CLIENT:
MOSTAK AHMED GONG

REPORT ON:

SUB-SOIL INVESTIGATION FOR THE CONSTRUCTION OF PROPOSED 10 (TEN) STORIED RESIDENTIAL BUILDING AT HOUNE NO. – 1398/15/1-E, ROAD#2, RIAJBAG TALTALA, KHILGAON, DHAKA, BANGLADESH.

JULY,- 2022.


SUB-SOIL INVESTIGATED & REPORTED BY:
CREATIVE DESIGN & DEVELOPMENT
(ENGINEERS, ARCHITECTS & PLANNERS)
65, SHER SHAH SURI ROAD, MOHAMMADPUR,
DHAKA. MOBILE: 01819-277566.

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**ATTACHMENT**

## 1.0 INTRODUCTION:

A reasonably accurate conception about the subsoil parameters of any project site is an essential priority for proper planning and designing the foundation of the concerned structure, So that the structure after its construction word remain safe and stable although out it's service period. Paying due considerations to those for **Mostak Ahmed Gong**, was agreed to offer the sub-surface investigation work of the same in favor of **Creative Design & Development,** a well reputed geotechnical firm in Dhaka, Bangladesh.

According to work order of representative of the client, a detailed sub-soil study was comprising execution of **5 (Five)** number borings **101ft** deep, including the different field and laboratory tests, report submission etc had been undertaken and carried out by **Creative Design & Development**, are responsible for soil tests but the Reporter/Engineer is responsible only for Report, during the period of **July,- 2022**.

## 2.0 METHODOLOGY:

**Agrani Soil Engineers & Geologist,** sent one SPT Test team for field test at the site. According to work order, Team Leader of SPT Test team contracted with representative of client for recognizing the selected land and locations for field test. After complete the field test, Team Leader collected the signature on Bore Logs sheet from the representative of client.

## 3.0 CLIENT:

**Mostak Ahmed Gong,** Khilgaon, Dhaka.

## 4.0 LOCATION:

The soil investigation works for construction of Proposed 10- Storied Residential Building at House No.- 373/B, Taltala, Khilgaon, Dhaka.

## 5.0 SCOPE OF WORK:

The main scopes of this investigation work are:

a. Execution of exploratory borings, recording of sub-soil stratification and position of ground water table.

b. Execution of standard penetration test (SPT) at an interval of 5ft depth with collection of disturbed soil samples up to final depth exploration of each borings.

c. Collection of undisturbed soil samples by thin walled Shelby tubes for each bore hole.

d. Preparation of fine report with all works including detailed description of soil stratification sub-soil.

e. From the filed tests and laboratory tests, scope of calculation for bearing capacity values for design shallow foundation.

f. For loose and soft strata, from the filed test and laboratory tests, scope calculation for skin friction and bearing values for design deep foundation.

## 6.0 FIELD WORKS:

All the filed works and filed tests were conducted as per standard procedure as laid down in ASTM specification are as follows:

**6.1 Exploratory Boring drilling:**

Drilling was executed by wash boring method. A hole was started by driving vertically a 4" diameter steel casing into the ground to some depth and then the formation ground casing was broken up by repeated drops of a chopping bit attached to the lower and of drilling pipe. The upper end of the same was forced at high pressure through pressure pipe. Forced slurry or water emerges at high velocity through the pores of the chopping bit, and returns to the surface through the annular space between drilling pipe and the side of the casing or hole, carrying with it the broken-up soil. In this way drilling is advanced up to a level of 6" above the depth, where SPT has to be executed.

**6.2 Standard Penetration Test:**

Standard penetration Tests have been executed in all the bore holes at 5ft. intervals of depth up to the final depth of boring. In this test, a split spoon sampler of 2" out diameter and 1-3/8" inner diameter, is made to penetrate 18 inches, into the soil by drops of a hammer weighing 140 lbs. failing freely for a height of 30 inches. Numbers of blows of hammer required for penetration of each 6 inch length of the sampler are recorded. The number of blows for the last 12 inch penetration of the total 18 inch is know as the standard penetration value (N-values) as specified by ASTM and is plotted the SPT value of the particular depth.

**6.3 Extraction of soil samples:**

Disturbed soil samples were collected at 5'-0" intervals and at every change of soil strata by split spoon sampler. These soil samples were studied visually and the soil classification were done to prepare strata chart of soils up to the explored depth. Before collection of samples, the hole is washed and cleaned the drill pipe with the help of an adapter and is lowered into the hole.

The sampler is then pressed down into the ground in one rapid continuous movement until the tube, except 4 inches from the top is filled with soil sample. Undisturbed soil samples are taken at a depth where layer of soil is changed such as 8 ft 12 ft. Undisturbed soil samples are collected by means of thin walled sharp ended 3 inch dia. Shelby tube from the cohesive soil formation. The collect tubes were then labeled with detailed job designation, date and shifted to the laboratory for testing.

**7.0 LABORATORY TESTS:**

All Laboratory Tests conducted on soil samples collected either in the disturbed or in the undisturbed state. All tests were done as per ASTM procedures, are as follows:

**7.1 Natural Moisture content:**

The water content of a soil sample is the ratio of the weight of the water in the sample to its dry weight. It is usually expressed as a percentage. The soil sample is weight both in natural state and in over dry state and the moisture content is calculated by dividing the loose of weight of the sample by its dry weight.

**7.2 complete grain size Analysis:**

The object of grain size analysis is to determine the size of the soil grains, and the percentage by weight of soil particles of different particles size, comprising a soil sample. The process consists of either sieve analysis or hydrometer analysis or both. The hydrometer analysis is adopted for sample passing sieve No. 200.

For hydrometer analysis, a 40 gas of the over dry sample, is thoroughly mixed with required quantity of water in a calibrated glass cylinder. In order to avoid flocculation, a little dispersing agent is added. The density of the suspension is measured at specified time intervals, by means of a hydrometer or special design. At any particular time the size of the largest particle remounting in suspension at the level of the hydrometer can be computed by means of stocks Law, where as he weight of the particles finer than that size, can be computed from the density of the suspension at the same level. The mixture is washed through U.S standard sieve No. 200 and the fraction retained is dried. The fraction retained on each sieve is weighed for calculation of the percentage of different fraction. The results are represented by cumulative curves plotted on semi-logarithmic graph paper.

**7.3 Atterberg limits:**

Physical properties of clay are greatly influenced by water content. A given soil behave as a fluid or a soil or, as a plastic materials, depending on how much water its contain. The water contents that correspond to the boundaries between the states of consistency are called as the Atterberg limit. Liquid Limit is the minimum water content at which a clay soil just starts behaving like a fluid. The water content at which 25 blows are required is termed as the limit. The plastic limit is the minimum water content at which a soil is just plastic and is determined by rolling out a soil sample at a slowly decreasing water content until, the desired water content is reached, at which a thread of 1/8 inch diameter just begging to crumble.

**7.4 Specific Gravity Test:**

The specific gravity of soil particles ($G_S$) is defined as the ratio of the mass of give volume of soil particles to the mass of an equal volume of water at $4^0$C. The specific gravity of a solid for most natural soils falls in general range of 2.60 to 2.80. To determine the specific gravity of soil sample, 25 grams of over dried soil sample is thoroughly pulverized and is placed in a calibrated psychomotor. Water is poured incise the pycnometer until it's top is slightly below the calibrated mark. The mixture is then boiled thoroughly in order to eliminate all the air bubbles. More water is then added to the mixture till it over-night, the temperature is then recorded and the bottle is weighed.

The specific gravity $G_s$ is given by:

$$G_S = \frac{Gt \,.\, Ws}{Ws - W1 + W2}$$

Where, $G_t$ = Specific gravity of water at TOC.
$W_S$ = The weight of over dry soil (25gms.)
$W_1$ = Weight of flask + soil + water.
$W_2$ = Weight of flask + water.


**7.5 Direct shear Test:**

Direct shear test can be performed for both cohesion less & cohesive soil to determine shear strength, angle of internal friction, cohesion c, volume change etc. The test is done in a direct shear machine which consists of a normal loading device, shearing displacement of approximately 10mm per minute is often for a sample used for a sample thickness of about 1.2cm. The results of a direct shear test on a cohesion less & cohesive soil can be presented in a summary table & by stress-strain curve.

A stress-strain curve normally consists of shear stress, various shear displacement for both the undisturbed and the remolded test under a specified normal load the normal load usually varies from 1/3kg/cm$^2$ to 1kg/cm$^2$. Another curve of normal stress verses shearing stress will give angle of internal and cohesion for cohesive soil.

**7.6 Unconfined Compression Test:**

Unconfined compression test is a simple method for determination of shearing strength of cohesive soil which is important to determine the bearing capacity of soil. As the name implies, the lateral confining pressure in an unconfined compression test is kept zero, unsupported specimen and at failure is measured carefully trimming it to a cylindrical shape of 7cm height and 3.5cm dia. The load is applied axially on the top of the specimen an is distributed uniformly over surface of the specimen with the help of double providing ring assembly fitted with a strain gauge, fitted with the apparatus. The load is applied at such a rate that the vertical deformation of the sample is nearly 2% (two percent) per minute in order to avoid and drainage during compression. The load is kept increasing until the specimen fails along shearing plane. The maximum load at failure knows as the unconfined compressive strength of the sample the shearing strength of the sample is half of the unconfined compressive strength.

**7.7 Consolidation Test:**

The gradual process of compression of soil under the action of static load and with decrease of void ratio due to expulsion of water from the soil pores is termed consolidation The phenomenon compressibility characteristics of a soil as the period and magnitude of settlement of a foundation depends on these characteristics. The test is performed on a specimen of circular shape of 6.35cm dia and 2.54cm thickness, The specimen is prepared from the undisturbed sample by carefully trimming it to the required dimension with the help of a cutting edge and wire saw The specimen is then placed in the consolidation ring and its top and bottom are trimmed off level with that of the ring The specimen along with the ring on the top and the other at the bottom of the specimen. The load is then applied on porous stone and on the specimen with the help of a level arrangement with the apparatus.

Decreases in volume of specimen are read from a strain gauge attached to the consolidation unit at specified time intervals the consolidation unit is always kept full with water in order to avoid evaporation of the specimen. The load increment is allowed after each twenty four house, the observed reading are then plotted on semi-logarithmic graph paper to give the pressure-void ratio curve from which compression index, $\mathbf{C_C}$ can be calculated. $C_C$ is important factor governing the settlement process of underlying soils.

**8.0 DESCRIPTION OF SOIL COMPOSITION:**

The following terms are used in this report for description of soil composition:

Trace fine sand : 1 to 10% fine sand.
Little silt : 11 to 20% silt.
Some clay : 20 to 35% clay.
Sandy silt : 35 to 50% sand & 50 to 70% silt.
Clayey silt : 35 to 50% clay & 50 to 70% silt.
Silty sand : 35 to 50% silt & 50 to 70 % sand.

## 9. 0 CORRELATION TABLE OF SOILS BASED ON SPT-VALUES:

Two tables for Non -- Cohesive and cohesive soils based on N- Values as below

### 9.1 values of Unit Weight and Angle of Internal Friction of Non- Cohesive soil Based on N-Values (After K. Terzaghi and R. B. Peck):

Table No. 1

| N-Values | Condition | Relative Density | Angle of Internal Friction | Moist Unit Wt. In Pcf. |
|---|---|---|---|---|
| 0-4 | Very loose | 0.0-0.2 | $25^0$-$30^0$ | 70-100 |
| 4-10 | Loose | 0.2-0.4 | $30^0$-$35^0$ | 90-115 |
| 10-30 | Medium | 0.4-0.6 | $35^0$-$40^0$ | 110-140 |
| 30-50 | Dense | 0.6-0.85 | $40^0$-$45^0$ | 110-140 |
| Over 50 | Very dense | 1.00 | $45^0$ | 130-150 |

The tabulated values apply for dry/moist cohesion less sand. For silty sands the bearing capacity values must be reduced by study of grain size classification and applying judgment. Correction for water table close to bottom of foundation the bearing values should be reduced to half. The bearing values are, however, not affected by the water table at a depth greater than 1.5B below foundation level, B being least dimension of the bottom of foundation. Bearings values for intermediate position of water table may be reduced by liner interpolation.

### 9.2 Values of approximate Unconfined Compressive Strength Based on N-Values For Cohesive Soil (After K. Terzaghi and R.B. Peck):

Table No.- 2

| N-Values | Condition | Unconfined compressive Strength in Tsf. |
|---|---|---|
| Below 2 | Very soft | Below 0.25 |
| 2-4 | Soft | 0.25-0.50 |
| 4-8 | Medium | 0.50-1.00 |
| 8-15 | Stiff | 1.00-2.00 |
| 15-30 | Very stiff | 2.00-4.00 |
| Over | Hard | Over 4.00 |

In the above table the shear strength of cohesive soil is equal to 1/2 of unconfined compressive strength and the angle of shearing resistance is equal to zero. It should be remembered that the correlation for cohesive soil is always much reliable.

## 10.0 PHYSICAL PROPERTIES:

Physical Properties of the subsoil formation of the project area have been evaluated by the execution of **5 (Five)** number borings **101ft** deep. The overall physical properties may be summarized as follows:

### 10.1 Stratification of soil:

The top soil at and around each of grayish soft filling soil with rubbish/light brownish gray soft to medium clayey silt, trace fine sand/silt, trace fine sand, some clay/brownish gray very stiff silt, trace fine sand, some clay and underlying soil is yellowish brown with gray stiff to very stiff silt, trace fine sand, some clay/brownish stiff to very stiff silt, trace to little fine sand, some to little clay and the bottom soil is brownish gray/brownish very stiff to hard silt, trace to little fine sand, some to little clay (Ref. Bore logs).

### 10.2 Consistency/Compactness:

Up to the depth of EGL to 6ft, consistency of the top soil usually soft consistency of soil, however, gradually increase the consistency. The subsequent deep layers soft to medium soil state.

### 10.3 Ground Water Table:

The position of Ground Water table (GWT) is about 6ft from existing ground.

### 10.4 Natural moisture content, Unit Weight, Specific Gravity and Limits:

Table No. 3

| Range of Variation in Laboratory Test Results: | | |
|---|---|---|
| **Name of the Soil Test** | **No. of Tests** | **Range of Variation** |
| Natural Moisture content | 10 | From 20% to 34% |
| Natural unit Weight | - | From - Pcf to - Pcf |
| Dry density | - | From - Pcf to - Pcf |
| Specific gravity | 10 | From 2.665 to 2.688 |
| Liquid Limited | 10 | From 37% to 46% |
| Plasticity index | 10 | From 14% to 19%, NP= Non Plastic |
| Grain Size | 20 | From curve |

## 11.0 ENGINEERING PROPERTIES:

The engineering properties of soil, including the cohesion, compressibility and the angle of internal granular friction have been determined by performing laboratory tests on the soil samples collected during filed investigation. These are as follows:

**11.1 Cohesion:** The values of cohesion, as reported from the performance of unconfined compression (-Nos.) tests varies from - Psi to - Psi.

**11.2 Compressibility:** The top layer of plastic silty soil usually has been observed moderately compressible in nature by consolidation tests (-Nos.), as the values of compression index, varies from - to - and the corresponding values of the initial void ratio, - to -.

### 11.3 Angle of Internal Friction:

The angle of internal friction values of the investigated of soil, as reported form the performance of direct shear test (05Nos.) varies form $15^0$ to $17^0$.

## 12. 0 EVALUATION OF BEARING CAPACITY:

### 12.1 Bearing Capacities of the Shallow Condition from the SPT:

Table No.- 4

| Bearing capacities of the shallow foundation (values in Tsf, F. S. =3.0): | | |
|---|---|---|
| SPT Range | Allowable Bearing capacity in Tsf. | |
| | Continuous footing B=4ft | Isolated Column footing B=8ft |
| 0 - 2 | 0.00 - 0.225 | 0.00 - 0.30 |
| 2 – 4 | 0.225 – 0.45 | 0.30 – 0.60 |
| 4 – 8 | 0.45 –0.90 | 0.60 – 1.20 |
| 8 – 15 | 0.90 – 1.80 | 1.20 – 2.40 |
| 15 – 30 | 1.80 – 3.60 | 2.40 – 4.80 |
| > 30 | > 3.60 | > 4.80 |

Note:

a. Width= 4ft for strip footing and width = 8ft for isolated footing respectively.

b. The above values are the net allowable Bearing capacities.

c. The cohesive soil has been considered in a saturated condition.

### 12.2 Bearing capacity of the shallow foundation from the soil parameters:

The bearing capacities of the shallow foundation may more appropriately be determined from the parameters of soil such as the values of cohesion and the angle of internal friction as obtained from the performance of laboratory tests. These have been done considering the general equations of the Bearings capacity of the foundation as suggested by Terzaghi. The evaluated values are provided in the following Table No. 5 and Table No. 6.

**BEARING CAPACITIES OF THE SHALLOW FOUNDATION FROM FIELD AND LABORATORY TEST (VALUES IN TSF, F. S.=2.50):**

Table No. 5

| Bore Hole No. | Depth in Ft | Field SPT | Cohesion Tsf | Bearing capacity (Tsf) | |
|---|---|---|---|---|---|
| | | | | For Strip footing | For Circular or Square footing |
| BH-1 | 5 | 2 | - | 0.37 | 0.47 |
| | 10 | 4 | 0.25 | 0.68 | 0.86 |
| | 15 | 7 | 0.44 | 0.99 | 1.31 |
| | 20 | 18 | 1.13 | 2.36 | 3.08 |
| BH-2 | 5 | 2 | - | 0.37 | 0.47 |
| | 10 | 2 | 0.13 | 0.37 | 0.47 |
| | 15 | 4 | 0.25 | 0.68 | 0.86 |
| | 20 | 15 | 0.94 | 1.99 | 2.61 |
| BH-3 | 5 | 2 | - | 0.37 | 0.47 |
| | 10 | 2 | 0.13 | 0.37 | 0.47 |
| | 15 | 5 | 0.31 | 0.76 | 1.03 |
| | 20 | 18 | 1.13 | 2.36 | 3.08 |
| BH-4 | 5 | 2 | - | 0.37 | 0.47 |
| | 10 | 3 | 0.19 | 0.54 | 0.68 |
| | 15 | 7 | 0.44 | 0.99 | 1.31 |
| | 20 | 15 | 0.94 | 1.99 | 2.61 |
| BH-5 | 5 | 2 | - | 0.37 | 0.47 |
| | 10 | 3 | 0.19 | 0.54 | 0.68 |
| | 15 | 6 | 0.38 | 0.88 | 1.19 |
| | 20 | 17 | 1.06 | 2.24 | 2.92 |

**Note: SPT correction depends on overburden Pressure, Water Table. F.S.=2.50 as Bangladesh National Building Code (BNBC).**

**Bearing Capacities of the Shallow Foundation from Unconfined Compression Tests (Values in Tsf, F. S. = 2.50):**

Table No. 6

| Bore Hole No. | Depth in Ft | Unconfined Compression Strength in Psi | Allowable bearing capacity in Tsf | |
|---|---|---|---|---|
| | | | Strip footing | Square footing |
| BH-01-05 | - | - | - | - |

## 12.3 BEARING CAPACITIES OF PILES FROM THE SPT AND SOIL RAMETERS:

**Skin Friction and the End Bearing Capacities of Piles (F. S.=2.50):**

Table No.7:

| | BH-1 | | | | BH-2 | | | | BH-3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth Ft | N | Cu Tsf | $f_s$ Tsf | $f_b$ Tsf | N | Cu Tsf | $f_s$ Tsf | $f_b$ Tsf | N | Cu Tsf | $f_s$ Tsf | $f_b$ Tsf |
| 5 | 2 | - | - | - | 2 | - | - | - | 2 | - | - | - |
| 10 | 4 | 0.25 | 0.03 | - | 2 | 0.13 | 0.02 | - | 2 | 0.13 | 0.02 | - |
| 15 | 7 | 0.44 | 0.06 | - | 4 | 0.25 | 0.03 | - | 5 | 0.31 | 0.04 | - |
| 20 | 18 | 1.13 | 0.15 | - | 15 | 0.94 | 0.15 | - | 18 | 1.13 | 0.15 | - |
| 25 | 16 | - | 0.13 | 6.23 | 17 | - | 0.14 | 6.62 | 16 | - | 0.13 | 6.23 |
| 30 | 11 | - | 0.09 | 5.14 | 9 | - | 0.08 | 4.21 | 10 | - | 0.08 | 4.67 |
| 35 | 13 | - | 0.11 | 7.09 | 15 | - | 0.13 | 8.18 | 18 | - | 0.15 | 9.82 |
| 40 | 11 | - | 0.09 | 6.86 | 12 | - | 0.10 | 7.48 | 14 | - | 0.12 | 8.72 |
| 45 | 14 | - | 0.12 | 9.82 | 15 | - | 0.13 | 10.5 | 17 | - | 0.14 | 11.9 |
| 50 | 23 | - | 0.19 | 17.9 | 20 | - | 0.16 | 15.5 | 19 | - | 0.16 | 14.8 |
| 55 | 14 | - | 0.12 | 12.0 | 16 | - | 0.13 | 13.7 | 15 | - | 0.13 | 12.8 |
| 60 | 19 | - | 0.16 | 17.7 | 18 | - | 0.15 | 16.8 | 18 | - | 0.15 | 16.8 |
| 65 | 21 | - | 0.17 | 21.2 | 19 | - | 0.16 | 19.2 | 20 | - | 0.16 | 20.2 |
| 70 | 17 | - | 0.14 | 18.5 | 16 | - | 0.13 | 17.4 | 18 | - | 0.15 | 19.6 |
| 75 | 19 | - | 0.16 | 22.2 | 20 | - | 0.16 | 23.3 | 22 | - | 0.18 | 25.7 |
| 80 | 16 | - | 0.13 | 19.9 | 23 | - | 0.19 | 28.6 | 19 | - | 0.16 | 23.6 |
| 85 | 28 | - | 0.23 | 37.0 | 32 | - | 0.26 | 42.3 | 30 | - | 0.25 | 39.7 |
| 90 | 42 | - | 0.30 | 58.8 | 40 | - | 0.30 | 56.0 | 37 | - | 0.28 | 51.8 |
| 95 | 45 | - | 0.31 | 66.6 | 46 | - | 0.31 | 68.0 | 45 | - | 0.31 | 66.6 |
| 100 | 50 | - | 0.32 | 77.9 | 50 | - | 0.32 | 77.9 | 50 | - | 0.32 | 77.9 |

**To be Continued----------**

## 12.3 BEARING CAPACITIES OF PILES FROM THE SPT AND SOIL RAMETERS:

**Skin Friction and the End Bearing Capacities of Piles (F. S.=2.50):**

**Table No.7:**

| | BH-4 | | | | BH-5 | | | |
|---|---|---|---|---|---|---|---|---|
| **Depth Ft** | **N** | **Cu Tsf** | **$f_s$ Tsf** | **$f_b$ Tsf** | **N** | **Cu Tsf** | **$f_s$ Tsf** | **$f_b$ Tsf** |
| 5 | 2 | - | - | - | 2 | - | - | - |
| 10 | 3 | 0.19 | 0.03 | - | 3 | 0.19 | 0.03 | - |
| 15 | 7 | 0.44 | 0.06 | - | 6 | 0.38 | 0.05 | - |
| 20 | 15 | 0.94 | 0.13 | - | 17 | 1.06 | 0.14 | - |
| 25 | 18 | - | 0.15 | 7.01 | 19 | - | 0.16 | 7.40 |
| 30 | 9 | - | 0.08 | 4.21 | 16 | - | 0.13 | 4.48 |
| 35 | 17 | - | 0.14 | 9.27 | 18 | - | 0.15 | 9.82 |
| 40 | 12 | - | 0.10 | 7.48 | 15 | - | 0.13 | 9.35 |
| 45 | 14 | - | 0.12 | 9.82 | 17 | - | 0.14 | 11.9 |
| 50 | 20 | - | 0.16 | 15.5 | 19 | - | 0.16 | 14.8 |
| 55 | 16 | - | 0.13 | 13.7 | 23 | - | 0.19 | 19.7 |
| 60 | 20 | - | 0.16 | 18.7 | 11 | - | 0.09 | 10.2 |
| 65 | 18 | - | 0.15 | 18.2 | 17 | - | 0.14 | 17.2 |
| 70 | 19 | - | 0.16 | 20.7 | 17 | - | 0.14 | 18.5 |
| 75 | 21 | - | 0.17 | 24.5 | 22 | - | 0.18 | 25.7 |
| 80 | 26 | - | 0.21 | 32.4 | 20 | - | 0.16 | 24.9 |
| 85 | 36 | - | 0.28 | 47.6 | 24 | - | 0.20 | 31.7 |
| 90 | 39 | - | 0.29 | 54.6 | 38 | - | 0.29 | 53.2 |
| 95 | 43 | - | 0.30 | 63.6 | 45 | - | 0.31 | 66.6 |
| 100 | 50 | - | 0.32 | 77.9 | 50 | - | 0.32 | 77.9 |

**Note:** N = Blows/ft, Cu = Cohesion.

a. $f_s$ = Allowable value of the skin friction.

b. $f_b$ = Allowable value of the pile end bearing capacity.

c. SPT (N) values are corrected within calculation.

d. The values of $f_s$ and $f_b$ have been halved in making preliminary estimate about the carrying capacity of a Bored R. C. C. pile.

e. In the case of plastic silty soil, the values of the cohesion have been obtained from the SPT values.

## 13.0 FORMULA USED FOR COMPUTATION:

**For cohesive soil**

The ultimate bearing capacity,

$Qult = CN_C = \frac{Q_U . N_e}{2}$ ( J. E. Bowles)

$qall = \frac{q_u . N_C}{2.3} + {}_YD_f = \frac{q_u N_C}{6} = {}_YD_F$ (factor of safety = 3.00)

Where, $q_u$ = Unconfined Compressive Strength in tsf.

$N_c$ = Bearing Capacity Factor

= 6.8 square footing.

= 5.7 continuous footing.

**For Non-cohesive soil:**

$Qult = C N_C Sc + {}_y D_f Nq + 0.5_y BN_y S_y$ (J. E. Bowles)

Where, C = Cohesion, y = Unit weight of soil

$D_f$ = Depth of footing, B= Width of footing

$N_C$, $N_q$ & $N_y$ = bearing capacity factors = f (@) = f(N)

Sc, $S_y$ = Shape Factors = f (B, $D_f$ )

Qallowable = qult/F. S. (F. S. = 3)

(Ref. Book: Foundation Analysis and Design by J .E. Bowles, Page No. 213-277).

## ULTIMATE SKIN FRICTION (fs) AND END BEARING ($f_q$)

**For Cohesive soil:**

fs = $FC_d$ (M. J. Tomlinson)

Where, $C_d = q_u$ = Unconfind Compressive strength of soil and

F= Bearing Capacity Factor (ranges between 0.60 & 45)

**For Non- Cohesive Soil:**

For high displacement piles, $f_s = 2.0$ N Kn / $m^2$

For low displacement $f_s = 1.0$ N KN / $m^2$

Where, N average of corrected N- value along the length of the pile.

For bored piles in sand, $f_q = 14$ N $(D_b/B)$ Kn/$m^2$

Where $D_b$ = actual penetration into the granular soil.

For bored pile in sand, the unit frictional resistance ($f_s$) is given by

$F_s = 0.67$ N kN/ $m_2$ (K . R. Arora)

**Consolidation Settlement:**

$S = (C_C/(1-e_0)) * H * \log (p^0 + \Delta p) / p_0$.

(Ref. Book: Soil Mechanics and Foundation Engineering by K. R. Arora, Page No.- 383-450, 638-647 & 1003-1006).

## 13.1 LOAD CALCULATION FOR ANY DIAMETER / ANY LENGTH OF PILE:

$P = \prod D L f_s + \prod /4 D^2 f_b$

a. p = Allowable working Load.
b. $f_s$ = Average allowable value of the skin friction = - tsf.
c. $f_b$ = Allowable value of the pile end bearing capacity = - tsf.
d. $\prod$ = pai, a constant = 3.146.
e. D = pile Diameter.
f. L = Required length of pile =- ft.

## 14.0 COMPUTATION FOR CONSOLIDATION SETTLEMENT:

The vertical downward movement of the base of a structure is called settlement and its effect upon the structure depends on its magnitude, its uniformity, the length of the time over which it takes place, and the nature of the clay soils. The consolidation settlement can be calculated form test result of unit weight and consolidation tests. The approximate average settlement depends, column load of building.

## 15.0 CONCLUSIONS:

On the basis of above analysis and discussions, the following conclusions may be drawn regarding the sub-soil condition of the project area.

a. The overall soil formation of the investigated site are more or less regular in between the bore hole locations.

b. The top layers of the investigated site have been encountered with comprising of soft filling soil with rubbish/soft to medium clayey silt, trace fine sand/silt, trace fine sand, some clay/very stiff silt, trace fine sand, some clay (Ref. bore logs).

c. The underlying soil is stiff to very stiff silt, trace fine sand, some clay/stiff to very stiff silt, trace to little fine sand, some to little clay and the bottom soil is very stiff to hard silt, trace to little fine sand, some to little clay (Ref. Bore logs).

d. Bearing capacities for Shallow Foundation as Isolated column footing are shown in Table – 5 & 6.

e. Skin friction & End bearing capacities are shown in Table-7.

f. Bearing capacities for shallow foundation including isolated column footing are not suitable for all borings (Ref. Table-5).

g. Shallow foundation including column footing may not be provided at building site for all borings.

h. R.C.C. Cast-in-Situ Piles are suitable at project site for all borings.

## 16.0 RECOMMENDATION:

On the basis of aforesaid conclusion, the following recommendations are suggested for Proposed 10- Storied Residential Building at House No.- 373/B, Taltala, Khilgaon, Dhaka.

### R.C.C. CAST-IN-SITU PILE:

The average bearing capacities (F.S=2.50) of different diameter pile with the embedment length up to **100ft** from EGL of each boring may be considered as follows:

- **80 Ton** for **20 inch** dia pile

Note:

a. 1 Tsf = 1.094 Kg/cm$^2$ = 2ksf, 1 Ton = 2000 lbs = 9.87kN,
1m= 3.28ft, EGL = Existing Ground level & F. S. = Factor of Safety.

b. **The designer may select any others alternative type, depth as well as the bearing capacity of the foundation in the light of information provided in this report.**

c. Foundation base should be kept dry during construction period.

d. Pile load test should be performed. If pile load test is not performed then value of pile capacity should be considered half.

07.07.2022

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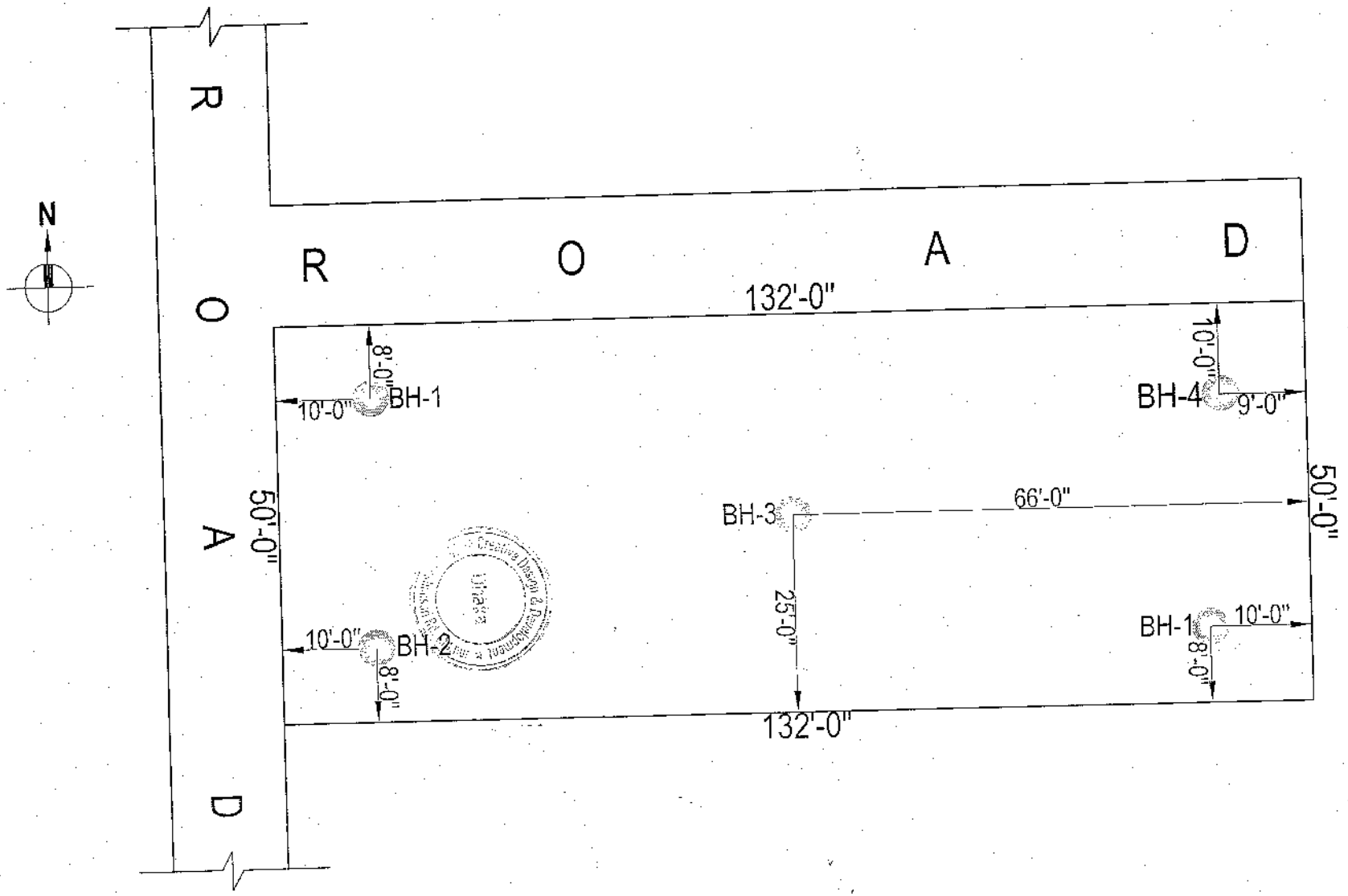
65, Shershahsuri Road (5th Floor)
[illegible]

| CREATIVE DESIGN & DEVELOPMENT | SITE PLAN<br>(NOT TO SCALE) | Project : 10- Storied Residential Building<br>Location : House No.- 373/B, Taltala,<br>Khilgaon, Dhaka. |
|---|---|---|



# CREATIVE DESIGN & DEVELOPMENT

Client : **MOSTAK AHMED GONG**
Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.

Bore Hole No: 1 (One)
Ground Level: ( - ) 0'-0"
R. L: ( - ) 0'-0"
Ground Water Level: ( - ) 6'-0"

| NUMBER OF SAMPLE | TYPE OF SA | DEPTH IN FEET | THICKNESS | LITHOLOGICAL DESCRIPTION | LITHOLOGICAL LOG | DIA OF BORING | STANDARD PENETRATION RESISTANCE BLOWS PER 12 INCH OF PENETRATION | INDEX / REMARKS |
|---|---|---|---|---|---|---|---|---|
| D-1 | | 5' | 6'-0" | Grayish soft Filling soil with rubbish. | | 4" INCH | 2 | CLAY |
| D-2 | | 10' | 11'-0" | Light brownish gray medium silt, trace fine sand/Silt, trace fine sand, some clay. | | | 4 | |
| D-3 | | 15' | | | | | 7 | |
| D-4 | | 20' | 10'-0" | Brownish gray very stiff Silt, trace fine sand, some clay. | | | 18 | SILT & CLAY |
| D-5 | | 25' | | | | | 16 | |
| D-6 | | 30' | 25'-0" | Yellowish brown with gray stiff to very stiff silt, trace fine sand, some clay. | | | 11 | |
| D-7 | | 35' | | | | | 13 | |
| D-8 | | 40' | | | | | 11 | SILT |
| D-9 | | 45' | | | | | 14 | |
| D-10 | | 50' | | | | | 23 | |
| D-11 | | 55' | 30'-0" | Brownish stiff to very stiff Silt, trace to little fine sand, some to little clay. | | | 14 | SAND |
| D-12 | | 60' | | | | | 19 | |
| D-13 | | 65' | | | | | 21 | |
| D-14 | | 70' | | | | | 17 | |
| D-15 | | 75' | | | | | 19 | MICA |
| D-16 | | 80' | | | | | 16 | |
| D-17 | | 85' | 19'-0" | Brownish gray/brownish very stiff to hard Silt, trace to little fine sand, some to little clay. | | | 28 | |
| D-18 | | 90' | | | | | 42 | |
| D-19 | | 95' | | | | | 45 | |
| D-20 | | 100' | | | | | 50 | |

0 5 10 15 20 25 30 35 40 45 50

Tested by:

Checked By:

# CREATIVE DESIGN & DEVELOPMENT

Client : **MOSTAK AHMED GONG**
Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.

Bore Hole No: 2 (Two)
Ground Level: ( - ) 0'-0"
R. L: ( - ) 0'-0"
Ground Water Level: ( - ) 6'-0"

| NUMBER OF SAMPLE | TYPE OF SA | DEPTH IN FEET | THICKNESS | LITHOLOGICAL DESCRIPTION | LITHOLOGICAL LOG | DIA OF BORING | STANDARD PENETRATION RESISTANCE BLOWS PER 12 INCH OF PENETRATION | INDEX / REMARKS |
|---|---|---|---|---|---|---|---|---|
| D-1 | | 5' | 6'-0" | Grayish soft Filling soil with rubbish. | | 4" INCH | 2 | |
| D-2 | | 10' | 11'-0" | Light brownish gray soft to medium Clayey silt, trace fine sand/Silt, trace fine sand, some clay. | | | 2 | |
| D-3 | | 15' | | | | | 4 | |
| D-4 | | 20' | 10'-0" | Brownish gray very stiff Silt, trace fine sand, some clay. | | | 15 | |
| D-5 | | 25' | | | | | 17 | |
| D-6 | | 30' | 26'-0" | Yellowish brown with gray stiff to very stiff silt, trace fine sand, some clay. | | | 9 | |
| D-7 | | 35' | | | | | 15 | |
| D-8 | | 40' | | | | | 12 | |
| D-9 | | 45' | | | | | 15 | |
| D-10 | | 50' | | | | | 20 | |
| D-11 | | 55' | 29'-0" | Brownish very stiff Silt, trace to little fine sand, some to little clay. | | | 16 | |
| D-12 | | 60' | | | | | 18 | |
| D-13 | | 65' | | | | | 19 | |
| D-14 | | 70' | | | | | 16 | |
| D-15 | | 75' | | | | | 20 | |
| D-16 | | 80' | | | | | 23 | |
| D-17 | | 85' | 19'-0" | Brownish gray/brownish hard Silt, trace to little fine sand, some to little clay. | | | 32 | |
| D-18 | | 90' | | | | | 40 | |
| D-19 | | 95' | | | | | 46 | |
| D-20 | | 100' | | | | | 50 | |

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# CREATIVE DESIGN & DEVELOPMENT

Client : **MOSTAK AHMED GONG**
Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.

Bore Hole No: 3 (Three)
Ground Level: ( - ) 0'-0"
R. L: ( - ) 0'-0"
Ground Water Level: ( - ) 6'-0"

| NUMBER OF SAMPLE | TYPE OF SA | DEPTH IN FEET | THICKNESS | LITHOLOGICAL DESCRIPTION | LITHOLOGICAL LOG | DIA OF BORING | STANDARD PENETRATION RESISTANCE BLOWS PER 12 INCH OF PENETRATION | INDEX / REMARKS |
|---|---|---|---|---|---|---|---|---|
| D-1 | | 5' | 6'-0" | Grayish soft Filling soil with rubbish. | | 4" INCH | 2 | DISTURBED |
| D-2 | | 10' | 11'-0" | Light brownish gray soft to medium Clayey silt, trace fine sand/Silt, trace fine sand, some clay. | | | 2 | UNDESTURBED |
| D-3 | | 15' | | | | | 5 | REMARKS |
| D-4 | | 20' | 10'-0" | Brownish gray very stiff Silt, trace fine sand, some clay. | | | 18 | |
| D-5 | | 25' | | | | | 16 | |
| D-6 | | 30' | 26'-0" | Yellowish brown with gray stiff to very stiff silt, trace fine sand, some clay. | | | 10 | |
| D-7 | | 35' | | | | | 18 | |
| D-8 | | 40' | | | | | 14 | |
| D-9 | | 45' | | | | | 17 | |
| D-10 | | 50' | | | | | 19 | |
| D-11 | | 55' | 30'-0" | Brownish very stiff Silt, trace to little fine sand, some to little clay. | | | 15 | |
| D-12 | | 60' | | | | | 18 | |
| D-13 | | 65' | | | | | 20 | |
| D-14 | | 70' | | | | | 18 | |
| D-15 | | 75' | | | | | 22 | |
| D-16 | | 80' | | | | | 19 | |
| D-17 | | 85' | 18'-0" | Brownish gray/brownish hard Silt, trace to little fine sand, some to little clay. | | | 30 | |
| D-18 | | 90' | | | | | 37 | |
| D-19 | | 95' | | | | | 45 | |
| D-20 | | 100' | | | | | 50 | |

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Checked By:

# CREATIVE DESIGN & DEVELOPMENT

Client : **MOSTAK AHMED GONG**
Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.

Bore Hole No: 4 (Four)
Ground Level: ( - ) 0'-0"
R. L: ( - ) 0'-0"
Ground Water Level: ( - ) 6'-0"

| NUMBER OF SAMPLE | TYPE OF SA | DEPTH IN FEET | THICKNESS | LITHOLOGICAL DESCRIPTION | LITHOLOGICAL LOG | DIA OF BORING | STANDARD PENETRATION RESISTANCE BLOWS PER 12 INCH OF PENETRATION | INDEX / REMARKS |
|---|---|---|---|---|---|---|---|---|
| D-1 | | 5' | 5'-0" | Grayish soft Filling soil with rubbish. | | 4" INCH | 2 | |
| D-2 | | 10' | 11'-0" | Light brownish gray soft to medium Clayey silt, trace fine sand/Silt, trace fine sand, some clay. | | | 3 | |
| D-3 | | 15' | | | | | 7 | |
| D-4 | | 20' | 10'-0" | Brownish gray very stiff Silt, trace fine sand, some clay. | | | 15 | |
| D-5 | | 25' | | | | | 18 | |
| D-6 | | 30' | 26'-0" | Yellowish brown with gray stiff to very stiff silt, trace fine sand, some clay. | | | 9 | |
| D-7 | | 35' | | | | | 17 | |
| D-8 | | 40' | | | | | 12 | |
| D-9 | | 45' | | | | | 14 | |
| D-10 | | 50' | | | | | 20 | |
| D-11 | | 55' | 30'-0" | Brownish very stiff Silt, trace to little fine sand, some to little clay. | | | 16 | |
| D-12 | | 60' | | | | | 20 | |
| D-13 | | 65' | | | | | 18 | |
| D-14 | | 70' | | | | | 19 | |
| D-15 | | 75' | | | | | 21 | |
| D-16 | | 80' | | | | | 26 | |
| D-17 | | 85' | 18'-0" | Brownish gray/brownish hard Silt, trace to little fine sand, some to little clay. | | | 36 | |
| D-18 | | 90' | | | | | 39 | |
| D-19 | | 95' | | | | | 43 | |
| D-20 | | 100' | | | | | 50 | |

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# CREATIVE DESIGN & DEVELOPMENT

Client : **MOSTAK AHMED GONG**
Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.

Bore Hole No: 5 (Five)
Ground Level: ( - ) 0'-0"
R. L: ( - ) 0'-0"
Ground Water Level: ( - ) 6'-0"

| NUMBER OF SAMPLE | TYPE OF SA | DEPTH IN FEET | THICKNESS | LITHOLOGICAL DESCRIPTION | LITHOLOGICAL LOG | DIA OF BORING | STANDARD PENETRATION RESISTANCE BLOWS PER 12 INCH OF PENETRATION | INDEX / REMARKS |
|---|---|---|---|---|---|---|---|---|
| D-1 | | 5' | 6'-0" | Grayish soft Filling soil with rubbish. | | 4" INCH | 3 | |
| D-2 | | 10' | 11'-0" | Light brownish gray soft to medium Clayey silt, trace fine sand/Silt, trace fine sand, some clay. | | | 3 | |
| D-3 | | 15' | | | | | 6 | |
| D-4 | | 20' | 10'-0" | Brownish gray very stiff Silt, trace fine sand, some clay. | | | 17 | |
| D-5 | | 25' | | | | | 19 | |
| D-6 | | 30' | 25'-0" | Yellowish brown with gray stiff to very stiff silt, trace fine sand, some clay. | | | 16 | |
| D-7 | | 35' | | | | | 18 | |
| D-8 | | 40' | | | | | 15 | |
| D-9 | | 45' | | | | | 17 | |
| D-10 | | 50' | | | | | 19 | |
| D-11 | | 55' | 34'-0" | Brownish very stiff Silt, trace to little fine sand, some to little clay. | | | 23 | |
| D-12 | | 60' | | | | | 11 | |
| D-13 | | 65' | | | | | 17 | |
| D-14 | | 70' | | | | | 17 | |
| D-15 | | 75' | | | | | 22 | |
| D-16 | | 80' | | | | | 20 | |
| D-17 | | 85' | | | | | 24 | |
| D-18 | | 90' | 14'-0" | Brownish gray/brownish hard Silt, trace to little fine sand, some to little clay. | | | 38 | |
| D-19 | | 95' | | | | | 45 | |
| D-20 | | 100' | | | | | 50 | |

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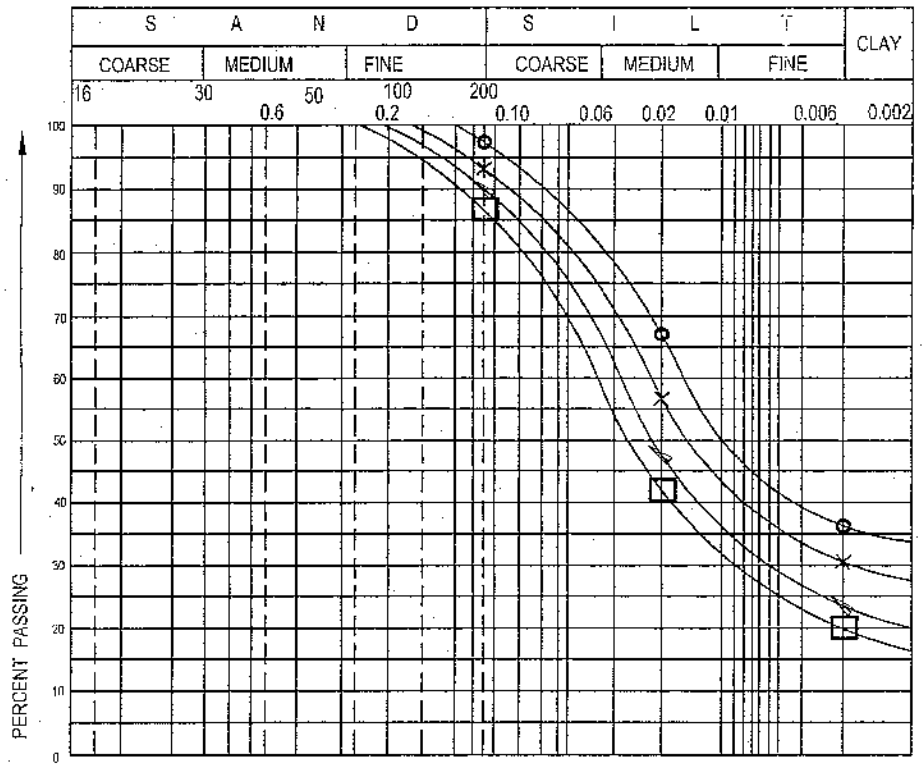
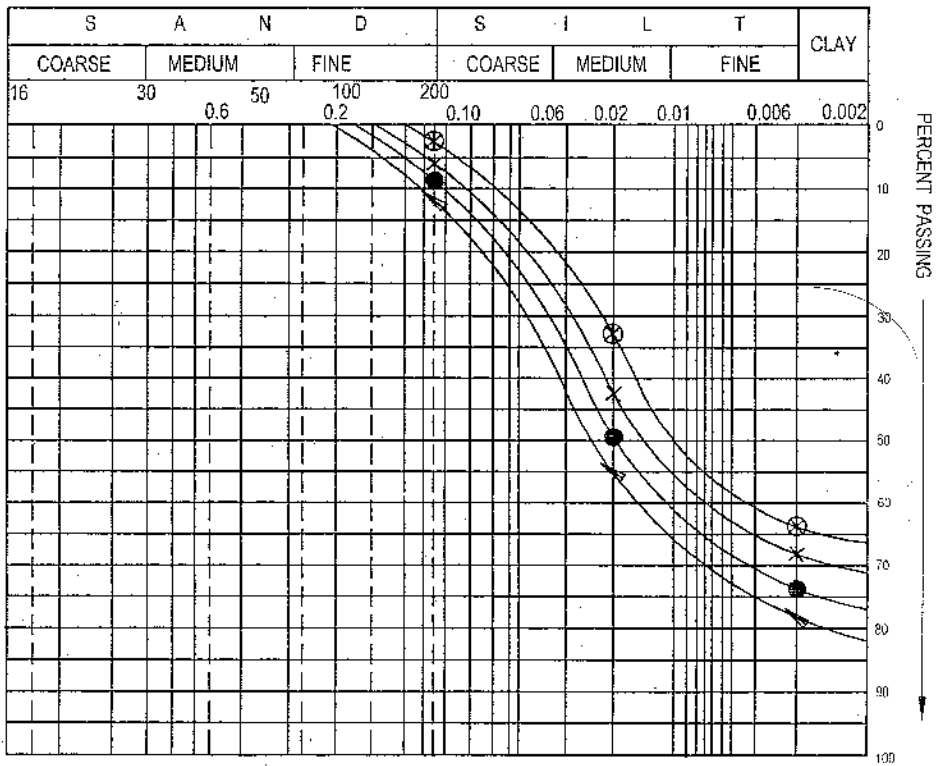
# CREATIVE DESIGN & DEVELOPMENT

## GRAIN SIZE DISTRIBUTION

Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.




| SYMBLE | BORE | SAMPLE | Depth in Ft/m | N . M . C | ATTERBERG LIMIT | | | SPECIFIC GRAVITY | SOIL CLASSIFICATION | SAND % | SILT % | CLAY % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L . L | P . L | P . I | | | | | |
| ○ ○ ○ | 01 | D-02 | 10 | 32 | 45 | 27 | 18 | 2.667 | Silt, trace fine sand, some clay. | 03 | 63 | 34 |
| × × × | | D-04 | 20 | 20 | 37 | 23 | 14 | 2.688 | Silt, trace fine sand, some clay. | 07 | 66 | 27 |
| ◁ ◁ ◁ | | D-16 | 80 | | | | | | Silt, little fine sand, little clay. | 13 | 72 | 16 |
| □ □ □ | | D-18 | 90 | | | | | | Silt, trace fine sand, some clay. | 10 | 70 | 20 |
| ⊛ ⊛ ⊛ | 02 | D-03 | 15 | 32 | 45 | 27 | 18 | 2.668 | Silt, trace fine sand, some clay. | 03 | 63 | 34 |
| ✳ ✳ ✳ | | D-05 | 25 | 21 | 38 | 24 | 14 | 2.686 | Silt, trace fine sand, some clay. | 06 | 65 | 29 |
| ⊛ ⊛ ⊛ | | D-17 | 85 | | | | | | Silt, trace fine sand, some clay. | 09 | 68 | 23 |
| ◁ ◁ ◁ | | D-19 | 95 | | | | | | Silt, little fine sand, little clay. | 12 | 70 | 18 |

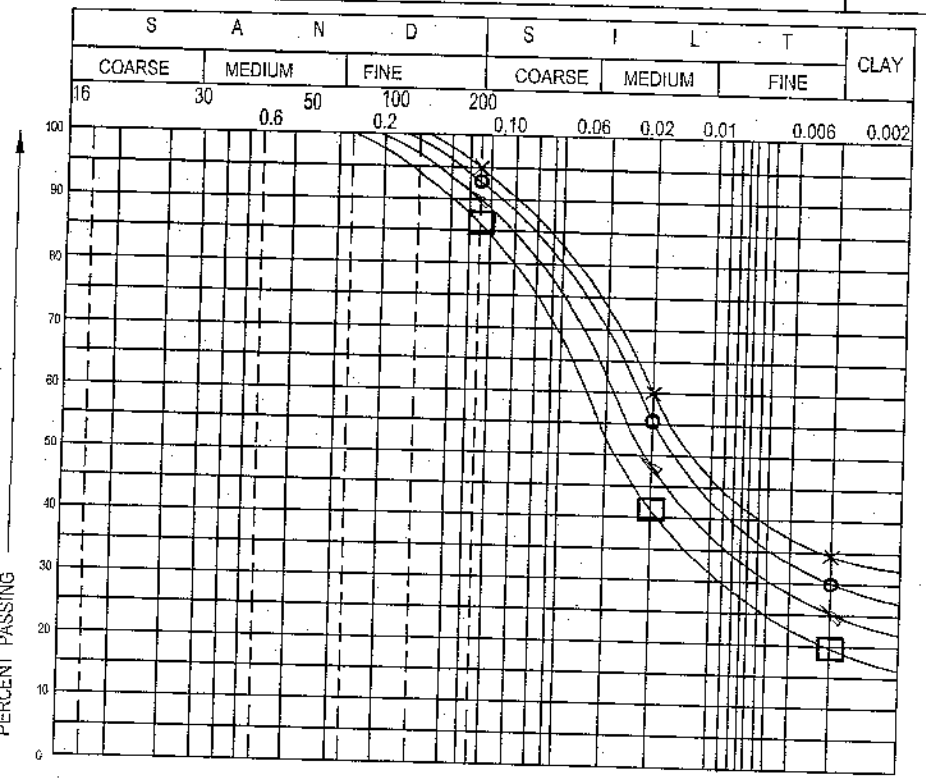
Tested By:

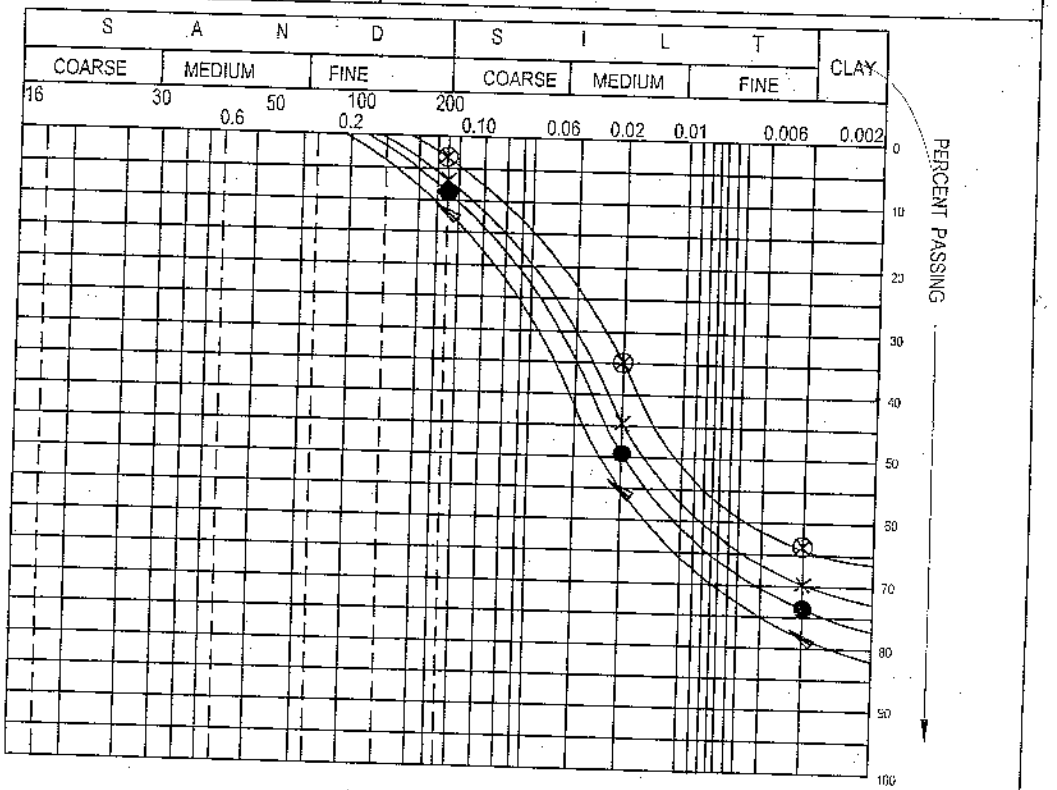
Checked By:

# CREATIVE DESIGN & DEVELOPMENT

## GRAIN SIZE DISTRIBUTION

Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.




| SYMBLE | BORE | SAMPLE | Depth in Ft/m | N . M . C | ATTERBERG LIMIT | | | SPECIFIC GRAVITY | SOIL CLASSIFICATION | SAND % | SILT % | CLAY % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L . L | P . L | P . I | | | | | |
| ○ ○ ○ | 03 | D-04 | 20 | 20 | 37 | 23 | 14 | 2.688 | Silt, trace fine sand, some clay. | 07 | 66 | 27 |
| × × × | | D-06 | 30 | 24 | 42 | 26 | 16 | 2.681 | Silt, trace fine sand, some clay. | 05 | 63 | 32 |
| ◁ ◁ ◁ | | D-16 | 80 | | | | | | Silt, little fine sand, little clay. | 14 | 70 | 16 |
| □ □ □ | | D-18 | 90 | | | | | | Silt, trace fine sand, some clay. | 10 | 68 | 22 |
| ⊛ ⊛ ⊛ | 04 | D-03 | 15 | 27 | 44 | 26 | 18 | 2.676 | Silt, trace fine sand, some clay. | 04 | 62 | 34 |
| ✳ ✳ ✳ | | D-05 | 25 | 20 | 37 | 23 | 14 | 2.688 | Silt, trace fine sand, some clay. | 07 | 66 | 27 |
| ◉ ◉ ◉ | | D-15 | 75 | | | | | | Silt, trace fine sand, some clay. | 09 | 68 | 23 |
| ◁ ◁ ◁ | | D-19 | 95 | | | | | | Silt, little fine sand, little clay. | 12 | 70 | 18 |

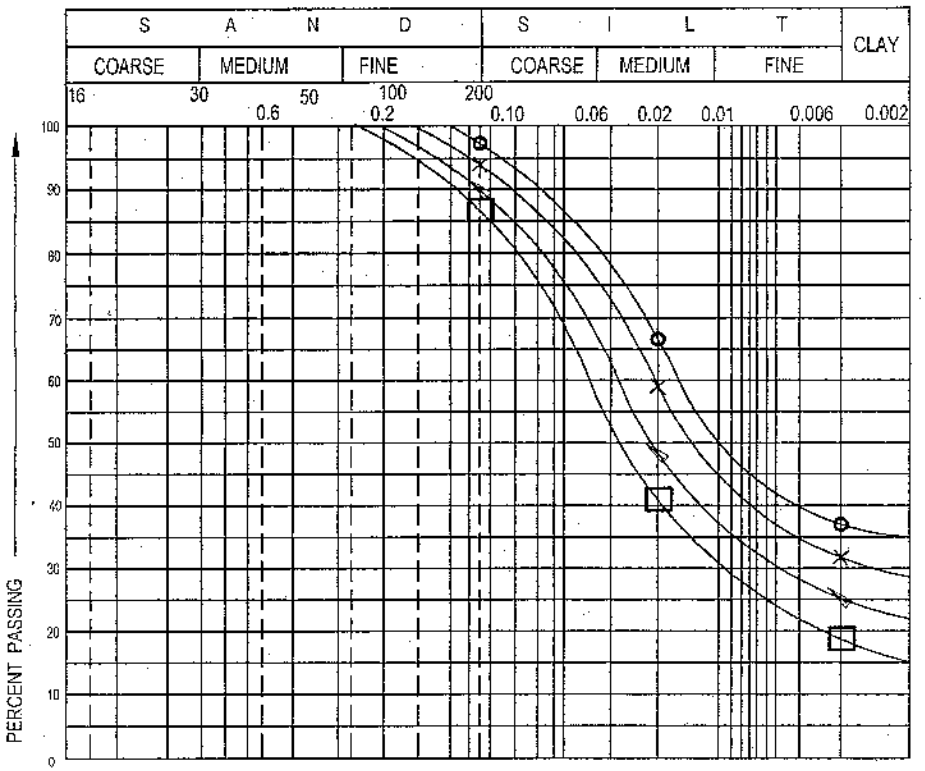
Tested By:

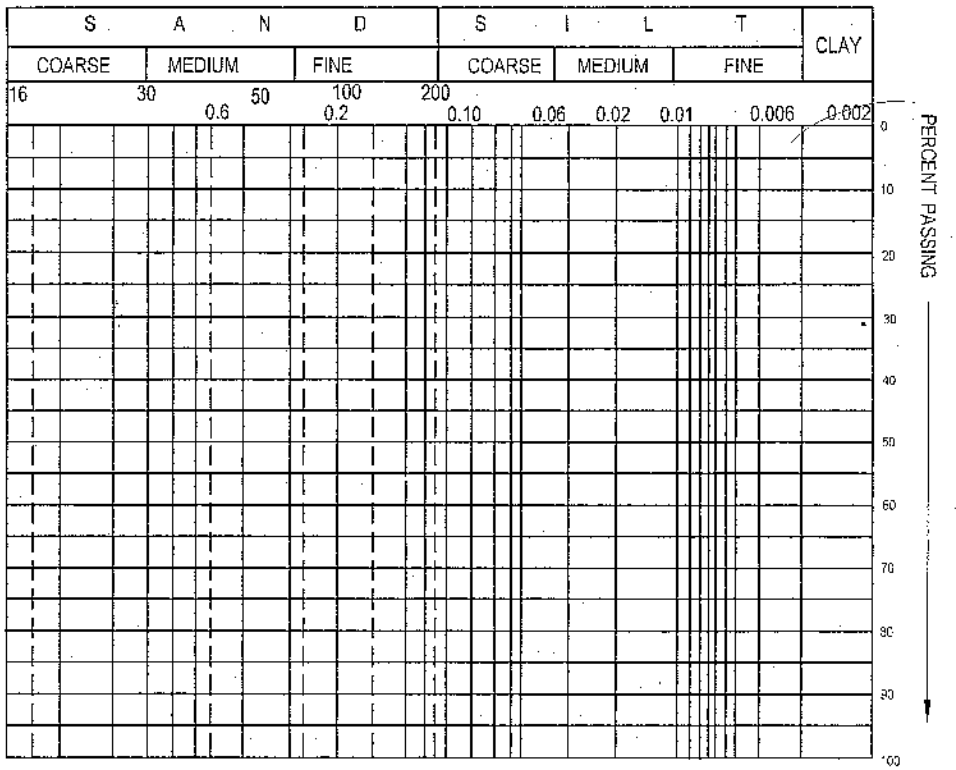
Checked By:

CREATIVE DESIGN & DEVELOPMENT

# GRAIN SIZE DISTRIBUTION

Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.




| SYMBLE | BORE | SAMPLE | Depth in Ft/m | N . M . C | ATTERBERG LIMIT | | | SPECIFIC GRAVITY | SOIL CLASSIFICATION | SAND % | SILT % | CLAY % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L . L | P . L | P . I | | | | | |
| ○ ○ ○ | 05 | D-02 | 10 | 34 | 46 | 27 | 19 | 2.665 | Clayey silt, trace fine sand. | 03 | 62 | 35 |
| × × × | | D-04 | 20 | 21 | 39 | 24 | 15 | 2.686 | Silt, trace fine sand, some clay. | 06 | 65 | 29 |
| ◭ ◭ ◭ | | D-18 | 90 | | | | | | Silt, trace fine sand, some clay. | 10 | 68 | 22 |
| □ □ □ | | D-20 | 100 | | | | | | Silt, little fine sand, little clay. | 14 | 71 | 15 |
| ⊛ ⊛ ⊛ | | | | | | | | | | | | |
| ✳ ✳ ✳ | | | | | | | | | | | | |
| ◉ ◉ ◉ | | | | | | | | | | | | |
| ◭ ◭ ◭ | | | | | | | | | | | | |

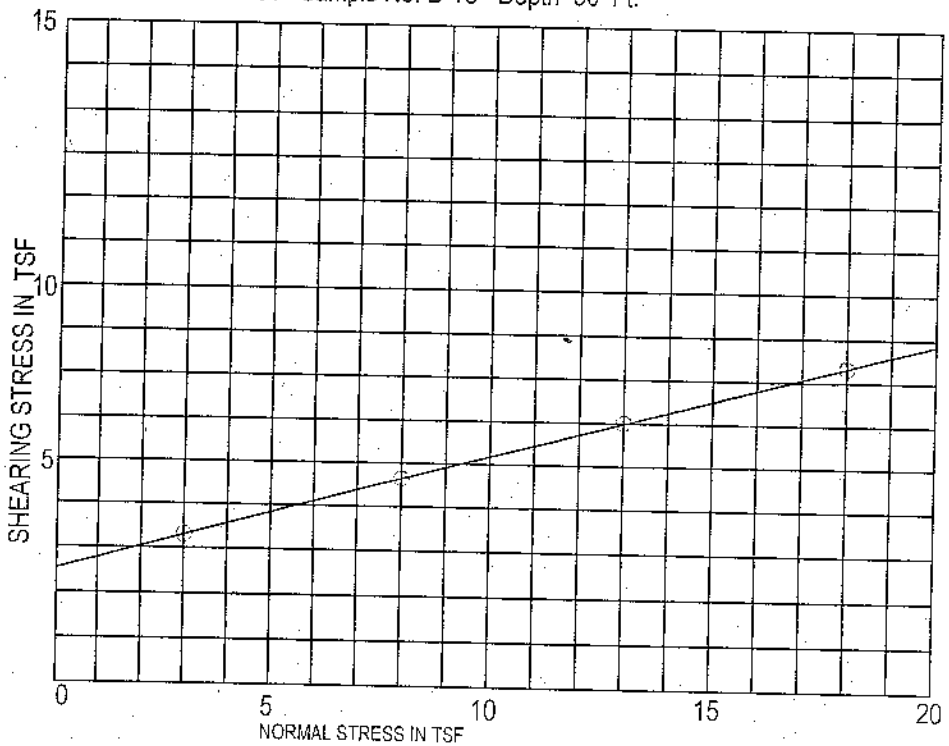
Dhaka

Tested By:

Checked By:

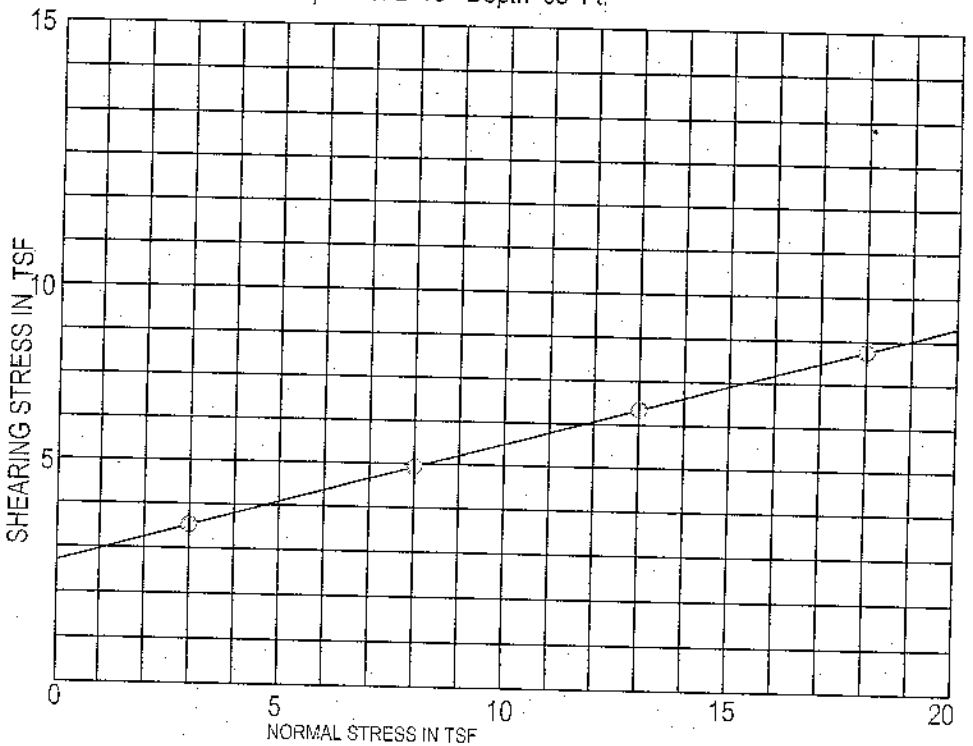
| CREATIVE DESIGN & DEVELOPMENT | DIRECT SHEAR TEST | Project : 10- Storied Residential Building<br>Location : House No.- 373/B, Taltala,<br>Khilgaon, Dhaka. |
|---|---|---|

Bore Hole No. 01 Sample No. D-18 Depth 90 Ft.




| | |
|---|---|
| SHEARING ANGLE, Ø (Degree) | 16° |
| COHESION, C (Tsf) | 2.50 |

Bore Hole No. 02 Sample No. D-19 Depth 95 Ft.



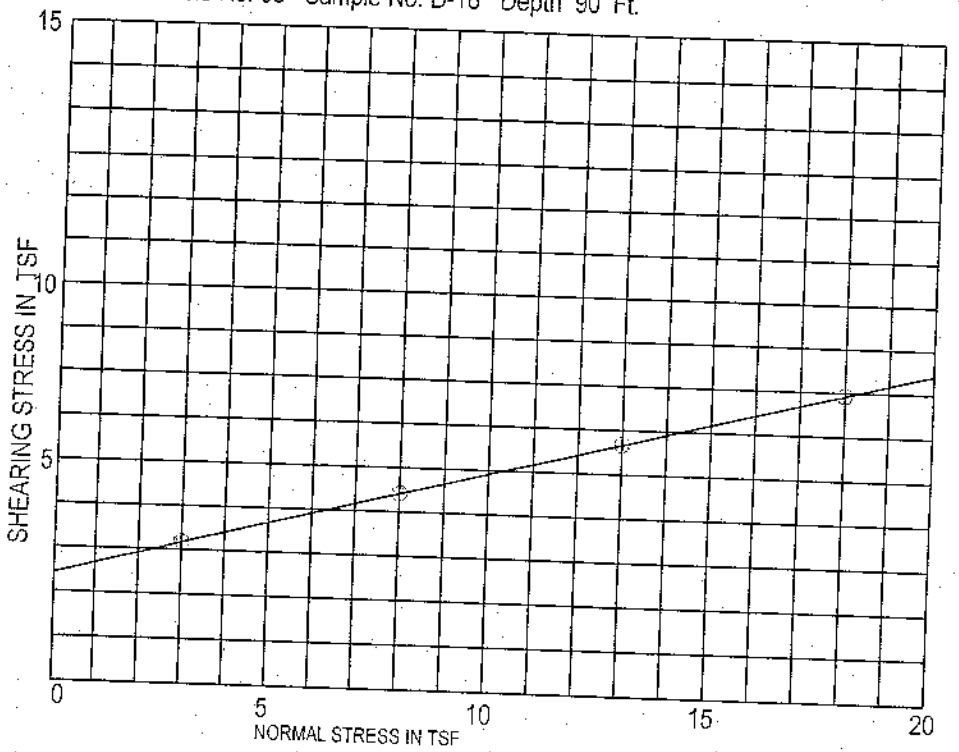

| | |
|---|---|
| SHEARING ANGLE, Ø (Degree) | 17° |
| COHESION, C (Tsf) | 2.75 |

Tested By:

Checked By:

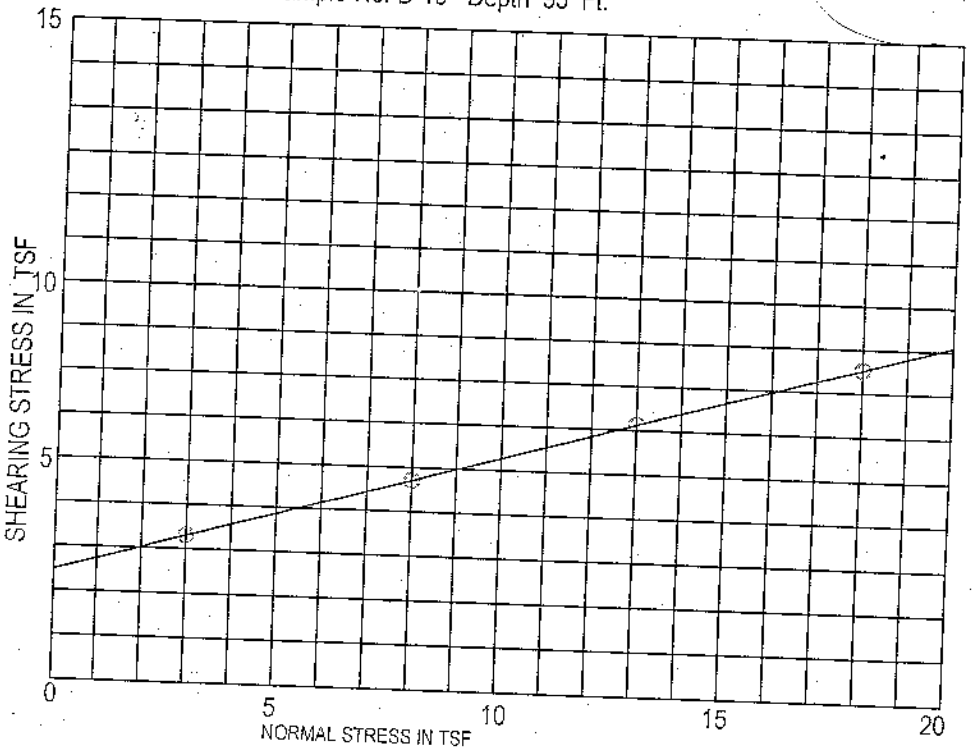
| CREATIVE DESIGN & DEVELOPMENT | DIRECT SHEAR TEST | Project : 10- Storied Residential Building<br>Location : House No.- 373/B, Taltala,<br>Khilgaon, Dhaka. |
|---|---|---|

Bore Hole No. 03 Sample No. D-18 Depth 90 Ft.




| | |
|---|---|
| SHEARING ANGLE, Ø (Degree) | 15° |
| COHESION, C (Tsf) | 2.30 |

Bore Hole No. 04 Sample No. D-19 Depth 95 Ft.



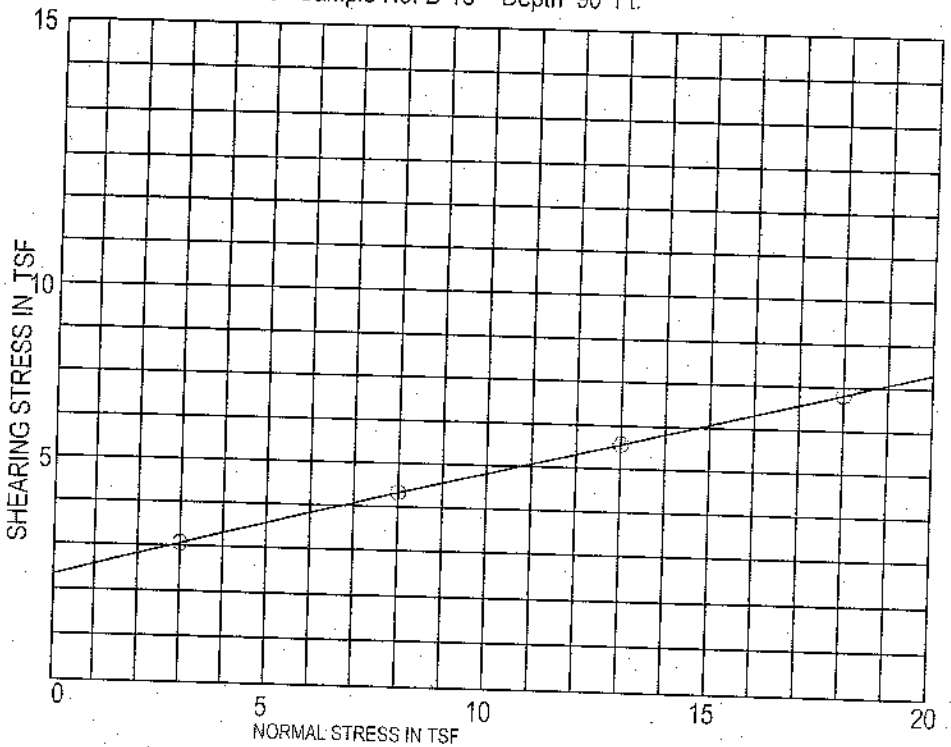

| | |
|---|---|
| SHEARING ANGLE, Ø (Degree) | 17° |
| COHESION, C (Tsf) | 2.40 |

sted By:

Checked By:

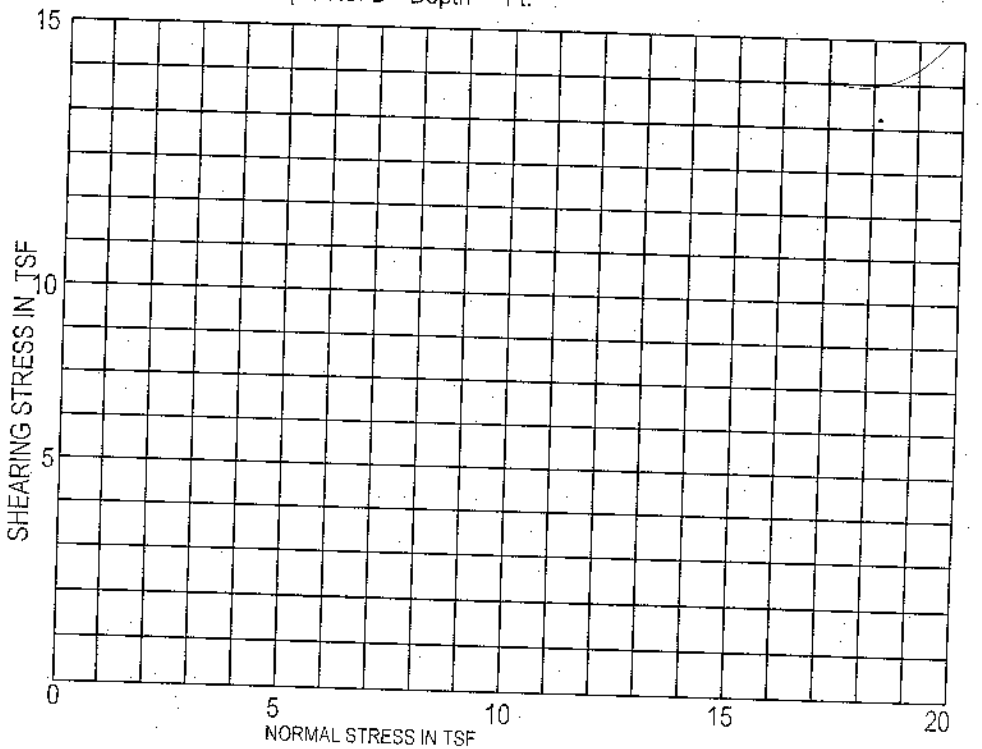
| CREATIVE DESIGN & DEVELOPMENT | DIRECT SHEAR TEST | Project : 10- Storied Residential Building<br>Location : House No.- 373/B, Taltala,<br>Khilgaon, Dhaka. |
|---|---|---|

Bore Hole No. 05 Sample No. D-18 Depth 90 Ft.




| | |
|---|---|
| SHEARING ANGLE, Ø (Degree) | 15° |
| COHESION, C (Tsf) | 2.25 |

Bore Hole No.- Sample No. D- Depth - Ft.




| | |
|---|---|
| SHEARING ANGLE, Ø (Degree) | |
| COHESION, C (Tsf) | |

Tested By:

Checked By:

CREATIVE DESIGN & DEVELOPMENT

# SUMMARY OF TEST RESULTS

Project : 10- Storied Residential Building
Location : House No.- 373/B, Taltala,
Khilgaon, Dhaka.

| Bore Hole No. | Sample No. | Depth in ft | wet unit weight (pcf) | Dry Unit Weight (pcf) | Natural Moisure Content (%) | Liquid Limit (%) | Plasticity index (%) | Unconfined Compression Test | | Consolidation Test | | Triaxial Shear Test | | Direct Shear Test | | Grain Size Test | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Strength (psi) | strain at failure (%) | Compression index (cc) | Void (eo) | ϕ° | Cohesion (Tsf) | ϕ° | Cohesion (Tsf) | SAND (%) | SILT (%) | CLAY (%) | S. P. gravity |
| | | | | | | | | | | | | | | | | | | | |
| 01 | D-02 | 10 | | | 32 | 45 | 18 | | | | | | | | | 03 | 63 | 34 | 2.667 |
| | D-04 | 20 | | | 20 | 37 | 14 | | | | | | | | | 07 | 66 | 27 | 2.688 |
| | D-16 | 80 | | | | | | | | | | | | | | 13 | 72 | 16 | - |
| | D-18 | 90 | | | | | | | | | | | | 16° | 2.50 | 10 | 70 | 20 | - |
| 02 | D-03 | 15 | | | 32 | 45 | 18 | | | | | | | | | 03 | 63 | 34 | 2.668 |
| | D-05 | 25 | | | 21 | 38 | 14 | | | | | | | | | 06 | 65 | 29 | 2.686 |
| | D-17 | 85 | | | | | | | | | | | | | | 09 | 68 | 23 | - |
| | D-19 | 95 | | | | | | | | | | | | 17° | 2.75 | 12 | 70 | 18 | - |
| | | | | | | | | | | | | | | | | | | | |
| 03 | D-04 | 20 | | | 20 | 37 | 14 | | | | | | | | | 07 | 66 | 27 | 2.688 |
| | D-06 | 30 | | | 24 | 42 | 16 | | | | | | | | | 05 | 63 | 32 | 2.681 |
| | D-16 | 80 | | | | | | | | | | | | | | 14 | 70 | 16 | - |
| | D-18 | 90 | | | | | | | | | | | | 15° | 2.30 | 10 | 68 | 22 | - |
| 04 | D-03 | 15 | | | 27 | 44 | 18 | | | | | | | | | 04 | 62 | 34 | 2.676 |
| | D-05 | 25 | | | 20 | 37 | 14 | | | | | | | | | 07 | 66 | 27 | 2.688 |
| | D-15 | 75 | | | | | | | | | | | | | | 09 | 68 | 23 | - |
| | D-19 | 95 | | | | | | | | | | | | 17° | 2.40 | 12 | 70 | 18 | - |
| | | | | | | | | | | | | | | | | | | | |
| 05 | D-02 | 10 | | | 34 | 46 | 19 | | | | | | | | | 03 | 62 | 35 | 2.665 |
| | D-04 | 20 | | | 21 | 39 | 15 | | | | | | | | | 06 | 65 | 29 | 2.686 |
| | D-18 | 90 | | | | | | | | | | | | 15° | 2.25 | 10 | 68 | 22 | - |
| | D-20 | 100 | | | | | | | | | | | | | | 14 | 71 | 15 | - |

Tested By:

Checked By: