



Geotechnical Engineering–II

BSc Civil Engineering – 5th Semester

Lab # 7

by

Dr. Muhammad Irfan

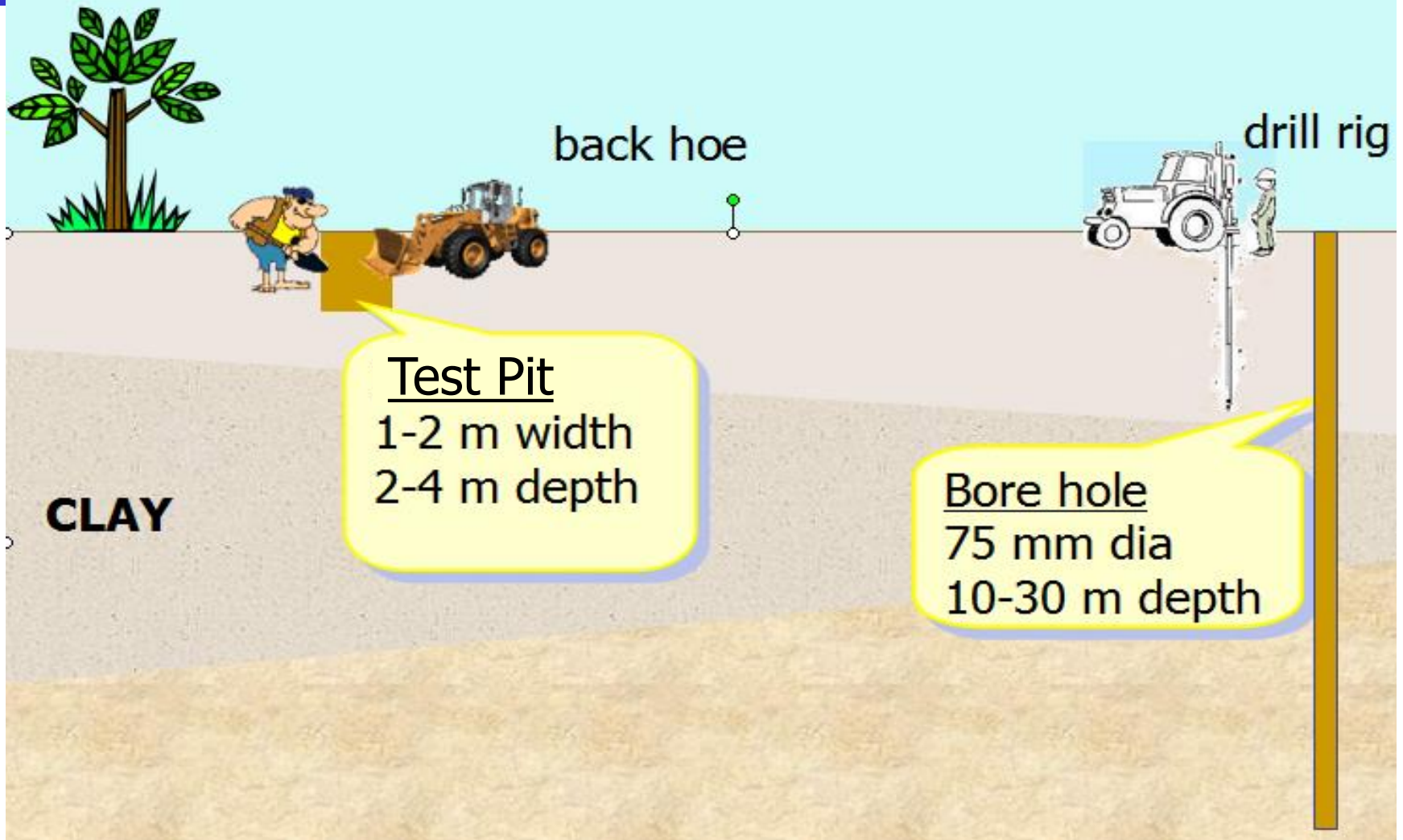
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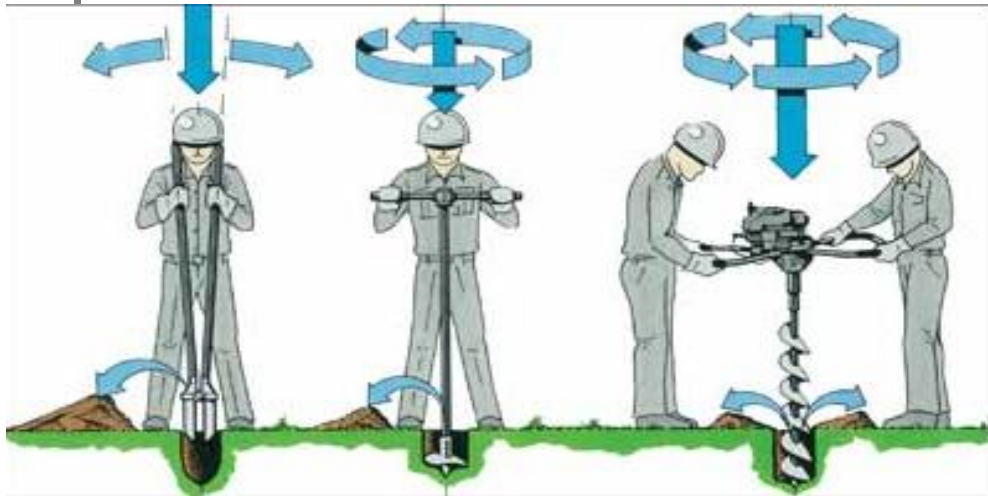
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Lecture Handouts: <https://groups.google.com/forum/#!forum/geotech-ii>

SOIL EXPLORATION

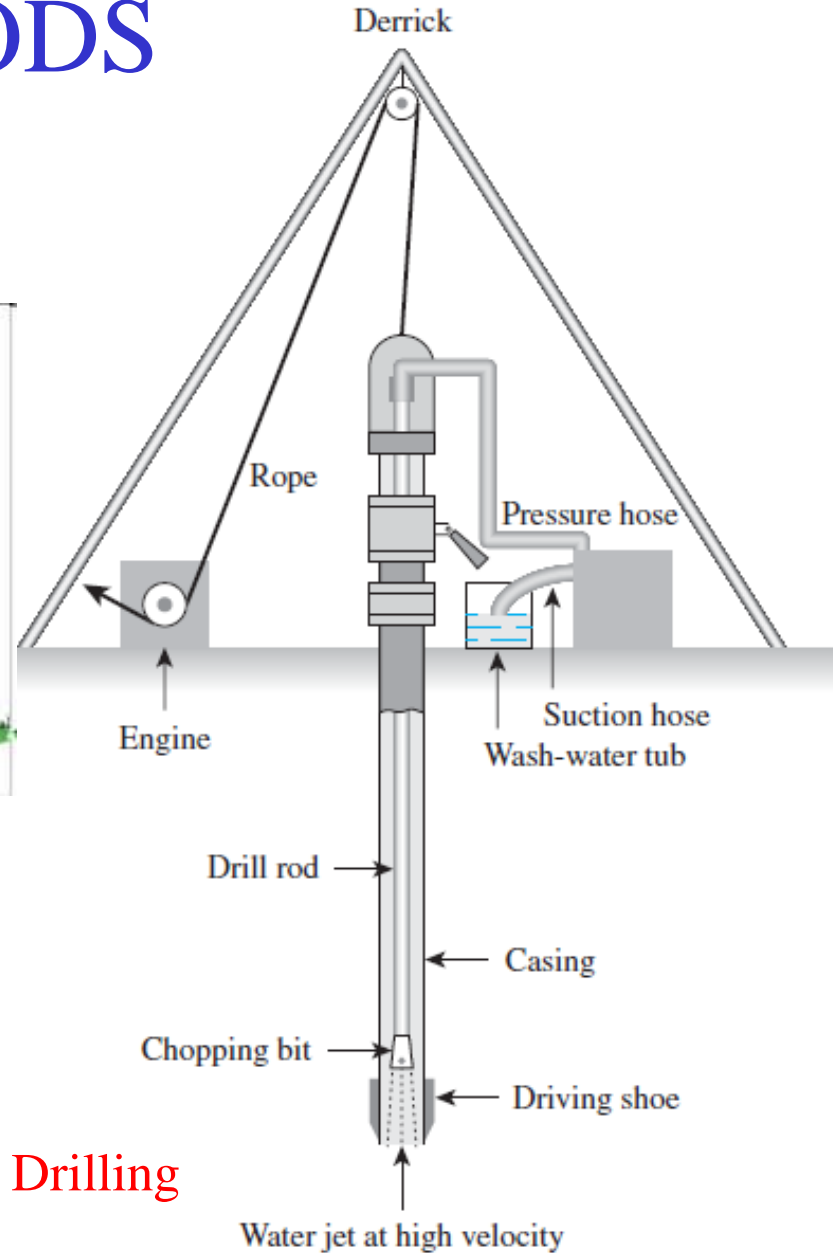


DRILLING METHODS



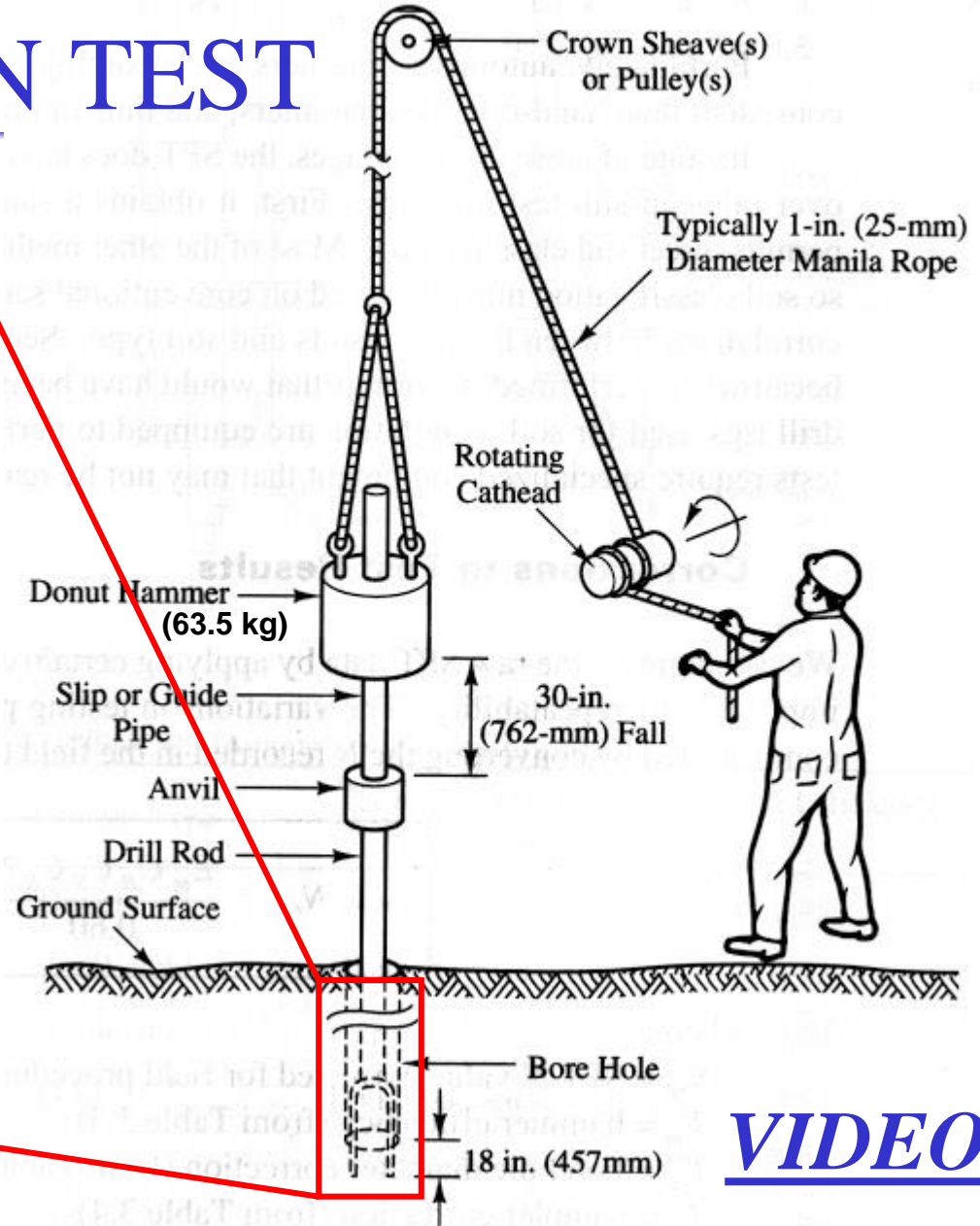
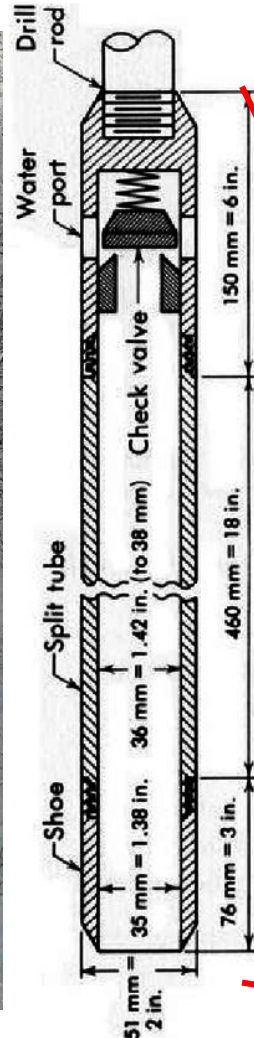
Auger Drilling

VIDEO



Rotary Drilling

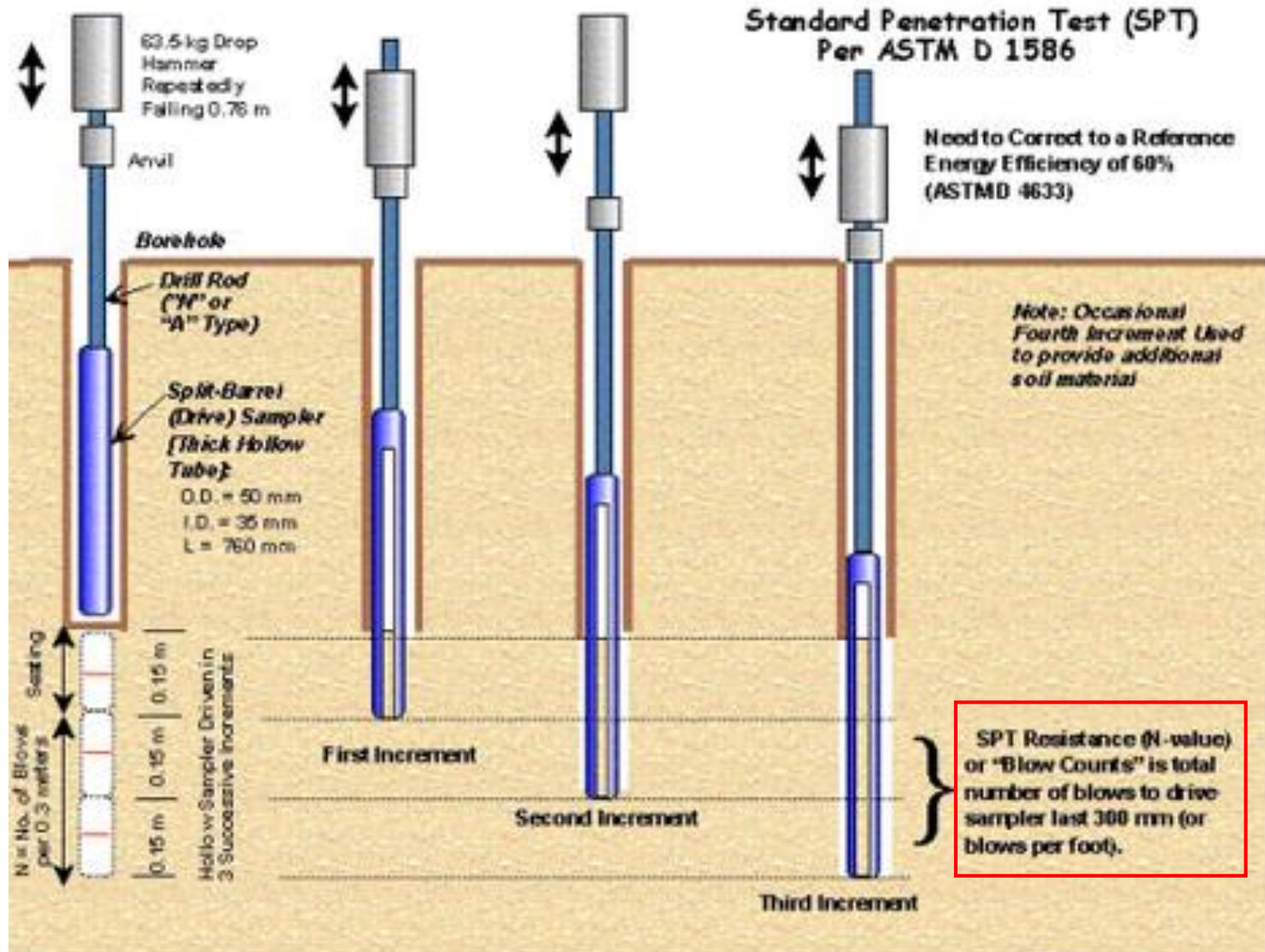
STANDARD PENETRATION TEST



Split Spoon Sampler

VIDEO

STANDARD PENETRATION TEST (SPT)



STANDARD PENETRATION TEST (SPT)

Weight of the hammer = 63.5 kg

Drop height = 30 in (762 mm)

No. of blows for *penetration* of 6 in (0.15 m) is counted

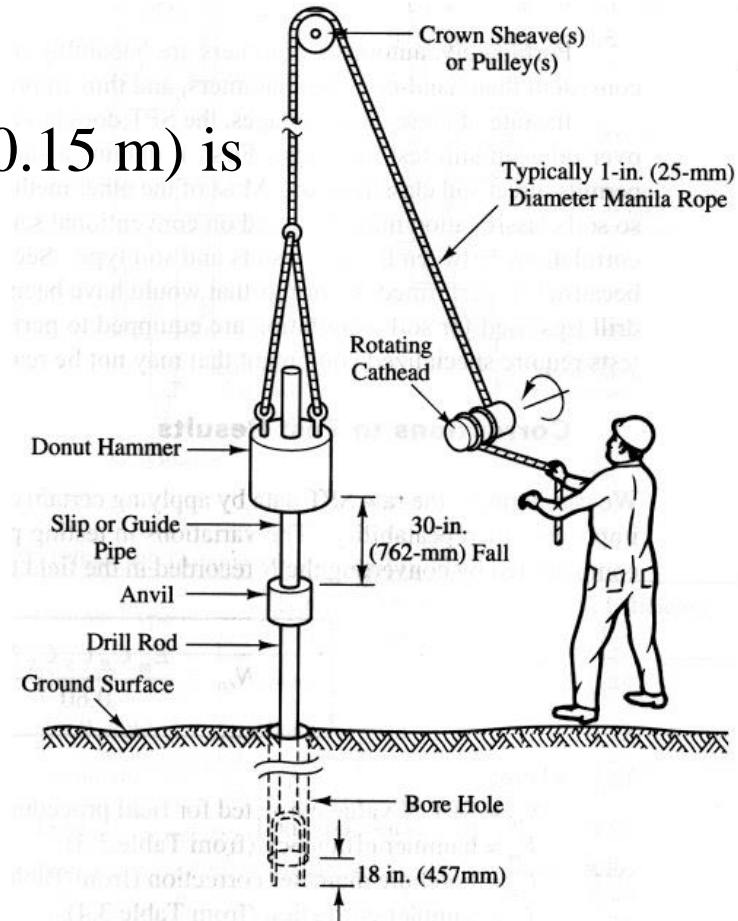
No. of blows for

First 6 in (0.15 m) = X

Second 6 in (0.15 m) = Y

Third 6 in (0.15 m) = Z

SPT N = Y + Z



| SPT N (blows/300 mm) | Relative Density (%) | Friction Angle (degrees) | State of Packing |
|-------------------------|-------------------------|--------------------------------|---------------------|
| 4 | 20 | 30 | Very Loose |
| 4 – 10 | 20 – 40 | 30 – 35 | Loose |
| 10 – 30 | 40 – 60 | 35 – 40 | Medium Dense |
| 30 – 50 | 60 – 80 | 40 – 45 | Dense |
| > 50 | > 80 | 45 | Very Dense |

SANDS/GRAVELS

CLAYS / SILTS

| SPT N (blows/300 mm) | Undrained shear strength, C_u (kPa) | Consistency |
|-------------------------|---|-------------|
| 2 | 10 | Very Soft |
| 2 – 4 | 10 – 25 | Soft |
| 4 – 8 | 25 – 50 | Medium |
| 8 – 15 | 50 – 100 | Stiff |
| 15 – 30 | 100 – 200 | Very Stiff |
| > 30 | > 200 | Hard |

FIELD BOREHOLE LOGS

- Prepared through *field observations* in the *field*.

PROJECT: 1000-1500 W RLNG CCPP at Bhikki, District Shekhpura

BOREHOLE NO: 2-02

SHEET: 1/5

LOCATION: Main Building Area.

DEPTH OF W.T: 2.40

FINAL DEPTH: 33m

E: 346011.30 N: 3497007.61

STARTED ON: 19-10-15

ENDED ON: 22-10-15

GROUND ELEV: 201.19 JOB NO.: J-614

LOGGED BY: Usman Majid

CHECKED BY: M. Shahid

| DEPTH, m | TYPE OF SAMPLE | STANDARD PENETRATION BLOWS | | | OBSERVED N-VALUE (Blows/30 cm) | DESCRIPTION OF MATERIAL | REMARKS |
|----------|----------------|----------------------------|-----|-----|--------------------------------|--|-----------------------------------|
| | | 6" | 6" | 6" | | | |
| 0.0 | | | | | | At. surface; ^{Land.} Abandoned Cultivation field Brown, silty clay/clay, Medium to high plastic, Med-High strength, Dry to slightly moist, Trace grass roots. | |
| 1.0 | SPT-1 | 1 | 1,0 | 1,1 | (3) | Brown, soft, silty clay, Medium plastic, Med. to high dry, trace concretions. | S.L. = 40cm |
| 2.0 | SPT-2 | 2 | 1,1 | 1,2 | (5) | Brown, firm, silty clay/clay, Med to high plastic, Med to high dry strength, trace concretions, Moist to wet | S.L. = 37cm |
| 3.0 | UDS-1 | (atched as shelly) | | | | Brown, silty clay, Medium to high plastic, medium dry strength, trace concretions, WET | S.L. = 48 wt = 1.6 gm UDS-1 |
| 3.5 | | | | | | | |
| 4.0 | SPT-3 | 3 | 2,3 | 3,3 | (11) | Brownish gray, Medium dense, silty sand, with trace clay, trace mica, wet | S.L. = 30cm |
| 5.0 | SPT-4 | 3 | 2,2 | 3,3 | (10) | Brownish gray, medium Loose to medium dense, silty sand with trace clay, trace mica, wet. | S.L. = 28cm |
| 6.0 | SPT-5 | 6 | 5,5 | 3,6 | (22) | Brownish gray, Medium dense, silty sand, trace clay, trace mica, wet | S.L. = 28cm |
| 7.0 | SPT-6 | 5 | 5,5 | 2,6 | (22) | | S.L. = |

| | | | | | | | | | | | | | |
|-------------|-------------|---------------|-------------|------------|-------|----------|-------|---------|------|------|-------|----------|------|
| SPT Value | Sand | <4 | 4-10 | 10-30 | 30-50 | >50 | Silty | <2 | 2-4 | 4-8 | 8-15 | 15-30 | >30 |
| Consistency | Gravel | V. Loose | Loose | M. Dense | Dense | V. Dense | Clay | V. Soft | Soft | Firm | Stiff | V. Stiff | Hard |
| Terms | 0-10% Trace | 10-20% Little | 20-35% Some | 35-50% And | | | | | | | | | |

CLIENT: Govt. of Punjab

CONSULTANT: NESPAK (Pvt.) Ltd.

DIGITIZED BOREHOLE LOGS

Prepared through

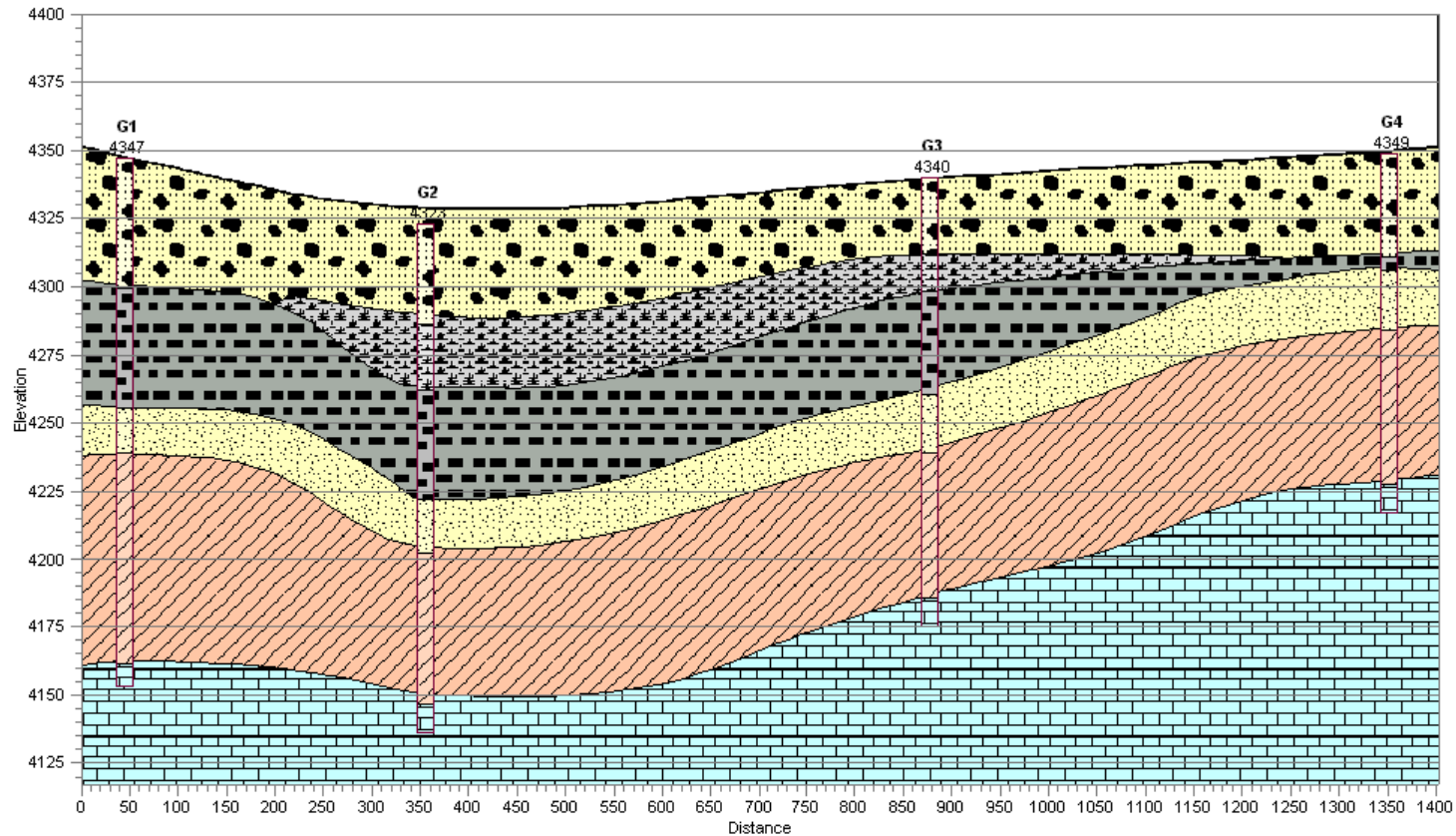
- *Field Logs*, and
- *Laboratory Testing*

| PROJECT: Geotechnical Investigations for Dadu 500kV Substation | | | | BOREHOLE NO: BH-01 | | SHEET 2 OF 3 | | | |
|--|------------------|---|---------|-------------------------------|---|----------------------|--------------------------------------|-----------------------------------|----|
| LOCATION: Dadu Site | | | | DEPTH OF W.T: 2.70 m | | FINAL DEPTH: 25 m | | | |
| COORDS. E: 374917 m | | N: 2955649 m | | BORING STARTED ON: 23-01-2015 | | ENDED ON: 24-01-2015 | | | |
| GROUND ELEV: 99.73 m | | | | LOGGED BY: M. Ali Chughtai | | CHECKED BY: Shoab | | | |
| DEPTH, m | REDUCED LEVEL, m | DRILLING DETAILS | SAMPLES | LEGEND | DESCRIPTION OF MATERIAL | DEPTH, m | SPT BLOWS FOR LAST 30 cm PENETRATION | STANDARD PENETRATION TEST PROFILE | |
| | | | | | | | | 30 | 60 |
| 10 | 89.73 | HYDRAULIC FEED STRAIGHT ROTARY DRILLING | SPT-9 | | Brown to Blackish Grey, Low to Medium Plastic, Very Soft to Soft, LEAN CLAY (CL), trace sand, trace mica. | | 2 | | |
| 11 | 88.73 | | UDS-2 | | | | | | |
| 12 | 87.73 | | SPT-10 | | | 3 | | | |
| 13 | 86.73 | | SPT-11 | | Grey, Medium Dense, SILTY SAND (SM), trace mica. | 29 | | | |
| 14 | 85.73 | | SPT-12 | | | 25 | | | |
| 15 | 84.73 | | SPT-13 | | 20 | | | | |
| 16 | 83.73 | | SPT-14 | | Blackish Grey, Low to Medium Plastic, Stiff to Very Stiff, SILTY CLAY (CL-ML). | 9 | | | |
| 17 | 82.73 | | SPT-15 | | | 16 | | | |
| 18 | 81.73 | | SPT-16 | | Grey, Medium Dense to Dense, SILTY SAND (SM), trace mica. | 34 | | | |
| 19 | 80.73 | | SPT-17 | | | 22 | | | |
| 20 | 79.73 | | SPT-18 | | (CONTINUED) | 19 | | | |

CLIENT:
NEPCC-CHINT

CONSULTANTS:
NESPAK

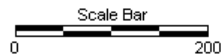
SUBSURFACE PROFILE



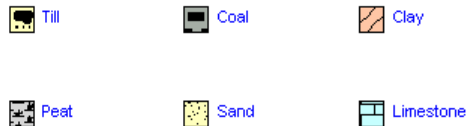
GAEA Technologies
44 Canadian Oaks Dr.
Whitby, ON L1N 6W8
CANADA

Project: Tutorial

Project Number: 2000-001
Location: Someplace, somewhere
Drawn By: M. Fraser
Date: 11/02/2000



Legend



Plan View





CONCLUDED