



আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম
الجامعة الإسلامية العالمية شيتاغونغ
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Ref. IIUC/PPD/Ten-2023(0005)

Date: 24th November 2023

Tender Schedule of Geotechnical Lab Apparatus/Equipment for Civil Engineering Department, Faculty of Science & Engineering, IIUC

Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
A	Name of The Experiment/ Test: Field Identification Test ASTM Standard: ASTM D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)			
1	Spatula	10 Pcs		
2	Wooden Hammer	04 Pcs		
3	Steel Hammer	05 Pcs		
4	Beaker (500 ml)	05 Pcs		
5	Beaker (1000 ml)	05 Pcs		
6	Glass Rod/Stirrer	05 Pcs		
7	1/8 Inch Dia Steel Rod (1 foot Length)	1 kg		
8	Small Hand Lens	3 Pcs		
9	Stopper	3 Pcs		
Sub-total				

Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
B	Name of The Experiment/ Test: Specific Gravity Test ASTM Standard: ASTM D854 – 14: Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer			
1	Pycnometer (Volumetric Flux) with Stopper Pycnometer should conform the following standards- ASTM D854, AASHTO T100 Capacity: 500 mL Material: Pyrex including supply, installation, training and commissioning and as per other relevant instruction by the authority (users)	05 Pcs		
2	Balance A balance meeting the requirements of Guide ASTM-D4753 for a balance of 0.01 g readability. When using the 250–mL pycnometers, the balance capacity shall be at least 500 g and when using the 500–mL pycnometers, the balance capacity shall be at least 1000 g. Balance should conform the following standards- Capacity: 1520 gm Power: Readability /Sensibility: 0.01g Country of Origin: USA/EU/Equivalent Including supply, installation, training and commissioning and as per other relevant instruction by the authority (users)	02 Pcs		
3	Funnel A non-corrosive smooth surface funnel with a stem that extends past the calibration mark on the volumetric flask or stoppered seal on the stoppered flasks. The diameter of the stem of the funnel must be large enough that soil solids will easily pass through/ Qualify, including supply, installation, training and commissioning and as per other relevant instruction by the authority (users)	05 Pcs		



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B	Name of The Experiment/ Test: Specific Gravity Test ASTM Standard: ASTM D854 – 14: Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer			
4	Bunsen Burner Should be capable of maintaining a temperature adequate to boil water, including supply, installation, training and commissioning and as per other relevant instruction by the authority (users)	02 Pcs		
5	Standard pipette or medicinal dropper Including supply, installation, training and commissioning and as per other relevant instruction by the authority (users)	04 Pcs		
6	Desiccator A desiccator cabinet or large desiccator jar of suitable size containing silica gel or anhydrous calcium sulfate. Desiccator should conform the following standards (refer to appendix). It should be Stainless steel cabinet with Clear-View door eliminates danger of glass breakage. Includes glass desiccator tray and two heavy-gauge ceramic shelves that are fully adjustable with 1/2" (13mm) centers. Outside dimensions are: 12.5" x 12.25" x 12.5" and the inside dimensions are 11.5" x10" x 12", include training, installation, commissioning, etc. all complete as per instruction.	02 Pcs`		
7	Thermometer Thermometric Device, capable of measuring the temperature range within which the test is being performed, having a readability of 0.1°C and a maximum permissible error of 0.5°C. The device must be capable of being immersed in the sample and calibration solutions to a depth ranging between 25 and 80mm. To ensure the accuracy of the thermometric device, it shall be standardized by comparison to a NIST traceable thermometric device. The standardization shall include at least one temperature reading within the range of testing. The thermometric device shall be standardized at least once every 12 months. Include training, installation, commissioning, etc. all complete as per instruction	05 Pcs		
8	Vacuum Pump A vacuum pump or water aspirator, capable of producing a partial vacuum of 100 mm of mercury (Hg) or less absolute pressure. Capacity: 85 Liter/minute (3 cu. ft. per minute) Maximum vacuum 29-30" Operating Temperature: 1.00 to 76.6° C Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction	02 Pcs		
	Sub-Total			

C	Name of The Experiment/Test: Particle/Grain Size Analysis Test (Sieve Analysis) ASTM Standard: D6913 – 04: Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	<p>ASTM Standard Sieves with Lid and Pan: In sieving, a set of standard sized sieves. For single sieve-set sieving, the sieve set will range from the maximum sieve size to the No. 200 (75-μm) sieve. For composite sieving, there will be a coarser sieve set and a finer sieve set. Together, these sets will range from the maximum sieve size to the No. 200 (75-μm) sieve. The designated separating sieve will be used as the minimum size in the coarser set and the maximum size in the finer set.</p> <p>8" dia. brass frame sieve, 3" SS mesh 8" dia. brass frame sieve, 2" SS mesh 8" dia. brass frame sieve, 1.5" SS mesh 8" dia. brass frame sieve, 1 " SS mesh 8" dia. brass frame sieve, 0.75" SS mesh 8" dia. brass frame sieve, 0.374" SS mesh 8" dia. brass frame sieve, #4 SS mesh 8" dia. brass frame sieve, #10 SS mesh 8" dia. brass frame sieve, #20 SS mesh 8" dia. brass frame sieve, #40 SS mesh 8" dia. brass frame sieve, #60 SS mesh 8" dia. brass frame sieve, #100 SS mesh 8" dia. brass frame sieve, #140 SS mesh 8" dia. brass frame sieve, #200 SS mesh 8" x 2" Sieve bottom pan Sieve cover/lid with ring handle Include training, installation, commissioning, etc. all complete as per instruction</p>	2 Sets		
2	<p>Sieve Brushes To assist in the removal of the material retained on the smaller (\leq 200-mm or 8-in.) diameter and finer sieve sizes (\leq 3/4-in. (19.0-mm)). The brushes shall have the following characteristics:</p> <ul style="list-style-type: none"> The bristles shall be firmly attached to the brush handle so that the bristles do not become part of the retained material. The bristles shall be firm and small enough to readily remove the particles entangled in the sieve openings, but made of a material that will not damage the wire cloth or wear rapidly. Wire bristles, even brass, shall not be used on wire cloth size finer than No. 20 (850μm). The bristles have to be small in diameter and soft when brushing wire cloth size equal to or less than the No. 100 (150-μm) mesh. Small diameter, soft bristles will remove the particles without any re-alignment of the wire cloth. Include training, installation, commissioning, etc. all complete as per instruction 	10 Pcs		
3	<p>Containers: Three types of Containers are required</p> <ul style="list-style-type: none"> Specimen Containers 	10 Pcs		

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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
C	Name of The Experiment/Test: Particle/Grain Size Analysis Test (Sieve Analysis) ASTM Standard: D6913 – 04: Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis			
	<ul style="list-style-type: none"> Collection/Transfer Container Cumulative Mass Container Include installation, commissioning, etc. all complete as per instruction			
4	Spoon: Appropriate Size for mixing and transferring soils, handling corrosive chemicals, etc. stainless steel spoon is 13" (330mm) long. Include, installation, commissioning, etc. all complete as per instruction	10 Pcs		
5	Bowl: Standard Sized. Include installation, commissioning, etc. all complete as per instruction	10 Pcs		
6	Sieve Shaker: The "Standard Shaking Period" must be from 10 to 20 minutes. The shaker shall have a timing device or a timing device shall be used in conjunction with the shaker. Shaker should handle up to ten 8" sieves, twelve 5" sieves, sixteen 3" full-height sieves or eighteen half-height 8" sieves. Motor: ¼ hp motor, 30-minute timer. Power: 220V-60Hz Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction	02 Pcs		
	Sub-total			

Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
D	Name of The Experiment/Test: Particle/Grain Size Analysis Test by Hydrometer ASTM Standard: D422 – 63: Standard Test Method for Particle-Size Analysis of Soils			
1	Hydrometer: An ASTM hydrometer, graduated to read in either specific gravity of the suspension or grams per litre of suspension, and conforming to the requirements for hydrometers 151H or 152H in Specifications ASTM E100. Dimensions of both hydrometers are the same, the scale being the only item of difference. Type 1: Seamless, symmetrical stem and bulb do not vary in diameter. One-piece ballast is secured to lower part of the body. Uses ASTM 152 H scale, graduated to read in grams per liter (g/L) of suspension and has a range of -5 to +60g/L in 1g/L divisions at 68°F (20°C). Total length: 11" (280mm). Type 2: Uses ASTM 151 H scale, graduated to read specific	05 Pcs		



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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
D	Name of The Experiment/Test: Particle/Grain Size Analysis Test by Hydrometer ASTM Standard: D422 – 63: Standard Test Method for Particle-Size Analysis of Soils			
	gravity with a range of 0.995 to 1.038 in 0.001 divisions at 68°F (20°C). Total length: 11" (280mm). Include training, installation, commissioning, etc. all complete as per instruction			
2	Sedimentation Cylinder: Sedimentation Cylinder—A glass cylinder essentially 18 in. (457 mm) in height and 2 1/2 in. (63.5 mm) in diameter, and marked for a volume of 1000 mL. The inside diameter shall be such that the 1000-mL mark is 36±2 cm from the bottom on the inside. Glass Cylinder, Capacity:500 ml and 1000 ml Material: Pyrex Include installation, commissioning, etc. all complete as per instruction.	06 Pcs		
3	Water/Jar Bath: A water bath or constant-temperature room for maintaining the soil suspension at a constant temperature during the hydrometer analysis. A satisfactory water tank is an insulated tank that maintains the temperature of the suspension at a convenient constant temperature at or near 68°F (20°C). Jar bath should provide a consistent bath temperature of 68°F (20°C) accurate to within 0.1% of input span ±1°F Temperature Range: of 50°F (10°C) to 20°F (49°C) Tank volume: 20.5 gallons (77.6 Liters). Bath dimensions: ID-37"L x 8"W x 16"D (940 x 203 x 406 mm). Overall dimensions: 48"L x 11"W x 19"D (1220 x 280 x 483 mm) Country of Origin: USA/EU/ Equivalent Include training, installation, commissioning, etc. all complete as per instruction.	01 Pcs		
4	Stirring Apparatus/ Mechanical Mixture Stirring Apparatus shall consist of a mechanically operated stirring device in which a suitably mounted electric motor turns a vertical shaft at a speed of not less than 10 000 rpm without load. The shaft shall be equipped with a replaceable stirring paddle made of metal, plastic, or hard rubber. The shaft shall be of such length that the stirring paddle will operate not less than 3/4 in. (19.0 mm) nor more than 1 1/2 in. (38.1 mm) above the bottom of the dispersion cup. Operating speed should be above 10,000 RPM (no load). Includes stirring apparatus with stainless steel paddle and chrome-plated dispersion cup. Dimensions: 20" x 6.5" x 7" (508 x 165 x 178mm) Country of Origin: US/EU/Equivalent, Include training, installation, commissioning, etc. all complete as per instruction.	02 Pcs		

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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
D	Name of The Experiment/Test: Particle/Grain Size Analysis Test by Hydrometer ASTM Standard: D422 – 63: Standard Test Method for Particle-Size Analysis of Soils			
5	Dispersive Agent A solution of sodium hexametaphosphate (sometimes called sodium metaphosphate) shall be used in distilled or demineralized water, at the rate of 40 g of sodium hexametaphosphate/litre of solution.	05 kg		
	Sub-total			

Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
E	Name of The Experiment/Test: Moisture Content Determination Test ASTM Standard: D2216 – 10: Standard Test Methods for Laboratory, Determination of Water (Moisture) Content of Soil and Rock by Mass			
1	Drying Oven (Maximum working temperature is up to 300°C): Vented, thermostatically-controlled, preferably of the forced-draft type, meeting the requirements of Specification E145 and capable of maintaining a uniform temperature of 110 ±5°C throughout the drying chamber. Lab Bench Oven, Adjustable Dial Temp. Control Temperature: 300°C Max Capacity: 7 cu. ft. (198L) Power: 2110 watts, 230V 50/60Hz Country of Origin: US/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.	01 Pc		
2	Rotatory Drying Oven (Maximum working temperature is up to 250°C): RPM: (0.5-10) Standard Rotatory Drying Oven (Maximum working temperature is up to 250°C) RPM: (0.5-10).Capacity: 7 cu. ft. (50L) Power: 2110 watts, 230V 50/60Hz Country of Origin: US/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.	01 Pc		
3	Gloves, Nitrile-Coated, Hot Mil (5 Pair Hard & 5 Pair Soft): Container Handling Apparatus, heat resistant gloves, tongs, or suitable holder for moving and handling hot containers after drying. Non-woven, felt insulation and a full-length heat barrier protect hands. Nitrile coating prevents cuts and abrasions. For use in handling hot objects up to 400°F. Include training, installation, commissioning, etc. all complete as per instruction.	10 Pairs		
	Sub-total			



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F Name of The Experiment/Test: Atterberg Limits Determination Test ASTM Standard: ASTM D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils				
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	Muffle Furnace Large (0.5 cu. ft.), 3095W Max. Temp: 2192°F (1200°C) Chamber Dimensions (H x W x D): 5" x 7" x 10" (130 x 180 x 250mm). Include installation, commissioning, etc. all complete as per instruction.	01 Pc		
2	Porcelain Evaporating Dish 765ml capacity, 185mm dia. x 54mm height Include installation, commissioning, etc. all complete as per instruction.	05 Pcs		
3	Tongs Nickel plated, 1/4" (6mm) wire size, 18" (457mm) length. Include installation, commissioning, etc. all complete as per instruction.	05 Pcs		
Sub-total				

G Name of The Experiment/Test: Organic Content Determination Test ASTM Standard: D2974 – 14: Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils				
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	Liquid Limit Device (Casagrande Apparatus) Unit consists of brass cup, cam mechanism, carriage and crank mounted on a hard rubber base. Includes H-4229 ASTM grooving tool and gauge block. Crank can be shifted to right- or left-hand operation. Complies with ASTM D4318; AASHTO T89, T90 Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.	03 Pcs		
2	Flat Grooving Tool Liquid Limit Metal Grooving Tool for use with all liquid limit machines. Include training, installation, commissioning, etc. all complete as per instruction.	03 Sets		
3	Glass Plates Standard Size Include training, installation, commissioning, etc. all complete as per instruction.	03 Pcs		
Sub-total				

H Name of The Experiment/Test: Constant Head and Falling Head Permeability Test ASTM Standard: D2216 – 10: Standard Test Method for Permeability of Granular Soils (Constant Head)				
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	Permeameter	01 Pc		



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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
H	Name of The Experiment/Test: Constant Head and Falling Head Permeability Test ASTM Standard: D2216 – 10: Standard Test Method for Permeability of Granular Soils (Constant Head)			
	<p>Shall have specimen cylinders with minimum diameters approximately 8 or 12 times the maximum particle size. The permeameter should be fitted with: (1) a porous disk or suitable reinforced screen at the bottom with a permeability greater than that of the soil specimen, but with openings sufficiently small (not larger than 10 % finer size) to prevent movement of particles; (2) manometer outlets for measuring the loss of head, h, over a length, l, equivalent to at least the diameter of the cylinder; (3) a porous disk or suitable reinforced screen with a spring attached to the top, or any other device, for applying a light spring pressure of 22 to 45-N (5 to 10-lbf) total load, when the top plate is attached in place. Permeameter Cell, 3.0" (76mm) Two manometer ports are grooved & screened on the inside. 100 mesh screens used to prevent migration of material through valves & tubing during test. Acrylic chamber permits viewing sample. Spring incorporated into top cap to apply 5-10 lbs. force against screen to prevent soil density changes. Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.</p>			
2	<p>Filter Papers Standard Lab Filter Papers. Include installation, commissioning, etc. all complete as per instruction.</p>	02 Boxes		
3	<p>Constant Head Tank Constant Head Tank to supply water and to remove most of the air from tap water, fitted with suitable control valve. Capacity: 1500 cc Acrylic tank with regulating valve for flow control of water and a porous media on bottom to filter out air bubbles. Tank measures 5.625" diameter x 5.25" height. Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.</p>	01 Pc		
4	<p>Scoop Scoop, with a capacity of about 100 g (0.25 lb.) of soil, Aluminum, Flat Nose Scoop Bowl Vol./Water (oz/cu. in.): 6.7 (12.2), Length: 6" (152mm), Width: 3-3/4" (95mm), Depth: 2" (51mm), Overall Length: 9-1/4" (235m)</p>	08 Pcs		
5	Specimen Compaction Equipment/ Tamper/ Hammer	02 Sets		



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H	Name of The Experiment/Test: Constant Head and Falling Head Permeability Test ASTM Standard: D2216 – 10: Standard Test Method for Permeability of Granular Soils (Constant Head)			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
	with Ring Stand and Test Tube Compaction equipment as deemed desirable may be used. The following are suggested: a vibrating tamper fitted with a tamping foot 51 mm (2 in.) in diameter; a sliding tamper with a tamping foot 51 mm (2 in.) in diameter, and a rod for sliding weights of 100 g (0.25 lb) (for sands) to 1 kg (2.25 lb) (for soils with a large gravel content), having an adjustable height of drop to 102 mm (4 in.) for sands and 203 mm (8 in.) for soils with large gravel contents. Rod with sliding weights on a 2" (51mm) dia foot. Stop allows adjusting height of drop up to 8" (203mm). Includes one .25 lb. (100g) and one 2.25 lb. (1kg) weight.			
6	Timer: Standard Lab Timer	05 Pcs		
7	Cylinders Glass Cylinder, Capacity:250 ml, Material: Pyrex	05 Pcs		
	Sub-total			

I	Name of The Experiment/Test: Relative Density Test ASTM Standard: D4253 – 14: Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	Vibrating Table with Controller Steel table conforming to the requirements of 6.9 with a vertically vibrating, cushioned steel deck generally 30 by 30 in. (760 by 760 mm), actuated by an electromagnetic vibrator of the solid-impact type with a net mass over 45 kg. The table shall be mounted to a concrete floor or slab having a mass of greater than 450 kg Table is 30" x 30" (762 x 762mm), and vibration is provided by an electromagnetic vibrator rated above 100lbs (45.5kg). Capacity for table is 750 lbs (341kg), Height is 21" (533mm). Include training, installation, commissioning, etc. all complete as per instruction.	01 Pc		
2	Mold Assembly Consisting of Standard Molds 0.1cu. ft. capacity mold set. Mold is 6" (152.4mm) ID x 6.112" (155.2mm) H Cylindrical metal molds having nominal volumes of 0.100 ft ³ (2830 cm ³) and 0.500 ft ³ (14 200 cm ³). The molds shall conform to the requirements. The actual volume of the molds shall be within ±1.5 % of the specified nominal volume	02 Sets		
3	Guide Sleeves One guide sleeve with clamp	01 Set		



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I	Name of The Experiment/Test: Relative Density Test ASTM Standard: D4253 – 14: Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
	assembly, or other suitable attachment devices, for each size mold. For easy centering of the guide sleeve above the mold, two of the three setscrews on the clamp assembly should be provided with lock nuts.			
4	Surcharge Base Plates One surcharge base plate for each standard size mold, conforming to the requirements.	01 Set		
5	Surcharge Weights One surcharge weight for each size mold. See Fig. 5 for tolerances related to the 0.100 ft ³ (2830 cm ³) and 0.500 ft ³ (14 200 cm ³) molds. For special molds, similar tolerances should be maintained. The total mass of the surcharge base plate and surcharge weight shall be equivalent to a surcharge stress of 2.00 ± 0.02 lb/in. ² (13.8 ± 0.1 kPa) for the mold being used. For special molds, the surcharge base plate and weight can be composed of a single solid mass of metal. Include training, installation, commissioning, etc. all complete as per instruction.	01 Set		
6	Surcharge Base-Plate Handle A device used to initially place and then to remove the surcharge base plate upon completion of densification. An example of such a handle is given in Fig. 4(b); however, any convenient hooking device may be used.	01 Set		
7	Dial-Indicator Gauge Holder and Dial Indicator A device used, in conjunction with the guide brackets, to measure the difference in elevation between the top surfaces of the mold and surcharge base plate after densification [Fig. 4(c)]. The dial indicator shall have a 2-in. (50-mm) or greater travel, with 0.001-in. (0.025-mm) graduations and mounted so that the dial stem is parallel with the vertical axis of the mold. The dial indicator may be digital, analog clockwise-movement type where the dial pointer reads zero when the stem is extended, or counterclockwise type where the dial pointer reads zero when the stem is all the way in. Set includes a 2" (50.8mm) dia., 2.0 x 0.001" mechanical dial gauge. A metal, 3 x 12 x .125" (76 x 305 x 3.2mm) calibration bar is also included. Include training, installation, commissioning, etc. all complete as per instruction.	01 Set		
8	Straightedge Standard lab straightedge	01 Set		
	Sub-total			

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Ref. IIUC/PPD/Ten-2023(0005)

Date: 24st November 2023

Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
J	Name of The Experiment/Test: Compaction Test (Standard and Modified) ASTM Standard: D698 – 12: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft ³ (600 kN-m/m ³)) D1557 – 12: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kN-m/m ³))			
1	Molds (Small Size 2 Sets & Large Size 2 Sets) Small Size: Standard Proctor Compact. Mold, 4" Mold volume is 1/30 ft ³ Cold-rolled steel tubing, plated for rust resistance Mold dimensions are 4" ID x 4.584" H with a 2" detachable collar. Large Size: Standard Proctor Compact. Mold, 6" Mold volume is 1/13.33 ft ³ Cold-rolled steel tubing, plated for rust resistance Mold dimensions are 6" ID x 4.584" H with a 2" detachable collar. Include training, installation, commissioning, etc. all complete as per instruction.	02 Sets	Small:	
		02 Sets	Large:	
2	Manual Rammer (Small Size 2 Pcs & Large Size 2 Pc) Manual, moisture/density Hammer/Rammer meets AASHTO specs. It incorporates a 10 lb (4.5kg) weight and a drop of 18" (457mm) with a 2" (51) face. Machined Steel, plated for rust resistance. Include training, installation, commissioning, etc. all complete as per instruction.	02 Pcs	Small:	
		02 Pcs	Large:	
3	Extruder Designed for lab and field use to extract soil samples from 4" and 6" compaction molds, as well as 2" and 2.8" tube samples. The ejection force is generated by means of a 3-ton (27.7kN) capacity, hand-operated hydraulic jack. Piston stroke is 8" (235mm). Overall dimensions 13"W x 6"D x 27"H (330 x 152 x 686mm). Include training, installation, commissioning, etc. all complete as per instruction.	01 Set		
4	Mixing Pan Galvanized steel with wire-bound rolled-top edges, Features 2 drop handles and straight sides. 18 x 18 x 1.5" deep (457 x 457 x 38mm)	03 Pcs		
5	Trowel Forged steel trowel for striking off molds, etc., has edges ground straight and rubber/plastic handle. Dimensions: 2.75" x 5" (70 x 127mm)	04 Pcs		
6	Straightedge Standard lab straightedge	01 Set		
	Sub-total			

K	Name of The Experiment/Test: Direct Shear Test ASTM Standard: ASTM D3080: Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	Dead-Weight Direct Shear Test Device Machine include the carriage, stand, vertical load hanger and a balanced lever loading arm with a 10:1 ratio that reduces the weight required to perform tests. The carriage accepts shear box squares up to 4.0" (100mm) internal dimension. Forward and reverse measurements permit residual shear testing as standard. A built-in safety feature prevents the over travel of the load measuring system. The HM-5750 and HM-5750M are supplied complete with a 2,000 lbf (10kN) capacity load ring, 1.0" x 0.001" (25.4 x 0.01mm) and 0.5" x 0.0001" (12 x 0.002mm) dial indicator. Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.	01 Set		
2	Load And Deformation Dial gauges: Standard Sizes	01 Set		
	Sub-total			

Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
L	Name of The Experiment/Test: Unconfined Compression Test ASTM Standard: ASTM D2166: Standard Test Method for Unconfined Compressive Strength of Cohesive Soil			
1	Compression Device Unconfined Compressive Strength Test Apparatus screw operated load frame. Capacity 5000kg(50kN) with a gear box and motor drive giving Rates of strain 1.25, 1.5, 2.5mm/min. A pair of cone seating, adaptor for proving ring, and stain dial gauge bracket. One pair of male/female coning tools for 38mm dia samples with ring and dial gauge. For operation on 230 V Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.	01 Set		
2	Sample Trimming Equipment Adjustable Soil Trimmers: 3 and 4in diameter capacities. Ease of adjustment allows for precisely trimming cylindrical soil samples to any diameter between 1 and 3in or 4in (25.4 to 76 or 101.6mm). Adjustable Soil Trimmer Top Platens provide control of diameters when preparing soil specimens for various soil lab tests. Top platens are available to fit a range of soil specimens from 1.0 to 4.0in. Open-End Wire Saw can be used with a Soil Trimmer, Miter	01 Set		



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L	Name of The Experiment/Test: Unconfined Compression Test ASTM Standard: ASTM D2166: Standard Test Method for Unconfined Compressive Strength of Cohesive Soil			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
	Box, or independently for precision trimming of the soil sample to the specific diameter or length. Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.			
	Sub-total			

M	Name of The Experiment/Test: Consolidation Test (One Dimensional) ASTM Standard: ASTM D2435: Standard Test Method for One-Dimension Consolidation Properties of Soil Using Incremental Loading			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	<p>Consolidation Device (Including ring, porous stones and load plate) Option 1 Front Loading Oedometer (consolidation), cast aluminum frame, the lever arm incorporates 9:1, 10:1 and 11:1 beam ratio. Consolidation cell for high pressure, 50 mm specimen dia., complete with an upper and lower porous disc, cutter ring and the cylinder wall. Consolidation cell for high-pressure ASTM, 63.50 mm (2.5") specimen dia., complete with an upper and lower porous disc, cutter ring and the cylinder wall. Set of Weights for consolidation, 32 kg comprising 1 pcs. 10 kg, 3 pcs. 5 kg, 2 pcs. 2 kg, 1 pcs. 1 kg, 3 pcs. 0.5 kg, 2 pcs. 0.25 kg. Bench for consolidation with 3 oedometer capacity Country of Origin: USA/EU/Equivalent</p> <p>Option 2 Features Include:</p> <ul style="list-style-type: none"> Highly-sensitive accuracy in lower load ranges Integral digital readout simplifies checking applied load and setup of predetermined load Adjustable upper cross beam <ul style="list-style-type: none"> Instantaneous loading without impact Flexible load choice Not sensitive to shock Choice of English or Metric models Digital readout displays applied loads with the help of precision pressure regulators and pressure transducers with a linearity of $\pm 0.1\%$. The 1" (25.4mm) thick aluminum platforms have centering pads and accept any consolidation ring up to 4.0" (100.0mm) in diameter. 	01 Set		

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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
M	Name of The Experiment/Test: Consolidation Test (One Dimensional) ASTM Standard: ASTM D2435: Standard Test Method for One-Dimension Consolidation Properties of Soil Using Incremental Loading			
	<ul style="list-style-type: none"> Stainless steel vertical rods support the cross-head and dial gauge. One Pressure Ball is included with the unit. Air supply tubing (25') to hook up the compressed air line is also included. Include training, installation, commissioning, etc. all complete as per instruction.			
2	Dial Gauge Standard dial gauges	03 Sets		
3	Metal Straightedge Standard lab Metal straightedge	02 Sets		
	Sub-total			

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Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)																						
N	Name of The Experiment/Test: Triaxial Test (Unconsolidated Undrained, Consolidated Undrained and Consolidated Drained); ASTM Standard: ASTM D2850: Standard Test Method for Unconsolidated – Undrained Triaxial Compression Test on Cohesive Soils; ASTM D4767: Consolidated Undrained Triaxial Compression Test for Cohesive Soil; ASTM D7181: Standard Test Method for Consolidated Drained Triaxial Compression Test for Soils																									
1	Specifications <table border="1"> <tr> <td>Load capacity:</td> <td>11000 lbf (50kN)</td> </tr> <tr> <td>Speed range — Testing:</td> <td>0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min)</td> </tr> <tr> <td>Speed range — Fast Approach:</td> <td>3.0 in/min (75.0 mm/min)</td> </tr> <tr> <td>Data channels:</td> <td>4</td> </tr> <tr> <td>Platen Size/ Travel:</td> <td>10" (254mm) / 4" (100mm)</td> </tr> <tr> <td>Data storage:</td> <td>1000 tests and up to 3000 readings per test</td> </tr> <tr> <td>Clearance, vertical:</td> <td>40" (1000mm)</td> </tr> <tr> <td>Clearance, horizontal:</td> <td>15" (380mm)</td> </tr> <tr> <td>Voltage:</td> <td>220V 50/60Hz – 5.0amps</td> </tr> <tr> <td>Shipping weight:</td> <td>300 lbs (136kg)</td> </tr> <tr> <td>Country of Origin</td> <td>USA/EU/Equivalent</td> </tr> </table> Software Required <ul style="list-style-type: none"> • Triaxial Unconsolidated Undrained Module Software • Triaxial Consolidated Undrained Module • Triaxial Unconfined Compression Module • Triaxial – Consolidated Drained Module 	Load capacity:	11000 lbf (50kN)	Speed range — Testing:	0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min)	Speed range — Fast Approach:	3.0 in/min (75.0 mm/min)	Data channels:	4	Platen Size/ Travel:	10" (254mm) / 4" (100mm)	Data storage:	1000 tests and up to 3000 readings per test	Clearance, vertical:	40" (1000mm)	Clearance, horizontal:	15" (380mm)	Voltage:	220V 50/60Hz – 5.0amps	Shipping weight:	300 lbs (136kg)	Country of Origin	USA/EU/Equivalent	01 Set		
Load capacity:	11000 lbf (50kN)																									
Speed range — Testing:	0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min)																									
Speed range — Fast Approach:	3.0 in/min (75.0 mm/min)																									
Data channels:	4																									
Platen Size/ Travel:	10" (254mm) / 4" (100mm)																									
Data storage:	1000 tests and up to 3000 readings per test																									
Clearance, vertical:	40" (1000mm)																									
Clearance, horizontal:	15" (380mm)																									
Voltage:	220V 50/60Hz – 5.0amps																									
Shipping weight:	300 lbs (136kg)																									
Country of Origin	USA/EU/Equivalent																									
2	Sample Trimming Equipment Adjustable Soil Trimmers: 3 and 4in diameter capacities. Ease of adjustment allows for precisely trimming cylindrical soil samples to any diameter between 1 and 3in or 4in (25.4 to 76 or 101.6mm). Adjustable Soil Trimmer Top Platens provide control of diameters when preparing soil specimens for various soil lab tests. Top platens are available to fit a range of soil specimens from 1.0 to 4.0in. Open-End Wire Saw can be used with a Soil Trimmer, Miter Box, or independently for precision trimming of the soil sample to the specific diameter or length. Country of Origin: USA/EU/Equivalent Include training, installation, commissioning, etc. all complete as per instruction.	01 Set																								

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N	Name of The Experiment/Test: Triaxial Test (Unconsolidated Undrained, Consolidated Undrained and Consolidated Drained); ASTM Standard: ASTM D2850: Standard Test Method for Unconsolidated – Undrained Triaxial Compression Test on Cohesive Soils; ASTM D4767: Consolidated Undrained Triaxial Compression Test for Cohesive Soil; ASTM D7181: Standard Test Method for Consolidated Drained Triaxial Compression Test for Soils			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
3	Rubber Membrane	01 Set		
	Sub-total			

O	Name of The Experiment/ Test: Impact test of Metal Specimen ASTM Standard: ASTM E 23 Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	<p>Digital Pendulum Impact Testing Machine including Accessories Strictly conforms to ASTM-E-23-2007 specifications. Works on pendulum principle, difference between height of drop of pendulum before rupture and height of rise after rupture of specimen is directly proportional to impact energy absorbed by specimen and is indicated by a pointer on a digital display. Single stand design which facilitates fast and easy positioning and centering of specimen which is basic requirement of sub-zero testing. Unique spring-loaded braking systems for smooth and jerk free braking Accessories:</p> <ul style="list-style-type: none"> • Charpy Striker - 1 no. • Charpy Support Block - 1 set. • Specimen setting gauge (for charpy) -1 no. • Set of spanners - 1 set. • Foundation bracket - 1 no. • Self-centering tong for charpy test specimen (useful particularly for carrying out tests at sub-zero temperature) • Sub-zero temperature bath with digital temperature indicator • Go: No-Go gauges for confirming the following parameters of specimen within the limits specified by standard <ul style="list-style-type: none"> ▪ Centre line of notch from both ends ▪ Angle of V notch ▪ Depth below standard V notch ▪ Cross section of 10x10 mm specimen ▪ Milling cutter for V notch ▪ Charpy & Izod Notch (V & U) Broaching machines • Lateral expansion gauges as per ASTM-E-23 	01 Set		



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Sub-total			
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P	Name of The Experiment/ Test: Test of Slender Column			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	Column Testing Apparatus Should be compatible with IIUC's existing Universal Testing Machine (UTM)	01 Set		
	Sub-Total			

Q	Multifunctional Apparatus/Equipment			
Sl. No.	Description	Unit	Cost/ Unit (Tk.)	Amount (Tk.)
1	Concrete Mixture Machine	01 Pc		
2	Wire Basket Stand of 3.35 mm or Finer Mesh	01 Pc		
3	Cylindrical Metal Measures with Handles	02 Pcs		
	Sub-total			

Summary for Grand Total

Sl. No	Description	Amount (Tk.)
A	Field Identification Test Apparatus Setup	
B	Specific Gravity Test Apparatus Setup	
C	Particle/Grain Size Analysis Test (Sieve Analysis) Apparatus Setup	
D	Particle/Grain Size Analysis Test by Hydrometer Apparatus Setup	
E	Moisture Content Determination Test Apparatus Setup	
F	Atterberg Limits Determination Test Apparatus Setup	
G	Organic Content Determination Test Apparatus Setup	
H	Constant Head and Falling Head Permeability Test Apparatus Setup	
I	Relative Density Test Apparatus Setup	
J	Compaction Test (Standard and Modified) Apparatus Setup	
K	Direct Shear Test Apparatus Setup	
L	Unconfined Compression Test Apparatus Setup	
M	Consolidation Test (One Dimensional) Test Apparatus Setup	
N	Triaxial Test (Unconsolidated Undrained, Consolidated Undrained and Consolidated Drained) Test Apparatus Setup	
O	Impact test of Metal Specimen Test Apparatus Setup	
P	Test of Slender Column Apparatus Setup	
Q	Multifunctional Apparatus/Equipment	
	Total	



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Appendix

Detailed Specification of Geotechnical Engineering Laboratory Apparatus

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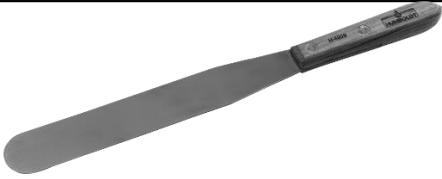
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A. Field Identification Test Apparatus Setup

Name of The Experiment/ Test: Field Identification Test

ASTM Standard: ASTM D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)

Name of Apparatus/ Equipment	Specification	
Spatula		Flexible stainless-steel blades with straight edges and rounded ends. Blade is riveted into wooden handle. Spatula should comply with ASTM C185, C780; AASHTOT137
Wooden Hammer		
Steel Hammer		
Beaker (500 ml)		Product Type: Pyrex Glass Beaker. Capacity: 500 ml. Color: Transparent. Heat Resistant: Yes. Material: Borosilicate Glass.
Beaker (1000 ml)		Product Type: Pyrex Glass Beaker. Capacity: 1000 ml. Color: Transparent. Heat Resistant: Yes. Material: Borosilicate Glass.



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Name of Apparatus/ Equipment	Specification	
Glass Rod/Stirrer		
1/8 Inch Dia Steel Rod (1 foot Length)		
Small Hand Lens		
Stopper		



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B. Specific Gravity Test Apparatus Setup

Name of The Experiment/Test: Specific Gravity Test

ASTM Standard:D854 – 14: Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer

Name of Apparatus/ Equipment	Specification	
<p>Pycnometer (Volumetric Flux) with Stopper</p>	<p>The water pycnometer shall be either a stoppered flask, stoppered iodine flask, or volumetric flask with a minimum capacity of 250 mL. The volume of the pycnometer must be 2 to 3 times greater than the volume of the soil-water mixture used during the deairing portion of the test.</p>	<p>Pycnometer should conform the following standards- ASTM D854, AASHTO T100 Capacity: 500 mL Material: Pyrex</p>
<p>Balance</p>	<p>A balance meeting the requirements of Guide ASTM-D4753 for a balance of 0.01 g readability. When using the 250–mL pycnometers, the balance capacity shall be at least 500g and when using the 500–mL pycnometers, the balance capacity shall be at least 1000 g.</p>	<p>Balance should conform the following standards- ASTM D5333, ASTM D1140, ASTM D2435, ASTM D4318, ASTM D4373, ASTM D4643, ASTM D4644, ASTM D4647, ASTM D5102, ASTM D4546, ASTM D6276, ASTM D7263, ASTM D854, ASTM D422, ASTM D2216, ASTM D2850, ASTM D3282, ASTM D6035, ASTM D5084</p>



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Name of Apparatus/ Equipment	Specification	
		Capacity: 1520 gm Power: Readability /Sensibility: 0.01g Country of Origin: USA/EU/Equivalent
Funnel	A non-corrosive smooth surface funnel with astem that extends past the calibration mark on the volumetricflask or stoppered seal on the stoppered flasks. The diameter ofthe stem of the funnel must be large enough that soil solids willeasily pass through.	
Bunsen Burner	Bunsen Burner, capable of maintaining atemperature adequate to boil water.	
Pipette	Standard pipette or medicinal dropper.	
Desiccator		A desiccator cabinet or large desiccator jarof suitable size containing silica gel or anhydrous calciumsulfate.It is preferable to use a desiccant thatchanges color to indicatewhen it needs reconstitution. Desiccator should conform the following standards ASTM D2172, ASTM C472, ASTM D2216, ASTM D4643, ASTM D5102, ASTM D854, ASTM D4644 Stainless steel cabinet with Clear-View door eliminates danger of glass breakage. Includes glass desiccator tray and two heavy-gauge ceramic shelves that are fully adjustable with 1/2" (13mm) centers. Outside dimensions are: 12.5" x 12.25" x 12.5" and the inside dimensions are 11.5" x10" x 12"
Thermometer	Thermometric Device, capable of measuring the temperaturerange within which the test is being performed, havinga readability of 0.1°C and a maximum permissible error of0.5°C. The device must be capable of being immersed in thesample and calibration solutions to a depth ranging between 25and 80 mm. Full immersion thermometers shall not be used. Toensure the accuracy of the thermometric device, the thermometricdevice shall be standardized by comparison to a NISTtraceable thermometric device. The standardization shall includeat	



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Name of Apparatus/ Equipment	Specification
	<p>least one temperature reading within the range of testing. The thermometric device shall be standardized at least once every twelve months.</p> <div style="display: flex; align-items: center;">  <div data-bbox="1045 667 1380 1032"> <p>Thermometer should conform the following standards-ASTM D2434, ASTM D6927, ASTM D422, ASTM D3282, ASTM D854 Digital Thermometer is preferable. Accuracy of $\pm 2.0^{\circ}\text{F}$ / $\pm 1.0^{\circ}\text{C}$.</p> </div> </div>
Vacuum Pump	<p>A vacuum pump or water aspirator, capable of producing a partial vacuum of 100 mm of mercury (Hg) or less absolute pressure.</p> <div style="display: flex; align-items: center;">  <div data-bbox="925 1108 1380 1583"> <p>Vacuum Pump should conform the following standards: ASTM D2041, ASTM D4867, ASTM D4767, ASTM D5084, ASTM D6035, ASTM D7181, ASTM D854 Capacity: 85 Liter/minute (3 cu. ft. per minute) Maximum vacuum 29-30" Operating Temperature: 1.00 to 76.6°C Country of Origin: USA/EU/Equivalent</p> </div> </div>

C. Particle/Grain Size Analysis Test (Sieve Analysis) Apparatus Setup

Name of The Experiment/Test: Particle/Grain Size Analysis Test (Sieve Analysis)

ASTM Standard: D6913 – 04: Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

Name of Apparatus/ Equipment	Specification
ASTM Standard Sieves with Lid	In sieving, a set of standard sized sieves. For single sieve-set sieving, the sieve set will range from the maximum sieve size to the No. 200



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Name of Apparatus/ Equipment	Specification
And Pan	<p>(75-μm) sieve. For composite sieving, there will be a coarser sieve set and a finersieve set. Together, these sets will range from the maximum sieve size to the No. 200 (75-μm) sieve. The designated separating sieve will be used as the minimum size in the coarser set and the maximum size in the finer set.</p> <div data-bbox="478 734 853 967" style="text-align: center;"> </div> <p>8" dia. brass frame sieve, 3" SS mesh 8" dia. brass frame sieve, 2" SS mesh 8" dia. brass frame sieve, 1.5" SS mesh 8" dia. brass frame sieve, 1 " SS mesh 8" dia. brass frame sieve, 0.75" SS mesh 8" dia. brass frame sieve, 0.374" SS mesh 8" dia. brass frame sieve, #4 SS mesh 8" dia. brass frame sieve, #10 SS mesh 8" dia. brass frame sieve, #20 SS mesh 8" dia. brass frame sieve, #40 SS mesh 8" dia. brass frame sieve, #60 SS mesh 8" dia. brass frame sieve, #100 SS mesh 8" dia. brass frame sieve, #140 SS mesh 8" dia. brass frame sieve, #200 SS mesh 8" x 2" Sieve bottom pan Sieve cover/lid with ring handle</p>
Sieve Brushes	<p>Brushes to assist in the removal of the material retained on the smaller (\leq 200-mm or 8-in.) diameter and finer sieve sizes (\leq 3/4-in. (19.0-mm)). The brushes shall have the following characteristics:</p> <ul style="list-style-type: none"> The bristles shall be firmly attached to the brush handle so that the bristles do not become part of the retained material.



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Name of Apparatus/ Equipment	Specification
	<ul style="list-style-type: none"> The bristles shall be firm and small enough to readily remove the particles entangled in the sieve openings, but made of a material that will not damage the wire cloth or wear rapidly. Wire bristles, even brass, shall not be used on wirecloth size finer than No. 20 (850-μm). The bristles have to be small in diameter and soft when brushing wire cloth size equal to or less than the No. 100(150-μm) mesh. Small diameter, soft bristles will remove the particles without any re-alignment of the wire cloth
Container	<p>Three types of Container are required</p> <ul style="list-style-type: none"> Specimen Containers Collection/Transfer Container Cumulative Mass Container
Spoon	<p>Appropriate Size For mixing and transferring soils, handling corrosive chemicals, etc. stainless steel spoon is 13" (330mm) long.</p>
Sieve Shaker	<p>The "Standard Shaking Period" must be from 10 to 20 minutes. The shaker shall have a timing device or a timing device shall be used in conjunction with the shaker.</p> <div style="display: flex; align-items: center;">  <div style="width: 400px;"> <p>Shaker should handle up to ten 8" sieves, twelve 5" sieves, sixteen 3" full-height sieves or eighteen half-height 8" sieves.</p> <p>Motor 1/4 hp motor 30-minute timer. Power: 220V 60Hz Country of Origin: USA/EU/Equivalent</p> </div> </div>



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D. Particle/Grain Size Analysis Test by Hydrometer Apparatus Setup

Name of The Experiment/Test: Particle/Grain Size Analysis Test by Hydrometer

ASTM Standard:D422 – 63: Standard Test Method for Particle-Size Analysis of Soils

Name of Apparatus/ Equipment	Specification
<p>Hydrometer</p>	<p>An ASTM hydrometer, graduated to read in either specific gravity of the suspension or grams per litre of suspension, and conforming to the requirements for hydrometers 151H or 152H in Specifications ASTM E100. Dimensions of both hydrometers are the same, the scale being the only item of difference.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Type 1: Seamless, symmetrical stem and bulb do not vary in diameter. One-piece ballast is secured to lower part of the body. Uses ASTM 152 H scale, graduated to read in grams per liter (g/L) of suspension and has a range of -5 to +60g/L in 1g/L divisions at 68°F (20°C). Total length: 11" (280mm). Type 2: Uses ASTM 151 H scale, graduated to read specific gravity with a range of 0.995 to 1.038 in 0.001 divisions at 68°F (20°C). Total length: 11" (280mm).</p> </div> </div>
<p>Sedimentation Cylinder</p>	<p>Sedimentation Cylinder—A glass cylinder essentially 18in. (457 mm) in height and 2 1/2 in. (63.5 mm) in diameter, and marked for a volume of 1000 mL. The inside diameter shall be such that the 1000-mL mark is 36±2 cm from the bottom on the inside.</p>



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Name of Apparatus/ Equipment	Specification	
		<p>Glass Cylinder Capacity: 500 ml and 1000ml Material: Pyrex</p>
Water Bath	<p>A waterbath or constant-temperature room for maintaining the soilsuspension at a constant temperature during the hydrometeranalysis. A satisfactory water tank is an insulated tank thatmaintains the temperature of the suspension at a convenientconstant temperature at or near 68°F (20°C).</p>	
Hydrometer Jar Bath		<p>Jar bath should provide a consistent bath temperature of 68°F (20°C) accurate to within 0.1% of input span $\pm 1^\circ\text{F}$ Temperature Range: of 50°F (10°C) to 20°F (49°C) Tank volume: 20.5 gallons (77.6 Liters). Bath dimensions: ID: 37"L x 8"W x 16"D (940 x 203 x 406 mm). Overall dimensions: 48"L x 11"W x 19"D (1220 x 280 x 483 mm) Country of Origin: USA/EU/ Equivalent</p>
Stirring Apparatus/ Mechanical	<p>Stirring Apparatus shall consist of a mechanically operatedstirring device in which a suitably mounted electric motor turnsa vertical shaft at a speed of not less than 10 000 rpm withoutload. The shaft shall be</p>	



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Name of Apparatus/ Equipment	Specification
Mixture	<p>equipped with a replaceable stirringpaddle made of metal, plastic, or hard rubber.The shaft shall be of such length that the stirring paddle will operate not less than 3/4 in. (19.0 mm) nor more than 1 1/2 in.(38.1 mm) above the bottom of the dispersion cup.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Operating speed should be above 10,000 RPM (no load). Includes stirring apparatus with stainless steel paddle and chrome-plated dispersion cup. Dimensions: 20" x 6.5" x 7" (508 x 165 x 178mm) Country of Origin: US/EU/Equivalent</p> </div> </div>
Dispersive Agent	<p>A solution of sodium hexametaphosphate (sometimes called sodium metaphosphate) shall be used in distilled or demineralized water, at the rate of 40 g of sodium hexametaphosphate/litre of solution.</p>



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E. Moisture Content Determination Test Apparatus Setup

Name of The Experiment/Test: Moisture Content Determination Test

ASTM Standard: D2216 – 10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Name of Apparatus/ Equipment	Specification
<p>Drying Oven (Maximum working temperature is upto 300°C)</p>	<p>Vented, thermostatically-controlled, preferably of the forced-draft type, meeting the requirements of Specification E145 and capable of maintaining a uniform temperature of $110 \pm 5^\circ\text{C}$ throughout the drying chamber.</p> <div style="display: flex; align-items: center;">  <div style="width: 650px;"> <p>Lab Bench Oven, Adjustable Dial Temp. Control Temperature: 300°C Max Capacity: 7 cu. ft. (198L) Power: 2110 watts, 230V 50/60Hz Country of Origin: US/EU/Equivalent</p> </div> </div>
<p>Rotatory Drying Oven (Maximum working temperature is upto 250°C) RPM: (0.5-10)</p>	<p>Standard Rotatory Drying Oven (Maximum working temperature is upto 250°C) RPM: (0.5-10). Capacity: 7 cu. ft. (198L) Power: 2110 watts, 230V 50/60Hz Country of Origin: US/EU/Equivalent</p>
<p>Gloves, Nitrile-Coated, Hot Mil</p>	<p>Container Handling Apparatus, heat resistant gloves, tongs, or suitable holder for moving and handling hot containers after drying.</p> <div style="display: flex; align-items: center;">  <div style="width: 650px;"> <p>Non-woven, felt insulation and a full-length heat barrier protect hands. Nitrile coating prevents cuts and abrasions. For use in handling hot objects up to 400°F.</p> </div> </div>



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F. Atterberg Limits Determination Test Apparatus Setup

Name of The Experiment/Test: Atterberg Limits Determination Test

ASTM Standard: ASTM D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Name of Apparatus/ Equipment	Specification	
Liquid Limit Device		Unit consists of brass cup, cam mechanism, carriage and crank mounted on a hard rubber base. Includes H-4229 ASTM grooving tool and gauge block. Crank can be shifted to right- or left-hand operation. Complies with ASTM D4318; AASHTO T89, T90 Country of Origin: USA/EU/Equivalent
Flat Grooving Tool		Liquid Limit Metal Grooving Tool for use with all liquid limit machines.
Glass Plates		



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G. Organic Content Determination Test Apparatus Setup

Name of The Experiment/Test: Organic Content Determination Test

ASTM Standard: D2974 – 14: Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Name of Apparatus/ Equipment	Specification	
Muffle Furnace		Max. Temp: 2192°F (1200°C) Chamber Dimensions (HxWxD): 5" x 7" x 10" (130 x 180 x 250mm) Small (0.5cu.ft.), 1500W benchtop muffle furnace Country of Origin: US/EU/Equivalent
Porcelain Evaporating Dish		765ml capacity, 185mm dia. x 54mm height
Tongs		Nickel plated, 1/4" (6mm) wire size, 18" (457mm) length



H. Constant Head and Falling Head Permeability Test Apparatus Setup

Name of The Experiment/Test: Constant Head And Falling Head Permeability Test

ASTM Standard: D2216 – 10: Standard Test Method for Permeability of Granular Soils (Constant Head)

Name of Apparatus/ Equipment	Specification																								
<p>Permeameter</p>	<p>Shall have specimen cylinders with minimum diameters approximately 8 or 12 times the maximum particle size in accordance with Table 1.</p> <div data-bbox="667 862 1193 1384" data-label="Diagram"> </div> <p style="text-align: center;">FIG. 1 Constant-Head Permeameter</p> <table border="1" data-bbox="448 1429 1409 1601" style="margin-left: auto; margin-right: auto;"> <caption>TABLE 1 Cylinder Diameter</caption> <thead> <tr> <th rowspan="2">Maximum Particle Size Lies Between Sieve Openings</th> <th colspan="4">Minimum Cylinder Diameter</th> </tr> <tr> <th colspan="2">Less than 35 % of Total Soil Retained on Sieve Opening</th> <th colspan="2">More than 35 % of Total Soil Retained on Sieve Opening</th> </tr> <tr> <td></td> <td>2.00-mm (No. 10)</td> <td>9.5-mm (¾-in.)</td> <td>2.00-mm (No. 10)</td> <td>9.5-mm (¾-in.)</td> </tr> </thead> <tbody> <tr> <td>2.00-mm (No. 10) and 9.5-mm (¾ in.)</td> <td>76 mm (3 in.)</td> <td>...</td> <td>114 mm (4.5 in.)</td> <td>...</td> </tr> <tr> <td>9.5-mm (¾-in.) and 19.0-mm (¾ in.)</td> <td>...</td> <td>152 mm (6 in.)</td> <td>...</td> <td>229 mm (9 in.)</td> </tr> </tbody> </table> <p>The permeameter should be fitted with: (1) a porous disk or suitable reinforced screen at the bottom with a permeability greater than that of the soil specimen, but with openings sufficiently small (not larger than 10 % finer size) to prevent movement of particles; (2) manometer outlets for measuring the loss of head, h, over a length, l, equivalent to at least the diameter of the cylinder; (3) a porous disk or suitable reinforced screen with a spring attached to the top, or any other device, for applying a light spring pressure of 22 to 45-N (5 to 10-lbf) total load, when the top plate is attached in place.</p>	Maximum Particle Size Lies Between Sieve Openings	Minimum Cylinder Diameter				Less than 35 % of Total Soil Retained on Sieve Opening		More than 35 % of Total Soil Retained on Sieve Opening			2.00-mm (No. 10)	9.5-mm (¾-in.)	2.00-mm (No. 10)	9.5-mm (¾-in.)	2.00-mm (No. 10) and 9.5-mm (¾ in.)	76 mm (3 in.)	...	114 mm (4.5 in.)	...	9.5-mm (¾-in.) and 19.0-mm (¾ in.)	...	152 mm (6 in.)	...	229 mm (9 in.)
Maximum Particle Size Lies Between Sieve Openings	Minimum Cylinder Diameter																								
	Less than 35 % of Total Soil Retained on Sieve Opening		More than 35 % of Total Soil Retained on Sieve Opening																						
	2.00-mm (No. 10)	9.5-mm (¾-in.)	2.00-mm (No. 10)	9.5-mm (¾-in.)																					
2.00-mm (No. 10) and 9.5-mm (¾ in.)	76 mm (3 in.)	...	114 mm (4.5 in.)	...																					
9.5-mm (¾-in.) and 19.0-mm (¾ in.)	...	152 mm (6 in.)	...	229 mm (9 in.)																					

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Name of Apparatus/ Equipment	Specification	
		<p>Permeameter Cell, 3.0" (76mm) Two manometer ports are grooved & screened on the inside. 100 mesh screens used to prevent migration of material through valves & tubing during test. Acrylic chamber permits viewing sample. Spring incorporated into top cap to apply 5-10 lbs. force against screen to prevent soil density changes. Country of Origin: USA/EU/Equivalent</p>
Filter Papers	Standard Lab Filter Papers	
Constant Head Tank		<p>Constant Head Tank to supply water and to remove most of the air from tap water, fitted with suitable control valve.</p> <p>Capacity: 1500 cc Acrylic tank with regulating valve for flow control of water and a porous media on bottom to filter out air bubbles. Tank measures 5.625" diameter x 5.25" height. Country of Origin: USA/EU/Equivalent</p>
Scoop		<p>Scoop, with a capacity of about 100 g (0.25 lb) of soil</p> <p>Aluminum, Flat Nose Scoop— Bowl Vol./Water (oz/cu. in.): 6.7 (12.2), Length: 6" (152mm), Width: 3-3/4" (95mm), Depth: 2" (51mm), Overall Length: 9-1/4" (235m)</p>
Specimen Compaction Equipment/ Tamper/ Hammer	<p>Compaction equipment as deemed desirable may be used. The following are suggested: a vibrating tamper fitted with a tamping foot 51 mm (2 in.) in diameter; a sliding tamper with a tamping foot 51 mm (2 in.) in diameter, and a rod for sliding weights of 100 g (0.25 lb) (for sands) to 1 kg (2.25 lb) (for soils with a large gravel content), having an adjustable height of drop to 102 mm (4 in.) for sands and 203 mm (8 in.) for soils with large gravel contents</p>	



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Name of Apparatus/ Equipment	Specification	
		Rod with sliding weights on a 2" (51mm) dia foot. Stop allows adjusting height of drop up to 8" (203mm). Includes one .25 lb. (100g) and one 2.25 lb. (1kg) weight.
Timer		Standard lab timer
Cylinders		Glass Cylinder Capacity: 250 ml Material: Pyrex

Name of The Experiment/Test: Relative Density Test

ASTM Standard: D4253 – 14: Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

Name of Apparatus/ Equipment	Specification
Vibrating Table With Controller	Steel table conforming to the requirements of 6.9 with a vertically vibrating, cushioned steel deck generally 30 by 30 in. (760 by 760 mm), actuated by an electromagnetic vibrator of the solid-impact type with a net mass over 45 kg. The table shall be mounted to a concrete floor or slab having a mass of greater than 450 kg



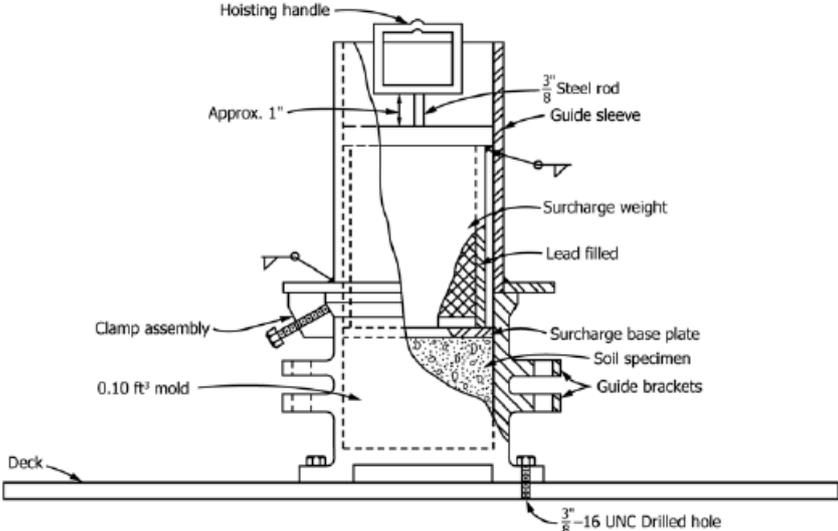
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Name of Apparatus/ Equipment	Specification	
		<p>Table is 30" x 30" (762 x 762mm), and vibration is provided by an electromagnetic vibrator rated above 100lbs (45.5kg). Capacity for table is 750 lbs (341kg) Height is 21" (533mm).</p>
<p>Mold Assembly Consisting of Standard Molds</p>	<p>An example of a typical mold assembly is shown in Fig. 1.</p>  <p>FIG. 1 Schematic Drawing of a Typical Mold Assembly</p>  <p>0.1cu. ft. capacity mold set. Mold is 6" (152.4mm) ID x 6.112" (155.2mm) H</p> <p>Cylindrical metal molds having nominal volumes of 0.100 ft³ (2830 cm³) and 0.500 ft³ (14 200cm³). The molds shall conform to the requirements shown in Fig. 2. The actual volume of the molds shall be within ±1.5 % of the specified nominal volume.</p>	

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Name of Apparatus/ Equipment	Specification																																		
	<p style="text-align: center;">These handles cast on 0.50 cu. ft. mold only</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Size Mold ft³ (cm³)</th> <th colspan="6">Dimensions, in. (mm)</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> </tr> </thead> <tbody> <tr> <td></td> <td>+0.005, -0.000 (+0.13, -0.00)</td> <td>+0.005, -0.000 (+0.13, -0.00)</td> <td>±0.016 (±0.4)</td> <td>±0.016 (±0.4)</td> <td>±0.016 (±0.4)</td> <td>±0.016 (±0.4)</td> </tr> <tr> <td>0.100 (2830)</td> <td>6.000 (152.40)</td> <td>6.112 (155.24)</td> <td>7.13 (181.1)</td> <td>6.50 (165.1)</td> <td>0.50 (12.7)</td> <td>1.13 (28.7)</td> </tr> <tr> <td>0.500 (14 200)</td> <td>11.000 (279.40)</td> <td>9.092 (230.94)</td> <td>12.13 (308.0)</td> <td>9.50 (241.3)</td> <td>0.63 (16.0)</td> <td>2.00 (50.8)</td> </tr> </tbody> </table> <p style="text-align: center;">FIG. 2 Details of Molds</p>	Size Mold ft ³ (cm ³)	Dimensions, in. (mm)						A	B	C	D	E	F		+0.005, -0.000 (+0.13, -0.00)	+0.005, -0.000 (+0.13, -0.00)	±0.016 (±0.4)	±0.016 (±0.4)	±0.016 (±0.4)	±0.016 (±0.4)	0.100 (2830)	6.000 (152.40)	6.112 (155.24)	7.13 (181.1)	6.50 (165.1)	0.50 (12.7)	1.13 (28.7)	0.500 (14 200)	11.000 (279.40)	9.092 (230.94)	12.13 (308.0)	9.50 (241.3)	0.63 (16.0)	2.00 (50.8)
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	A	B	C	D	E	F																													
	+0.005, -0.000 (+0.13, -0.00)	+0.005, -0.000 (+0.13, -0.00)	±0.016 (±0.4)	±0.016 (±0.4)	±0.016 (±0.4)	±0.016 (±0.4)																													
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Surcharge Base Plates	Surcharge Base Plates—One surcharge base plate foreach standard size mold, conforming to the requirements offig. 5																																		

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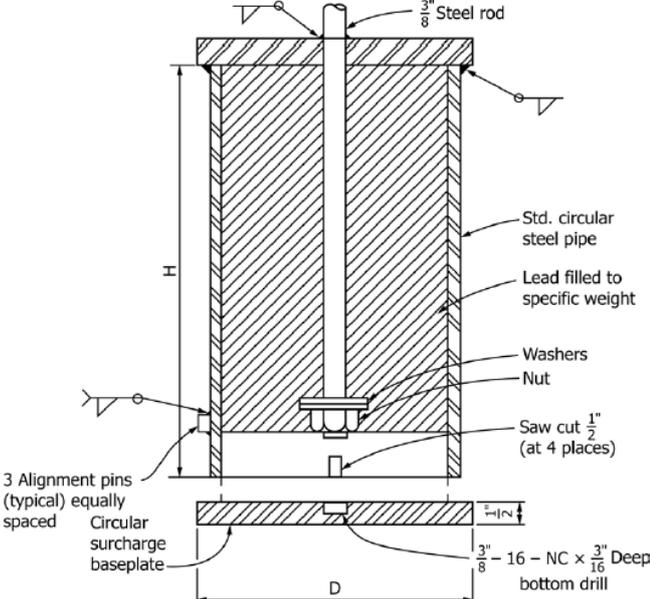
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Name of Apparatus/ Equipment	Specification															
	 <p>NOTE 1—All plates shall be 0.50-in. (12.7-mm) thick steel. NOTE 2—Top plates for weights may be torch-cut, but edges must be ground as smooth as practicable. Surcharge base plates must be machined to the specified diameter. NOTE 3—Hoisting handles shall have the same shape as the surcharge base plate handle (see Fig. 4 (b)).</p> <table border="1" data-bbox="395 1265 1305 1339"> <thead> <tr> <th>Size Mold, ft³ (cm³)</th> <th>D, in. (mm)</th> <th>H, in. (mm)</th> <th>Standard Pipe, in. (mm)</th> <th>Total Weight Required, lb (kg)</th> </tr> </thead> <tbody> <tr> <td>0.100 (2830)</td> <td>5.94 (151)</td> <td>6.0 (150)</td> <td>4.0 (100)</td> <td>56.5 ± 0.5 (25.6 ± 0.2)</td> </tr> <tr> <td>0.500 (14 200)</td> <td>10.88 (276)</td> <td>9.0 (230)</td> <td>10 (250)</td> <td>190 ± 2 (86.2 ± 0.9)</td> </tr> </tbody> </table>	Size Mold, ft ³ (cm ³)	D, in. (mm)	H, in. (mm)	Standard Pipe, in. (mm)	Total Weight Required, lb (kg)	0.100 (2830)	5.94 (151)	6.0 (150)	4.0 (100)	56.5 ± 0.5 (25.6 ± 0.2)	0.500 (14 200)	10.88 (276)	9.0 (230)	10 (250)	190 ± 2 (86.2 ± 0.9)
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0.100 (2830)	5.94 (151)	6.0 (150)	4.0 (100)	56.5 ± 0.5 (25.6 ± 0.2)												
0.500 (14 200)	10.88 (276)	9.0 (230)	10 (250)	190 ± 2 (86.2 ± 0.9)												
<p>Surcharge Weights</p>	<p>Surcharge Weights—One surcharge weight for each size mold. See Fig. 5 for tolerances related to the 0.100 ft³(2830 cm³) and 0.500 ft³ (14 200 cm³) molds. For special molds, similar tolerances should be maintained. The total mass of the surcharge base plate and surcharge weight shall be equivalent to a surcharge stress of 2.00 ± 0.02 lb/in.² (13.8 ± 0.1 kPa) for the mold being used. For special molds, the surcharge base plate and weight can be composed of a single solid mass of metal.</p>															
<p>Surcharge Base-Plate Handle</p>	<p>Surcharge Base-Plate Handle—A device used to initially place and then to remove the surcharge base plate upon completion of densification. An example of such a handle is given in Fig. 4(b); however, any convenient hooking device may be used.</p>															

6

Signature



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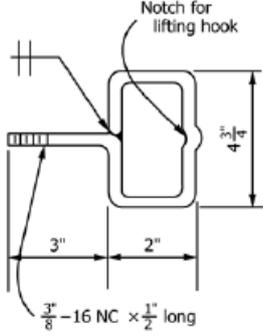
Kumira, Chittagong-4318, Bangladesh

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Name of Apparatus/ Equipment	Specification
	 <p>(b) Surcharge Base Plate Handle (1 Required)</p>
<p>Relative Density Gauge Set/ Dial Indicator Gauge</p>	<p>Dial-Indicator Gauge Holder and Dial Indicator—A device used, in conjunction with the guide brackets, to measure the difference in elevation between the top surfaces of the mold and surcharge base plate after densification [Fig. 4(c)]. The dial indicator shall have a 2-in. (50-mm) or greater travel, with 0.001-in. (0.025-mm) graduations and mounted so that the dial stem is parallel with the vertical axis of the mold. The dial indicator may be digital, analog clockwise-movement type where the dial pointer reads zero when the stem is extended, or counterclockwise type where the dial pointer reads zero when the stem is all the way in.</p>  <p>Set includes a 2" (50.8mm) dia., 2.0 x 0.001" mechanical dial gauge. A metal, 3 x 12 x .125" (76 x 305 x 3.2mm) calibration bar is also included</p>
<p>Straightedge</p>	<p>Standard lab straightedge</p>



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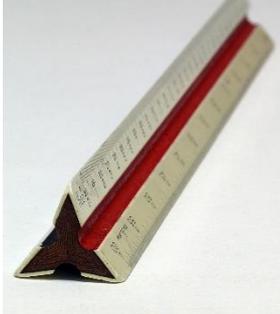
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Name of Apparatus/ Equipment	Specification
	



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I. Relative Density Test Apparatus Setup

Name of The Experiment/Test: Compaction Test (Standard And Modified)

ASTM Standard: D698 – 12: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))

D1557 – 12: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))

Name of Apparatus/ Equipment	Specification	
Molds		<p>Small Size: Standard Proctor Compact. Mold, 4" Mold volume is 1/30 ft³ Cold-rolled steel tubing, plated for rust resistance Mold dimensions are 4" ID x 4.584" H with a 2" detachable collar.</p> <p>Large Size: Standard Proctor Compact. Mold, 6" Mold volume is 1/13.33 ft³ Cold-rolled steel tubing, plated for rust resistance Mold dimensions are 6" ID x 4.584" H with a 2" detachable collar.</p>
Manual Rammer		<p>Manual, moisture/density Hammer/Rammer meets AASHTO specs. It incorporates a 10 lb (4.5kg) weight and a drop of 18" (457mm) with a 2" (51) face. Machined Steel, plated for rust resistance.</p>
Extruder		<p>Designed for lab and field use to extract soil samples from 4" and 6" compaction molds, as well as 2" and 2.8" tube samples. The ejection force is generated by means of a 3-ton (27.7kN) capacity, hand-operated hydraulic jack. Piston stroke is 8" (235mm). Overall dimensions 13"W x 6"D x 27"H (330 x 152 x 686mm).</p>



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Mixing Pan		Galvanized steel with wire-bound rolled-top edges, Features 2 drop handles and straight sides. 18 x 18 x 1.5" deep (457 x 457 x 38mm)
Trowel		Forged steel trowel for striking off molds, etc., has edges ground straight and rubber/plastic handle. Dimensions: 2.75" x 5" (70 x 127mm)

J. Compaction Test (Standard and Modified) Apparatus Setup

Name of The Experiment/Test: Direct Shear Test

ASTM Standard: ASTM D3080: Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions

Name of Apparatus/ Equipment	Specification
Dead-Weight Direct Shear Test Device	 <p>Machine include the carriage, stand, vertical load hanger and a balanced lever loading arm with a 10:1 ratio that reduces the weight required to perform tests.</p> <p>The carriage accepts shear box squares up to 4.0" (100mm) internal dimension.</p> <p>Forward and reverse measurements permit residual shear testing as standard.</p> <p>A built-in safety feature prevents the over travel of the load measuring system. The HM-5750 and HM-5750M are supplied complete with a 2,000 lbf (10kN) capacity load ring, 1.0" x 0.001" (25.4 x 0.01mm) and 0.5" x 0.0001" (12 x 0.002mm) dial indicator.</p> <p>Country of Origin: USA/EU/Equivalent</p>



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Load And Deformation Dial gauges	Included with the machine.
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K. Direct Shear Test Apparatus Setup

Name of The Experiment/Test: Unconfined Compression Test (This test can also be done with the Tri-Axial Machine)

ASTM Standard: ASTM D2166: Standard Test Method for Unconfined Compressive Strength of Cohesive Soil

Name of Apparatus/ Equipment	Specification	
Compression Device		<p>Unconfined Compressive Strength Test Apparatus screw operated load frame. Capacity 5000kg(50kN) with a gear box and motor drive giving Rates of strain 1.25, 1.5, 2.5mm/min. A pair of cone seating, adaptor for proving ring, and stain dial gauge bracket. One pair of male/female coning tools for 38mm dia samples with ring and dial gauge. For operation on 230 V Country of Origin: USA/EU/Equivalent</p>
Sample Trimming Equipment		<p>Adjustable Soil Trimmers: 3 and 4in diameter capacities. Ease of adjustment allows for precisely trimming cylindrical soil samples to any diameter between 1 and 3in or 4in (25.4 to 76 or 101.6mm). Adjustable Soil Trimmer Top Platens provide control of diameters when preparing soil specimens for various soil lab tests. Top platens are available to fit a range of soil specimens from 1.0 to 4.0in. Open-End Wire Saw can be used with a Soil Trimmer, Miter Box, or independently for precision trimming of the soil sample to the specific diameter or length. Country of Origin: USA/EU/Equivalent</p>



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L. Unconfined Compression Test Apparatus Setup

Name of The Experiment/Test: Consolidation Test (One Dimensional)

ASTM Standard: ASTM D2435: Standard Test Method for One-Dimension Consolidation Properties of Soil Using Incremental Loading

Name of Apparatus/ Equipment	Specification



Consolidation Device (Including ring, porous stones and load plate)

Option 1



Front Loading Oedometer (consolidation), cast aluminium frame, the lever arm incorporates 9:1, 10:1 and 11:1 beam ratios.

Consolidation cell for high pressure, 50 mm specimen dia., complete with an upper and lower porous disc, cutter ring and the cylinder wall.

Consolidation cell for high-pressure ASTM, 63.50 mm (2.5") specimen dia., complete with an upper and lower porous disc, cutter ring and the cylinder wall.

Set of Weights for consolidation, 32 kg comprising 1 pcs. 10 kg, 3 pcs. 5 kg, 2 pcs. 2 kg, 1 pcs. 1 kg, 3 pcs. 0.5 kg, 2 pcs. 0.25 kg.

Bench for consolidation with 3 oedometer capacity

Country of Origin: USA/EU/Equivalent

Option 2



Features Include:

- Highly-sensitive accuracy in lower load ranges
- Integral digital readout simplifies checking applied load and setup of predetermined load
- Adjustable upper cross beam
- Instantaneous loading without impact
- Flexible load choice
- Not sensitive to shock
- Choice of English or Metric models
- Digital readout displays applied loads with the help of precision pressure regulators and pressure transducers with a linearity of $\pm 0.1\%$.
- The 1" (25.4mm) thick aluminum platforms have centering pads and accept any consolidation ring up to 4.0" (100.0mm) in diameter.
- Stainless steel vertical rods support the cross-head and dial gauge.
- One Pressure Ball is included with the unit.
- Air supply tubing (25') to hook up the compressed air line is also included.



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Dial Gauge	Standard dial gauges
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M. Consolidation Test (One Dimensional) Test Apparatus Setup

Name of The Experiment/Test: Triaxial Test (Unconsolidated Undrained, Consolidated Undrained and Consolidated Drained)

ASTM Standard: ASTM D2850: Standard Test Method for Unconsolidated - Undrained Triaxial Compression Test on Cohesive Soils

ASTM D4767: Consolidated Undrained Triaxial Compression Test for Cohesive Soil

ASTM D7181: Standard Test Method for Consolidated Drained Triaxial Compression Test for Soils

Name of Apparatus/ Equipment	Specification																						
Triaxial Apparatus	 <p>Specifications</p> <table border="1"> <tr> <td>Load capacity:</td> <td>11000 lbf (50kN)</td> </tr> <tr> <td>Speed range — Testing:</td> <td>0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min)</td> </tr> <tr> <td>Speed range — Fast Approach:</td> <td>3.0 in/min (75.0 mm/min)</td> </tr> <tr> <td>Data channels:</td> <td>4</td> </tr> <tr> <td>Platen Size / Travel:</td> <td>10" (254mm) / 4" (100mm)</td> </tr> <tr> <td>Data storage:</td> <td>1000 tests and up to 3000 readings per test</td> </tr> <tr> <td>Clearance, vertical:</td> <td>40" (1000mm)</td> </tr> <tr> <td>Clearance, horizontal:</td> <td>15" (380mm)</td> </tr> <tr> <td>Voltage:</td> <td>220V 50/60Hz - 5.0amps</td> </tr> <tr> <td>Shipping weight:</td> <td>300 lbs (136kg)</td> </tr> <tr> <td>Country of Origin</td> <td>USA/EU/Equivalent</td> </tr> </table> <p>Software Required</p> <ul style="list-style-type: none"> • Triaxial Unconsolidated Undrained Module Software • Triaxial Consolidated Undrained Module • Triaxial Unconfined Compression Module • Triaxial - Consolidated Drained Module 	Load capacity:	11000 lbf (50kN)	Speed range — Testing:	0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min)	Speed range — Fast Approach:	3.0 in/min (75.0 mm/min)	Data channels:	4	Platen Size / Travel:	10" (254mm) / 4" (100mm)	Data storage:	1000 tests and up to 3000 readings per test	Clearance, vertical:	40" (1000mm)	Clearance, horizontal:	15" (380mm)	Voltage:	220V 50/60Hz - 5.0amps	Shipping weight:	300 lbs (136kg)	Country of Origin	USA/EU/Equivalent
Load capacity:	11000 lbf (50kN)																						
Speed range — Testing:	0.00001 – 2.00000 in/min (0.00001 – 50.80000 mm/min)																						
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Data channels:	4																						
Platen Size / Travel:	10" (254mm) / 4" (100mm)																						
Data storage:	1000 tests and up to 3000 readings per test																						
Clearance, vertical:	40" (1000mm)																						
Clearance, horizontal:	15" (380mm)																						
Voltage:	220V 50/60Hz - 5.0amps																						
Shipping weight:	300 lbs (136kg)																						
Country of Origin	USA/EU/Equivalent																						



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Triaxial Test (Unconsolidated Undrained, Consolidated Undrained and Consolidated Drained) Test Apparatus Setup

Name of The Experiment/Test: Impact test of Metal Specimen

ASTM Standard: ASTM E 23 Standard Test Methods for Notched Bar Impact Testing of Metallic Materials.

Name of Apparatus/ Equipment	Specification
<p>Digital Pendulum Impact Testing Machine including Accessories</p>	<p>Strictly conforms to ASTM-E-23-2007 specifications. Works on pendulum principle, difference between height of drop of pendulum before rupture and height of rise after rupture of specimen is directly proportional to impact energy absorbed by specimen and is indicated by a pointer on a digital display. Single stand design which facilities fast and easy positioning and centering of specimen which is basic requirement of sub-zero testing. Unique spring-loaded braking systems for smooth and jerk free braking</p> <div data-bbox="469 1155 823 2000" style="display: flex; align-items: center;">  <div data-bbox="836 1155 1412 2000" style="margin-left: 20px;"> <p>Accessories:</p> <ul style="list-style-type: none"> • Charpy Striker - 1 no. • Charpy Support Block - 1 set. • Specimen setting gauge (for charpy) - 1 no. • Set of spanners - 1 set. • Foundation bracket - 1 no. • Self centering tong for charpy test specimen (useful particularly for carrying out tests at sub zero temperature) • Sub zero temperature bath with digital temperature indicator • Go : No-Go gauges for confirming the following parameters of specimen within the limits specified by standard <ol style="list-style-type: none"> a) Centre line of notch from both ends b) Angle of V notch c) Depth below standard V notch d) Cross section of 10x10 mm specimen e) Milling cutter for V notch </div> </div>



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Name of Apparatus/ Equipment	Specification
	f) Charpy&Izod Notch (V & U) Broaching machines • Lateral expansion gauges as per ASTM-E-23

N. Impact test of Metal Specimen Test Apparatus Setup

Name of The Experiment/Test: Static Bending Test of Steel and Timber Beam

ASTM Standard: ASTM D143- Standard Test Methods for Small Clear Specimens of Timber

ASTM E 855-Standard Test Methods for Bend Testing of Metallic Flat Materials for Spring Applications Involving Static Loading

Name of Apparatus/ Equipment	Specification
Deflectometer	<div data-bbox="475 1205 896 1601" data-label="Image"> </div> <p data-bbox="922 1205 1401 1317">Should be compatible with IIUC's existing Universal Testing Machine (UTM)</p>



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O. Test of Slender Column Apparatus Setup

Name of The Experiment/Test: Test of Slender Column

Name of Apparatus/ Equipment	Specification	
Column Testing Apparatus		Should be compatible with IIUC's existing Universal Testing Machine (UTM)

Multifunctional Apparatus/Equipment

Name of Apparatus/ Equipment	Specification	
Concrete Mixture Machine		



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Name of Apparatus/ Equipment	Specification
Cylindrical Metal Measures with Handles	



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Date: 24th November 2023

Terms and conditions:

1. Tender schedule is available at Purchase & Procurement Division (PPD) of IIUC and may be purchased paying Tk-500/- (Five hundred taka only) non-refundable from **25th November, 2023** to **05th December, 2023** during office hour (**10:00 AM to 4:00 PM**). Tender Schedule may also be downloaded from the web site (www.iiuc.ac.bd). Payment receipt must be enclosed with the quotation in both the cases.
2. The Quoted Tender Schedule has to be submitted in the dedicated Tender Box kept in the office of Purchase and Procurement Division (PPD) at International Islamic University Chittagong (IIUC) on **05th December, 2023** within office hour.
3. The Quoted Tender Schedules will be opened at **1:00 PM** on **09th December, 2023**
4. VAT and AIT has to be included in the bidder's quoted rate (like Basic Price + VAT @7.5% + AIT @3%) & will be deducted from the contractor's bill as per rule.
5. No advance or no partial bill will be allowed for this Tender.
6. Supplied items (equipment & accessories) must be thoroughly checked/inspected by the responsible and competent authority. Any discrepancy/deviation/lacking from/of the tender specification leads to outright rejection of the supplied item/s. Defective item/s shall not be accepted.
7. The quoted item shall be supplied on C&F Factory Price basis or to the office of IIUC. Adequate measure(s) should be taken during installation, commissioning, training among the faculties and lab technicians. Any item/s found damaged/defective (equipment & accessories) during installation, commissioning, training must be replaced within a stipulated time which will be assigned by the competent authority.
8. Supplier must provide service & maintenance warranty and guarantee for replacement during maintenance period.
9. The maintenance period will be considered after successful completion of works stated in clause # 7.
10. The final bill will be paid by A/C payee cheque in favor of the bidder after user acknowledgment/confirmation report from Civil Engineering Department & performing other official formalities. If any default is found, payment will be suspended till the defaults are removed. There is no scope to increase the quoted price after issuing the Work Order.
11. IIUC authority reserves the right to accept or reject any or all tender without assigning any reason/s.
12. The bidder has to submit earnest money (refundable) via pay order from any scheduled bank equivalent to 2.5% (two and half percent) of Quoted Price along with this quotation.
13. An amount of 5% (Five percent) of the bill will be kept as Security Money and will be released after 6 (six) months of completion of the work or completion of maintenance period whichever is higher.
14. In case of imported items, proper documents such as Proforma Invoice, LC, Custom & C&F etc. must be provided with quotation (if already imported). Apart from that Manufacturer's Authorization Letter & Manufacturer's ISO Certification have to be submitted.
15. In case of locally produced goods, BSTI/BAB Certification must be provided.
16. For any detail or clarification, interested bidder may contact Prof. **Dr. Engr. Muhammad Abu Eusuf, P. Eng**, Chairman, Dept. of CE (01966-881362)


(Mohammad Faisal)
Director
Purchase and Procurement Division
International Islamic University Chittagong
Cell: 01840 747326

Signature of Bidder:
Name:
Mobile No.:
Address:



