

REPORT ON
SOIL INVESTIGATION WORK FOR THE PROPOSED
BASEMENT + GROUND + THREE STORIED RESIDENTIAL
(APARTMENTS) CUM COMMERCIAL BUILDING
AT MOUZA - RADHANAGAR, J. L. NO.- 39,
R. S. PLOT NO.- 3186 / 3263, R.S. KHATIAN NO.- 1468,
L. R. PLOT NO.- 3407, L. R. KHATIAN NO.- 8006,
WARD NO.- 34, MAHALLA - B. C. ROAD, HOLDING NO.- 83
UNDER BURDWAN MUNICIPALITY, P. S. - BURDWAN,
DISTRICT - PURBA BARDHAMAN, PIN. - 713101

SOIL INVESTIGATION DONE BY:-

ASSOCIATED FOUNDATION ENGINEERS
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DECEMBER – 2012

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REPORT ON

Proposed Basement + Ground + Three storied
Residential (Apartments) Cum Commercial Building " at
Mouza - Radhanagar, J. L. No.- 39, R. S. Plot No.- 3186 / 3263,
R.S. Khatian No.- 1468, L. R. Plot No.- 3407, L. R. Khatian No.- 8006,
Ward No.- 34, Mahalla - B. C. Road, Holding No.- 83 under Burdwan
Municipality, P. S. - Burdwan, District - Purba Bardhaman, Pin. - 713101

A. GENERAL

It has been proposed to construct a Multistoried building at the above location.

For ascertaining the safe bearing capacity of soil, it was decided to carry out a detailed sub-soil investigation and M/s. Associated Foundation Engineers was awarded this work for suggesting the most suitable type of foundation for the above project.

The scope of the work comprised of sinking 3 nos. of bore holes (3x 40m).

The bore holes were of 150mm. in diameter. Standard penetrometer tests were conducted at close intervals of depth. Undisturbed soil samples were recovered at suitable intervals and tested in the laboratory. Disturbed soil samples were also recovered at close intervals of depth for logging & identification purposes.

Depending on the above, this report presents bore logs, soil profiles & laboratory tests results. It is seen that the sub-soils are of medium quality.

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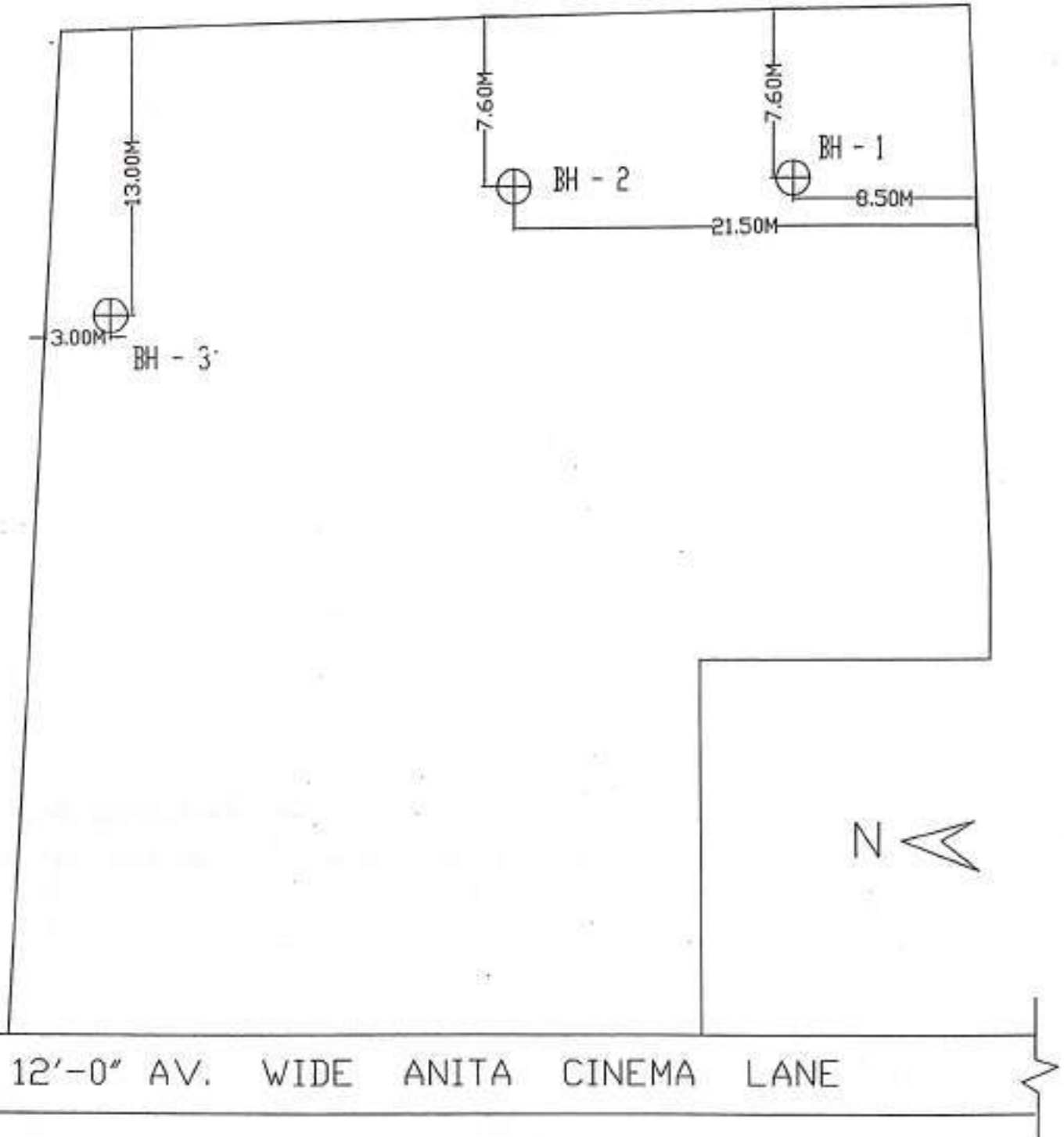


FIG. -1. SCHEMATIC PLAN OF BOREHOLES.



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B. FIELD INVESTIGATION

The various operations adopted during the course of this investigation are discussed in brief below.

BORING

For sinking the bore holes, the shell and auger method of boring was adopted. The holes were of 150mm. in diameter. These were advanced up to the required depth. Casing pipes of 150mm. diameter were used initially and bentonite slurry later on for side stabilisation of bore holes.

SAMPLING

During the course of boring, undisturbed and disturbed samples were collected at fairly regular intervals. Undisturbed samples of 10cm. diameter were recovered (whenever feasible) by means of open drive sampling using samplers of standard length 45cm. A two tier assembly was used with a cutting shoe attached to the lower end of the tube. This was driven by a jarring link as far as practicable. After withdrawal, both ends of the tubes were sealed with paraffin wax capped, labeled and transported to the laboratory. A number of disturbed samples were also collected at suitable intervals for identification and logging purposes.

STANDARD PENETRATION TESTS

A number of standard penetration tests were conducted at regular intervals in the bore holes. The tests were conducted by driving a standard split spoon sampler by means of a monkey of 65kg. weight falling freely from a height of 75cm. The number of blows required for every 7.5cm. Penetration was recorded up to a total penetration of 60cm. The S.P.T. or 'N' value was estimated as the number of blows required for the middle 30cm. penetration.



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The split spoon sampler conformed to I.S. specification with an outer diameter of 50.8mm. and an inner diameter of 35mm. After completion of the test the sampler was withdrawn, It was opened and the soil specimen was preserved for logging and identification purposes.

C. LABORATORY TESTING

The following laboratory tests were performed on undisturbed and disturbed samples to determine the engineering properties of the sub-soil at different depths. All the tests were carried out according to Indian standard specifications.

1. Natural Moisture Content.
2. Atterberg Limits (LL. & PL.)
3. Hydrometer and Sieve Analysis.
4. Bulk Density (wet & dry)
5. Specific Gravity.
6. Strength Tests.
7. Consolidation.

The results of these tests have been presented systematically in result sheets later on.



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D. SUB-SOIL STRATIFICATION AND PROPERTIES
I. SUB-SOIL STRATIFICATION

The exploratory borings at the site revealed a medium quality of sub-soil. The generalised soil profile encountered at the site is shown in fig.2 and in the enclosed bore hole log data sheets in the appendix. The variation of 'N' values with depth is shown in figure 3 & in the bore hole log data sheets. The average sub-soil profile with properties are shown in fig. 4. The results of the laboratory tests conducted to determine the engineering properties of the sub-soil are presented in the appendix. The other back-up sheets are also presented therein. Based on visual classification and results of field & laboratory tests three major strata including filled-up materials are identified.

Brief descriptions of the various soil strata are given below :-

1. TOP - SOIL

The top layer consists of very loose filling of clayey silt with brich bats, sand etc. extending down to 2.46 m. depth below the E.G.L.

2. STRATUM - I

Soft to medium to stiff light grey to brownish grey clayey silt with kankars extends from 2.46 m. down to a depth of 11.00 m. below E.G.L. Clayey coarse silt pockets were observed at some locations in this layer.

The maximum & minimum values of 'N' observed in this layer are 13 & 03 respectively while the average 'N' value is 08.

The average engineering properties are as follows :-

| | | |
|------------------|-------|-----------|
| Bulk density | 1.88 | gm /c.c. |
| Dry density | 1.55 | gm /c.c |
| Water content | 22 | % |
| Specific gravity | 2.71 | |
| Void ratio | 0.788 | |
| Cohesion | 0.462 | kg /sq.cm |
| Friction angle | 0° | degree |
| Liquid limit | 42 | % |
| Plastic limit | 21 | % |



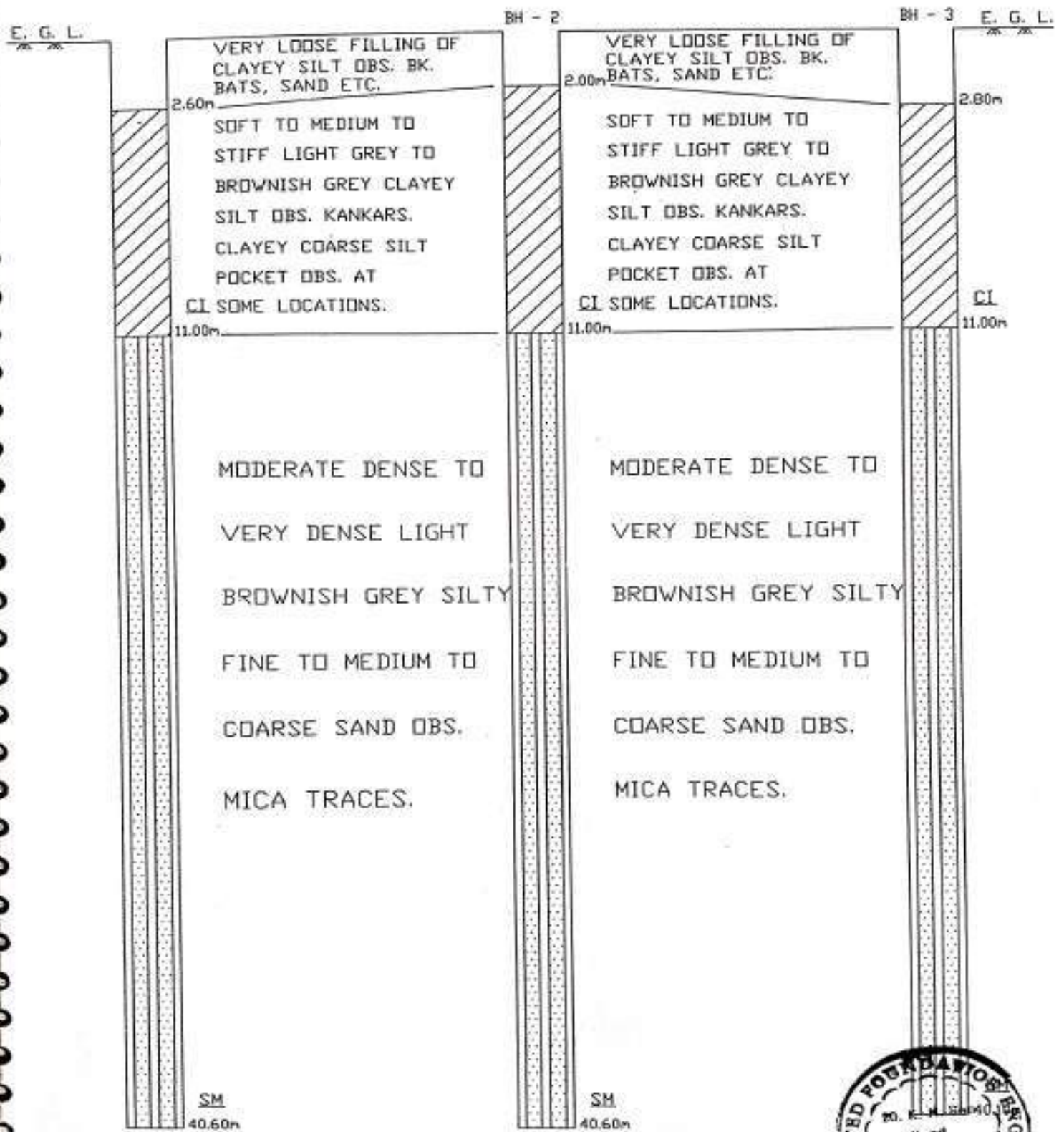


FIG.-2. GENERALISED SUB-SOIL PROFILE.



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VALUES OF 'N' → Sheet No:- 08

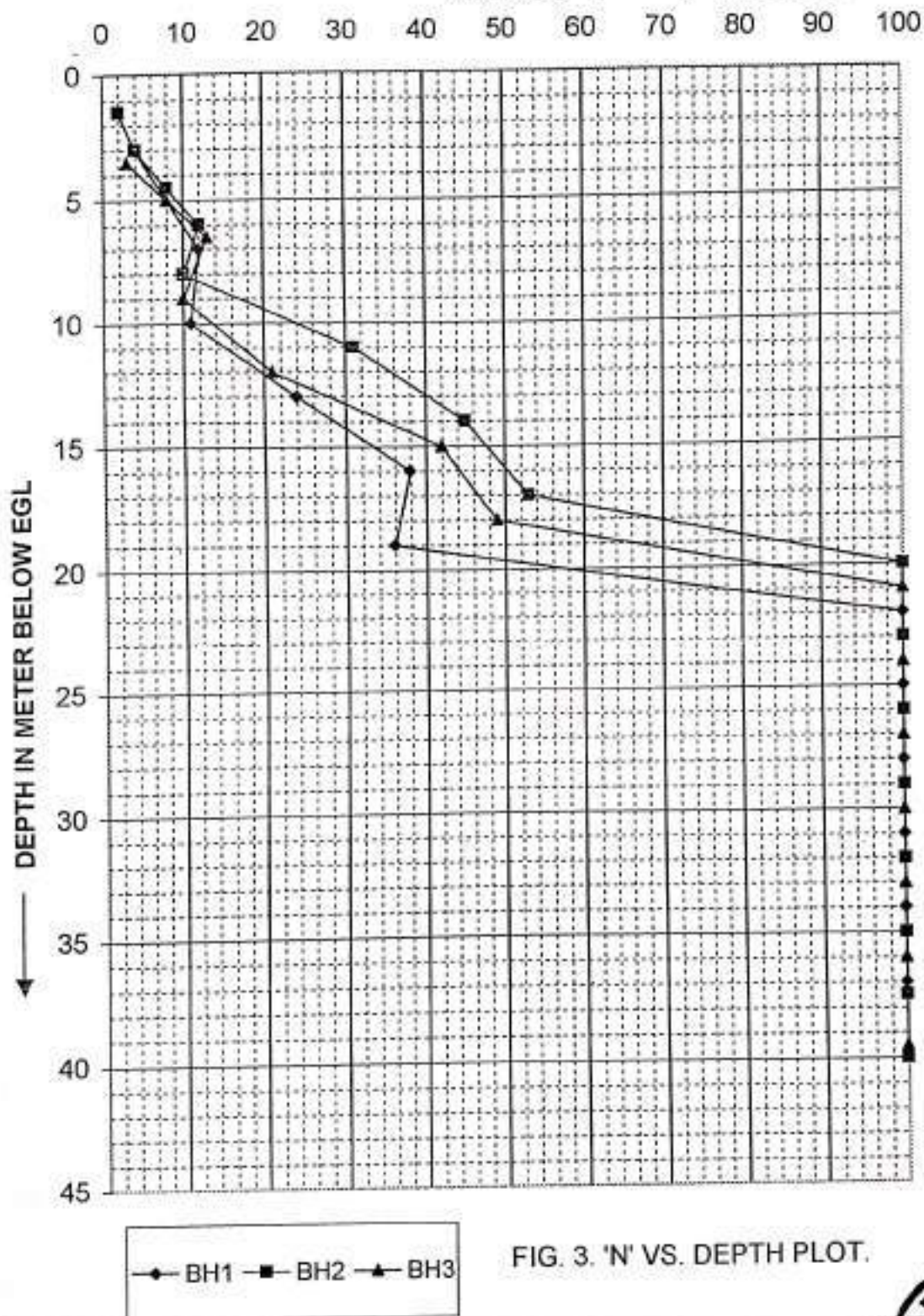


FIG. 3. 'N' VS. DEPTH PLOT.

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| | | |
|--------------------|----|---|
| Sand size particle | 08 | % |
| Silt size particle | 61 | % |
| Clay size particle | 31 | % |

According to IS classification system , it may be symbolised as CI combination.

3. STRATUM – II

Moderate dense to very dense light brownish grey silty fine to medium to coarse sand with mica traces extends from 11.00 m. down to the termination depth of 40.60 m below E.G.L. This layer is ideally suitable to support deep foundations in the form of piles.

The maximum & minimum values of 'N' observed in this layer are >100 & 21 respectively while the average 'N' value is 82.

According to IS classification system , it may be symbolised as SM combination.

From the above, it can be said that the sub-soils are of medium quality.

II. SUB - SOIL PROPERTIES

The details of laboratory tests results have been presented sequentially in the appendix. The other back-up sheets are given therein as below :-

1. Laboratory tests results tables.
2. Bore Hole log data sheets/ field records.
3. Consolidation characteristics.
4. Grain size distribution curves from sieve & hydrometer analysis.

Based on the bore logs and the laboratory tests results, the average sub-soil profile with the average properties are presented in fig. 4.



E. G. L.

E. G. L.

VERY LOOSE FILLING OF
CLAYEY SILT OBS. BK.
BATS, SAND ETC.

SOFT TO MEDIUM TO
STIFF LIGHT GREY TO
BROWNISH GREY CLAYEY
SILT OBS. KANKARS,
CLAYEY COARSE SILT
POCKET OBS. AT
SOME LOCATIONS. CI

2.46m

| | | | | | | | | | | | |
|------|------|----|------|-------|-------|---|----|----|----|----|----|
| 1.89 | 1.55 | 22 | 2.71 | 0.788 | 0.462 | 0 | 42 | 21 | 08 | 61 | 31 |
|------|------|----|------|-------|-------|---|----|----|----|----|----|

| | | | | | | | | | | | |
|---------------------|--------------------|-----------------|------------------|------------|-----------------------------|-------------------|----------------|-----------------|--------|--------|--------|
| BULK DENSITY GMS/CC | DRY DENSITY GMS/CC | WATER CONTENT % | SPECIFIC GRAVITY | VOID RATIO | COHESION KG/CM ² | FRICTION ANGLE(D) | LIQUID LIMIT % | PLASTIC LIMIT % | SAND % | SILT % | CLAY % |
| | | | | | | | | | | | |

11.00m

MODERATE DENSE TO
VERY DENSE LIGHT
BROWNISH GREY SILTY
FINE TO MEDIUM TO
COARSE SAND OBS.
MICA TRACES.

SM

40.60m

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FIG.-4. AVERAGE SUB-SOIL PROFILE WITH PROPERTIES.

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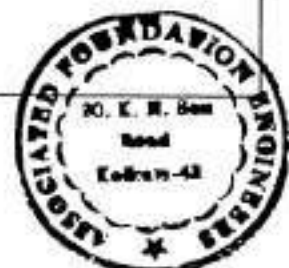
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E. FOUNDATION CONSIDERATIONS AND BEARING CAPACITY

The proposed construction would be a multistoried building . Accordingly the loading would be moderate which would depend also on column spacing for the proposed RCC framed structure. However, the foundation design would not only depend on the height and loading but also on the sub-soil condition. For the sub-soil condition the two necessary conditions are to be satisfied i.e. the soil would not fail in shear and the settlement should be within permissible limit.

From the sub-soil condition , it is revealed that the soft to medium stiff to stiff clayey silt deposit of stratum-I can be used as a load bearing stratum for lightly loaded structure. Shallow foundations in the form of raft footing may be investigated at first in this case for supporting lightly loaded structure. Raft footing of size 30m x 30m. founded at a depth of 3.0 m. below G. L. may be used according to the column spacing and planning of the building. Net allowable bearing capacities for such footings have been calculated keeping the settlement within permissible limit of 10 cm. and these have been shown below:-

| Footing Size | Net Allowable Bearing Capacity, (t/ sq.m.) | Settlement (mm.) | Recommended Capacity, (t/ sq.m.) |
|-----------------|--|--------------------|------------------------------------|
| Raft= 30m x 30m | 10.9 | 100.0 | 7.4 |



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For moderate to heavily loaded structures, deep foundations in the form of bored cast-in-situ R.C.C. piles have been investigated for the proposed construction. These should rest at (-) 20.0 m. having cut-off at (-) 1.5 m. below the E.G.L. depending on functional requirement.

PILE CAPACITY DETERMINATION

Ultimate Load Capacity, $P_u = P_f + P_t$

$$P_f = \pi D \times [9.5 \times 4.6 \times 0.75] + \pi D \times 9.0 [0.88 \times 10.0 \times \tan 32^\circ] = 258.4 D$$

$$P_t = A_t q_t = \pi D^2 / 4 [0.88 \times 10.0] \times (25-1) = 166 D^2$$

$$\therefore P_u = 258.4 D + 166 D^2$$

$$\therefore P_{all} = 103.4 D + 66.4 D^2 \quad (F.O.S. = 2.5)$$

For 400 mm. dia pile, $P_a = 52 \text{ t}$

The following safe load carrying capacity values may be used depending on requirement :-

| PILE DIA, mm. | PILE TIP, m. | CUT-OFF, m. | SAFE CAPACITY, t |
|---------------|--------------|-------------|------------------|
| 400 | (-) 20.0 | (-) 1.5 | 52 |
| 450 | (-) 20.0 | (-) 1.5 | 60 |
| 500 | (-) 20.0 | (-) 1.5 | 68 |

| PILE DIA, mm. | PILE TIP, m. | CUT-OFF, m. | SAFE CAPACITY, t |
|---------------|--------------|-------------|------------------|
| 400 | (-) 12.0 | (-) 1.5 | 25 |
| 450 | (-) 12.0 | (-) 1.5 | 29 |
| 500 | (-) 12.0 | (-) 1.5 | 34 |

However, the actual load carrying capacity should be determined by carrying out load tests at site as per IS code of practice. A minimum distance of $2.5D - 3D$ should be maintained between the center to center of piles, where D is the pile diameter.

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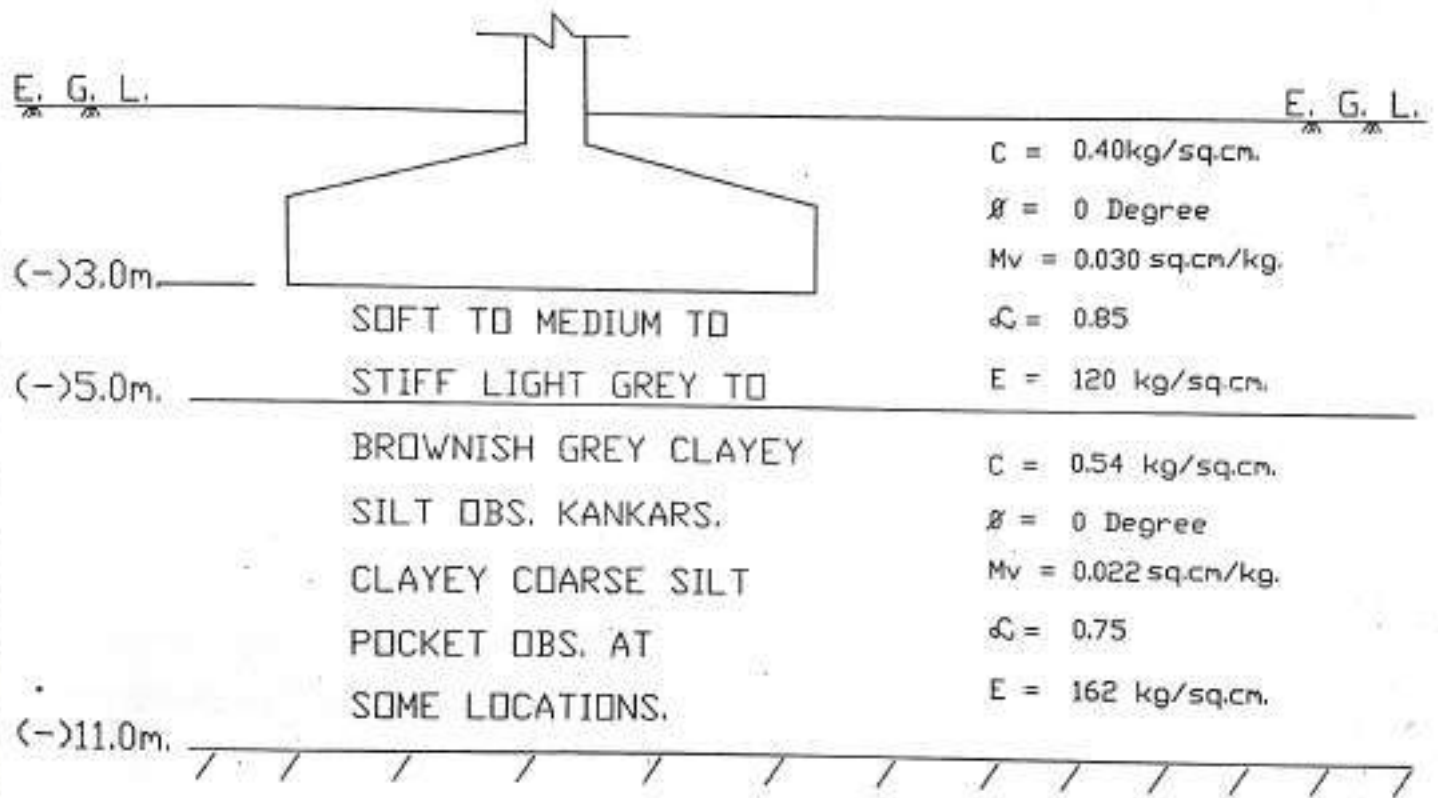


FIG. - 5. FOUNDATION DESIGN MODEL FOR SHALLOW FOOTING.



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E. G. L.

E. G. L.

∇ CUT-OFF = (-)1.50m

SOFT TO MEDIUM TO
STIFF LIGHT GREY TO
BROWNISH GREY CLAYEY
SILT OBS. KANKARS,
CLAYEY COARSE SILT
POCKET OBS. AT
SOME LOCATIONS.

$C = 0.462 \text{ kg/sq.cm.}$

$\phi = 0 \text{ Degree}$

11.00m

MODERATE DENSE TO
VERY DENSE LIGHT
BROWNISH GREY SILTY
FINE TO MEDIUM TO
COARSE SAND OBS.
MICA TRACES.

MINIMUM 'N' = 21

20.00m

∇ TERMINATION LEVEL = (-)20.00m

FIG. - 5-A. FOUNDATION DESIGN MODEL FOR DEEP FOUNDATIONS.



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SAMPLE CALCULATION FOR BEARING CAPACITY

SIZE OF RAFT (SIZE = 30 m x 30 m)

As per IS : 6403-1981,

Net Allowable Bearing Capacity, $q_{na} = C N_c S_c D_c I_c / F.O.S.$

$C = 4.0 \text{ t/m}^2$, $F.O.S. = 2.5$, $N_c = 5.14$, $S_c = 1.3$

$I_c = 1.0$,

$D_c = (1 + 0.2 \times 3.0/30) = 1.02$

Therefore, $q_{na} = (4.0 \times 5.14 \times 1.3 \times 1.02 \times 1.0)/2.5 = 10.90 \text{ t/m}^2$

SAMPLE CALCULATION FOR SETTLEMENT

SIZE OF RAFT (SIZE = 30 m x 30 m)

As per IS : 8009(PART-I)-1976 :-

$S_t = S_i + S_c$

$S_i = pB(1 - u^2) / E$

$= [10.9 \times 30 \times (1 - 0.5 \times 0.5) \times 1.12] \times 1000 / 1200$

$= 22.9 \text{ mm}$

$S_c = M_v \Delta p H$

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STRATUM – I

$$\Delta p = \frac{30 \times 30 \times 10.90}{(30 + 1)(30 + 1)} = 10.20 \text{ t/m}^2$$

$$H = 2.0 \text{ m. } M_v = 0.0030 \text{ sq.m / t}$$

$$Sc1 = 0.0030 \times 2.0 \times 10.20 \times 0.85 \times 1000 = 52 \text{ mm}$$

STRATUM – II

$$\Delta p = \frac{30 \times 30 \times 10.90}{(30 + 5)(30 + 5)} = 8.00 \text{ t/m}^2$$

$$H = 6.0 \text{ m. } M_v = 0.0022 \text{ sq.m / t}$$

$$Sc2 = 0.0022 \times 6.0 \times 8.00 \times 0.75 \times 1000 = 72 \text{ mm}$$

$$\text{Therefore, } Sc = Sc1 + Sc2 = 52 + 72 = 124 \text{ mm}$$

$$\text{Therefore, Total settlement, } St = Si + Sc$$

$$= 22.9 \text{ mm} + 124 \text{ mm} = 146.9 \text{ mm}$$

Restricting settlement to 100 mm. ,

$$q_{na} = (100/146.9) \times 10.9 = 7.42 \text{ t/m}^2$$

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F. RECOMMENDATIONS

Based on the field and the laboratory tests results and the above discussions, the followings are summarised :-

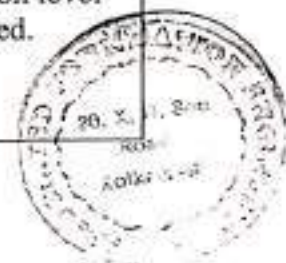
1. The sub-soils are of medium quality .
2. The top layer consists of very loose filling of clayey silt with brich bats, sand etc. extending down to 2.46 m. depth below the E.G.L.
3. Soft to medium to stiff light grey to brownish grey clayey silt with kankars extends from 2.46 m. down to a depth of 11.00 m. below E.G.L. The strength of this layer is medium ($C = 0.462$ kg/sq.cm.) and compressibility is medium ($M_v = 0.030$ sq.cm./ kg for 0.50 to 1.0 kg/sq.cm. pressure range). Clayey coarse silt pockets were observed at some locations.
4. Moderate dense to very dense light brownish grey silty fine to medium to coarse sand with mica traces extends from 11.00 m. down to the termination depth of 40.60 m below E.G.L.
5. Depth of foundation for the proposed construction is estimated at (-) 3.0m. below the E.G.L. However, the foundations should go at least 200 to 300mm. in side the parent soil depending on the location.

The following net safe bearing capacity value may be taken for routine design :-

| Type of Footing | Size | Net safe bearing capacity, t/sq.m. |
|-----------------|-----------|------------------------------------|
| Raft | 30m x 30m | 7.4 |

6. The standing water level was observed at (-)1.5m. below the E.G.L. during Boring.. Isolated footings, if used , are suggested to be tied at the foundation level to reduce the differential settlement. Construction in stages is recommended.

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7. In view of the height of the structure, deep foundations in the form of bored cast-in-situ R.C.C. piles have also been investigated for the proposed construction. These should rest at (-) 20.0 m. / (-) 12.0m. having cut-off at (-) 1.5 m. below the E.G.L. depending on functional requirement.

The following safe load carrying capacity values may be used depending on requirement :-

| PILE DIA, mm. | PILE TIP, m. | CUT-OFF, m. | SAFE CAPACITY, t |
|---------------|--------------|-------------|------------------|
| 400 | (-) 20.0 | (-) 1.5 | 52 |
| 450 | (-) 20.0 | (-) 1.5 | 60 |
| 500 | (-) 20.0 | (-) 1.5 | 68 |

| PILE DIA, mm. | PILE TIP, m. | CUT-OFF, m. | SAFE CAPACITY, t |
|---------------|--------------|-------------|------------------|
| 400 | (-) 12.0 | (-) 1.5 | 25 |
| 450 | (-) 12.0 | (-) 1.5 | 29 |
| 500 | (-) 12.0 | (-) 1.5 | 34 |

However, the actual load carrying capacity should be determined by carrying out load tests at site as per IS code of practice. A minimum distance of 2.5D – 3D should be maintained between the center to center of piles, where D is the pile diameter.

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A P P E N D I X

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LABORATORY TESTS RESULTS TABLE

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BORE HOLE LOG DATA SHEETS/FIELD RECORDS

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CONSOLIDATION CHARACTERISTICS

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GRAIN SIZE DISTRIBUTION CURVES

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TABLE : 1. LABORATORY TESTS RESULT

| BORE HOLE | SAMPLE NO | DEPTH (M.) | BULK DENSITY (gms/c.c.) | DRY DENSITY (gms/cc) | W % | G | eo | C (kg/sqc (m) | ϕ (Degree) | LL % | PL % | SAND % | SILT % | CLAY % |
|-----------|-----------|------------|-------------------------|----------------------|-----|------|-------|---------------|-----------------|------|------|--------|--------|--------|
| BH-1 | UDS-1 | 4.50-4.95 | 1.89 | 1.55 | 22 | 2.70 | 0.787 | 0.42 | 0° | 38 | 19 | 9 | 70 | 21 |
| BH-1 | UDS-2 | 9.00-9.45 | 1.91 | 1.59 | 20 | 2.71 | 0.699 | 0.56 | 0° | 43 | 18 | 10 | 65 | 25 |
| BH-2 | UDS-1 | 2.50-2.95 | 1.84 | 1.51 | 22 | 2.67 | 0.859 | 0.34 | 0° | 37 | 16 | 12 | 69 | 19 |
| BH-2 | UDS-2 | 4.00-4.45 | 1.88 | 1.54 | 22 | 2.70 | 0.822 | 0.44 | 0° | 44 | 24 | 5 | 60 | 35 |
| BH-2 | UDS-3 | 7.50-7.95 | 1.90 | 1.57 | 21 | 2.70 | 0.804 | 0.42 | 0° | 42 | 23 | 7 | 60 | 33 |
| BH-3 | UDS-1 | 3.00-3.45 | 1.83 | 1.50 | 22 | 2.71 | 0.874 | 0.33 | 0° | 41 | 21 | 9 | 59 | 32 |
| BH-3 | UDS-2 | 4.50-4.95 | 1.88 | 1.55 | 21 | 2.72 | 0.831 | 0.46 | 0° | 45 | 25 | 6 | 59 | 35 |
| BH-3 | UDS-3 | 6.00-6.45 | 1.91 | 1.57 | 22 | 2.72 | 0.712 | 0.59 | 0° | 46 | 27 | 7 | 53 | 40 |
| BH-3 | UDS-4 | 8.50-8.95 | 1.92 | 1.57 | 22 | 2.72 | 0.704 | 0.60 | 0° | 42 | 19 | 8 | 57 | 35 |

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619/207 Son/G.T/2014-15, GZER-HIDCO/09/00014
03/CL-1/EGE/RM;BBM/BD/19
BM/G.T.E-1/23-24/130



PROJECT: PROPOSED MULTISTORIED BUILDING AT
HOLDING NO. 83, P.S. & DIST.-BURDWAN

ASSOCIATED SHEET
FOUNDATION NO.
ENGINEERS 21

BORE LOG DATA SHEET

BORE HOLE NO : 1

| | | | | | |
|--------------------|------|--------------------|------|------------------------|------------|
| PENETROMETER (SPT) | NDS. | | NDS. | COMMENCED ON : | 30-11-2012 |
| PENETROMETER (SPT) | 13 | UNDISTURBED (UDS) | 2 | COMPLETED ON : | 01-12-2012 |
| CONE (PC) | | PENETROMETER (SPT) | 13 | BORE HOLE DIA : | 150 mm. |
| VANE (V) | | DISTURBED (DS) | 2 | R.L. OF GROUND : | |
| | | | | WATER STRUCK AT : | 1.50m |
| | | | | STANDING WATER LEVEL : | 1.50m |

| DESCRIPTION | SYMBOL | N - VALUE | | | | SAMPLES | |
|---|--------|-----------|----|----|-----|----------|---------------|
| | | 25 | 50 | 75 | 100 | REF NO. | DEPTH (M) |
| VERY LOOSE FILLING OF CLAYEY SILT OBS. BK. BATS, SAND ETC. 2.60M | | | | | | DS - 1 | 1.50 |
| SOFT TO MEDIUM TO STIFF LIGHT GREY TO BROWNISH GREY CLAYEY SILT OBS. KANKARS. CLAYEY COARSE SILT POCKET OBS. AT SOME LOCATIONS. 11.00M | | | | | | DS - 2 | 2.50 |
| | | N = 4 | | | | SPT - 1 | 3.00 - 3.60 |
| | | N = 12 | | | | UDS - 1 | 4.50 - 4.95 |
| | | N = 11 | | | | SPT - 2 | 7.00 - 7.60 |
| | | N = 24 | | | | UDS - 2 | 9.00 - 9.45 |
| | | N = 38 | | | | SPT - 3 | 10.00 - 10.60 |
| MODERATE DENSE TO VERY DENSE LIGHT BROWNISH GREY SILTY FINE TO MEDIUM TO COARSE SAND OBS. MICA TRACES. 40.60M | | | | | | SPT - 4 | 13.00 - 13.60 |
| | | N = 56 | | | | SPT - 5 | 16.00 - 16.60 |
| | | N = 100 | | | | SPT - 6 | 19.00 - 19.60 |
| | | N = 100 | | | | SPT - 7 | 22.00 - 22.60 |
| | | N = 100 | | | | SPT - 8 | 25.00 - 25.60 |
| | | N = 100 | | | | SPT - 9 | 28.00 - 28.60 |
| | | N = 100 | | | | SPT - 10 | 31.00 - 31.60 |
| | | N = 100 | | | | SPT - 11 | 34.00 - 34.60 |
| | | N = 100 | | | | SPT - 12 | 37.00 - 37.60 |
| | | N = 100 | | | | SPT - 13 | 40.00 - 40.60 |



PROJECT: PROPOSED MULTISTORIED BUILDING AT

HOLDING NO. 83, P.S. & DIST.-BURDWAN

ASSOCIATED SHEET
FOUNDATION NO.
ENGINEERS 22

BORE LOG DATA SHEET

BORE HOLE NO : 2

| | | | | | |
|--------------------|------|--------------------|------|------------------------|------------|
| PENETROMETER (SPT) | NOS. | | NOS. | COMMENCED ON : | 01-12-2012 |
| PENETROMETER (SPT) | 16 | UNDISTURBED (UDS) | 3 | COMPLETED ON : | 02-12-2012 |
| CONE (PC) | | PENETROMETER (SPT) | 16 | BORE HOLE DIA : | 150 mm. |
| VANE (V) | | DISTURBED (DS) | 1 | R.L. OF GROUND : | |
| | | | | WATER STRUCK AT : | 1.50m |
| | | | | STANDING WATER LEVEL : | 1.50m |

| DESCRIPTION | SYMBOL | N - VALUE | | | | SAMPLES | |
|---|--------|-----------|----|----|-----|----------|---------------|
| | | 25 | 50 | 75 | 100 | REF NO. | DEPTH (M) |
| VERY LOOSE FILLING OF CLAYEY SILT OBS. BK. BATS, SAND ETC. | | | | | | DS - 1 | 1.00 |
| 2.00M | | N = 2 | | | | SPT - 1 | 1.50 - 2.10 |
| SOFT TO MEDIUM TO STIFF LIGHT GREY TO BROWNISH GREY CLAYEY SILT OBS. KANKARS. CLAYEY COARSE SILT POCKET OBS. AT SOME LOCATIONS. | | N = 4 | | | | UDS - 1 | 2.50 - 2.95 |
| | | N = 8 | | | | SPT - 2 | 3.00 - 3.60 |
| | | N = 12 | | | | UDS - 2 | 4.00 - 4.45 |
| | | N = 10 | | | | SPT - 3 | 4.50 - 5.10 |
| 11.00M | | N = 31 | | | | SPT - 4 | 6.00 - 6.60 |
| | | N = 45 | | | | UDS - 3 | 7.50 - 7.95 |
| | | N = 53 | | | | SPT - 5 | 8.00 - 8.60 |
| MODERATE DENSE TO VERY DENSE LIGHT BROWNISH GREY SILTY FINE TO MEDIUM TO COARSE SAND OBS. MICA TRACES. | | | | | | SPT - 6 | 11.00 - 11.60 |
| | | | | | | SPT - 7 | 14.00 - 14.60 |
| | | | | | | SPT - 8 | 17.00 - 17.60 |
| | | | | | | SPT - 9 | 20.00 - 20.60 |
| | | | | | | SPT - 10 | 23.00 - 23.60 |
| | | | | | | SPT - 11 | 26.00 - 26.60 |
| | | | | | | SPT - 12 | 29.00 - 29.60 |
| | | | | | | SPT - 13 | 32.00 - 30.60 |
| | | | | | | SPT - 14 | 35.00 - 35.60 |
| | | | | | | SPT - 15 | |
| | | | | | | SPT - 16 | |
| 40.60M | | | | | | | |



PROJECT: PROPOSED MULTISTORIED BUILDING AT
 HOLDING NO. 83, P.S. & DIST.-BURDWAN

ASSOCIATED SHEET
 FOUNDATION NO.
 ENGINEERS 23

BORE LDG DATA SHEET

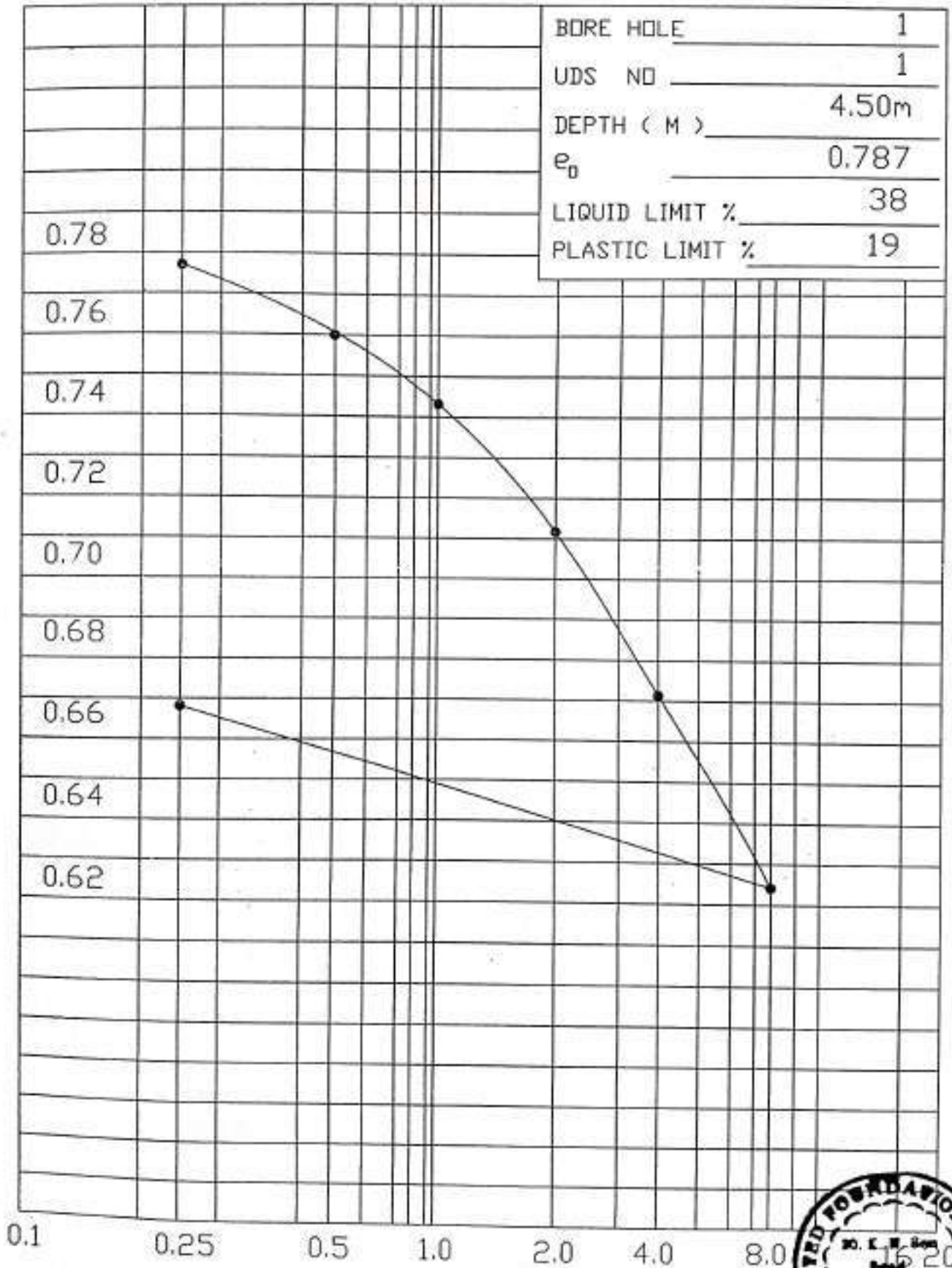
BORE HOLE NO : 3

| | | | | | |
|--------------------|------|--------------------|------|------------------------|------------|
| PENETROMETER (SPT) | NDS. | | NDS. | COMMENCED ON : | 02-12-2012 |
| PENETROMETER (SPT) | 14 | UNDISTURBED (UDS) | 4 | COMPLETED ON : | 03-12-2012 |
| CONE (PC) | | PENETROMETER (SPT) | 14 | BORE HOLE DIA : | 150 mm. |
| VANE (V) | | DISTURBED (DS) | 2 | R.L. OF GROUND : | |
| | | | | WATER STRUCK AT : | 1.60m |
| | | | | STANDING WATER LEVEL : | 1.60m |

| DESCRIPTION | SYMBOL | N - VALUE | | | | SAMPLES | |
|--|--------|-----------|------|------|-------|---|---|
| | | 25 | 50 | 75 | 100 | REF NO. | DEPTH (M) |
| VERY LOOSE FILLING OF CLAYEY SILT OBS. BK. BATS, SAND ETC. 2.80M | | | | | | DS - 1 DS - 2 | 1.50 2.50 |
| SOFT TO MEDIUM TO STIFF LIGHT GREY TO BROWNISH GREY CLAYEY SILT OBS. KANKARS. CLAYEY COARSE SILT POCKET OBS. AT SOME LOCATIONS. 11.00M | | N=3 | N=8 | N=13 | N=10 | UDS - 1 SPT - 1 UDS - 2 SPT - 2 UDS - 3 SPT - 3 UDS - 4 SPT - 4 | 3.00 - 3.45 3.50 - 4.10 4.50 - 4.95 5.00 - 5.60 6.00 - 6.45 6.50 - 7.10 8.50 - 8.95 9.00 - 9.60 |
| MODERATE DENSE TO VERY DENSE LIGHT BROWNISH GREY SILTY FINE TO MEDIUM TO COARSE SAND OBS. MICA TRACES. 40.10M | | N=21 | N=42 | N=49 | N=100 | SPT - 5 SPT - 6 SPT - 7 SPT - 8 SPT - 9 SPT - 10 SPT - 11 SPT - 12 SPT - 13 SPT - 14 | 12.00 - 12.60 15.00 - 15.60 18.00 - 18.60 21.00 - 21.60 24.00 - 24.60 27.00 - 27.60 30.00 - 30.60 33.00 - 33.60 36.00 - 36.60 |



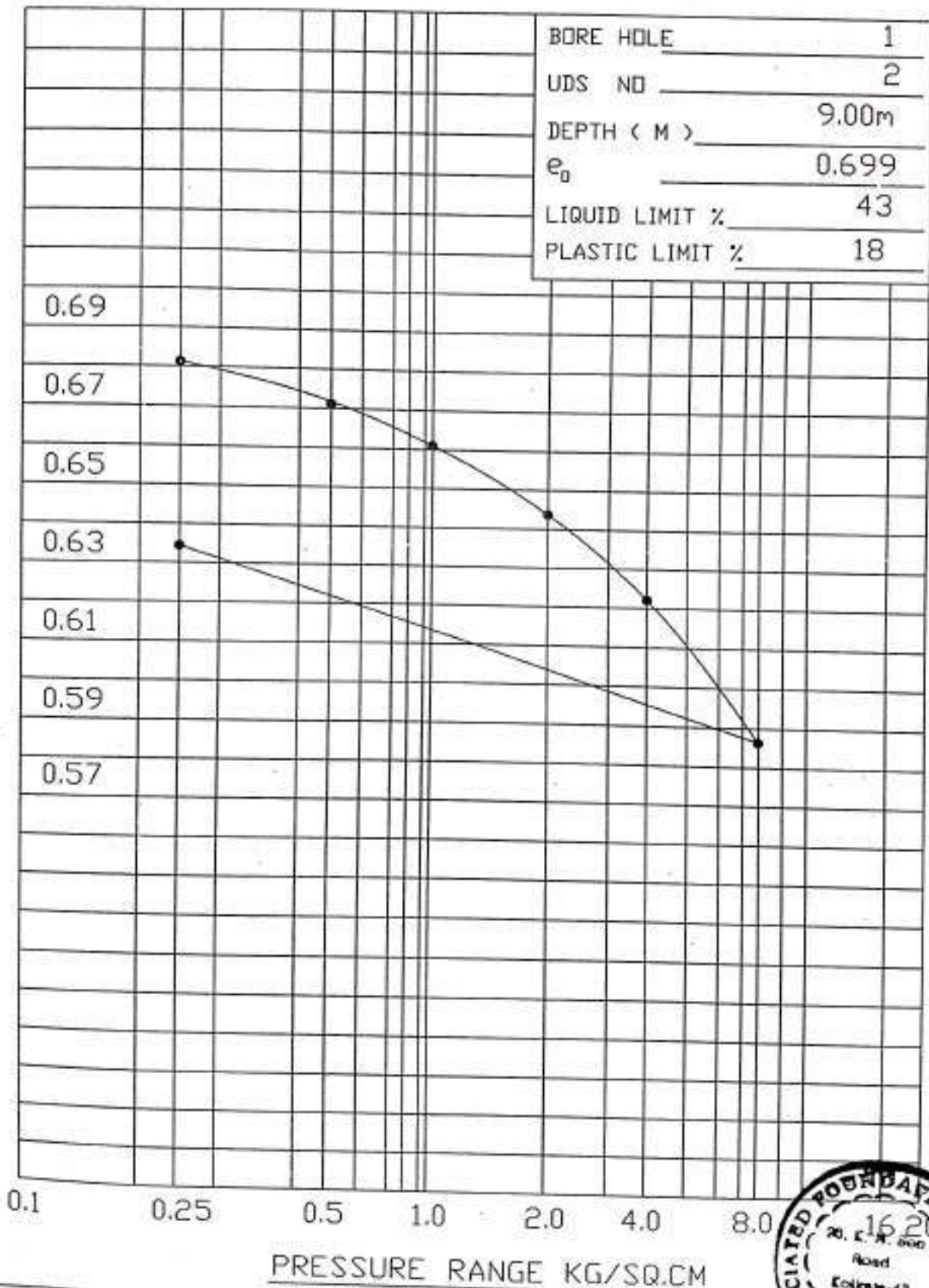
e VS LOG p CURVE



PRESSURE RANGE KG/SQ.CM



e VS LOG p CURVE

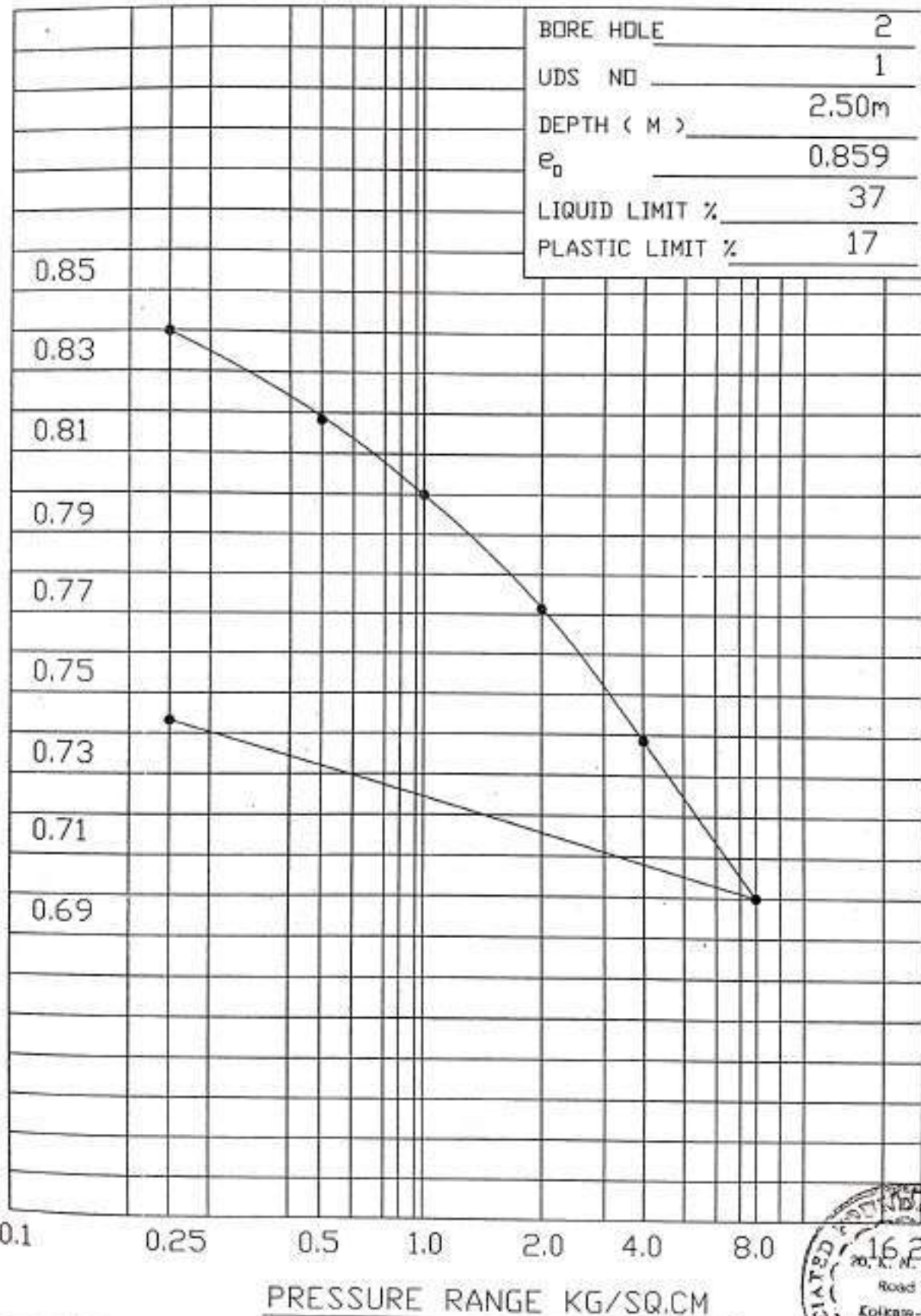


| | |
|-----------------|-------|
| BORE HOLE | 1 |
| UDS NO | 2 |
| DEPTH (M) | 9.00m |
| e_0 | 0.699 |
| LIQUID LIMIT % | 43 |
| PLASTIC LIMIT % | 18 |

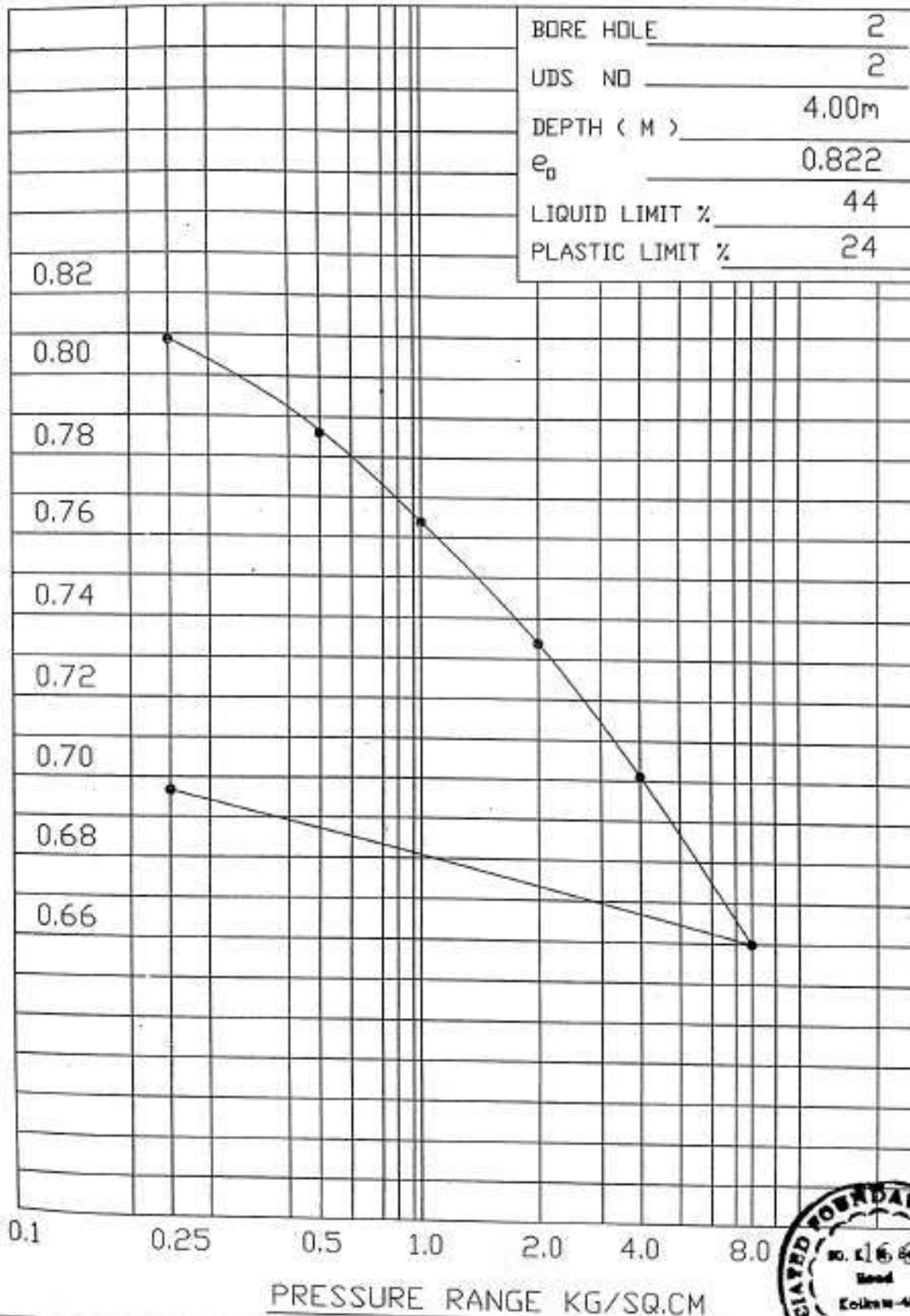


PRESSURE RANGE KG/SQ.CM

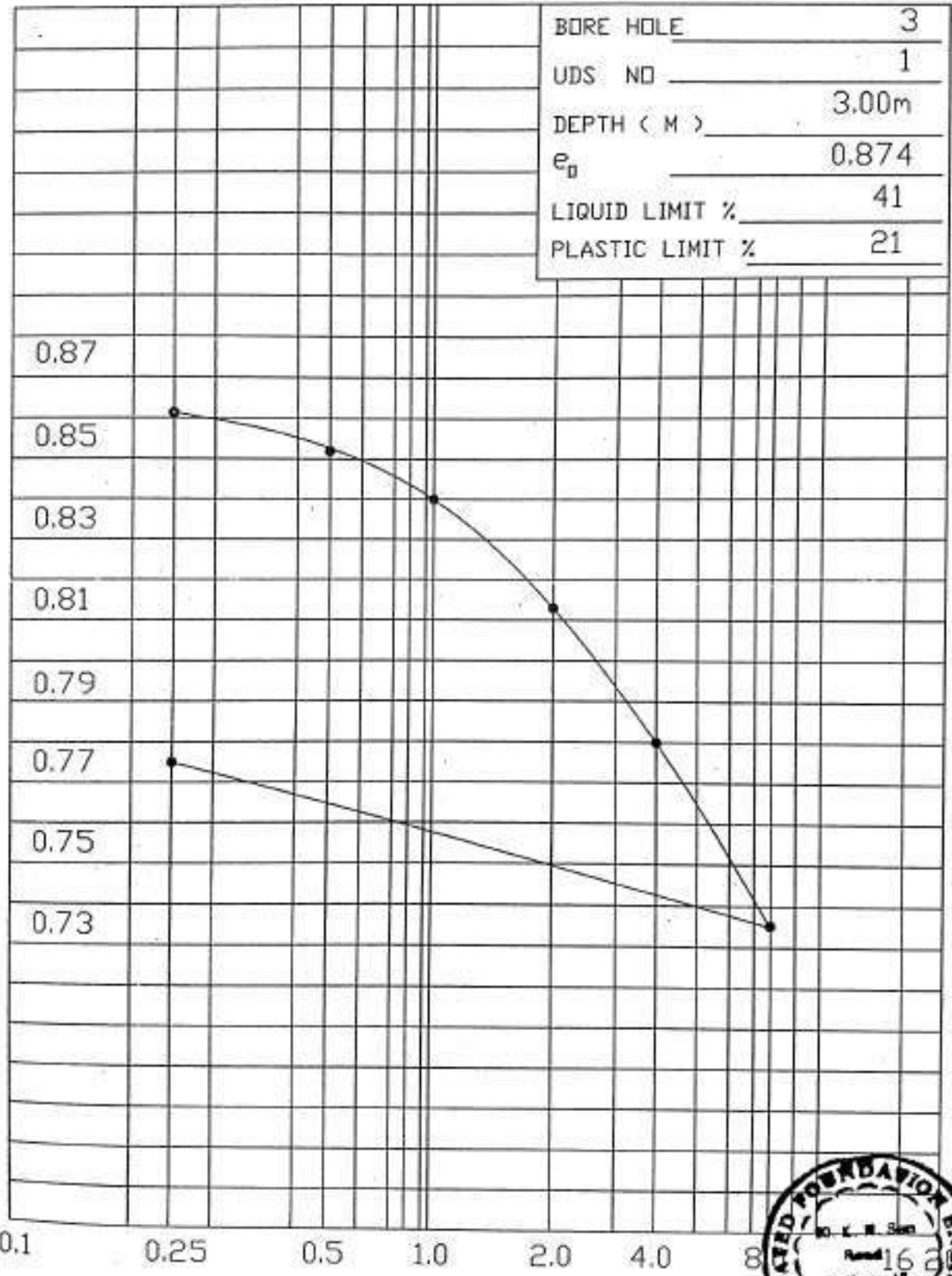
e VS LOG p CURVE



e VS LOG p CURVE



e VS LOG p CURVE



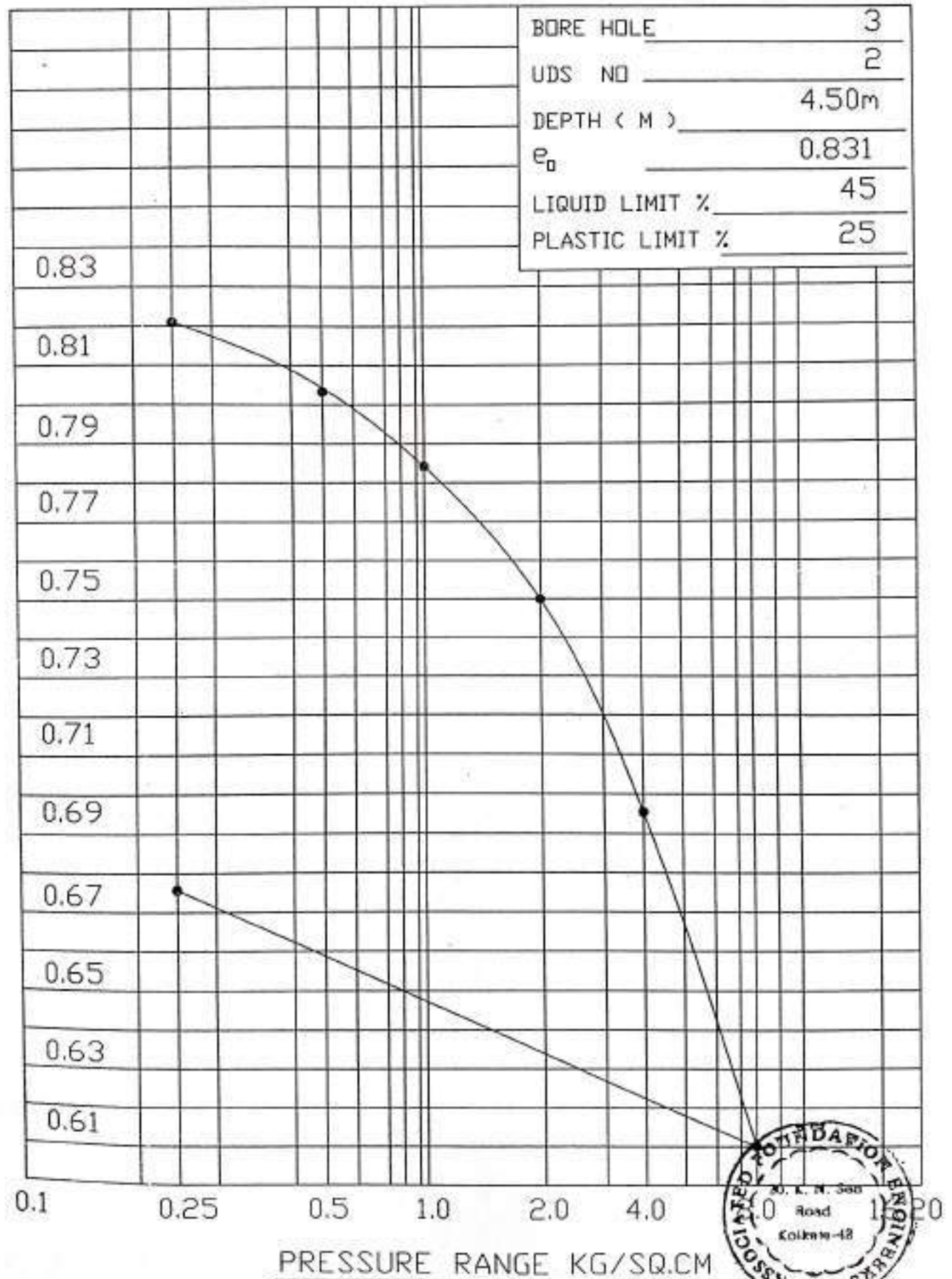
| | |
|-----------------|-------|
| BORE HOLE | 3 |
| UDS NO | 1 |
| DEPTH (M) | 3.00m |
| e_0 | 0.874 |
| LIQUID LIMIT % | 41 |
| PLASTIC LIMIT % | 21 |

0.1 0.25 0.5 1.0 2.0 4.0 8

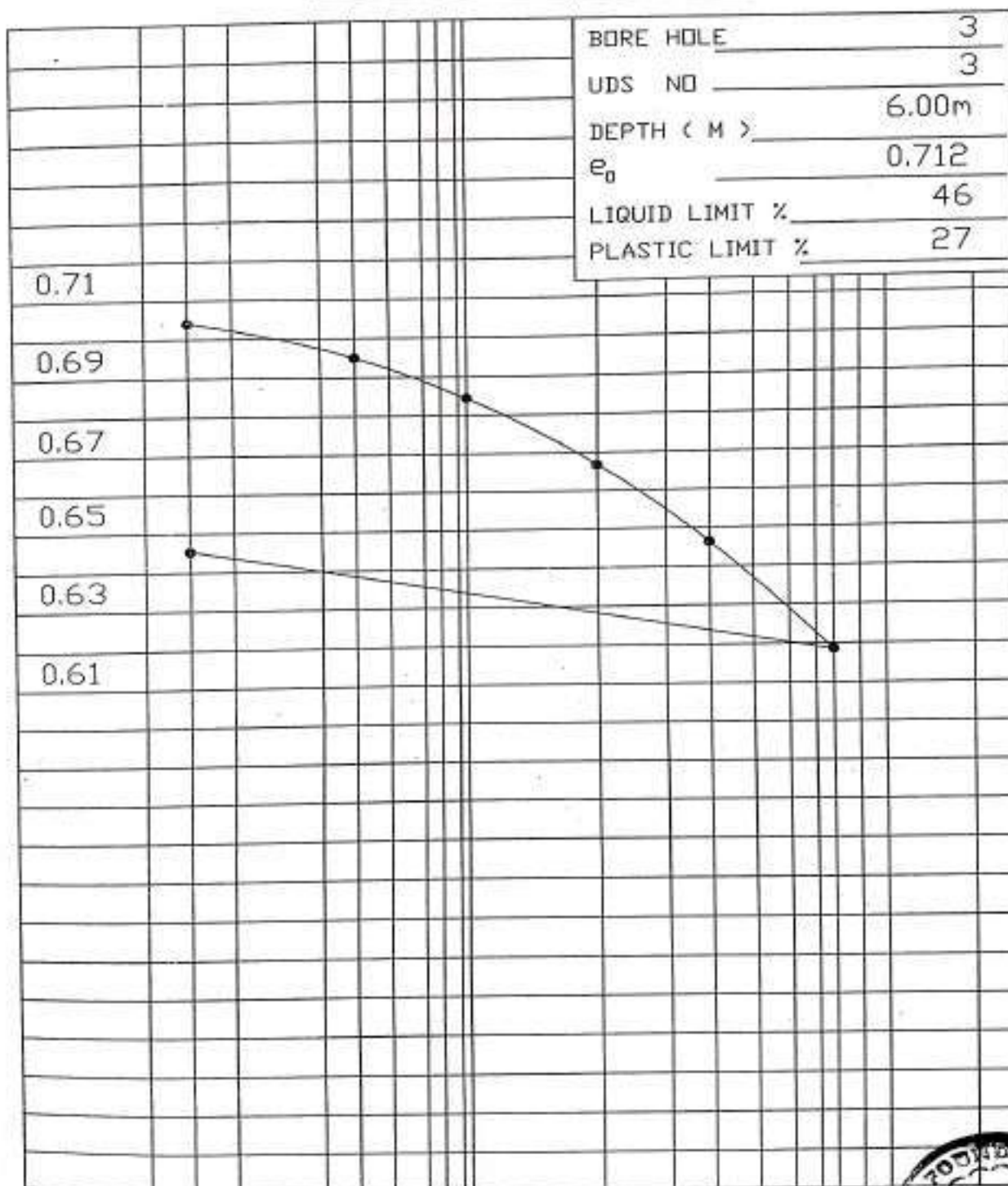
PRESSURE RANGE KG/SQ.CM



e VS LOG p CURVE



e VS LOG p CURVE



| | |
|-----------------|-------|
| BORE HOLE | 3 |
| UDS NO | 3 |
| DEPTH (M) | 6.00m |
| e_0 | 0.712 |
| LIQUID LIMIT % | 46 |
| PLASTIC LIMIT % | 27 |

0.1 0.25 0.5 1.0 2.0 4.0 8.0

PRESSURE RANGE KG/SQ.CM



e VS LOG p CURVE

