

Setting Up Small Testing Laboratory at Field

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Designers and builders of construction projects no longer can consider quality control testing an option or convenience. In the past decade, testing for the quality of materials and finished construction has become a necessity that no responsible builder can neglect.

The truth of this statement is proved not only by construction delays and cost overruns but also by catastrophic failures of major structures. Such catastrophies include dam failures, collapses and foundation breakdowns in multi-storeyed office and apartment structures; and other failures in stadia, factories, schools, auditoria, public buildings and bridges.

Each construction project determines its own individualized testing needs. A variety of factors influence the type of testing required. Among these factors are size of the structures, terrain, type of soil and subsurface conditions at the construction site and other conditions peculiar to the specific location. The expertise of the construction engineers and technical personnel working on the project will also have an influence on the testing and inspection need.

Testing facilities may range from a simple, inexpensive test kit carried in a portable chest to a fully equipped Central Testing Laboratory.

A small Field Testing Laboratory, which can perform all the required tests can be set up at any construction site with a small investment of about Rs. 71,300/-. The equipments of the Laboratory shall be as given below:

S. No.	Items	Qty	Approx. Cost (in Rs.)
1	Hydraulic Compression Testing Mechine, hand operated 100 tonnes capacity. Conform to the requirements of IS: 516-1959, IS :14858-2000 caliberated to an accuracy of $\pm 1\%$ indicated load within range.	1 No.	20,000

2	Cube moulds 150x150x150 mm size conforming to IS : 516-1959, IS : 10086-1982.	12 Nos.	5,000
3	Slump apparatus conforming to IS: 7320.	1 No.	1,000
4	Test sieve set IS : 460-1972, 30 cm dia frame of size 40mm, 20mm, 12.5mm and 10 mm and 20 cm dia frame of size 4.75mm, 3.35 mm, 2.36mm, 1.18mm, 600 micron, 300 micron, 150 micron, 90 micron and 75 micron.	One Set	5,000
5	Bulk density measure 3 and 15 litres capacity as per IS : 2386 (Part-III)- 1963.	One Each	2,000
6	Thickness and length gauge as per IS : 2386 (Part-I)- 1963.	One Each	800
7	15 cm dia aggregate crushing value apparatus as per IS : 2386 (Part-IV)- 1963.	1 No.	1,000
8	Graduated cylinder of glass 100, 250 and 1000 ml capacity.	3 Nos. each	300
9	Balances 1 kg, 5kg and 15 kg capacity.	One each	6,000
10	Electric oven, thermostatically controlled upto 200 ⁰ C, chamber space about 40x40x40 cm.	1 No.	4,000
11	Concrete Test Hammer (rebound hammer) of impact energy 2.207 N.m (0.225 Kgm) as per IS : 1331 (Part-2)- 1992.	1 No.	5,000
12	Flat edge 10 cm dia glass cylinder with glass plate 2000 ml capacity.	1 No.	200
13	Miscellaneous items such as mixing trays, rice trays, karni etc.	One Set	2,000
14	Le-chatelier apparatus as per IS : 4031.	2 Nos.	500
15	Vicat apparatus as per IS : 4031	1 No.	1,000
16	Vibration machine with 6 moulds as per IS : 4031.	1 No.	10,000

17	Hot Plate	1 No.	2,000
18	Apparatus (HCl heat of solution method) for estimation of cement content of fresh concrete.	1 No.	500
19	Chemicals for water content determination of fresh concrete sodium chloride, nitric acid, nitrobenzene, ferric alum, silver nitrate, potassium thiocyanate, sodium hydroxide and HCl.	For 50 tests	3,000
20	Glass ware for testing of S.No. 19	One Set	2,000
		Total	Rs. 71,300

With the above equipments, the following testing of construction materials can be conducted:-

1. TESTING OF COARSE AND FINE AGGREGATE:

- a) Sieve analysis as per IS : 2386 (Part-I)- 1963.
- b) Deleterious materials as per IS: 2386 (Part-II) – 1963.
- c) Specific gravity, density, voids and absorption as per IS: 2386 (Part-III) – 1963.
- d) Soundness as per IS: 2386 (Part-V) – 1963.

2. TESTING OF COARSE AGGREGATE:

- a) Aggregate crushing value as per IS: 2386 (Part-IV) – 1963.
- b) Elongation and flakiness index as per IS: 2386 (Part-I) – 1963.

3. TESTING OF FINE AGGREGATE:

- a) Silt content as per IS: 2386 (Part-I) – 1963.
- b) Material finer than 75 micron as per IS: 2386 (Part-I) – 1963.
- c) Organic impurities as per IS: 2386 (Part-II) – 1963.
- d) Bulking as per IS: 2386 (Part-III) – 1963.

4. TESTING OF CEMENT AS PER IS: 4031:

- a) Fineness of cement by dry sieving.
- b) Determination of soundness by le-chatelier method.
- c) Determination of consistency and setting time.
- d) Determination of compressive strength.

5. CONCRETE MIX DESIGN

6. TESTING OF FRESH CONCRETE:

- a) Test for workability as per IS : 1199-1959.
- b) Determination of density, yield, cement factor and air content as per IS : 1199-1959.
- c) Casting of cubes as per IS : 516-1959.
- d) Test for cement content of fresh concrete.
- e) Test for water/cement ratio and concrete 28 days compressive strength in 15 minutes of any grade of cement, so that any concrete batch discharged from the mixer found sub-standard should not be allowed for placing.

7. TESTING OF HARDENED CONCRETE:

- a) Compressive strength as per IS : 516-1959.
- b) Density.
- c) Non-destructive testing of concrete structures as per IS: 13311 (Part-II)- 1992.

8. TESTING OF CONCRETE ADMIXTURES AS PER IS: 2645 AND IS: 9103.

- a) Workability test.
- b) Permeability test by capillary absorption method
- c) Setting time
- d) Compressive strength
- e) Bleeding.

9. TESTING OF BRICKS:

- a) Compressive strength as per IS: 3495 (Part-I) – 1976.
- b) Water absorption as per IS: 3495 (Part-II) – 1976.
- c) Efflorescence as per IS: 3495 (Part-III) – 1976.

10. TESTING OF TARFELT AS PER IS: 1322 – 1982.

- a) Pliability test
- b) Storage sticking test
- c) Heat resistance test
- d) Water absorption test.

11. TESTING OF GLAZED TILES AS PER IS: 777- 1970.

- a) Impact strength test
- b) Water absorption test

12. TESTING OF MARBLE AS PER IS: 1124-1974

- a) Water absorption test
- b) Specific gravity test

13. TESTING OF WOOD AS PER IS: 287-1973

- a) Compressive strength

- b) Moisture content
- c) Density

14. TESTING OF FLUSH DOOR SHUTTER

- a) Knife test as per IS: 1659-1969.
- b) Glue adhesion test as per IS: 2202 (Part-I) – 1973
- c) End Immersion Test.

The above laboratory can be set up at any construction site in a small covered area of about 16 sq. meter with small investment of only Rs. 71,300/- which can perform tests on almost all construction materials including quality control of fresh concrete, testing of hardened and non-destructive testing of concrete structures. However, such laboratory must have well experienced persons to run it properly. A person may be trained in 15 days time for conducting all the above mentioned tests.

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We at engineeringcivil.com are grateful to **Sir Kaushal Kishore** for submitting this very useful field test information to us.

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