

Abstract

Name Of Work- Updation Of Quality Control Laboratory, Nashik By Providing Quality Control Laboratory Equipments @ Nashik

Sr no	Description	Quantity	Unit	Specification / Item No.
1	2	3	4	5
A) Laboratory Equipments				
Cement & Concrete testing equipments and tests :				
1	Providing ,fixing and commisioning Blaines's Air Permeability Apparatus For conducting Fineness test of Cement .	2	no	5 / Cont.
2	Providing Le-Chatelier apparatus, consists of small split cylinder of spring brass of other suitable metal 0.5mm thickness for soundness test of Cement.	5	no	3 / Cont.
3	Providing and commisioning Autoclave Machine with Digital Pressure Gauge and Tempreture controller.	1	no	35 / Cont.
4	Providing Cube Moulds for compression test of Concrete and cement			
	15x15x15 cm	12	no	33 / Cont.
	7.07 x7.07 x7.07 cm	12	no	33 / Cont.
Equipment for aggregates testing				
5	Specific Gravity			

	Providing Wire basket not more than 6.3 mm mesh or a perforated container of convenient size for density test on coarse aggregates for aggregates larger than 10 mm.	2	no	16 / Cont.
6	Providing Elongation index apparatus (Length Gauge) For Determination of Elongation index Of Aggregate	1	no	14 / Cont
7	Providing Flakiness Index apparatus (Thickness Gauge) For Determination of Flakiness index Of Aggregate	1	no	13 / Cont
Equipment for soil testing Lab				
8	Moisture content equipments			
	Providing and commissioning Rapid moisture content meter.	1	no	2 / Soil
9	Specific Gravity Test Apparatus for soil (I.S.2720,Part-III/Sec.1 and 2, 1980)			
	(i) Providing Pycnometer (1 lit. capacity) .	3	no	3 / Soil
	(ii)Providing Pycnometer (50 ml capacity)	6	no	
	(iii) Providing Gas Jar (1 lit capacity)	3	no	
	(iv)Providing Hot water bath (40cm X 30cm X 10cm with 12 holes of 75mm diameter)	1	no	
	(iv)Providing Vacuum Pump	1	no	
	(v)Providing Vacuum desiccator	1	no	
	(vi)Providing Glass Rods			
	(vi)Shrinkage apparatus	2	no	
10	Liquid limit test Apparatus (I.S.2720,Part V-1970) For Determination of Liquid limit of Soil			

	(i)Providing Liquid limit device consisting of brass cup and a carriage complete with grooving tools.	1	no	5 / Soil
11	Providing Plastic Limit Device(Set) (I.S.2720,Part V-1970) for Determination of Plastic Limit of Soil	2	no	6 / Soil
12	Providing Shrinkage Limit Device (Set)(I.S.2720,Part VI,1972) for Determination of Shrinkage Limit of Soil	1	no	7 / Soil
General Equipment				
General Equipment				
13	Electronic Balance Capacity 300gm	1	no	58/ Cont.
	Electronic Balance Capacity 30kg	1	no	58/ Cont.
	Electronic Balance Capacity 50kg	1	no	58/ Cont.
14	Glass Jar 1000ml	1	no	
	Glass Jar 500ml	1	no	
	Glass Jar 200ml	1	no	
	Glass Jar 100ml	1	no	
15	Electrical oven	1	no	6/ Cont.
16	Sieve Set For Fine Agg.	1	no	48/ Cont
17	Sand replacement test App.	1	no	15/ Soil
18	Core cutter Test App.	1	no	15/ Soil
19	Trovel	4	no	27/ Cont.
20	Enameld Trays	5	no	28/ Soil
21	Spanner Set	2	no	27/ Cont.

nasik

(1) / 5. DIGITAL BLAINE AIR PERMEABILITY APPARATUS

Purpose :

Digital Blaine air permeability apparatus is used to determine the fineness of cements, pozzolanas and other powdery materials. It is used to determine the specific surface as total surface area in cm^2/g of material.

Description:

It Consists of calibrated U-tube manometer, ground glass joint, stainless steel test cell and plunger, rubber aspirator bulb and perforated disc. Includes 8 oz (226.8g) bottle of red manometer fluid, filter paper, wood block for holding test cell during filling and funnel. Mounted on finished wood panel with rubber-footed base.

Digital Blaine air permeability apparatus with automated test cycle, electric suction pump, photoelectric cells for detection of levels, chronometer start-up and stop.

After the test, automatic display of the time measured. Precision of time displayed: 0.01 second. The apparatus is delivered complete. With Stainless steel cell with grid and plunger, bottle of manometric liquid, bag of 1000 filter paper disks, funnel.

The set is supplied complete with rubber aspirator, pack of filter paper and thermometer. Two versions which differ one to the other for the cell and plunger dimensions which are slightly different.

Automatic Blaine Apparatus in two models one with inbuilt data recording and control system & the second one with PC based data recording and onboard control system

Technical Specification :

- i) Power supply : 230 V 1ph 50Hz 20W
- ii) Overall dimensions : 220x170x470 mm
- iii) Weight : 8 kg
- iv) It consists one each of permeability cell 12.5mm I.D.
- v) Manometer U type mounted on stand with a built in stop cock
- vi) Perforated disc *Plunger Rubber stopper *Rubber tube 30cm long
- vii) Packet of 12 filter paper discs and a bottle of 100cc dibutyphthalate liquid

References :-

1. [G:\Specification\5\Air Permeability Apparatus Blaine Type - Aimil Ltd. \(Civil Engineering\) Product.html](G:\Specification\5\Air Permeability Apparatus Blaine Type - Aimil Ltd. (Civil Engineering) Product.html)
2. <G:\Specification\5\Automatic Blaine Apparatus - Inbuilt Data Recording and Onboard Control System - AimilLtd..html>
3. <G:\Specification\5\Blaine Air Permeability Apparatus - Humboldt Mfg. Co..html>
4. <G:\Specification\5\Blaine air permeability apparatus, automatic - Matest.html>
5. <G:\Specification\5\Blaine fineness apparatus, Cement testing equipment, Controls.html>
6. <G:\Specification\5\Buy Digital Blaine air permeability apparatus for specific surface area test of cement - civiltesti.html>
7. <G:\Specification\5\Digital blaine air permeability apparatus - Matest.html>
8. IS CODES\IS 5516_BLAINE AIR PERMEABILITY.pdf
9. <https://www.youtube.com/watch?v=AmMFpWx40kE>

10. [CHAPTER 33\BALINS AIR PERMEABILITY.docx](#)

(2) / 3. Le Chatelier moulds including it's Apparatus :-

Purpose :

Le Chatelier moulds are Used for determining the soundness of cements and limes using the expansion test according to the relevant standard. The mould consists of a spring tensioned split cylinder 30 mm internal diameter, 30 mm high with two indicator stems which measure 165 mm from the points of the centre line of the cylinder and O ring. Two or three moulds are required for each test. To perform the test, a hot water bath with having capacity to maintain 90 to 100 degree temperature is also required.

Description :

It should be single mould a package of 6 units and a complete kit including 3 moulds, glass plates and accessories for the verification of extensibility . Each mould have a identification serial number and certificate of conformity

Technical Specification :-

- i) Le Chatelier moulds 3 pcs.
- ii) 50x50 mm glass plates 6 pcs.
- iii) 300 gr Weights 1 pcs.
- iv) 100 gr Weight, 3 pcs.
- v) Tamping Rod 17 mm dia. x 70 gr
- vi) Steel Ruler
- vii) Plastic Carrying Case
- viii) It should have Stainless steel internal chamber housed in a stainless steel insulated exterior case.
- ix) Power 1500 W capable of reaching the boiling point in 30 minutes.
- x) Complete with rack for twelve moulds and cover.
- xi) Le Chatelier water bath. 220-240 V, 50-60 Hz, 1 ph.

References –

1. [G:\Specification\3\Cement Concrete Testing Equipment - LE Chatelier Mould Manufacturer from Nagpur.html](#)
2. [G:\Specification\3\Le Chatelier Apparatus - Manufacturers, Exporters, Suppliers.html](#)
3. [G:\Specification\3\Le Chatelier Mould - Soundness of Cement & Hydrated Lime - Utest Material Testing Equipment.html](#)
4. [G:\Specification\3\Le Chatelier moulds, Cement testing equipment, Controls.html](#)
5. [G:\Specification\3\Le Chatelier Soundness Kit - Cooper Technology Cooper Technology.html](#)
6. [IS CODES\IS 5514 Le Chatellieer mould.pdf](#)
7. <https://www.youtube.com/watch?v=je5ztHs9tII&t=5s>
8. [CHAPTER 33\LE CHATLEAR.docx](#)

(3) / 35 : Autoclave Machine with Digital Pressure Gauge & Temperature Controller :-

Purpose :

Autoclave Machine is used to determine the Soundness of cement. It consists of a high-pressure steam vessel with internal dimensions 154 mm dia. x 430 mm high to accept a rack for holding 12 specimens obtained with the moulds (see accessories). Complete with pressure gauge, pressure regulator, temperature regulator, control switches, safety valve and specimen rack. Certified conforming to ISPELS procedure.

Description:

Portable Autoclaves are provided with customized micro processor PID controller with dual digital display for time & temperature. These user friendly autoclaves require the user to just pour water, load material & press start; rest of the process is taken care by the customized controller.

Each of the units must be constructed with stainless steel material and heavy gauge aluminum. It should be specially focus on testing and compliance with the special parameters to ensure safe operations. These autoclaves Should be equipped with safety devices which protect operator and samples from over-pressure, over current and other mishandling conditions.

Vertical Double Drum Autoclave is completely made out of Stainless Steel having pressed top & ring and organ arc welded. The unit is having 3 layers - outer cover, jacket and inner chamber. This unit is set to create 20 psi of steam, having pressure gauge, 3 safety Valves for additional precaution, water level indicator. Also automatic condensed water ejector for perfect autoclaving, having pressure gauge and long lasting silicon gasket working on 220 VAC.

Technical Specification :-

- i) Overall dimensions: 450x475x1080 mm
- ii) Weight approx.: 55 kg
- ii) Heater: 2600 w
- iv) Double Wall Design Has Single Chamber For Steam And Water.
- v) Fully Automatic Operation Cycle Is Commenced By Press Of The Start Button.
- vi) Initial Air Purging Cycle At The Beginning Air Is Automatically Removed From The Chamber.
- vii) Microprocessor Based Digital Temperature Indicator Controller Controls Temperature/Pressure Precisely At Set Value.
- viii) Temperature Sensor : Pt-100.
- ix) In Built Digital Timer – Timer Can Be Adjusted As Per Sterilization Load Requirements.
- x) Automatic Steam Exhaust At The End Of Cycle.
- xi) Low Water Level Heater Safeguard.
- xii) Safety High Pressure Release Valve.

- xiii) Outer Cover Made Of Stainless Steel 1mm Thick.
- xiv) Lid, Flange & Bottom Sheet Also Made Of Stainless Steel.
- xv) All Joints Argon Welded. Joint Less Silicon Gasket, Heavy Duty Industrial Flange Heater.

Pressure Range : 15 To 22 Psi, Factory Set At 15 Psi.

Temperature Control : Microprocessor Based Digital Display.

Temperature Resolution : 0.1 Deg. C. Temperature Accuracy +/- 0.5 Deg. C.

Lid Fitting Pressure Gauge 0-30 Psi, Safety Spring Loaded Pressure Valve, Steam Release Valve.

Hydraulically Tested At 60 Psi.

Electrical : 230 V/15 A/50 Hz.

References :-

1. <G:\Specification\35\Autoclave, high pressure, Cement testing equipment, Controls.html>
2. <G:\Specification\35\Automatic Autoclaves, Automatic Medical Autoclaves, Fully Automatic Autoclaves, Manufacturer & Suppliers.html>
3. <G:\Specification\35\China Have Stock in Factory 50L 100L 150L 200L 500L Medical Steam Sterilizer Autoclave - China Autoclave, China Supplier of Autoclave.html>
4. <G:\Specification\35\Digital Autoclave Vertical, Manufacturer and Supplier, Sale Digital Autoclave with Cheap Price - Bluestone Ltd..html>
5. <G:\Specification\35\Fully Automatic Digital Autoclave at Rs 48000 Autoclaves ID 12989245388.html>
6. <G:\Specification\35\Laboratory Autoclaves Manufacturers in Mumbai, India Digital Autoclaves Manufacturer.html>
7. <G:\Specification\35\Portable Automatic Autoclave - Digital PAD Medica Instrument.html>
8. <IS CODES\is.14345.1996 Autoclave.pdf>
9. <CHAPTER 33\AUTO CLAVE.docx>
10. https://www.youtube.com/watch?v=lCaQz7_zsU

(4) / 33: Moulds

Purpose :

Cube moulds are used for casting of cube concrete specimen for testing strength & permeability of the concrete in Lab.

Description :

Moulds should have in superior construction finish and available in different size of 30x30x30 cm, 15x15x15 cm, 10x10x10 cm, 7.07x7.07x7.07 cm. Further, these moulds should come supported by base plate support and come machined to +/-0.02 mm accuracy and finished to within 0.02 mm. Moulds must be durable construction finish providing for lasting service usage.

Technical Specification :-

- a) Cube Mould having size 30 X 30 X 30 cm –**
 - Size : 30 X 30 X 30 cm.
 - Material : Cast iron
- b) Cube Mould having size 15 X 15 X 15 cm –**
 - Size : 15 X 15 X 15 cm.
 - Material : Cast iron
- c) Cube Mould having size 10 X 10 X 10 cm –**
 - Size : 10 X 10 X 10 cm.
 - Material : Cast iron
- d) Cube Mould having size 7.07 X 7.07 X 7.07 cm –**
 - Size : 7.07 X 7.07 X 7.07 cm.
 - Material : Cast iron

References :-

1. G:\Specification\33\Construction Bazaar_Products.html
2. <G:\Specification\33\Cube moulds , Concrete testing equipment, Controls.html>
3. [G:\Specification\33\Cylinder moulds, Concrete testing equipment, Controls \(CYLINDRICAL\).html](G:\Specification\33\Cylinder moulds, Concrete testing equipment, Controls (CYLINDRICAL).html)
4. IS CODES\is.10086.1982_CONCRETE Moulds.pdf
5. <CHAPTER 33\MOULDS.docx>

(5) / 16. Density basket

Purpose :

To evaluate specific gravity and water absorption of coarse aggregates.

Description:

The density basket is used to determine bulk specific gravity and absorption of coarse aggregates. A wire basket of not more than 6.3 mm mesh or a perforated container of convenient size, preferably chromium plated and polished, with wire hangers not thicker than one millimeter for suspending it from the balance.

Technical Specification :

Density basket 250 mm dia. x 250 mm high, stainless steel with 3.35 mm mesh opening with bail-type handle.

Overall dimensions: 400 x 650 x 1000 mm

Weight approx. 25.5 kg

References :-

IS :2386(Part-III)-1963 Indian Standard METHODS OF TEST FOR AGGREGATES FOR CONCRETE PART III SPECIFIC GRAVITY, DENSITY, VOIDS, ABSORPTION AND BULKING

1. <G:\Specification\16\Specific gravity frame and baskets, Aggregates testing equipment, Controls.html>
2. <IS CODES\IS 2386 Part3 STONE SPGR DENSITY.pdf>
3. <CHAPTER 33\dENSITY bASKET.docx>

(6) / 14. Length gauge

Purpose :

The elongation index of an aggregate is defined as the percentage by weight of particles whose greatest dimension (length) is 1.8 times their mean dimension. This test is applicable to aggregates larger than 6.3 mm.

Description:

Elongation gauge is used for this test. This test is specified in (IS: 2386 Part-I). However there are no recognized limits for the elongation index.

Technical Specification :

Dimensions : 360x75x75 mm

Weight approx .: 1 kg

References :

1. <G:\Specification\14\Length Gauge - Flakiness & Elongation index of the Aggregate - Aimil.com.html>
2. <G:\Specification\14\Length gauge, Aggregates testing equipment, Controls.html>
3. IS CODES\IS 2386 Part1_STONE SIZE N SHAPE.pdf

(7) / 13. Thickness Gauge with ISI certification Mark IS:2386 (Part 1)

Purpose :

The flakiness index is defined as the percentage by weight of aggregate particles whose least dimension is less than 0.6 times their mean size. Flakiness gauge is used for this test. Test procedure had been standardized in India (IS: 2386 part-I).

Description:

Used to determine if aggregate particles are to be considered flaky, i.e. their thickness is less than 0.6 of their nominal size. As alternative, for large sample analysis please refer to Flakiness sieves

Aggregates which are flaky and/or elongated will often lower the workability of a concrete mix and may also affect long term durability. In bituminous mixtures, flaky aggregates make for a harsh mix and may also crack and break up during compacting by rolling. The flakiness of aggregates is determined by measuring the thickness of individual particles. Aimil offers thickness gauge and length gauge with ISI certification mark as per IS: 2386 (Part 1) to check flakiness index and elongation index of the aggregate respectively.

Technical Specification :

Dimension : 400x150x6 mm

Weight, approx. : 600 g

References :-

IS :2386(Part-I)-1963 Indian Standard METHODS OF TEST FOR AGGREGATES FOR CONCRETE Particle size and shape

1. <G:\Specification\13\Bulk density measures, Aggregates testing equipment, Controls.html>
2. <G:\Specification\13\Lab Equipments - Flakiness Manufacturer from Ahmedabad..html>
3. <G:\Specification\13\Length Gauge - Flakiness & Elongation index of the Aggregate - Aimil.com.html>
4. <G:\Specification\13\Length gauge, Aggregates testing equipment, Controls.html>
5. [G:\Specification\13\Thickness Gauge and Length Gauge \(AIM 450, AIM 451\) Application & Industry, Authorized Distributor of AIMIL Ltd for Gujarat - TirthEnterprises.com.html](G:\Specification\13\Thickness Gauge and Length Gauge (AIM 450, AIM 451) Application & Industry, Authorized Distributor of AIMIL Ltd for Gujarat - TirthEnterprises.com.html)
6. <G:\Specification\13\Thickness gauge, Aggregates testing equipment, Controls.html>
7. [G:\Specification\13\Thickness Gauge, Flakiness & Elongation Aimil Ltd. \(Civil Engineering\).html](G:\Specification\13\Thickness Gauge, Flakiness & Elongation Aimil Ltd. (Civil Engineering).html)
8. <IS CODES\IS 2386 Part1 STONE SIZE N SHAPE.pdf>

(8) / Item No 2:- Rapid moisture content meter for determining the moisture content of soil.

Purpose :- Knowing Moisture Content of Soil one can decide

whether the soil needs to be dried or moisture increased to bring the soil to optimum moisture content

Description:-

The unit shall consist of a pressure vessel with clamp for sealing cap, capacity is 20 gm. Rubber sealing Gasket, pressure gauge calibrated in percentage moisture content 0 -25 % on the wet weight basis, an electronic balance for weighing sample, a scoop for measuring Carbide reagent, a bottle of reagent, one cleaning brush and a set of 4 steel balls that is three of 12.5 mm dia. And one of 25 mm dia. for through mixing. Complete in highly polished wooden carrying case with handle.

References:- ii) I.S. 2720(Part-II)-1973 “Methods of test for Soils Determination of Water content”

(9) / Item No 3 :- Specific gravity apparatus

Purpose :- Specific gravity is the ratio of the weight in air of given volume of soil solids at a stated temperature to the weight in air of an equal volume of distilled water at that temperature. The value of specific gravity of the soil finds the application in calculating void ratio, porosity, degree of saturation and in calculating void ratio in compaction & Consolidation tests of soil.

Description:-

Pycnometer (1 Liter capacity of quality clear glass)	Density bottle, calibrated at 20 degree centigrade
Pycnometer (density bottle, calibrated at 20 degree centigrade)	Density bottle, calibrated at 20 degree centigrade
Gas Jar (1 Liter Capacity of pyrex glass or borosil corning glass)	Glassware resistant to heat, chemicals, and electricity.
Hot water bath (Electrical 230 volts 40 x 30x10 cm with 12 holes of 75 mm dia)	Constructed with stainless steel inside chambers, it can receive up to 8 Le-chatalier mould. The bath reaches the boiling point in about 30 minutes (+ - Minutes) as requested by the specification Voltage : 220 V, single phase 50 Hz, 1000 W Dimensions: 350 x 200 x 300 mm. Net weight : 8 Kg It should be equipped with Thermo regulator to adjust water temperature up to 100°C The pump is required for operation.
Vaccum pump	Please order pump separately as it is not supplied with the unit of the permeability tester. Suction capacity 1.5 m ³ /h Final total pressure Approx. 10 mbar
Vaccum desicator	Frame with panels made of acrylic glass, work top made of aluminium, including four rails made of stainless steel, tray and hygrometer Glossary hygrometer Device gauging humidity or content of water vapour in the air., four casters (two of them with brakes), lateral bow-type handle.
Glass rod (150mm long & 3 mm dia) Shaking apparatus	150 mm long & 3 mm dia

References:- 1) I.S.2720 (Part-III/Section 2)-1980 "Determination of Specific Gravity ,Section 2,Fine,Medium,& Coarse grained soil"

(10) Item No.5 Determination of liquid limit of soil

Purpose :- Liquid Limit is the water content ,expressed as percentage of the oven dry weight of soil at the boundary between Liquid & Plastic Limit

Description:-

Materials - The materials of construction of the three different types of the grooving tools and of the gauge block shall be as given

A) Mechanical liquid limit device	A) Mechanical liquid limit device:- The liquid limit device consists of a hard rubber base carrying a sliding carriage assembly to which a brass cup is hinged. The cup is raised and allowed to fall through a height of 1cm on to the hard rubber base, by the help of a lead screw provided at the back of the sliding carriage. Specifications • Material: SS, Brass• Soil Disc Fall: 10mm/Second 2• Chord Height: 27mm
	B) : Electrically Operated Liquid Limit Devices The liquid limit devices are operated with electrically and have blow counter to complete with Casagrande grooving tools and a gauge block.These have a hard rubber base which carries a sliding carriage assembly Specifications • The cup is set in to and fro motion covering a height of 1 cm. • The cup hit the rubber base pad each time with the help of a lead screw provided at the back of the sliding carriage. • These apparatus can sustain an operating voltage of 220V, single phase, 50 Hz, AC supply.
Grooving Tools (Set of Type A,B,C,)	Type A)- It should be of sheet brass or cast brass material. It must have smooth finish. Type B) - It should be of brass rod or cast brass material. It must have smooth finish. Type C)- It should be of sheet brass or brass wire material. It must havesmooth finish.
Ground Glass Plate	Glass Ground Plate with smooth edges and corners of size 45 x45 cm & 10 mm thick
Polythene wash bottle (500 ml capacity)	It shall be of 500 ml capacity with air tight stopper with plastic delivery tube
Cone	It shall consist of mettalic cone with half angle 50° - 30' + 15'& 30.5 mm coned length. It is fixed at the end of the metallic rod with a disc at the top so as to have a total sliding weight of 148 + 0.5 gm. The rod shall pass through two guides (to ensure vertical movement) fixed to a stand. Provision is made for clamping the vertical rod at any desired height above the surface of soil paste.
Penetrometer Apparatus	
Trough(50mm internal dia & 50 mmht.)	It shall have 50 mm internal dia & 50 mm height.

References:- I.S.2720(Part V)-1970 Determination of Liquid & Plastic Limit

(11) / Item No.6 :- Plastic Limit Device for determination of plastic limit of soil.

Purpose :- Plastic Limit is the water content at which the soil just begins to crumble when rolled into a thread approximately 3 mm diameter

Description:-

- (i) **Evaporating Dish** – It shall be of porcelain with 10 to 15 cm in diameter with flat base and well polished.
- (ii) **Spatula or Palette knife** – It shall be of stainless steel with flexible blade. Blade shall be about 8 cm. long and 2 cm. wide.
- iii) Plastic wash bottle – 500 ml
- iv) Glass plate – 450mm x 450mm x 10mm

References:- I.S.2720(Part V)-1970 Determination of Liquid & Plastic Limit

(12) / Item No.7 Shrinkage Limit Test

Purpose :- Shrinkage Limit of soil is the maximum water content expressed as a percentage of dry weight of soil at which any further reduction in water content does not cause a decrease in volume of the soil mass

Description:-

- (i) Evaporating dish - Porcelain, about 12cm. in diameter with a pour out and flat bottom, being not less than 55mm. or enamel tray with pour out, capacity 500ml.
- (ii) Spatula Flexible, with the blade 8 cm long at 2 cm wide.
- (iii) Shrinkage dish - It shall be circular and of non-corroding metal (stainless steel), inert to mercury having a flat bottom and 45 mm in diameter and 15 mm. internal height. The internal corner between the bottom and the vertical sides shall be rounded into a smooth concave curve.
- (iv) Straight edge - It shall be of stainless steel, about 15 cm. long, 2.5 cm. wide and 3mm thick with one end beveled.
- (v) Glass cup - It shall be of clean and superior quality of glass, 50 to 55 mm in diameter and 25 mm in height, the top rim of which is ground smooth and leveled.
- (vi) Glass plate 2 Nos. - Each glass plate shall be 75 mm. x 75 mm. and 3 mm. thick. One plate shall be plane and another shall have three metal prongs inert to mercury (fig.5). The glass of the plates shall be of good quality and clean.

References:- I.S.2720(Part VI)-1972 Determination of “Shrinkage factor”

(13) / 58. **Electronic Balance.**

Purpose :-

For various test of testing of admixture.

Description :-

When high Precision & Analytical measurements required, to make work in laboratory or manufacturing operation faster, easier and more reliable, This type of balance are used.

Specification :-

- High contrast, Large Backlite LCD display for easy viewing with A.E.P (Advanced Eye Protection)
- Standard RS 232 C Interface
- Hanger for below balance weighing.
- Automatic External calibration.
- Dye cast aluminium design for long term stability and accurate results.
- Multiple weighing units .User selectable stability and filter level.
- USB Interface.
- Storage of maximum 200 samples.
- The balance should be supplied with Breeze shield .
- Dimensions : Pan size 125mm.
- Reachable Battery : Having Size 4V/4AH or AC 220v/110v.
- Readability: From 1000 gm up to 0.001 g.
- AC adapter : 120-volt

References –

1. <http://www.citizenscales.com/precision-balances-0-001gm-to-1000gm.html>
2. <http://www.contechindia.com/high-precision-laboratory-balances1.html>.
3. <http://www.citizenscales.com/precision-balances-0-001gm-to-1000gm.html>.
4. <http://www.krishnascientificsuppliers.com/electronic-balance.html#electronic-balance>.
5. <http://balance.balances.com/scales/1408>.
6. [IS CODES\is.1437.1967 Automatic weighing machines.pdf](#)

(15) / 6. DIGITAL ELECTRIC OVEN

Purpose:

Laboratory ovens are ovens for high-forced volume thermal convection applications. These ovens generally provide uniform temperatures throughout. Process applications for laboratory ovens can be for annealing, die-bond curing, drying, Polyimide baking, sterilizing, and other industrial laboratory functions

Description:

Digital Electric Oven Should be available in triple walled finish with inner chamber made in M.S. or S.S.304 grade metal option, which providing optimum function support as well as long lasting services life. The oven shall be 3” thick Glass wool Insulated with 3” thick Glass wool which ensures stable temperature with reduced energy. Electric oven having temperature range between 0°-250° C with accuracy ± 2°C. Single Door fitted on Heavy Hinges. Inner chamber made of S.S. and outer made of Mild steel with Powder coating. Specially designed stainless steel rod trays ensure uniform temperature distribution. Heating elements are made of high grade chrome plated micron wire. Temp is controlled by thermostat. Motorized Blower on top side of the chamber develops unique air flow system .Which ensures maximum uniform temperature inside the chamber? Unique air Flow assures quick recovery after door openings. It should be suitable for 230 Volts, A.C. single phase, above 50 RPM. All the control switches & pilot lamps are fitted on the front of panel having PC& Printer interfacing facility with RS 485 Port interfaced it should have air circulation fan for uniform temperature and also having Digital Temperature Controller cum indicator and Audio visual alarm warning also. It should have provided in the view of safety the limit switch for interlocking connection between motor & heater.

By means of Imported Microprocessor based auto tuned PID controller with CE mark & dual display of set value & process value.

Models (S) or (G)	Capacity Liters	Internal size H x W x D cm	External Size H x W x D cm	Trays
TI-128 E S / G	324	90 x 60 x 60	142 x 88 x 88	4

Desiccators:

Desiccators having size 200 mm diameters. Depth of plate support 140 mm complete with asbestos supporting plates 175 mm Diameter with Approximate 7 Nos. of holes of 2 cm dia Each. Desiccators shall be made of transparent glass not

having any pronounced tint and shall be as far as possible free from stones, bubbles, cords and other visible defects. They shall be reasonably free from strain. When graded according to the method prescribed in IS : 2303-1963t desiccators shall conform to Type 3 of glass. Desiccators shall be regular in shape and smoothly finished. They shall be symmetrical about the axis which shall be perpendicular to the plane of the base. The base shall enable the desiccators to stand vertically. Without rocking or spinning on a plane horizontal surface. For increasing the stability' and as protection against cracking, extra glass may be provided externally to form a protective rim at the base.

The side of the desiccators shall be stepped to accommodate perforated desiccators plates without rocking, in a plane parallel to the base. The lower part of the side, when making an acute angle with the base, shall be inclined at an angle not less than 75°. The upper part of the side above the step shall rise in the form of a vertical cylinder and end in a flange. The lid of desiccators shall be part-spherical in shape. Its rim shall form a flange the surface' of contact of which shall match that of the flange of the body of the desiccators evenly. The lid desiccators shall be provided with a knob at the top for ease of handling.

References :-

1. <G:\Specification\6\Air circulated Oven.html>
2. <G:\Specification\6\Digital Hot Air Oven, Hot Air Oven, Digital Hot Air Ovens, Gujarat, India..html>
3. <G:\Specification\6\Drying Oven, Laboratory Electric Oven, Thermostatically Controlled with Digital Indicator Safety Alarm - Aimil.com.html>
4. <G:\Specification\6\Hot Air Oven, Hot Air Ovens, Bottom Heater Hot Air Oven, GMP Model Hot Air Oven, Heating Mantles, Mumbai, India.html>
5. <G:\Specification\6\Laboratory Oven - General Purpose Oven Manufacturer from Mumbai..html>
6. <G:\Specification\6\Laboratory Ovens - Laboratory Ovens Exporter, Manufacturer, Service Provider & Supplier, Mira Bhayandar, India.html>
7. <G:\Specification\6\Memmert Type Hot Air Oven, Memmert Hot Air Ovens, Lab BOD Incubator, Mumbai, India.html>
8. <IS CODES\is.6365.1971 ELECTRIC OVEN.pdf>
9. <CHAPTER 33\Oven.docx>

(16) / 48 : Is standard brass sieves 4.75mm,2.36mm,1.18mm,600mic,300mic,150mic and 75 mic with pan having 200 mm dia

Purpose-

Grain size characteristics of soils that are predominately fine grains are evaluated by sieve analysis.

Technical Specifications

- i. should be Made up of Brass.
- ii. should have Fine Mesh Wire Cloth 4.75 mm, 3.35 mm, 2.36 mm, 1.18 mm, 600 Mic, 300 Mic, 150 Mic, 75 Mic
- iii. Should have pan 200 mm diameter.

References-

IS CODES\is.460.1.1985 FINE SIEVES.pdf

(17 & 18) / Item No.15 Field Density Test- (Sand Replacement Method)

Purpose :- The field density of a soil is its ,in-situ, dry unit weight under natural (e.g. in foundation) or artificial compacted (e.g. embacment) Condiion

Description:-

- (a) The field density kit for fine and medium grained soils up to 150mm depth shall consist of-
 - (i) Small Sand pouring cylinder- The equipment shall be of galvanized iron and as per dimensions
 - (ii) Tools For Excavating holes- Suitable tools such as scraper tool to make a level surface, bent spoon, and dibber
 - (iii) Cylindrical Calibrating container (Internal dia 100mm, depth 150 mm)- It shall have internal dia. 100mm and internal depth 150 mm. it shall be fitted with a flange approximately 50 mm wide and about 5 mm thick surrounding in open end.
 - (iv) Plane Plate (60x60cm)- It shall be of a good quality glass or of per spex of 60cm x 60 cm and 9 to 10 mm thick or larger.
 - (v) Metal Container (150mm Dia, 200mm Deep)- It shall be convenient size about 150 mm dia. And 200 mm deep with a removable cover.
 - (vi) Cylindrical Core cutter (127.4mm long , 100mm dia)-It shall be of steel , 127.4mm + 0.1 mm long and 100mm + 0.1 mm internal diameter with a wall thickness of 3 mm beveled at one end
 - (vii) Metal tray with hole 930x30cm, 4cm depth, 10 Cm Dia. of hole- It shall be of non corroding metal and of 30 cm x 30cm and 4 cm deep with 10 cm diameter hole in the centre.
- (b) The field density kit for fine, medium and coarse grained soils beyond 150mm and up to 250mm depth shall consist of-
 - (i) Large sand Pouring Cylinder- The equipment shall be of galvanized iron and as per dimensions.
 - (ii) Tools for Excavating holes- Suitable tools such as bent spoon, dibber.
 - (iii) Screw Driver (30cm Long, 5-10 mm Dia) - 30 cm long and having 5 to 10 mm diameter with a wooden handle.
 - (iv) Cylindrical Calibrating Container (Internal Dia 200 mm, depth250mm)- It shall be with an internal diameter of 200 mm and internal depth of 250 mm. it shall be fitted with a flange 75 mm wide and about 5 mm thick surrounding the open end

Metal Tray with hole(45x45 cm, 5cm deep, 20cm Dia. Of hole- It shall be of non-corrodible metal 45cm x 45 cm and 5 cm deep with 20 cm diameter hole in the centre.

References:- I.S. 2720-(Part-XXVIII)-1974 “Determination of Dry Density of Soils, in place by the sand Replacement Method”

(19) / 27: Reheometer :

Purpose :

Reheometer is used for measuring fundamental flow (rheological) properties of fresh concrete mixtures. The traditional method to measuring slump or slump cone are not capable of characterizing the fundamental rheological properties of concrete that exit during the process of mixing , transporting and placement concrete.Reheometer is a only instrument for measuring this properties.

Description:

TheReheometer is composed of a container (total three containers for aggregate size 10 mm,20 mm,40 mm)to hold the fresh concrete, a driver head that includes an electric motor and torque meter; a four-blade vane that is held by the chuck on the driver; a frame to attach the driver/vane assembly to the top of the container; and a laptop computer to operate the driver, record the torque during the test, and calculate the flow curve parameters. The container contains a series of vertical rods around the perimeter to prevent slipping of the concrete along the container wall during the test. The size of the container and length of the vane shaft are selected based on the nominal maximum size of the aggregate. The vane diameter and height are both 127 mm. The Reheometer software should performs all the necessary functions and stores data.

Technical Specification :

Minimum slump	:	The apparatus should operate for concrete having slump 75 mm & onwards.
Size of Container		For Nominal maximum size of aggregate 10mm, 20 mm, 40 mm.
Vane rotation speed		0.001 to 0.7 rev/s
Motor type		Integrated Servo Motor
Minimum Torque		90Nm for not more than 2 seconds
Peak Torque		0.01Nm
Continuous Maximum Torque		32Nm
Power Supply		230 V ,50 Hz
Test time		1 minute
Computer requirements		Windows 7 or higher Processor I5 or higher
Motor drive dimensions		11 x 11 x 43 cm
Motor console weigh		Max up to 10 kg

Carrying Case weight		20 kg, Including Motor
Frame		Drive, Base, Vane
Power Supply and Cables		

References :

1. <G:\Specification\27\Viskomat XL, Mortar, Cement and Fresh Concrete Rheometer Qualitest.html>
2. <G:\Specification\27\Schleibinger Testing Systems - BT - SCC Rheometer for Fresh Concrete.html>
3. G:\Specification\27\ICAR Rheometer_GERMANN.html

(20) / Item No.28 Enamel trays

Purpose :- To Perform soil test Sample

Description:-

Made of steel with white enamel and of the following sizes:-

- (i) 45 cm x 40 cm x 5 cm.
- (ii) 30 cm x 25 cm x 5 cm.
- 20 cm x 15 cm x 2.5 cm

References:- P.W.D.Hand Book (Part –II)-1990

(21) / 27: Reheometer :**Purpose :**

Reheometer is used for measuring fundamental flow (rheological) properties of fresh concrete mixtures. The traditional method to measuring slump or slump cone are not capable of characterizing the fundamental rheological properties of concrete that exist during the process of mixing, transporting and placement concrete. Reheometer is a only instrument for measuring this properties.

Description:

The Reheometer is composed of a container (total three containers for aggregate size 10 mm, 20 mm, 40 mm) to hold the fresh concrete, a driver head that includes an electric motor and torque meter; a four-blade vane that is held by the chuck on the driver; a frame to attach the driver/vane assembly to the top of the container; and a laptop computer to operate the driver, record the torque during the test, and calculate the flow curve parameters. The container contains a series of vertical rods around the perimeter to prevent slipping of the concrete along the container wall during the test. The size of the container and length of the vane shaft are selected based on the nominal maximum size of the aggregate. The vane diameter and height are both 127 mm. The Reheometer software should perform all the necessary functions and stores data.

Technical Specification :

Minimum slump	:	The apparatus should operate for concrete having slump 75 mm & onwards.
Size of Container		For Nominal maximum size of aggregate 10mm, 20 mm, 40 mm.
Vane rotation speed		0.001 to 0.7 rev/s
Motor type		Integrated Servo Motor
Minimum Torque		90Nm for not more than 2 seconds
Peak Torque		0.01Nm
Continuous Maximum Torque		32Nm
Power Supply		230 V ,50 Hz
Test time		1 minute
Computer requirements		Windows 7 or higher Processor I5 or higher
Motor drive dimensions		11 x 11 x 43 cm
Motor console weigh		Max up to 10 kg

Carrying Case weight		20 kg, Including Motor
Frame		Drive, Base, Vane
Power Supply and Cables		

References :

4. <G:\Specification\27\Viskomat XL, Mortar, Cement and Fresh Concrete Rheometer Qualitest.html>
5. <G:\Specification\27\Schleibinger Testing Systems - BT - SCC Rheometer for Fresh Concrete.html>
6. G:\Specification\27\ICAR Rheometer_GERMANN.html

Chitalwede

Abstract (Sub- Estimate No. 1)

Name Of Work- Updation Of Quality Control Laboratory,Chitalwede By Providing Laboratory Equipments @ Chitalwede.

Sr. no.	Description	Qty	Unit	Specification / Item No.
1	2	3	4	
1	Providing ,fixing and commisioning Blaines's Air Permeability Apparatus For conducting Fineness test of Cement .	1	no	5 / Cont.
2	Providing Le-Chatelier apparatus, consists of small split cylinder of spring brass of other suitable metal 0.5mm thickness for soundness test of Cement.	6	no	3 / Cont.
3	Providing and commisioning Autoclave Machine with Digital Pressure Gauge and Tempreture controller.	1	no	35 / Cont.
	Equipment for aggregates testing			
	Specific Gravity			
4	Providing Wire basket not more than 6.3 mm mesh or a perforated container of convenient size for density test on coarse aggregates for aggregates larger than 10 mm.	2	no	16 / Cont.
5	Providing Aggregate crushing Value apparatus For Determination of Crushing Value Of Aggregate.	1	no	18 / Cont.
6	Providing ,fixing and commisioning Los Angeles Abrasion Testing Machine with Counter and Abrassive Charge.	1	no	19 / Cont.
7	Providing ,fixing and commisioning Los Angeles Abrasion Testing Machine with Counter and Abrassive Charge.	1	no	12 / Cont.
8	Providing Elongation index apparatus (Length Gauge) For Determination of Elongation index Of Aggregate	1	no	14 / Cont.
9	Providing Flakiness Index apparatus (Thickness Gauge) For Determination of Flakiness index Of Aggregate	1	no	13 / Cont.
10	Moisture content equipments			
	Providing and commisioning Rapid moisture content meter.	1	no	2 / Soil
11	Specific Gravity Test Appratus for soil (I.S.2720,Part-III/Sec.1 and 2, 1980)			
	(i) Providing Pychnometer (1 lit. capacity) .	6	no	3 / Soil
	(ii)Providing Pychnometer (50 ml capacity)	12	no	
	(iii) Providing Gas Jar (1 lit capacity)	6	no	

	(iv)Providing Hot water bath (40cm X 30cm X 10cm with 12 holes of 75mm diameter)	1	no	
	(iv)Providing Vaccum Pump	1	no	
	(v)Providing Vaccum desiccator	1	no	
	(vi)Providing Glass Rods	2	no	
	Providing Shaking Apparatus.	1	no	
12	Liquid limit test Apparatus (I.S.2720,Part V-1970) For Determination of Liquid limit of Soil			
	(i)Providing Liquid limit device consisting of brass cup and a carriage complete with grooving tools.	3	no	5 / Soil
13	Providing Plastic Limit Device(Set) (I.S.2720,Part V-1970) for Determination of Plastic Limit of Soil	3	no	6 / Soil
14	Providing Shrinkage Limit Device (Set)(I.S.2720,Part VI,1972) for Determination of Shrinkage Limit of Soil	2	no	7 / Soil
15	Laboratory soil permeability apparatus IS 2770 part XVII , 1966. IS 2720 part XVI, 1975 It shall be of non corrodible material with essential dimation as internal diameter 100mm+0.01mm, and capacity 1000 cm ³ and internal effective height 127.3mm +- 0.1mm with all necessary accessories of falling and constant head	1	No.	31 / Soil
16	Relative Density Apparatus IS 2720 parts XIV 1975 It shall steel table with cushioned steel vibrating deck about 75cm*75cm size. The vibrator should have a net weight of over 45 Kg. with frequency of 3600 vibration per minut. A vibrator amplitude shall range between 0.05 to 0.65 mm under 115 Kg. load and shall be sutabile for use with to 220 volts, 50 cycles per sec, AC power supply with all necessary accessories	1	No.	32 / Soil
17	Automatic compactor IS 2720 (Part VII)-1980 The Automatic Soil compactor replaces the hand compaction procedure as specified for dry density/moisture content relationship of soil. Both light and heavy compaction test can be performed by this machine using either 100 mm diameter of 150 mm deameter compaction. Specifications: 1.Diameter of rammer-50mm 2.Weight of rammer-2.60 Kg for light compaction and 4.89 kg for Heavy compaction 3.Height of fall: 310 mm and 450 mm 4. Wired for 200 V, single phase , 50Hz supply	1	No.	34 / Soil
18	Swelling Test Apparatus Should be as per IS 2720 (Part XLI)-1977 with all accessories and suitable for non gravel soil particles.	1	No.	36 / Soil

19	Providing , fixing & commisioning Comperssion testing machine 200 MT.	1	No.	1 / Cont.
20	The Laboratory Concrete Mixer is used for preparing Mix Design of Concrete. Concrete Mixer Capacity 0.9 to 0.10 cum IS 12119 (1987)	1	No.	37 / Cont.
21	VibratingTable Machine	1	No.	42 / Cont.
22	Heating Equipment Oven Confirming to IS 2720 Part VII (1987) 1997	1	No.	6 / Cont.
23	Sand Replacement Mehtod (Fine & Medium grained soils up to 150 mm depth) Sand pouring cylinder with container & trayv	1	No.	15 / Soil
24	Cylindrical Core cutter (127.4mm long , 100mm dia)	1	No.	15 / Soil

Chitalwede

1 / 5 DIGITAL BLAINE AIR PERMEABILITY APPARATUS

Purpose :

Digital Blaine air permeability apparatus is used to determine the fineness of cements, pozzolanas and other powdery materials. It is used to determine the specific surface as total surface area in cm²/g of material.

Description:

It Consists of calibrated U-tube manometer, ground glass joint, stainless steel test cell and plunger, rubber aspirator bulb and perforated disc. Includes 8 oz (226.8g) bottle of red manometer fluid, filter paper, wood block for holding test cell during filling and funnel. Mounted on finished wood panel with rubber-footed base.

Digital Blaine air permeability apparatus with automated test cycle, electric suction pump, photoelectric cells for detection of levels, chronometer start-up and stop.

After the test, automatic display of the time measured. Precision of time displayed: 0.01 second. The apparatus is delivered complete. With Stainless steel cell with grid and plunger, bottle of manometric liquid, bag of 1000 filter paper disks, funnel.

The set is supplied complete with rubber aspirator, pack of filter paper and thermometer. Two versions which differ one to the other for the cell and plunger dimensions which are slightly different.

Automatic Blaine Apparatus in two models one with inbuilt data recording and control system & the second one with PC based data recording and onboard control system

Technical Specification :

- i) Power supply : 230 V 1ph 50Hz 20W
- ii) Overall dimensions : 220x170x470 mm
- iii) Weight : 8 kg
- iv) It consists one each of permeability cell 12.5mm I.D.
- v) Manometer U type mounted on stand with a built in stop cock
- vi) Perforated disc *Plunger Rubber stopper *Rubber tube 30cm long
- vii) Packet of 12 filter paper discs and a bottle of 100cc dibutylphthalate liquid

References :-

11. [G:\Specification\5\Air Permeability Apparatus Blaine Type - Aimil Ltd. \(Civil Engineering\) Product.html](G:\Specification\5\Air Permeability Apparatus Blaine Type - Aimil Ltd. (Civil Engineering) Product.html)
12. <G:\Specification\5\Automatic Blaine Apparatus - Inbuilt Data Recording and Onboard Control System - AimilLtd..html>
13. <G:\Specification\5\Blaine Air Permeability Apparatus - Humboldt Mfg. Co..html>
14. <G:\Specification\5\Blaine air permeability apparatus, automatic - Matest.html>
15. <G:\Specification\5\Blaine fineness apparatus, Cement testing equipment, Controls.html>
16. <G:\Specification\5\Buy Digital Blaine air permeability apparatus for specific surface area test of cement - civiltesti.html>
17. <G:\Specification\5\Digital blaine air permeability apparatus - Matest.html>

18. [IS CODES\IS 5516 BLAINE AIR PERMEABILITY.pdf](#)
19. <https://www.youtube.com/watch?v=AmMFpWx40kE>
20. [CHAPTER 33\BALINS AIR PERMEABILITY.docx](#)

2./3 Le Chatelier moulds including it's Apparatus :-

Purpose :

Le Chatelier moulds are Used for determining the soundness of cements and limes using the expansion test according to the relevant standard. The mould consists of a spring tensioned split cylinder 30 mm internal diameter, 30 mm high with two indicator stems which measure 165 mm from the points of the centre line of the cylinder and O ring. Two or three moulds are required for each test. To perform the test, a hot water bath with having capacity to maintain 90 to 100 degree temperature is also required.

Description :

It should be single mould a package of 6 units and a complete kit including 3 moulds, glass plates and accessories for the verification of extensibility . Each mould have a identification serial number and certificate of conformity

Technical Specification :-

- i) Le Chatelier moulds 3 pcs.
- ii) 50x50 mm glass plates 6 pcs.
- iii) 300 gr Weights 1 pcs.
- iv) 100 gr Weight, 3 pcs.
- v) Tamping Rod 17 mm dia. x 70 gr
- vi) Steel Ruler
- vii) Plastic Carrying Case
- viii) It should have Stainless steel internal chamber housed in a stainless steel insulated exterior case.
- ix) Power 1500 W capable of reaching the boiling point in 30 minutes.
- x) Complete with rack for twelve moulds and cover.
- xi) Le Chatelier water bath. 220-240 V, 50-60 Hz, 1 ph.

References –

9. <G:\Specification\3\Cement Concrete Testing Equipment - LE ChatelierMould Manufacturer from Nagpur.html>
10. <G:\Specification\3\Le Chatelier Apparatus - Manufacturers, Exporters, Suppliers.html>
11. <G:\Specification\3\Le ChatelierMould - Soundness of Cement & Hydrated Lime - Utest Material Testing Equipment.html>
12. <G:\Specification\3\Le Chateliermoulds, Cement testing equipment, Controls.html>
13. G:\Specification\3\Le Chatelier Soundness Kit - Cooper Technology _ Cooper Technology.html
14. [IS CODES\IS 5514 Le Chatellieer mould.pdf](#)
15. <https://www.youtube.com/watch?v=je5ztHs9tII&t=5s>
16. [CHAPTER 33\LE CHATLEAR.docx](#)

3 / 35 : Autoclave Machine with Digital Pressure Gauge & Temperature Controller :-

Purpose :

Autoclave Machine is used to determine the Soundness of cement. It consists of a high-pressure steam vessel with internal dimensions 154 mm dia. x 430 mm high to accept a rack for holding 12 specimens obtained with the moulds (see accessories). Complete with pressure gauge, pressure regulator, temperature regulator, control switches, safety valve and specimen rack. Certified conforming to ISPELS procedure.

Description:

Portable Autoclaves are provided with customized micro processor PID controller with dual digital display for time & temperature. These user friendly autoclaves require the user to just pour water, load material & press start; rest of the process is taken care by the customized controller.

Each of the units must be constructed with stainless steel material and heavy gauge aluminum. It should be specially focus on testing and compliance with the special parameters to ensure safe operations. These autoclaves Should be equipped with safety devices which protect operator and samples from over-pressure, over current and other mishandling conditions.

Vertical Double Drum Autoclave is completely made out of Stainless Steel having pressed top & ring and organ arc welded. The unit is having 3 layers - outer cover, jacket and inner chamber. This unit is set to create 20 psi of steam, having pressure gauge, 3 safety Valves for additional precaution, water level indicator. Also automatic condensed water ejector for perfect autoclaving, having pressure gauge and long lasting silicon gasket working on 220 VAC.

Technical Specification :-

- i) Overall dimensions: 450x475x1080 mm
- ii) Weight approx.: 55 kg
- ii) Heater: 2600 w
- iv) Double Wall Design Has Single Chamber For Steam And Water.
- v) Fully Automatic Operation Cycle Is Commenced By Press Of The Start Button.
- vi) Initial Air Purging Cycle At The Beginning Air Is Automatically Removed From The Chamber.
- vii) Microprocessor Based Digital Temperature Indicator Controller Controls Temperature/Pressure Precisely At Set Value.
- viii) Temperature Sensor : Pt-100.
- ix) In Built Digital Timer – Timer Can Be Adjusted As Per Sterilization Load Requirements.

- x) Automatic Steam Exhaust At The End Of Cycle.
- xi) Low Water Level Heater Safeguard.
- xii) Safety High Pressure Release Valve.
- xiii) Outer Cover Made Of Stainless Steel 1mm Thick.
- xiv) Lid, Flange & Bottom Sheet Also Made Of Stainless Steel.
- xv) All Joints Argon Welded. Joint Less Silicon Gasket, Heavy Duty Industrial Flange Heater.

Pressure Range : 15 To 22 Psi, Factory Set At 15 Psi.

Temperature Control : Microprocessor Based Digital Display.

Temperature Resolution : 0.1 Deg. C. Temperature Accuracy +/- 0.5 Deg. C.

Lid Fitting Pressure Gauge 0-30 Psi, Safety Spring Loaded Pressure Valve, Steam Release Valve.

Hydraulically Tested At 60 Psi.

Electrical : 230 V/15 A/50 Hz.

References :-

11. <G:\Specification\35\Autoclave, high pressure, Cement testing equipment, Controls.html>
12. <G:\Specification\35\Automatic Autoclaves, Automatic Medical Autoclaves, Fully Automatic Autoclaves, Manufacturer & Suppliers.html>
13. <G:\Specification\35\China Have Stock in Factory 50L 100L 150L 200L 500L Medical Steam Sterilizer Autoclave - China Autoclave, China Supplier of Autoclave.html>
14. <G:\Specification\35\Digital Autoclave Vertical, Manufacturer and Supplier, Sale Digital Autoclave with Cheap Price - Bluestone Ltd..html>
15. <G:\Specification\35\Fully Automatic Digital Autoclave at Rs 48000 Autoclaves ID 12989245388.html>
16. <G:\Specification\35\Laboratory Autoclaves Manufacturers in Mumbai, India Digital Autoclaves Manufacturer.html>
17. <G:\Specification\35\Portable Automatic Autoclave - Digital PAD Medica Instrument.html>
18. IS CODES\is.14345.1996_Autoclave.pdf
19. CHAPTER_33\AUTO CLAVE.docx
20. https://www.youtube.com/watch?v=lCaQz7_zsU

(4) /16. Density basket

Purpose :

To evaluate specific gravity and water absorption of coarse aggregates.

Description:

The density basket is used to determine bulk specific gravity and absorption of coarse aggregates. A wire basket of not more than 6.3 mm mesh or a perforated container of convenient size, preferably chromium plated and polished, with wire hangers not thicker than one millimeter for suspending it from the balance.

Technical Specification :

Density basket 250 mm dia. x 250 mm high, stainless steel with 3.35 mm mesh opening with bail-type handle.

Overall dimensions: 400 x 650 x 1000 mm

Weight approx. 25.5 kg

References :-

IS :2386(Part-III)-1963 Indian Standard METHODS OF TEST FOR AGGREGATES FOR CONCRETE PART III SPECIFIC GRAVITY, DENSITY, VOIDS, ABSORPTION AND BULKING

4. <G:\Specification\16\Specific gravity frame and baskets, Aggregates testing equipment, Controls.html>
5. <IS CODES\IS 2386 Part3 STONE SPGR DENSITY.pdf>
6. <CHAPTER 33\dENSITY bASKET.docx>

(5) /18. Crushing Value Apparatus

Purpose :

The aggregate crushing value provides a relative measure of resistance to crushing under gradually applied crushing load.

Description:

The test consists of subjecting the specimen of aggregate in standard mould to a compression test under standard load conditions.

Technical Specification :

(I) A steel cylinder 15 cm diameter with plunger and base plate made from special alloy steel, hardened to 650 HV (57,8 HRC), and protected against corrosion..

(II) A straight metal tamping rod 16mm diameter and 45 to 60cm long rounded at one end made from special alloy steel, hardened to 650 HV (57,8 HRC), and protected against corrosion..

(III) Cylindrical metal measure of sufficient rigidity to retain its form under rough

usage and of 11.5cm diameter and 18cm height made from special alloy steel, hardened to 650 HV (57,8 HRC), and protected against corrosion..

References:-

IS :2386(Part-IV)-1963 Indian Standard METHODS OF TEST FOR AGGREGATES FOR CONCRETE Mechanical properties.

1. <G:\Specification\18\Aggregate Crushing Value.html>
2. <G:\Specification\18\Aggregates Testing Equipment,Aggregate Crushing Value Apparatus,Suppliers Of Aggregates Testing Equipment,Aggregate Crushing Value Test Apparatus.html>
3. [G:\Specification\18\Crushing value apparatus \(ACV\), Aggregates testing equipment, Controls.html](G:\Specification\18\Crushing value apparatus (ACV), Aggregates testing equipment, Controls.html)
4. <G:\Specification\18\Crushing Value Apparatus Using with Aimil Compression Testing Machines - Aimil.com.html>
5. <IS CODES\IS 2386 Part4 STONE MECH PROPTY.pdf>
6. <CHAPTER 33\Crushing Value Apparatus.docx>

(6) / 19. IMPACT TEST

Purpose :

The aggregate impact test is carried out to evaluate the resistance to impact of aggregates. To determine the aggregate impact value (AIV) which provides a relative measure of the resistance of an aggregate to sudden shock or impact.

Description:

Used to determine the aggregate impact value (AIV) which provides a relative measure of the resistance of an aggregate to sudden shock or impact. The machine should have robustly designed, made from steel protected against corrosion. Fitted with a counter to check the number of blows delivered to the sample. Supplied with cylindrical measure and tamping rod.

Technical Specifications :

A metal tap or hammer weighing 13.5 to 14.0 kg the lower and of which shall be cylindrical in shape, 100 mm in diameter and 5 cm long with a 2mm chamfer at the lower edge, and case hardened. The hammer shall slide freely between vertical guides arranged so that the lower (cylindrical) part of the hammer is above and concentric with the cap. (v) Means for raising the hammer and allowing it to fall freely between the vertical guides from a height of 380 + 5.0mm on to the test sample in the cap and means for adjusting the height of fall within 5 mm. vi) Means for supporting the hammer whilst lastening or removing the cap. Measure.—A cylindrical metal measure (to the nearest gram) of sufficient rigidity to retain its form under rough usage and of the following internal dimensions—Diameter-75 mm Depth-50 mm Tamping rod— A straight metal tamping rod of circular cross-section 10 mm in diameter and 230 mm long, rounded at one end. Sieves, balance and oven covered under General laboratory equipments.

The machine should have robustly designed, made from steel protected against corrosion. Fitted with a counter to check the number of blows delivered to the sample. Supplied complete with two cylindrical measures (to BS and NF) and tamping rod.

Overall dimensions : 450x300x900 mm

Weight approx .: 60 kg

References

IS :2386(Part-IV)-1963 Indian Standard METHODS OF TEST FOR AGGREGATES FOR CONCRETE Mechanical properties.

1. G:\Specification\19\Impact_testing_machine,_Aggregates_testing_equipment,_Controls.html
2. [IS CODES\IS 2386_Part4_STONE_MECH_PROPTY.pdf](IS_CODES\IS_2386_Part4_STONE_MECH_PROPTY.pdf)
3. CHAPTER_33\Aggregate_Impact_Tester.docx

(7) /12. Los Angeles Abrasion testing machine with counter and abrasive charge

Purpose :

Abrasion test is carried out to test the hardness property of aggregates and to decide whether they are suitable for different pavement construction works. The principle of Los Angeles abrasion test is to find the percentage wear due to relative rubbing action between the aggregate and steel balls used as abrasive charge. Los Angeles abrasion test is a preferred one for carrying out the hardness property and has been standardized in India (IS: 2386 part-IV).

Description:

Los Angeles machine consists of circular drum of internal diameter 700 mm and length 520 mm mounted on horizontal axis enabling it to be rotated. An abrasive charge consisting of cast iron spherical balls of 48 mm diameters and weight 340-445 g is placed in the cylinder along with the aggregates. The number of the abrasive spheres varies according to the grading of the sample. The quantity of aggregates to be used depends upon the gradation and usually ranges from 5-10 kg. The cylinder is then locked and rotated at the speed of 30-33 rpm for a total of 500 -1000 revolutions depending upon the gradation of aggregates.

TECHNICAL SPECIFICATIONS:-

The machine should consist of a rolled steel drum of inside dia. of 700 mm and internal length 520 mm. The drum should be rotated by a speed reducer driven by an electric motor at a speed of between 30 and 33 r.p.m. The machine must be equipped with an automatic counter, which can be preset to the required number of revolutions of the drum or the total working time.

Power: 740 W

Dimensions approx.: 1000x850x1000 mm

Weight approx.: 350 kg

An abrasive charge consisting of cast iron spherical balls of 48 mm diameters and weight 340-445 g, total weight of charge should not be less than 10 kg must be supplied with the machine.

The machine must have Noise reduction CE compliant safety cabinet with door opening switch. It should have High resolution graphical display 128x80 pixels and 6 keys membrane keyboard.

Safety cabinets

- Dimensions (wxdxh): 1150x1000x1300 mm
- Total weight approx.: 80 kg

References

1. [G:\Specification\12\Los Angeles \(LA\) Abrasion Machine - Gilson Company, Inc..html](G:\Specification\12\Los Angeles (LA) Abrasion Machine - Gilson Company, Inc..html)
2. G:\Specification\12\Los Angeles Abrasion Machine _Material Testing _Geneq.html
3. <G:\Specification\12\Los Angeles abrasion machine, Aggregates testing equipment, Controls.html>
4. <IS CODES\IS 2386 Part4 STONE MECH PROPTY.pdf>
5. <CHAPTER 33\Los Angeles machine.docx>

(8) / 14. Length gauge

Purpose :

The elongation index of an aggregate is defined as the percentage by weight of particles whose greatest dimension (length) is 1.8 times their mean dimension. This test is applicable to aggregates larger than 6.3 mm.

Description:

Elongation gauge is used for this test. This test is specified in (IS: 2386 Part-I). However there are no recognized limits for the elongation index.

Technical Specification :

Dimensions : 360x75x75 mm

Weight approx .: 1 kg

References :

4. <G:\Specification\14\Length Gauge - Flakiness & Elongation index of the Aggregate - Aimil.com.html>
5. <G:\Specification\14\Length gauge, Aggregates testing equipment, Controls.html>

<IS CODES\IS 2386 Part1 STONE SIZE N SHAPE.pdf>

(9) /13. Thickness Gauge with ISI certification Mark IS:2386 (Part 1)

Purpose :

The flakiness index is defined as the percentage by weight of aggregate particles whose least dimension is less than 0.6 times their mean size. Flakiness gauge is used for this test. Test procedure had been standardized in India (IS: 2386 part-I).

Description:

Used to determine if aggregate particles are to be considered flaky, i.e. their thickness is less than 0.6 of their nominal size. As alternative, for large sample analysis please refer to Flakiness sieves

Aggregates which are flaky and/or elongated will often lower the workability of a concrete mix and may also affect long term durability. In bituminous mixtures, flaky aggregates make for a harsh mix and may also crack and break up during compacting by rolling. The flakiness of aggregates is determined by measuring the thickness of individual particles. Aimil offers thickness gauge and length gauge with ISI certification mark as per IS: 2386 (Part 1) to check flakiness index and elongation index of the aggregate respectively.

Technical Specification :

Dimension : 400x150x6 mm

Weight, approx. : 600 g

References :-

IS :2386(Part-I)-1963 Indian Standard METHODS OF TEST FOR AGGREGATES FOR CONCRETE Particle size and shape

9. <G:\Specification\13\Bulk density measures, Aggregates testing equipment, Controls.html>
10. <G:\Specification\13\Lab Equipments - Flakiness Manufacturer from Ahmedabad..html>
11. <G:\Specification\13\Length Gauge - Flakiness & Elongation index of the Aggregate - Aimil.com.html>
12. <G:\Specification\13\Length gauge, Aggregates testing equipment, Controls.html>

13. [G:\Specification\13\Thickness Gauge and Length Gauge \(AIM 450, AIM 451\) Application & Industry, Authorized Distributor of AIMIL Ltd for Gujarat - TirthEnterprises.com.html](G:\Specification\13\Thickness Gauge and Length Gauge (AIM 450, AIM 451) Application & Industry, Authorized Distributor of AIMIL Ltd for Gujarat - TirthEnterprises.com.html)
14. <G:\Specification\13\Thickness gauge, Aggregates testing equipment, Controls.html>
15. [G:\Specification\13\Thickness Gauge, Flakiness & Elongation Aimil Ltd. \(Civil Engineering\).html](G:\Specification\13\Thickness Gauge, Flakiness & Elongation Aimil Ltd. (Civil Engineering).html)
16. <IS CODES\IS 2386 Part1 STONE SIZE N SHAPE.pdf>

(10) / Item No 2:- Rapid moisture content meter for determining the moisture content of soil.

Purpose :- Knowing Moisture Content of Soil one can decide whether the soil needs to be dried or moisture increased to bring the soil to optimum moisture content

Description:-

The unit shall consist of a pressure vessel with clamp for sealing cap, capacity is 20 gm. Rubber sealing Gasket, pressure gauge calibrated in percentage moisture content 0 -25 % on the wet weight basis, an electronic balance for weighing sample, a scoop for measuring Carbide reagent, a bottle of reagent, one cleaning brush and a set of 4 steel balls that is three of 12.5 mm dia. And one of 25 mm dia. for through mixing. Complete in highly polished wooden carrying case with handle.

References:- ii) I.S. 2720(Part-II)-1973 “Methods of test for Soils Determination of Water content”

(11) / Item No 3 :-Specific gravity apparatus

Purpose :- Specific gravity is the ratio of the weight in air of given volume of soil solids at a stated temperature to the weight in air of an equal volume of distilled water at that temperature. The value of specific gravity of the soil finds the application in calculating void ratio ,porosity, degree of saturation and in calculating void ratio in compaction & Consolidation tests of soil .

Description:-

Pycnometer (1 Liter capacity of quality clear glass)	Density bottle, calibrated at 20 degree centigrade
Pycnometer (density bottle, calibrated at 20 degree centigrade)	Density bottle, calibrated at 20 degree centigrade
Gas Jar (1 Liter Capacity of pyrex glass or borosil corning glass)	Glassware resistant to heat, chemicals, and electricity.
Hot water bath (Electrical 230 volts 40 x 30x10 cm with 12 holes of 75 mm dia)	Constructed with stainless steel inside chambers, it can receive up to 8 Le-chatalier mould. The bath reaches the boiling point in about 30 minutes (+ - Minutes) as requested by the specification Voltage : 220 V, single phase 50 Hz, 1000 W Dimensions: 350 x 200 x 300 mm. Net weight : 8 Kg It should be equipped with Thermo regulator to adjust water temperature up to 100°C The pump is required for operation.
Vaccum pump	Please order pump separately as it is not supplied with the unit of the permeability tester.

Vaccum desicator	Suction capacity	1.5 m ³ /h
	Final total pressure	Approx. 10 mbar
	Frame with panels made of acrylic glass, work top made of aluminium, including four rails made of stainless steel, tray and hygrometer Glossary hygrometer Device gauging humidity or content of water vapour in the air., four casters (two of them with brakes), lateral bow-type handle.	

Glass rod (150mm long & 3 mm dia) Shaking apparatus 150 mm long & 3 mm dia

References:- 1) I.S.2720 (Part-III/Section 2)-1980 "Determination of Specific Gravity ,Section 2,Fine,Medium,& Coarse grained soil"

(12) / Item No.5 Determination of liquid limit of soil

Purpose :- Liquid Limit is the water content ,expressed as percentage of the oven dry weight of soil at the boundary between Liquid & Plastic Limit

Description:-

Materials - The materials of construction of the three different types of the grooving tools and of the gauge block shall be as given

A) Mechanical liquid limit device **A) Mechanical liquid limit device:-** The liquid limit device consists of a hard rubber base carrying a sliding carriage assembly to which a brass cup is hinged. The cup is raised and allowed to fall through a height of 1cm on to the hard rubber base, by the help of a lead screw provided at the back of the sliding carriage. Specifications • Material: SS, Brass• Soil Disc Fall: 10mm/Second 2• Chord Height: 27mm

B) : Electrically Operated Liquid Limit Devices The liquid limit devices are operated with electrically and have blow counter to complete with Casagrande grooving tools and a gauge block. These have a hard rubber base which carries a sliding carriage assembly Specifications

- The cup is set in to and fro motion covering a height of 1 cm.
- The cup hit the rubber base pad each time with the help of a lead screw provided at the back of the sliding carriage. • These apparatus can sustain an operating voltage of 220V, single phase, 50 Hz, AC supply.

Grooving Tools (Set of Type A,B,C,) Type A)- It should be of sheet brass or cast brass material. It must have smooth finish.
 Type B) - It should be of brass rod or cast brass material. It must have smooth finish.
 Type C)- It should be of sheet brass or brass wire material. It must havesmooth finish.

Ground Glass Plate Glass Ground Plate with smooth edges and corners of size 45 x45 cm & 10 mm thick

Polythene wash bottle (500 ml capacity) It shall be of 500 ml capacity with air tight stopper with plastic delivery tube

Cone Penetrometer Apparatus It shall consist of mettalic cone with half angle 50° - 30' + 15' & 30.5 mm coned length. It is fixed at the end of the metallic rod with a disc at the top so as to have a total sliding weight of 148 + 0.5 gm. The rod shall pass through two guides (to ensure vertical movement) fixed to a stand. Provision is made for clamping the vertical rod at any desired height above the surface of soil paste.

Trough(50mm internal dia & 50 mmht.) It shall have 50 mm internal dia & 50 mm height.

References:- I.S.2720(Part V)-1970 Determination of Liquid & Plastic Limit

(13) / Item No.6 :- Plastic Limit Device for determination of plastic limit of soil.

Purpose :- Plastic Limit is the water content at which the soil just begins to crumble when rolled into a thread approximately 3 mm diameter

Description:-

- (i) **Evaporating Dish** – It shall be of porcelain with 10 to 15 cm in diameter with flat base and well polished.
- (ii) **Spatula or Palette knife** – It shall be of stainless steel with flexible blade. Blade shall be about 8 cm. long and 2 cm. wide.
- iii) Plastic wash bottle – 500 ml
- iv) Glass plate – 450mm x 450mm x 10mm

References:- I.S.2720(Part V)-1970 Determination of Liquid & Plastic Limit

(14) / Item No.7 Shrinkage Limit Test

Purpose :- Shrinkage Limit of soil is the maximum water content expressed as a percentage of dry weight of soil at which any further reduction in water content does not cause a decrease in volume of the soil mass

Description:-

- (i) Evaporating dish - Porcelain, about 12cm. in diameter with a pour out and flat bottom, being not less than 55mm. or enamel tray with pour out, capacity 500ml.
- (ii) Spatula Flexible, with the blade 8 cm long at 2 cm wide.
- (iii) Shrinkage dish - It shall be circular and of non-corroding metal (stainless steel), inert to mercury having a flat bottom and 45 mm in diameter and 15 mm. internal height. The internal corner between the bottom and the vertical sides shall be rounded into a smooth concave curve.
- (iv) Straight edge - It shall be of stainless steel, about 15 cm. long, 2.5 cm. wide and 3mm thick with one end beveled.
- (v) Glass cup - It shall be of clean and superior quality of glass, 50 to 55 mm in diameter and 25 mm in height, the top rim of which is ground smooth and leveled.
- (vi) Glass plate 2 Nos. - Each glass plate shall be 75 mm. x 75 mm. and 3 mm. thick. One plate shall be plane and another shall have three metal prongs inert to mercury (fig.5). The glass of the plates shall be of good quality and clean.

References:- I.S.2720(Part VI)-1972 Determination of “Shrinkage factor”

(15) / Item No.31 Laboratory soil permeability apparatus

Purpose :- The coefficient of field permeability is defined as the rate of flow of water ,insitu under laminar flow condition through unite cross section area under unit hydraulic gradient at specified temperature

Description:-

The mould shall be of non corrodible material 1000 ml capacity with 100 mm internal diameter and 127.3 mm internal effective height. It shall be fitted with detachable base plate and removable extension collar, 60mm high. The assembly shall consist of A) DRAINAGE BASE - A base with a poros disc, 12 mm thick having a fitting for connection to water inlet or outlet.it shall be provided with a 12 mm thick and 108 mm dia. dummy plate of non corroding metal. B) DRAINAGE CAP - This shall be of non corroding metal having connection for water inlet or outlet. it shall be provided with 12 mm thick poros disc inserted.the fitting shall be provided for drainage base and cap for accomodating permeameter mould.rubber gaskets or 'O' rings shall be provided for achieving leak proofners.

ii) Static Compaction Equipment- The specifications of jack, extruder frame, moulds etc. are described under respective items else where.

lii) Permeameter mould - The mould shall be of non-corrodible material, 1000 ml capacity with 100 mm internal diameter & 127.3 mm internal effective height. It shall be fitted with a detachable base plate & removable extension collar, 60 mm high. The assembly shall consist of-

a)Drainage base- A base with a porous disc, 12 mm thick having a fitting for connection to water inlet or outlet. It shall be provided with a 12 mm thick & 108 mm diameter Dumy plate of non-corroding metal.

b) Drainage cap- This shall be of non-corroding metal having connection for water inlet or outlet. It shall be provided with 12 mm thick porous disc inserted. The fitting shall be provided for drainage base

and cap for accommodating permeameter mould. Rubber Gaskets or 'O' rings shall be provided for achieving leakproofness.

It is made up of wood and of height to suit the position of the board on the wall. It should be strong so that one or two persons may stand on it and take the readings of permeability. The stool will have a ladder

It should be superior and best quality tape 25 m long with graduations in cm and 1 mm as a smallest division. The marking should be clear and visible.

A C.C., T.W. board of size 56 cm x 30 cm and thickness 50 mm with suitable arrangement of fixing, bolting etc. 3 glass stand pipes above 6,4 and 2 cm dia should be fixed to sliding board so that the head can be adjusted to the desired height. There should be provision of four way cocks at the bottom of stand pipes on the fixed boards with per cock. 3 chemical air tight rubber corks should be provided with two 5 mm dia glass tubes which can be inserted through rubber cork. There will be top and bottom plate connected with the tie rods and nuts. The sample will be fixed with the help of bottom plate and swell plates

It is of 80 mm, 120 mm, 160 mm, 230mm internal dia and 160 mm, 240 mm, 320mm and 400 mm height respectively. It is fitted with (A) porous disc or suitable reinforced screen at the bottom. (B) Manometer outlets for measuring loss of heads, (C) porous disc or suitable reinforced screen with spring attached to the top

A suitable water reservoir capable of supplying water to the permeameter under constant head

It is non corroding metal with special cylindrical spout of 25mm in dia, for 10 mm maximum size particles and 13 mm in dia. For 2 mm maximum size particles. The length of the spout should be greater than the full length of permeameter at least by 160mm

The equipment shall consist of vibrating tamper fitted with a tamping foot 50 mm in diameter or a sliding tamper with a tamping foot 50 mm in dia. And a rod for sliding weights 100 g to 1 kg having an adjustable height of drop 100 mm to 200 mm

References:- IS 2720 XVII- Permeability Mould.

(16) / Item No. 32 Relative Density Apparatus

Purpose :-The concept of relative density gives a practically useful measure of compactness of soils

Description:-

Vibrating Table (75x75xcm)- A steel table with cushioned steel vibrating deck about 75cm x 75cm size. The vibrator should have a net weight of over 45 kg with a frequency of 3600 vibrations per minute. A vibrator amplitude shall range between 0.05 to 0.65 mm under 115 kg load and shall be suitable for use with a 220 Volt, 50 cycles/sec A.C. power supply.

Mould (3000 cc. 15000 cc) :- There shall be cylindrical metallic moulds of 3000cm³ and 1500cm³ capacity conforming to the dimensional requirements

Guide Sleeves:- For (a) 3000cm³ mould size (b) 1500cm³ mould size two or three sets of screws on the clamp assembly shall be provided with lock nuts.

Surcharge Base Plate With handle :- One surcharge base plate 10mm thick for 3000 cm³ and 15000 cm³ size of moulds.

Dial Gauge Holder:- It is of 50 to 60 mm dia. With 50 mm travel and 0.025mm least count.

Pouring Devices :-

Surcharge Weights :- One surcharge weight for each 3000 cm³ and 15000 cm³ size of moulds .the total weight of surcharge base plate and surcharge weight should be equivalent to pressure intensity of 140 gm/cm² for the respective cross sectional area of mould.

Pouring Devices :-Consisting of metal funnels 12 mm and 25 mm stem dia. And 15 cm long with cylindrical spouts and lipped brims for attaching to 15 cm diameter and 30 cm high metal can.

It shall steel table with cushioned steel vibrating deck about 75cm*75cm size. The vibrator should have a net weight of over 45 Kg. with frequency of 3600 vibration per minute. A vibrator amplitude shall range between 0.05 to 0.65 mm under 115 Kg. load and shall be suitable for use with to 220 volts, 50 cycles per sec, AC power supply with all necessary accessories

References:- As per P.W.Chapter-33 Part-II & IS 2720 Part-XIV -1975

(17) / Item No. 34 Automatic compactor

Purpose :- Compaction test helps to determine the relation between moisture content during compaction of soil & density of the compacted soil under a given effort compaction

Description:-

The Automatic Soil compactor replaces the hand compaction procedure as specified for dry density/moisture content relationship of soil. Both light and heavy compaction test can be performed by this machine using either 100 mm diameter or 150 mm diameter compaction. Specifications:

1. Diameter of rammer-50mm
2. Weight of rammer-2.60 Kg for light compaction and 4.89 kg for Heavy compaction
3. Height of fall: 310 mm and 450 mm
4. Wired for 200 V, single phase , 50Hz supply

1) The mould shall be of non corrodible material 1000 ml capacity with 100 mm internal diameter and 127.3 mm internal effective height. It shall be fitted with detachable base plate and removable extension collar, 60mm high. The assembly shall consist of

A) DRAINAGE BASE - A base with a porous disc, 12 mm thick having a fitting for connection to water inlet or outlet.it shall be provided with a 12 mm thick and 108 mm dia. dummy plate of non corroding metal.

B) DRAINAGE CAP - This shall be of non corroding metal having connection for water inlet or outlet. it shall be provided with 12 mm thick porous disc inserted.the fitting shall be provided for drainage base and cap for accomodating permeameter mould.rubber gaskets or 'O' rings shall be provided for achieving leak proofners.

2) ii) Static Compaction Equipment- The specifications of jack, extruder frame, moulds etc. are described under respective items else where.

lii) Permeameter mould - The mould shall be of non-corrodible material, 1000 ml capacity with 100 mm internal diameter & 127.3 mm internal effective height. It shall be fitted with a detachable base plate & removable extension collar, 60 mm high. The assembly shall consist of-

a) Drainage base- A base with a porous disc, 12 mm thick having a fitting for connection to water inlet or outlet. It shall be provided with a 12 mm thick & 108 mm diameter Dumpy plate of non-corroding metal.

b) Drainage cap- This shall be of non-corroding metal having connection for water inlet or outlet. It shall be provided with 12 mm thick porous disc inserted. The fitting shall be provided for drainage base and cap for accomodating permeameter mould. Rubber Gaskets or 'O' rings shall be provided for achieving leakproofness.

Casing mould (2250 cc) Apparatus

A) Permeameter - It shall be of 80 mm, 120 mm, 160 mm, 230 mm internal diameter & 160 mm, 240 mm, 320 mm &

400 mm height respectively. It shall be fitted with-

a) porous discs or suitable reinforced screen at the bottom

b) Manometer outlets for measuring loss of head.

c) porous discs or suitable reinforced screen with spring attached to the top.

B) Large Funnels - It shall be of non-corroding metal with special cylindrical spout of 25 mm in diameter for 10 mm maximum size particles & 13 mm in diameter for 2 mm maximum size particles. The length of the spout should be greater than the full length of permeameter atleast by 160 mm.

C) scoop- It shall be of non-corroding metal & of 100 mm capacity.

D) Compaction Equipments (Vibrating)- The equipment shall consist of vibrating tamper fitted with the tamping foot 50 mm in diameter or sliding tamper with a tamping foot 50 mm in diameter & a rod for sliding weights 100 gm to 1 kg having an adjustable height of drop 100 mm to 200 mm.

E) 75 micron screen of brass to suit the diameter of permeameter.

Control system features:

HYDRAULIC GROUP

- Dual stage pump: centrifugal low pressure high delivery for fast approach and automatic switch to radial multi-piston high pressure for loading
- DC motor, 720 W, 50-60 Hz
- Max working pressure 650 bar
- Third frame connection option (non contemporaneous use only), Active frame selection by software.
- Energy Saving technology to reduce the power consumption and silent operation

HARDWARE

- 132000 points high resolution/stability analogical channels
- Touch screen graphic display 240x128 pixel, icons driven showing figures and diagrams
- Large storing capacity on USB pen drive of test data downloadable to PC
- Ethernet port for communication with PC
- Integrated graphic printer as optional

FIRMWARE

- Simultaneous display of load, specific load, actual load rate and load/time graph
- LAN connection to PC for transmission, in real time, during loading, of load and time values
- Easy firmware update through Ethernet port
- Memory management with display of stored tests, download of data to internal printer or PC, delete single test or reset entire memory
- Automatic multi-coefficient calibration procedure with automatic storage of data without manual editing (using a suitable load cell and readout unit)

- Multi-coefficient calibration procedure with automatic storage of data (requires external reference load cell and readout unit)
- Recording facility of up to 10 test procedures for each channel including: type of test (e.g. compression, flexural, indirect tensile), specimen size and shape, load rate, standard in use, and other general information. Each one of the recorded test procedures can be activated by default to save time.
- Compatible with the Data Manager software 82-SW/DM, new release tailored on the requirements of laboratories for construction materials, for real time data acquisition, display and management
- 12 languages, Unit selection, etc.
- Screen saver

PHISICAL SPECIFICATIONS

- Overall dimensions: (hxlxd) 1292x350x450 mm

Weight approx.: 80 kg

- References:-**
- 1) I.S. 2720 –(Part VII)-1980, “Determination Water content-Dry density relation using Light Compaction
 - 2) I .S. 2720 –(Part VIII)-1983, “Determination Water content-Dry density relation using Light Compaction & Havey Compactio

(18) / 36 .Swelling pressure machine:-

Purpose :- To determination of Swelling Pressure of expansive soils

Description:-

- 1) The unit should have 3 (three) loading machines. The unit should comprise of loading unit up to 20 kg/cm² capacity. The unit should consist of aluminum cast body and a lever with the loading ratio from 1:7 to 1:10. Loading yoke should have self aligned bearing for proper transfer of load on the specimen. Beam should be fitted with counter balance weight while the body has a screw jack, for jerk less loading on the specimen through the beam. Horizontal clearance is so maintained that the unit accommodates cells with specimen up to 100mm diameter.
- 2) Consolidometer A device should hold the sample in a either fixed or floating with porous stones on each face of the sample.A consolidometer should also provide means for submerging the sample, for applying a vertical load and for measuring the change in the thickness of the specimen.
- 3) Th provision for fixing of the dial gauge should be rigid, in no case should the dial gauge be fixed to a cantilevered arm. Suitable provision should be made to enable the dial gauge to be fixed in such a way that the dial gauge records accurately the vertical expansion of the specimen . Specimen diameter The specimen shall be 60mm in diameter
- 4) Specimen Thickness The specimen shall be at least 20mm thick in all cases.
- 5) Ring The ring should be made of a material which is noncorrosive in relation to the soil tested. The inner surface shall be highly polished or coated with a thin coating of silicon grease. The thickness of of the ring shall be such that under assumed hydrostatic

stress conditions in the sample the change in diameter of the ring will not exceed 0.03 percent under the maximum load applied during the test. The ring should have one edge beveled suitably so that the sample is pressed into the ring with least disturbance. The ring should be placed with its cutting edge upwards in the consolometer and clamped with a special clamp which should in no way damage the sharp edge. The clamp should be made circular with central hole equal in diameter of the porous stone and should be perfectly concentric with the sample. The ring should be provided with a collar of internal diameter same as that of the ring and of effective height 20mm. The collar should rest securely on the specimen ring.

- 6) Porous Stone The stone should be of silicon carbide or aluminum oxide and of medium grade. It should have a high permeability. The diameter of the top stone should be 0.2 to 0.5 mm less than the internal diameter of the ring. The thickness of the stone should be minimum 15 mm. The top stone should be loaded through corrosion –resistance plate of sufficient rigidity and of minimum thickness 10mm to prevent breakage of the stone. The loading plate should have suitable holes for free drainage of water.
- 7) Dial gauge Accurate to 0.01 mm with a traverse of at least 20mm.
- 8) Water Reservoir For keep the soil samples submerged. It should be made of a material which is noncorrosive with 500 ml capacity.
- 9) Set of Weights Set of Weights should be provided as –
 - i) 0.05 kg/cm²- 2 No.
 - ii) 0.1 kg/cm²- 3 No.
 - iii) 0.20 kg/cm²- 3 No.
 - iv) 0.5 kg/cm²- 3 No.
 - v) 1.00 kg/cm²- 2 No.
 - vi) 2.00 kg/cm²- 2 No.
 - vii) 4.00 kg/cm²- 1 No.
 - viii) 5.0 kg/cm²- 1 No.

References:- The Swelling Pressure apparatus should be as per IS: 2720 (Part-XLI-1977) with all accessories. And it is suitable for Non Gravel soil particles.

**Item No 66 Providing, supplying, Testing & commissioning of Geophone
(Soil foundation depth)**

The apparatus shall conform

Frequency	Value
Natural frequency	10 Hz.
Tolerance	±3.5%.
Maximum tilt angle for specified Fn	10°
Typical spurious frequency	>240 Hz
Distortion	Value.
Distortion with 0.7 in/s p.p. coil-to case velocity	<0.1%
Distortion measurement frequency	12 Hz
Maximum tilt angle for distortion specification	10°
Typical distortion	<0.1%
Damping	Value.
Open circuit (Typical)	0.475
Damping with 20KΩ system input impedance	0.7
Tolerance	±3.5%
Resistance	Value..
Standard coil resistance	1800 Ω
Tolerance	±3.5%
Sensitivity	Value.
Sensitivity	85.8 V/m/s
Tolerance	±3.5%
Moving mass	11.8 g
Max coil excursion p.p .	2 mm
Physical Characteristics	Value.
Diameter	26.7 mm
Height	32 mm
Weight	85.6 g
Operating temperature range	-40°C to 100°C
Warranty Period*	3 years

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(19) /1: Compression Testing Machine 250 KN, 1000 KN, 2000 KN & 3000 KN

Purpose :

Machine used for testing compressive strength of concrete cubes.

Description :

This machine consist loading unit and pumping unit.

Loading Unit : Loading unit have Four column high stiffness welded frame tested for stability. Heavy duty spherical seat in lubricating oil bath, allowing initial free alignment at the initial contact with the specimen and automatic jamming up to the end of test. The hydraulic jack shall be fixed to the base , the upper plate must have aligning action & shaft attached which passes to the cross head and can be raised and lowered for initial clearance for adjustment the lower plate rests on the jack ram and shall be positioned with the help of centering pin. The lower and upper plates of the machine shall be hardened, ground and polished.

Pumping Unit : The dabble stage hydraulic pump shall be a motorized unit connected to a jack by means of a steel connecting tube. This consists Dual stage pump, centrifugal for fast approach and multi-piston for loading, DC motor, Energy Saving technology electronic valves for automatic loading / unloading and frame selection via display / software.

Automation and Computerisation: This whole system must fulfilled following features.

- I)** Automatic performance of the complete test cycle with closed lube digital feedback.
- II)** Full computerised system with dual user interface display and PC.
- III)** Compatible with new intuitive easy to use data manager software.
- IV)** Computable with new intuitive easy to use data manager software.
- V)** Reduced power consumption and silent operation by Energy Saving Technologies.
- VI)** Triple frame control through active frame selection via consoled display or Software.
- VII)** Internal graphic printer including load time plot.
- VIII)** Remote verification of setting and performances for malfunction debugging.
- IX)** Simultaneous display of load-specific load, actual load rate and load / time graph; LAN connection to PC; advanced memory management; multi coefficient calibration. Recording facility of up to 10 test profiles for each channel including type of test (e.g. compression, flexural, indirect tensile), specimen size and shape, load rate, standard in use and other general information. Each one of the recorded test profile should be recalled automatically to save time.
- X) Hardware :** 132,000 points effective resolution, three channels, touch screen graphic display 240x128 pixel, sampling rate 50/sec, large storing capacity on

USB pen drive, test data downloadable to PC, internet port, real time management software.

XI) Safety features: Includes Max. pressure valve to avoid machine overloading; piston travel limit switch; emergency stop button; front door and rear transparent fragment guard.

XII) Automation system must be attached with suitable SCADA system and regulatory work as instructed by Engineer Incharge.

Technical Specifications :

Specification	250 KN	1000 KN	2000 KN	3000 KN
Max vertical daylight, mm	200	350	350	350
Horizontal daylight, mm	220	350	350	370
Max piston travel, mm	50	50	50	50
Platen dimensions	200 mm dia.	300 mm dia.	300 mm dia.	300 mm dia.
Platen surface hardness	55.5 HRC (600 HV)	55.5 HRC (600 HV)	55.5 HRC (600 HV)	55.5 HRC (600 HV)
Platen flatness tolerance	0.03 mm	0.03 mm	0.03 mm	0.03 mm
Overall Dimensions mm	800x350 x950	850 x 400 x 1100	930 x 450 x 1530	1020 x 475 x 1550
Weight Approx. (Kg)	200 to 300	700 to 800	750 to 850	1100 to 1200
Pace Rate Control	Automatic throw control consol	Automatic throw control consol	Automatic throw control consol	Automatic throw control consol
LCD Display	4 line display	4 line display	4 line display	4 line display
Pump	Dual Stage Hydraulic	Dual Stage Hydraulic	Dual Stage Hydraulic	Dual Stage Hydraulic

References –

1. [G:\Specification\1\Automatic computerized 1000_2000kN testing machines for steel and concrete, Universal testers - Steel \(re-bars\) testing equipment, Controls.html](G:\Specification\1\Automatic computerized 1000_2000kN testing machines for steel and concrete, Universal testers - Steel (re-bars) testing equipment, Controls.html)
2. <G:\Specification\1\Automax SMART line, fully automatic tester, Concrete testing equipment, Controls.html>
3. <G:\Specification\1\Testing equipment for the construction industry - CONTROLS.html>
4. <Specification\1\Buy ST 9000 DPRC Digital Compression Testing Machine in India.html>
5. <CHAPTER 33\CTM.docx>

(20) / 37. Concrete Mixer 40 Ltrs capacity (Digital)

Purpose :

Pan type models have been selected for laboratory use, to prepare concrete specimens and samples.

Description:

Pan type models is selected for laboratory use, to prepare concrete specimens and samples, as they assure the best uniformity and efficient mixing. Model should be supplied with additional inter changeable mixing paddles.

This is vertical axle forced mixer with gear box in oil bath. It should be easy in discharge operation with adjustable in height.

Technical Specification :-

Mixer must be supplied with digital weighing system.

Overall Dimensions : mm : 850 x 800 x 1250

Weight Approx. (Kg) : 100

Pan Capacity (Ltr.) : 130

Mixing Capacity (Ltr.) : 90

Power (KW) : 2

References :-

1. [IS CODES\is.12119.1987_Concret Mixer Pan Type.pdf](#)
2. [CHAPTER 33\Concrete Mixer.docx](#)
3. [Specification\37\Concrete mixers new, Concrete testing equipment, Controls.html](#)
4. [Specification\37\Lab Concrete Mixer Motorized, Lab Concrete Mixer.html](#)
5. [Specification\37\MINI PORTABLE CONCRETE MIXER MACHINE - FOR SMALL CONSTRUCTION SITES & LABORATORY TESTING OF CONCRETE.html](#)

(21) / 42: Cube Vibrating Table (Digital) for Concrete Cubes

Purpose:

Cube Vibrating Table is used for giving vibration to concrete moulds to remove entrapped air from mixture.

Description:

Vibrating tables must be Robustly manufactured to operate with minimum noise level with Retaining edges to avoid the casuals falls of the mould from the table. Table must be with clamping device and peddles switches and must be fitted with two vibrates for a better and uniform vibration on all the table surface. Table tops must be heavy duty welded assembly and made from steel plates, I-Beams and tools the top assembly must be powered by to counter rotating vibrations to linear motion. The rugged base assembly supports and isolates the top assembly with springs. Table should allow to dial into the best operating frequency with digital accuracy digital sequence timer allow operation at multiple frequencies and durations.

Technical Specification :

Dimensions in mm	: 1250 x 650
Vibration per minutes	: 3000 to 3600
Power W	: 2 X 180
Supply	: 230 V, 50Hz, 1HP

References :

1. [IS CODES\is.2514.1963_Vibrating Table.pdf](#)
2. [CHAPTER 33\cube vibrating table.docx](#)
3. [Specification\42](#)

(22) / 6. DIGITAL ELECTRIC OVEN

Purpose:

Laboratory ovens are ovens for high-forced volume thermal convection applications. These ovens generally provide uniform temperatures throughout. Process applications for laboratory ovens can be for annealing, die-bond curing, drying, Polyimide baking, sterilizing, and other industrial laboratory functions

Description:

Digital Electric Oven Should be available in triple walled finish with inner chamber made in M.S. or S.S.304 grade metal option, which providing optimum function support as well as long lasting services life. The oven shall be 3" thick Glass wool Insulated with 3" thick Glass wool which ensures stable temperature with reduced energy. Electric oven having temperature range between 0°-250° C with accuracy $\pm 2^{\circ}\text{C}$. Single Door fitted on Heavy Hinges. Inner chamber made of S.S. and outer made of Mild steel with Powder coating. Specially designed stainless steel rod trays ensure uniform temperature distribution. Heating elements are made of high grade chrome plated micron wire. Temp is controlled by thermostat. Motorized Blower on top side of the chamber develops unique air flow system .Which ensures maximum uniform temperature inside the chamber? Unique air Flow assures quick recovery after door openings. It should be suitable for 230 Volts, A.C. single phase, above 50 RPM. All the control switches & pilot lamps are fitted on the front of panel having PC& Printer interfacing facility with RS 485 Port interfaced it should have air circulation fan for uniform temperature and also having Digital Temperature Controller cum indicator and Audio visual alarm warning also. It should have provided in the view of safety the limit switch for interlocking connection between motor & heater.

By means of Imported Microprocessor based auto tuned PID controller with CE mark & dual display of set value & process value.

Models (S) or (G)	Capacity Liters	Internal size H x W x D cm	External Size H x W x D cm	Trays
TI-128 E S / G	324	90 x 60 x 60	142 x 88 x 88	4

Desiccators:

Desiccators having size 200 mm diameters. Depth of plate support 140 mm complete with asbestos supporting plates 175 mm Diameter with Approximate 7 Nos. of holes of 2 cm dia Each. Desiccators shall be made of transparent glass not having any pronounced tint and shall be as far as possible free from stones, bubbles, cords and other visible defects. They shall be reasonably free from strain. When graded according to the method prescribed in IS : 2303-1963t desiccators shall conform to Type 3 of glass. Desiccators shall be regular in shape and smoothly finished. They shall be symmetrical about the axis which shall be perpendicular to the plane of the base. The base shall enable the desiccators to stand vertically.

Without rocking or spinning on a plane horizontal surface. For increasing the stability' and as protection against cracking, extra glass may be provided externally to form a protective rim at the base.

The side of the desiccators shall be stepped to accommodate perforated desiccators plates without rocking, in a plane parallel to the base. The lower part of the side, when making an acute angle with the base, shall be inclined at an angle not less than 75°. The upper part of the side above the step shall rise in the form of a vertical cylinder and end in a flange. The lid of desiccators shall be part-spherical in shape. Its rim shall form a flange the surface of contact of which shall match that of the flange of the body of the desiccators evenly. The lid desiccators shall be provided with a knob at the top for ease of handling.

References :-

10. <G:\Specification\6\Air circulated Oven.html>
11. <G:\Specification\6\Digital Hot Air Oven, Hot Air Oven, Digital Hot Air Ovens, Gujarat, India..html>
12. <G:\Specification\6\Drying Oven, Laboratory Electric Oven, Thermostatically Controlled with Digital Indicator Safety Alarm - Aimil.com.html>
13. <G:\Specification\6\Hot Air Oven, Hot Air Ovens, Bottom Heater Hot Air Oven, GMP Model Hot Air Oven, Heating Mantles, Mumbai, India.html>
14. <G:\Specification\6\Laboratory Oven - General Purpose Oven Manufacturer from Mumbai..html>
15. <G:\Specification\6\Laboratory Ovens - Laboratory Ovens Exporter, Manufacturer, Service Provider & Supplier, Mira Bhayandar, India.html>
16. <G:\Specification\6\Memmert Type Hot Air Oven, Memmert Hot Air Ovens, Lab BOD Incubator, Mumbai, India.html>
17. <IS CODES\is.6365.1971 ELECTRIC OVEN.pdf>
18. <CHAPTER 33\Oven.docx>

(23) / Item No.15 Field Density Test- (Sand Replacement Method)

Purpose :- The field density of a soil is its ,in-situ, dry unit weight under natural (e.g. in foundation) or artificial compacted (e.g. embacment) Condiion

Description:-

- (c) The field density kit for fine and medium grained soils up to 150mm depth shall consist of-
- (viii) Small Sand pouring cylinder- The equipment shall be of galvanized iron and as per dimensions
- (ix) Tools For Excavating holes- Suitable tools such as scraper tool to make a level surface, bent spoon, and dibber
- (x) Cylindrical Calibrating container (Internal dia 100mm, depth 150 mm)- It shall have internal dia. 100mm and internal depth 150 mm. it shall be fitted with a flange approximately 50 mm wide and about 5 mm thick surrounding in open end.
- (xi) Plane Plate (60x60cm)- It shall be of a good quality glass or of per spex of 60cm x 60 cm and 9 to 10 mm thick or larger.
- (xii) Metal Container (150mm Dia, 200mm Deep)- It shall be convenient size about 150 mm dia. And 200 mm deep with a removable cover.
- (xiii) Cylindrical Core cutter (127.4mm long , 100mm dia)-It shall be of steel , 127.4mm + 0.1 mm long and 100mm + 0.1 mm internal diameter with a wall thickness of 3 mm beveled at one end
- (xiv) Metal tray with hole 930x30cm, 4cm depth, 10 Cm Dia. of hole- It shall be of non corroding metal and of 30 cm x 30cm and 4 cm deep with 10 cm diameter hole in the centre.
- (d) The field density kit for fine, medium and coarse grained soils beyond 150mm and up to 250mm depth shall consist of-
- (v) Large sand Pouring Cylinder- The equipment shall be of galvanized iron and as per dimensions.
- (vi) Tools for Excavating holes- Suitable tools such as bent spoon, dibber.
- (vii) Screw Driver (30cm Long, 5-10 mm Dia) - 30 cm long and having 5 to 10 mm diameter with a wooden handle.
- (viii) Cylindrical Calibrating Container (Internal Dia 200 mm, depth250mm)- It shall be with an internal diameter of 200 mm and internal depth of 250 mm. it shall be fitted with a flange 75 mm wide and about 5 mm thick surrounding the open end

Metal Tray with hole(45x45 cm, 5cm deep, 20cm Dia. Of hole- It shall be of non-corrodible metal 45cm x 45 cm and 5 cm deep with 20 cm diameter hole in the centre.

References:- I.S. 2720-(Part-XXVIII)-1974 "Determination of Dry Density of

(24) / Item No.15 Field Density Test- (Sand Replacement Method)

Purpose :- The field density of a soil is its ,in-situ, dry unit weight under natural (e.g. in foundation) or artificial compacted (e.g. embacment) Condiion

Description:-

- (e) The field density kit for fine and medium grained soils up to 150mm depth shall consist of-
- (xv) Small Sand pouring cylinder- The equipment shall be of galvanized iron and as per dimensions
- (xvi) Tools For Excavating holes- Suitable tools such as scraper tool to make a level surface, bent spoon, and dibber
- (xvii) Cylindrical Calibrating container (Internal dia 100mm, depth 150 mm)- It shall have internal dia. 100mm and internal depth 150 mm. it shall be fitted with a flange approximately 50 mm wide and about 5 mm thick surrounding in open end.
- (xviii) Plane Plate (60x60cm)- It shall be of a good quality glass or of per spex of 60cm x 60 cm and 9 to 10 mm thick or larger.
- (xix) Metal Container (150mm Dia, 200mm Deep)- It shall be convenient size about 150 mm dia. And 200 mm deep with a removable cover.
- (xx) Cylindrical Core cutter (127.4mm long , 100mm dia)-It shall be of steel , 127.4mm + 0.1 mm long and 100mm + 0.1 mm internal diameter with a wall thickness of 3 mm beveled at one end
- (xxi) Metal tray with hole 930x30cm, 4cm depth, 10 Cm Dia. of hole- It shall be of non corroding metal and of 30 cm x 30cm and 4 cm deep with 10 cm diameter hole in the centre.
- (f) The field density kit for fine, medium and coarse grained soils beyond 150mm and up to 250mm depth shall consist of-
- (ix) Large sand Pouring Cylinder- The equipment shall be of galvanized iron and as per dimensions.
- (x) Tools for Excavating holes- Suitable tools such as bent spoon, dibber.
- (xi) Screw Driver (30cm Long, 5-10 mm Dia) - 30 cm long and having 5 to 10 mm diameter with a wooden handle.
- (xii) Cylindrical Calibrating Container (Internal Dia 200 mm, depth250mm)- It shall be with an internal diameter of 200 mm and internal depth of 250 mm. it shall be fitted with a flange 75 mm wide and about 5 mm thick surrounding the open end

Metal Tray with hole(45x45 cm, 5cm deep, 20cm Dia. Of hole- It shall be of non-corrodible metal 45cm x 45 cm and 5 cm deep with 20 cm diameter hole in the centre.

References:- I.S. 2720-(Part-XXVIII)-1974 “Determination of Dry Density of Soils, in place by the sand Replacement Method”