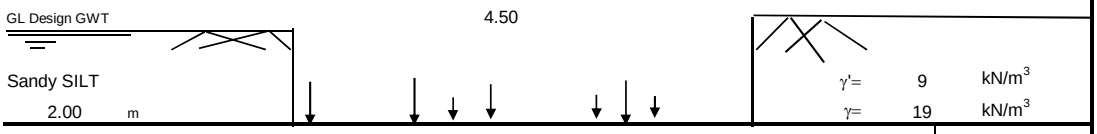
Total settlement = 30.40 mm

Allowable Bearing capacity for 25mm settlement= 107.1 KPa

Calculation for Bearing Capacity at Minor Bridge CH 62+160

Footing Size: 5.5x4.5 m

Depth : 2.00 m



Layer - I		Sandy	SILT		Z_1
		N_{av}=	8		
		ϕ_{av}=	0	degree	
		c_{av}=	0	kPa	
		γ_{av}=	9	kN/m^3	
4.50	m				
		Silty	SAND		
Layer - II		N_{av}=	19		……Z_2
		ϕ_{av}=	31	degree	
		c_{av}=	0	kPa	
8.00	m	γ_{av}=	10	kN/m^3	
		Sandy	SILT		
Layer - III		N_{av}=	34		Z_3
		ϕ_{av}=	33	degree	
		c_{av}=	0	kPa	
12.00	m	γ_{av}=	10	kN/m^3	

Safe Bearing Capacity from Shear Failure

Design ϕ= 28 degree

For Layer - I

As ϕ is 30° local failure is considered

Q(safe)= $(cN_cs_cd_ci_c+(\gamma*D)(N_q-1)s_qd_qi_q+0.5B\gamma N_\gamma s_\gamma d_\gamma i_{\gamma W}/FS$

FS=	2.5			w=	0.5			
N_c=	14.83	N_q=	6.4			N_γ=	5.39	Local shear failure
S_c=	1.164	S_q=	1.164			S_γ=	0.67	
dc=	1+0.2*(D/B)*tan(45+φ/2)=				1.09			
dq=dγ=	1+0.1*(D/B)*tan(45+φ/2)				1.04			
ic=iq=	(1-α/90)^2=	1.00		ig=	(1-α/φ)^2=		1.00	α=0
Q_{safe-I}=		**79.7**	**kPa**					

Design Bearing Capacity= **80** **kPa**

Settlement for Layer - I

δ (mm) = $m_v*H*\Delta p*\mu_g*d_f$*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= $[2.303*(H/C)*\log_{10}((p_o+\Delta p)/p_o)]*d_f$*Rigidity Factor (0.8) for sand

C=1.5*(C_{kd}/p_o)= 226.4 C_{kd}/N= 250 KN/m^2 1st layer I = 0.92

p_o= 13.25 p= 80.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_1 (mm)= 14.62

Settlement for Layer-II

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= m2/kN μ_g=

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 147.4 C_{kd}/N= 300 KN/m^2 2nd layer I = 0.36

p_o= 58 p= 80.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_2 (mm)= 6.74

Settlement for Layer-III

δ (mm) = m_v*H*Δp*μ_g*d_f*Rigidity Factor (0.8) for clay

m_v= 0.00005 m2/kN μ_g= 0.7

δ (mm)= [2.303*(H/C)*$\log_{10}${(p_o+Δp)/p_o}]*d_f*Rigidity Factor (0.8) for sand IS:8009 (Part I)

C=1.5*(C_{kd}/p_o)= 133.5 C_{kd}/N= 250 KN/m^2 3RD layer I = 0.152

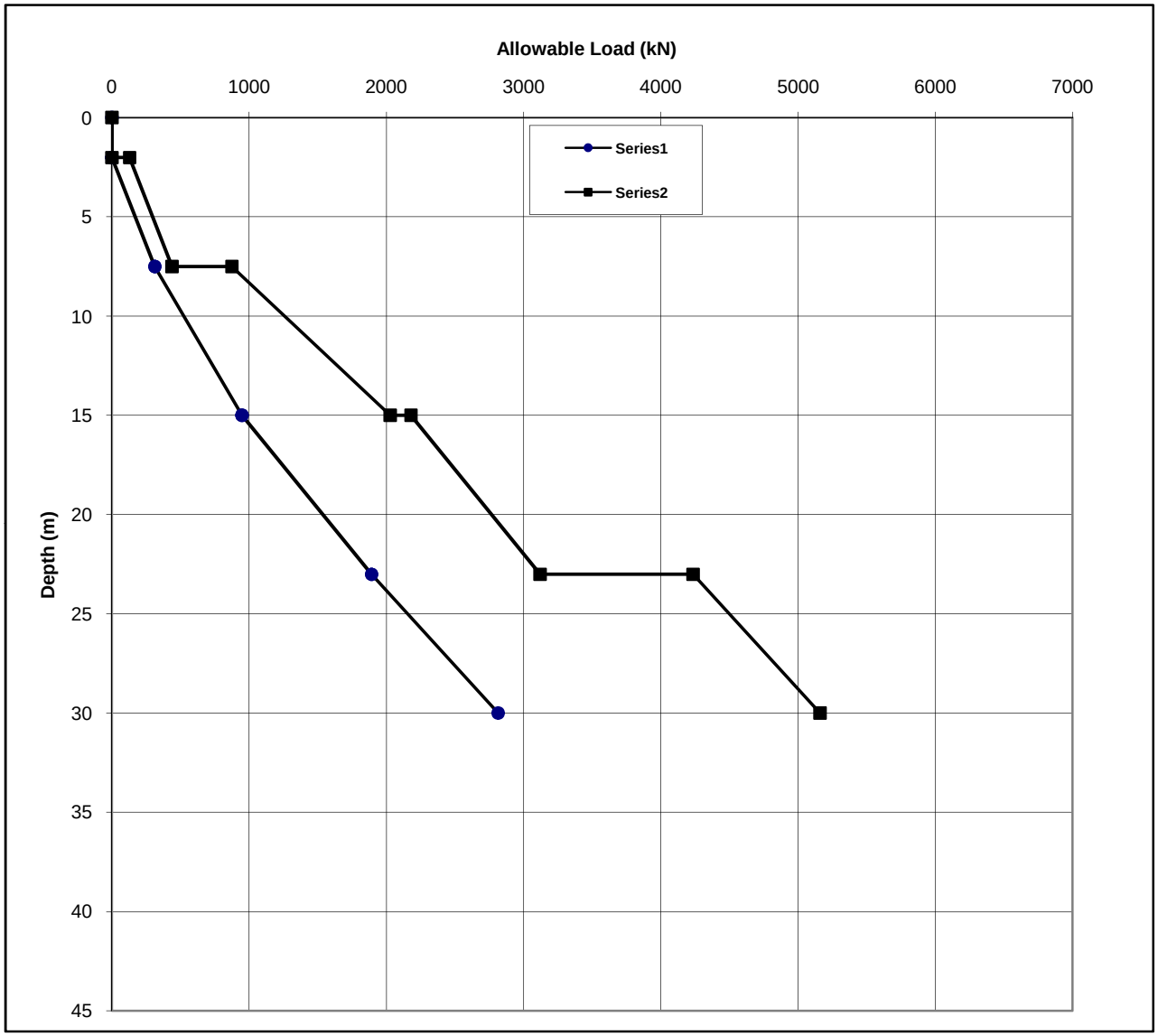
p_o= 95.5 p= 80.0 kPa

Rigidity factor= 0.8 Depth Factor, d_f= 0.88

δ_3 (mm)= 2.53

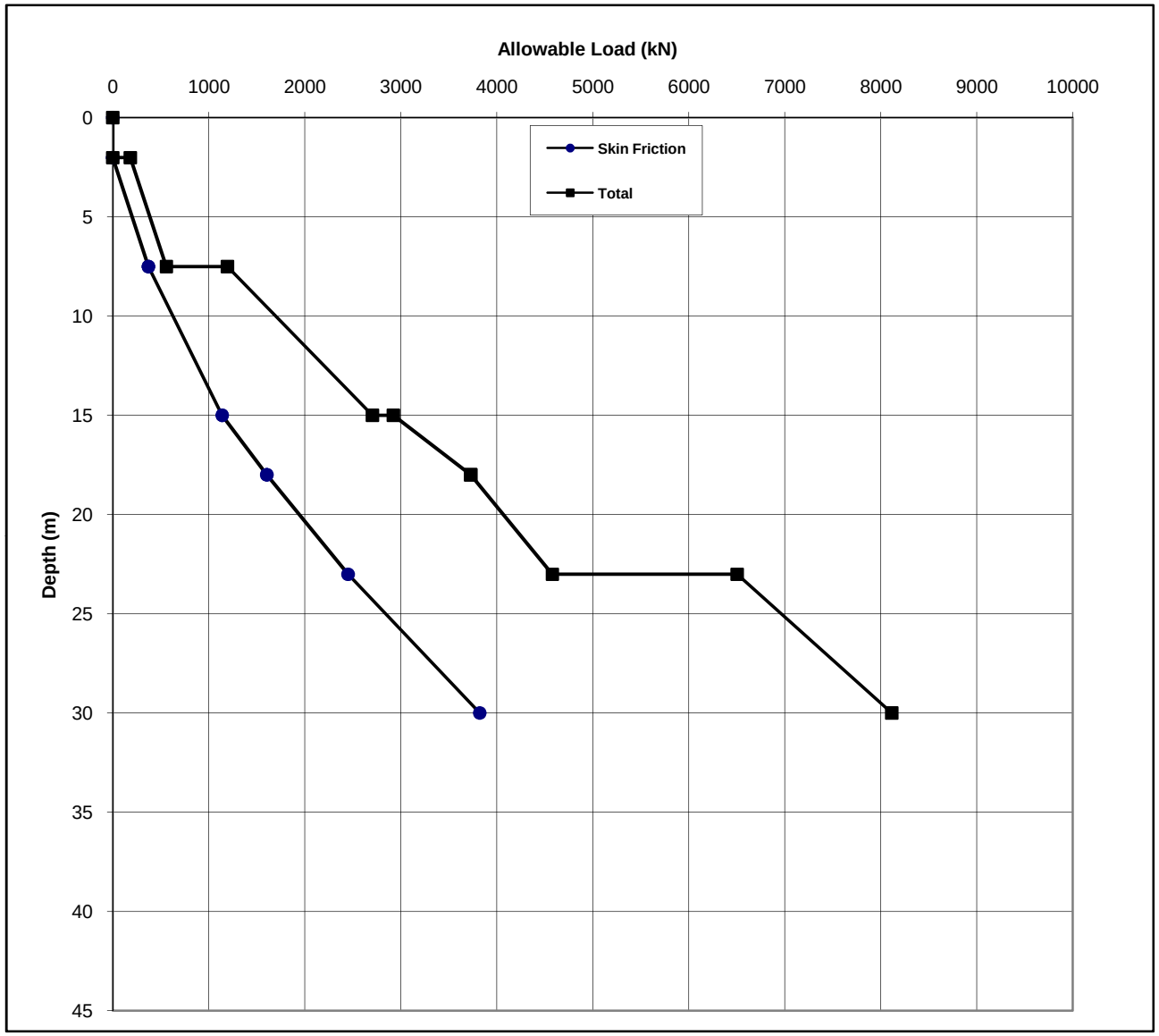
Total settlement = 23.88 mm

Allowable Bearing capacity for 25mm settlement= 80.0 KPa



Allowable Pile Capacity Major Bridge at Chainage 63+570

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity Major Bridge at Chainage 63+570

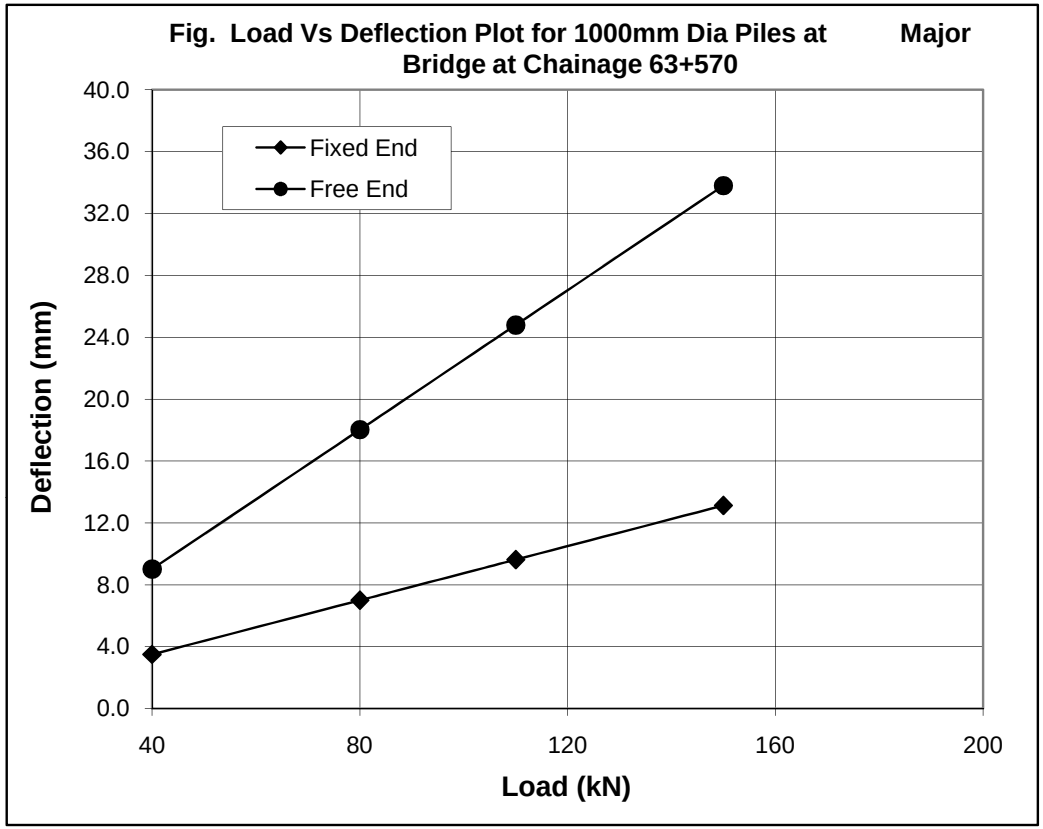
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 63+570 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
K_1	1.000	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.2	kg/cm^3

T=	(EI/KB)^0.25	
	507.37	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1116.22	cm
L_f/T=	1.9	Free
L_f (Free)=	964.01	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
40	3.50	9.01
80	7.00	18.02
110	9.62	24.78
150	13.12	33.80



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 110kN (for fixed head condition)

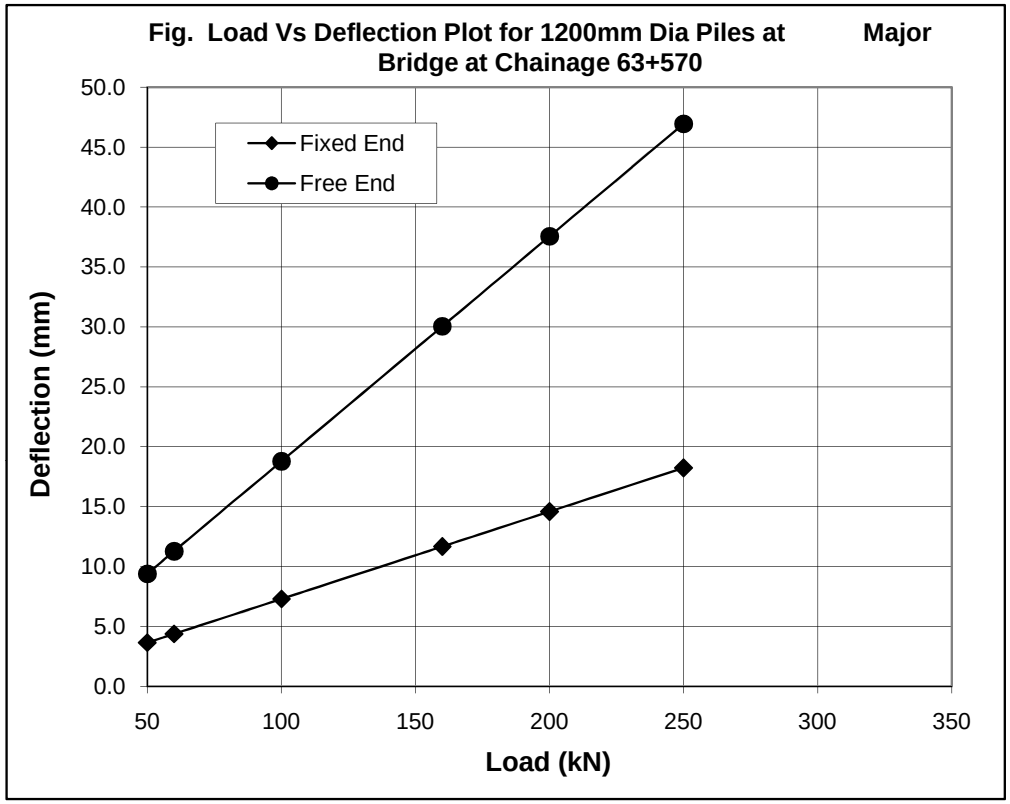
= 40 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE AT MAJOR BRIDGE CHAINAGE 63+570 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
K_1	1.000	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	$kg\text{-}cm^2$
K=(K1*0.3)/(1.5B)	0.166666667	kg/cm^3

T=	(EI/KB)^0.25	
	608.85	
L_f/T=	2.2	Fixed
L_f (Fixed)=	1339.46	cm
L_f/T=	1.9	Free
L_f (Free)=	1156.81	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

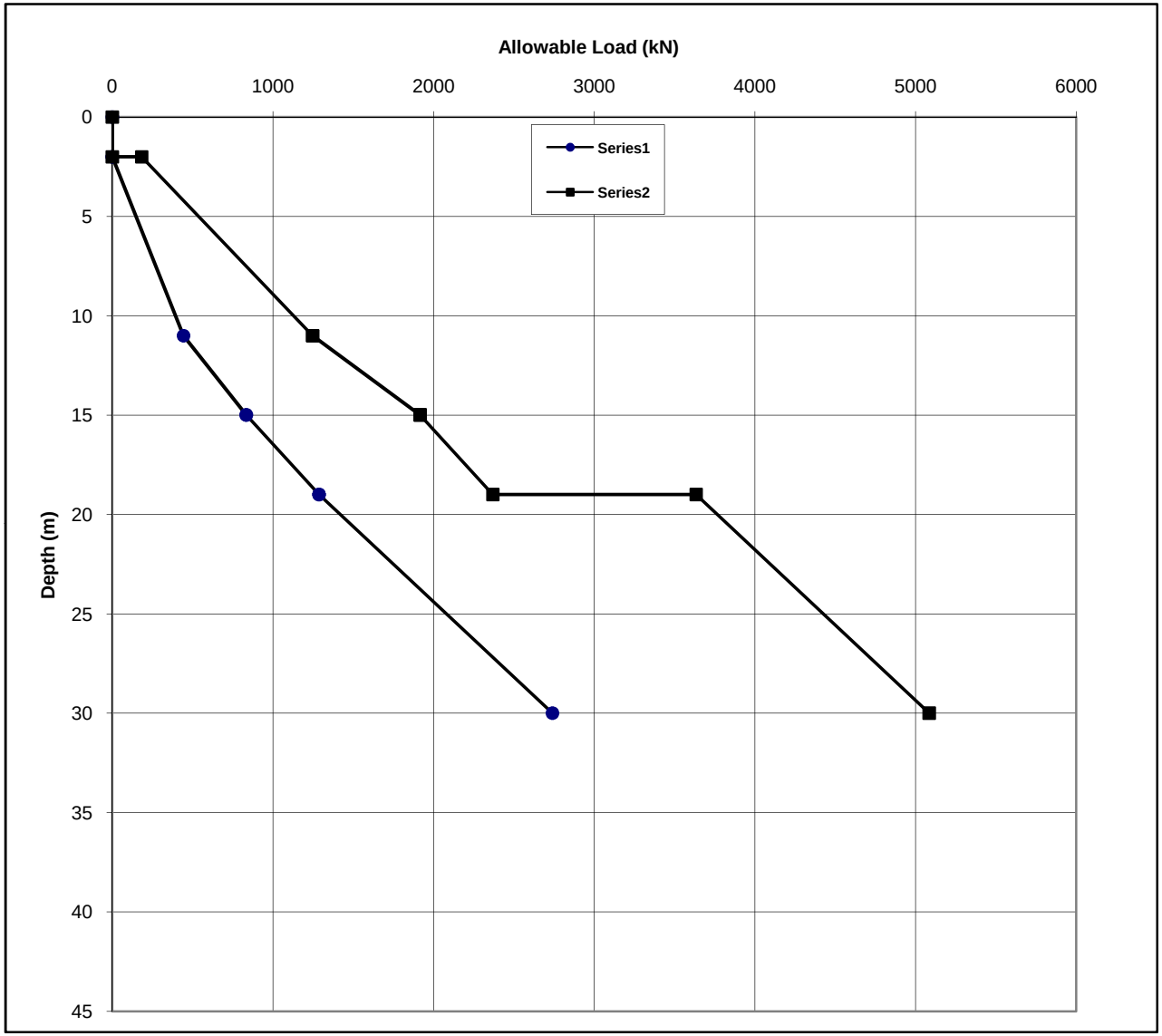
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	3.64	9.39
60	4.37	11.27
100	7.29	18.78
160	11.66	30.04
200	14.57	37.55
250	18.22	46.94



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

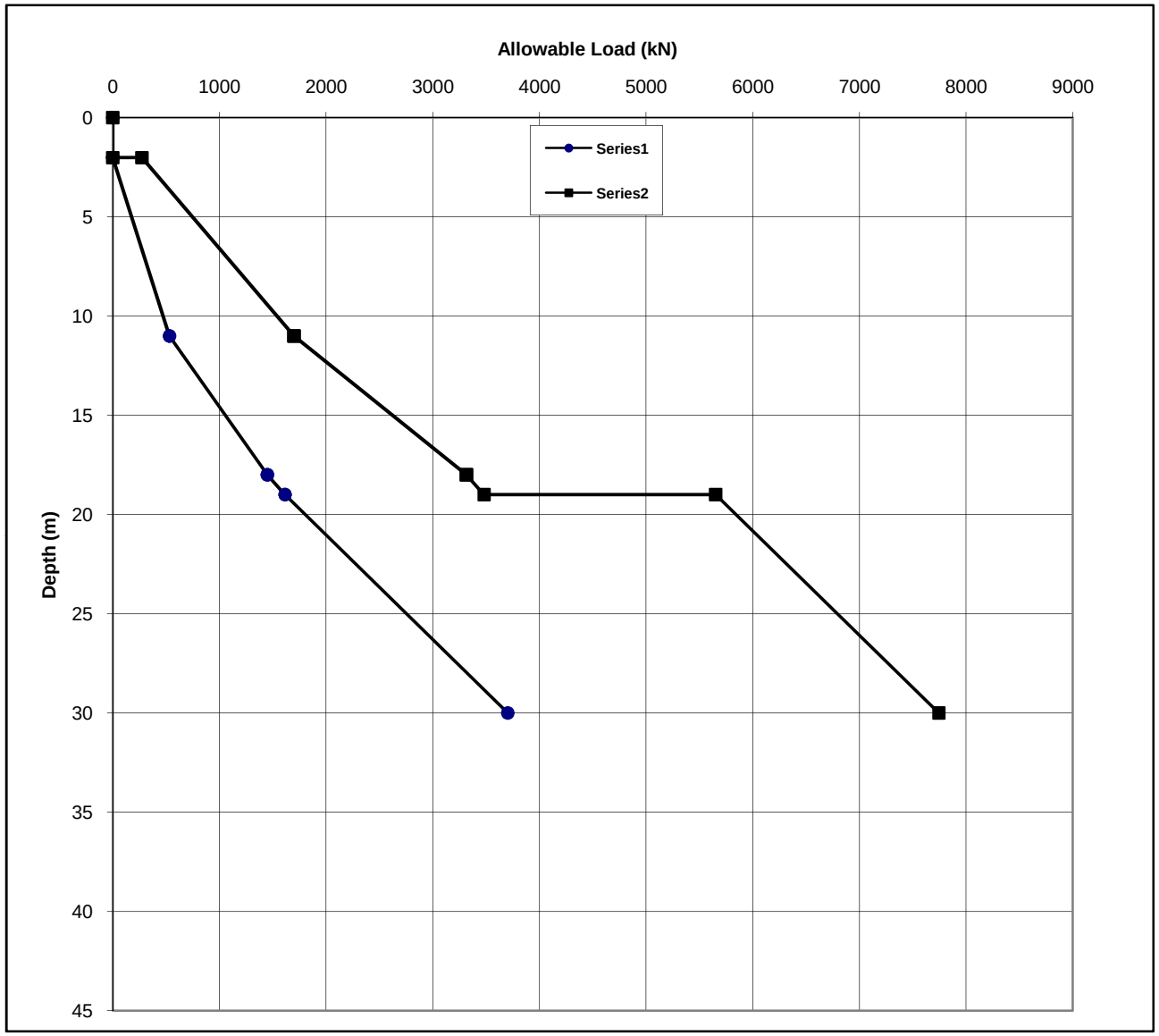
= 160kN (for fixed head condition)

= 60kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 64+270

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



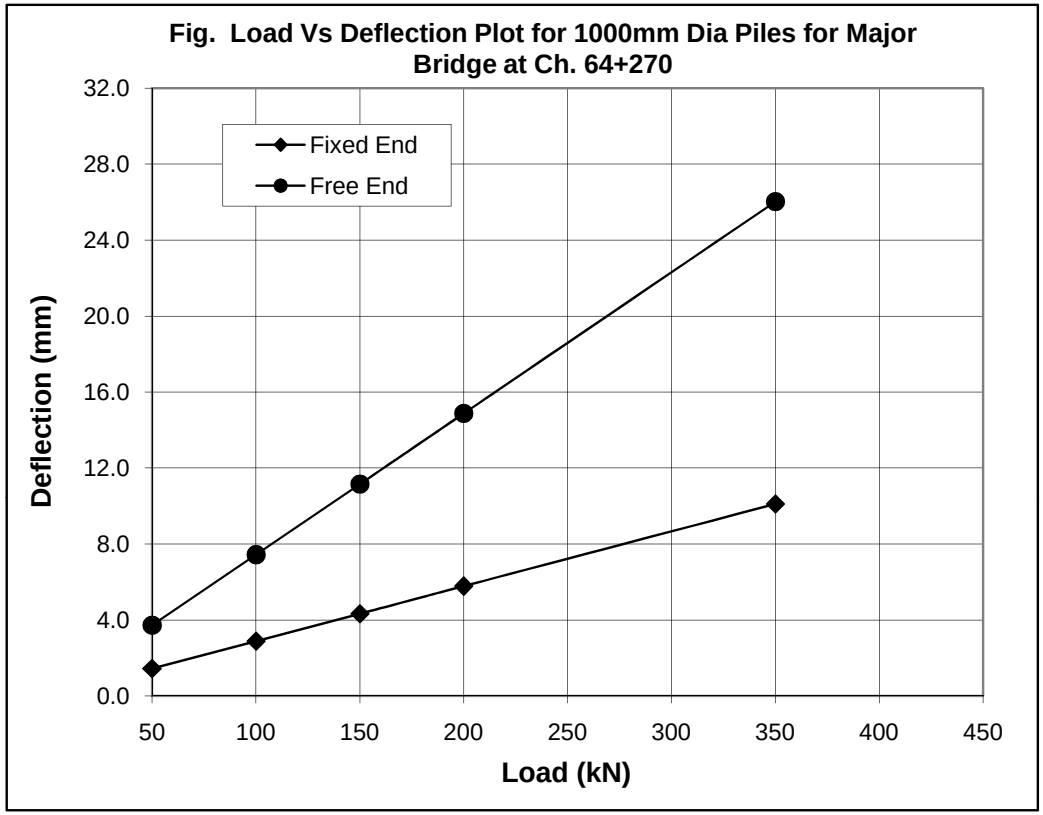
Allowable Pile Capacity at Major Bridge Ch. 64+270

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

D=	**100**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	350.65	
L_f/T=	2.2	Fixed
L_f (Fixed)=	771.44	cm
L_f/T=	1.9	Free
L_f (Free)=	666.24	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.44	3.72
100	2.89	7.44
150	4.33	11.16
200	5.77	14.88
350	10.10	26.03



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

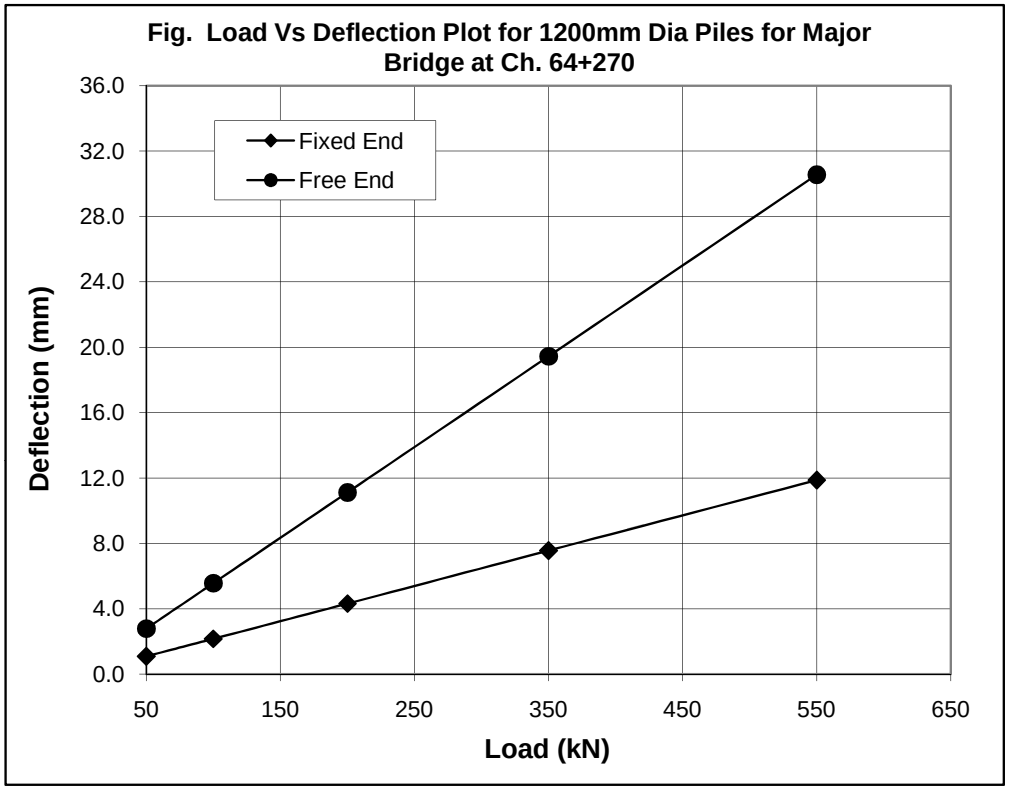
= 350kN (for fixed head condition)

= 130 kN (for free head condition)

D=	**120**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	405.72	
L_f/T=	2.2	Fixed
L_f (Fixed)=	892.58	cm
L_f/T=	1.9	Free
L_f (Free)=	770.86	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

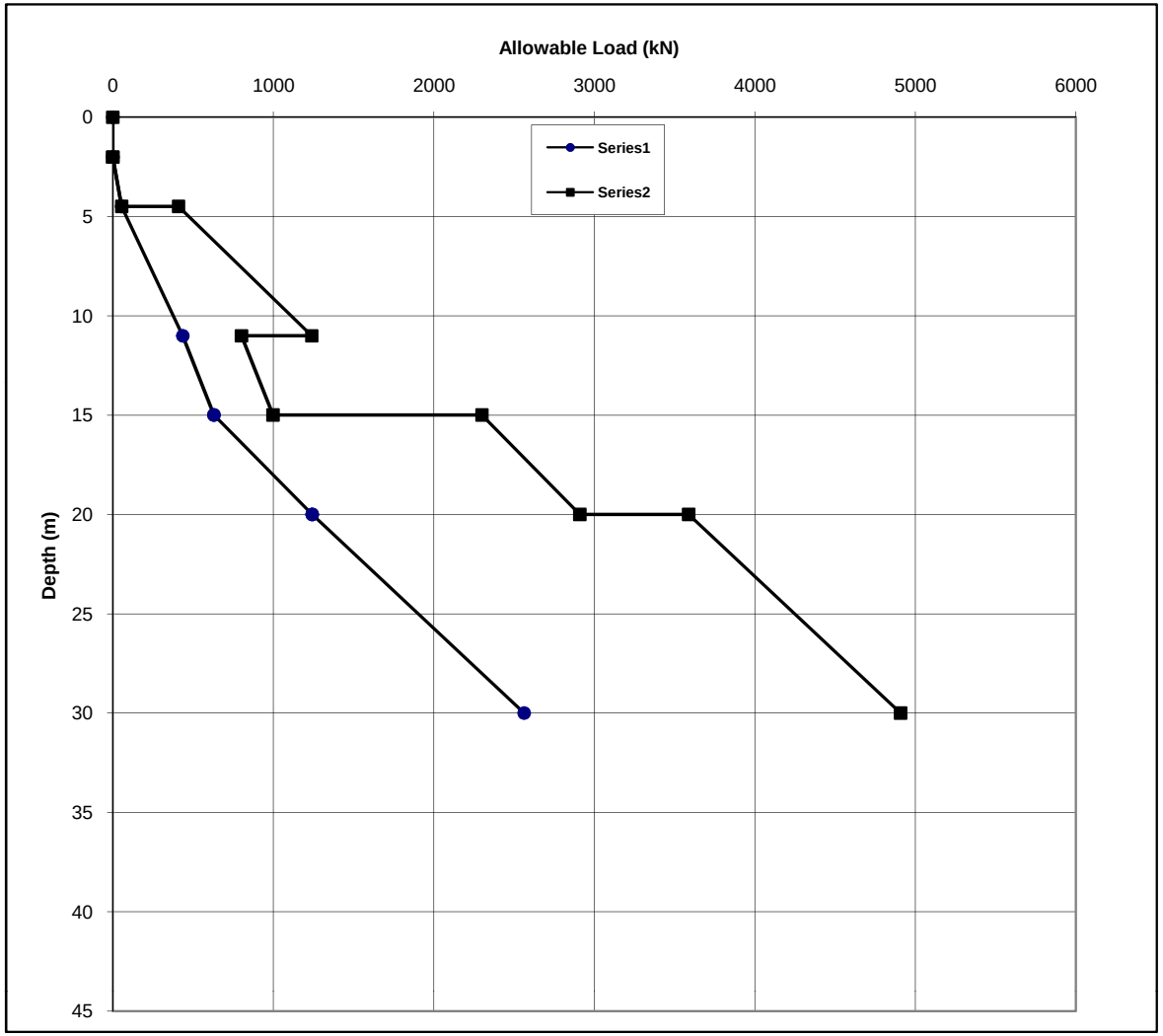
Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.08	2.78
100	2.16	5.56
200	4.31	11.11
350	7.55	19.45
550	11.86	30.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

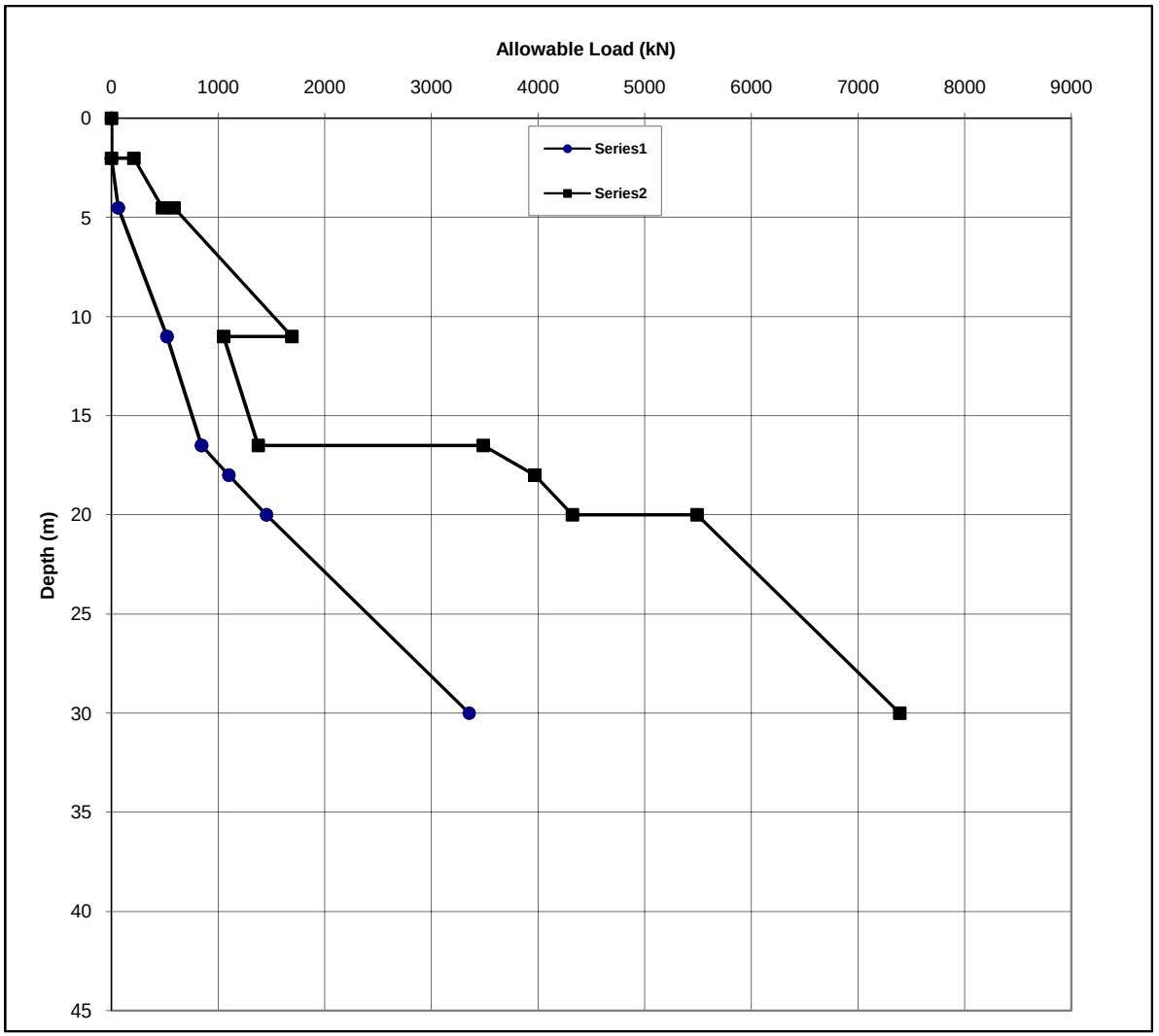
= 550kN (for fixed head condition)

= 210kN (for free head condition)



Allowable Pile Capacity at Major Bridge Ch. 64+270

Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1000**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**



Allowable Pile Capacity at Major Bridge Ch. 64+270

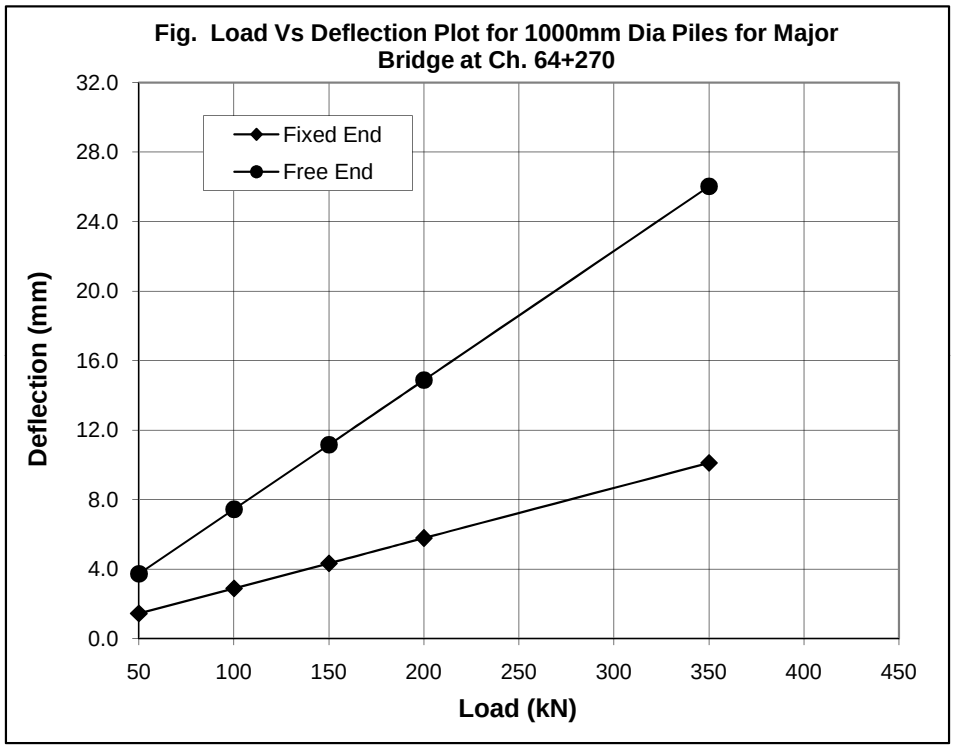
Pile Type=	**Bored**	**Factor of Safety**	
Pile Dia (mm)=	**1200**	**End Bearing =**	**2.5**
		Skin Friction =	**2.5**

LATERAL CAPACITY OF 1000 MM DIA BORED PILE FOR MAJOR BRIDGE AT CH 64+270 (IS: 2911 - PART-1/SEC-2-2010)

D=	**100**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	4908738.5	cm^4
EI=	1.32536E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	350.65	
L_f/T=	2.2	Fixed
L_f (Fixed)=	771.44	cm
L_f/T=	1.9	Free
L_f (Free)=	666.24	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.44	3.72
100	2.89	7.44
150	4.33	11.16
200	5.77	14.88
350	10.10	26.03



Hence lateral capacity (load corresponding to 1% of pile diameter=10mm deflection)

= 350kN (for fixed head condition)

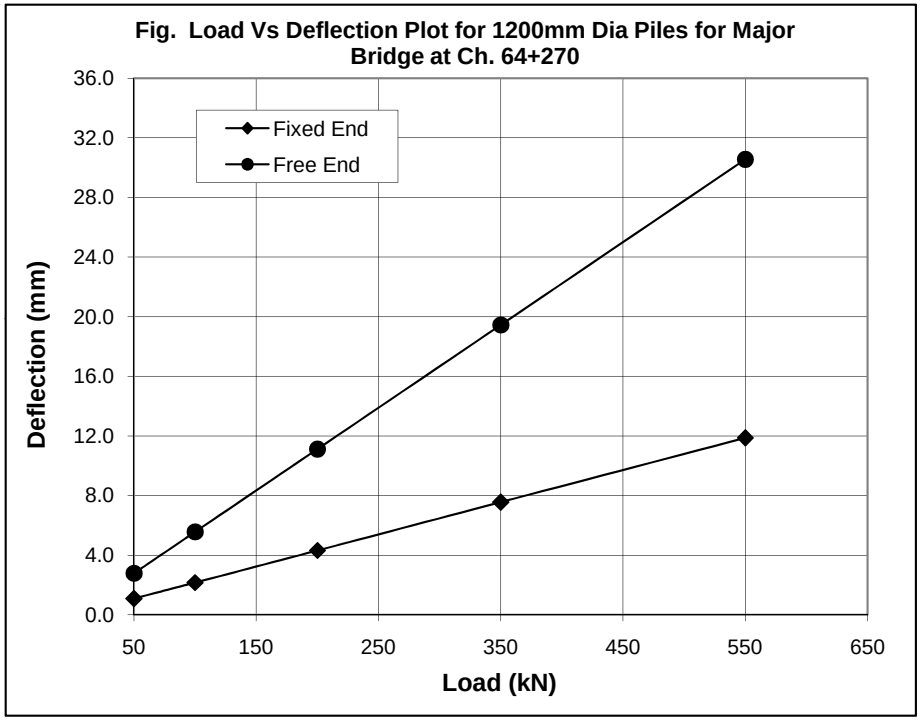
= 130 kN (for free head condition)

LATERAL CAPACITY OF 1200 MM DIA BORED PILE FOR MAJOR BRIDGE CH. 64+270 (IS: 2911 - PART-1/SEC-2-2010)

D=	**120**	cm
η_h=	0.250	kg/cm^3
E=	270000	kg/cm^2
I=	10178760.2	cm^4
EI=	2.74827E+12	kg-cm^2

T=	(EI/ηh)^0.2	
	405.72	
L_f/T=	2.2	Fixed
L_f (Fixed)=	892.58	cm
L_f/T=	1.9	Free
L_f (Free)=	770.86	cm
L_1=	0	cm
d=	$Q(L_1+L_f)^3/12EI$	Fixed
	$Q(L_1+L_f)^3/3EI$	Free

Q (kN)	d (mm) - Fixed	d (mm) - Free
50	1.08	2.78
100	2.16	5.56
200	4.31	11.11
350	7.55	19.45
550	11.86	30.56



Hence lateral capacity (load corresponding to 1% of pile diameter=12mm deflection)

= 550kN (for fixed head condition)

= 210kN (for free head condition)