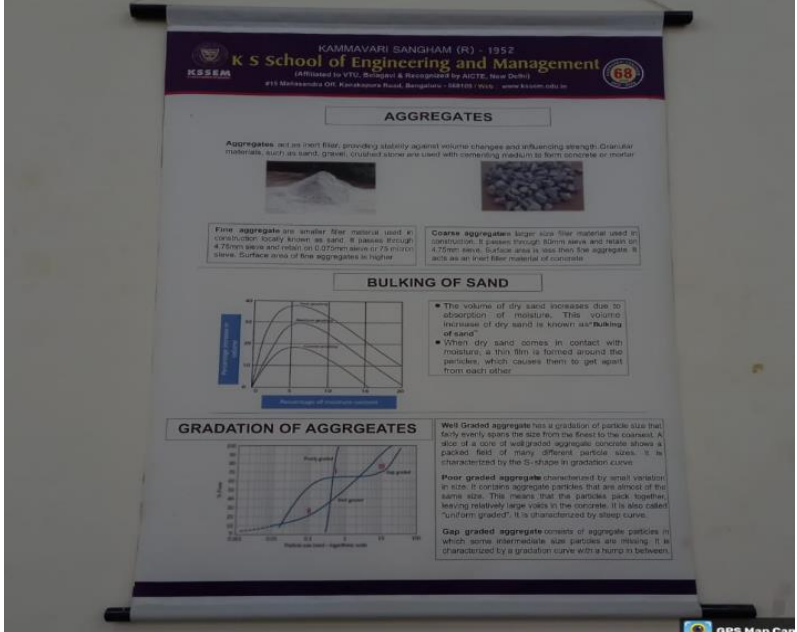
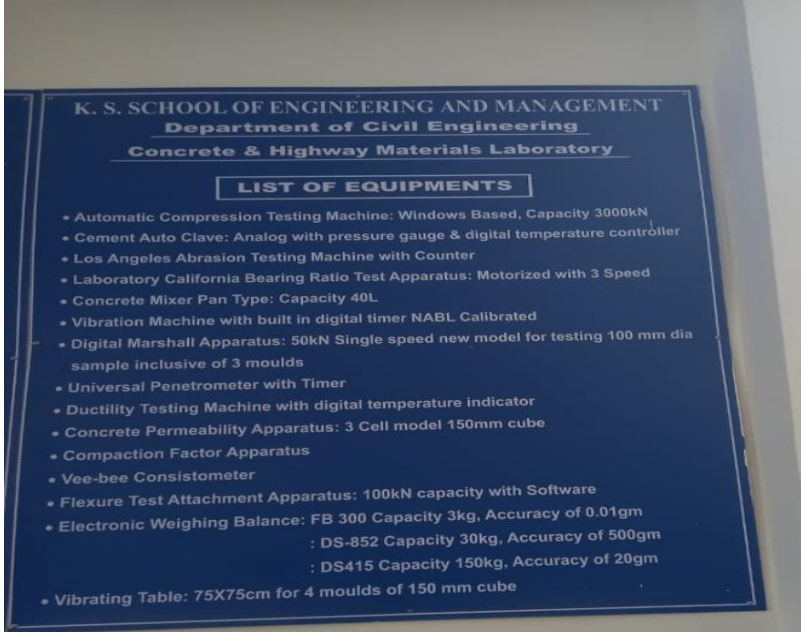


Working models /charts /monograms etc.

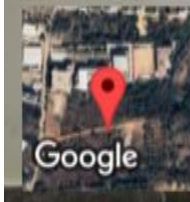
Name of the lab	Description
<b>CONCRETE &amp; HIGHWAY MATERIALS LAB</b>	
 <p><b>AGGREGATES</b></p> <p>Aggregates act as inert filler, providing stability against volume changes and enhancing strength. Granular materials, such as sand, gravel, crushed stone are used with cementing medium to form concrete or mortar.</p> <p><b>AGGREGATES</b></p> <p><b>Fine aggregate</b> are smaller size material used in concrete. Usually known as sand, it passes through 4.75mm sieve and retained on 0.075mm sieve or 75 micron sieve. Surface area of fine aggregate is higher.</p> <p><b>Coarse aggregate</b> larger size material used in construction. It passes through 4.75mm sieve and retained on 4.75mm sieve. Surface area is less than fine aggregate. It acts as an inert filler material of concrete.</p> <p><b>BULKING OF SAND</b></p> <p>• The volume of dry sand increases due to absorption of moisture. This volume increase of dry sand is known as "bulking of sand".</p> <p>• When dry sand comes in contact with moisture, a thin film is formed around the particles, which causes them to get apart from each other.</p> <p><b>GRADATION OF AGGREGATES</b></p> <p>Well Graded aggregate has a gradation of particle size that fairly evenly spans the size from the finest to the coarsest. A plot of a size of well graded aggregate concrete shows a packed field of many different particle sizes. It is characterized by the S-shape in gradation curve.</p> <p><b>Poor graded aggregate</b> characterized by small variation in size. It contains aggregate particles that are almost of the same size. This means that the particles pack together, leaving relatively large voids in the concrete. It is also called "uniform graded". It is characterized by steep curve.</p> <p><b>Gap graded aggregate</b> consists of aggregate particles in which some intermediate size particles are missing. It is characterized by a gradation curve with a hump in between.</p> <p>Mallasandra, Karnataka, India Bengaluru, Mallasandra, Karnataka 560062, India Lat 12.859246° Long 77.543344° 10/04/2025 12:43 PM GMT +05:30</p>	 <p><b>K. S. SCHOOL OF ENGINEERING AND MANAGEMENT</b> <b>Department of Civil Engineering</b> <b>Concrete &amp; Highway Materials Laboratory</b></p> <p><b>LIST OF EQUIPMENTS</b></p> <ul style="list-style-type: none"> <li>• Automatic Compression Testing Machine: Windows Based, Capacity 3000kN</li> <li>• Cement Auto Clave: Analog with pressure gauge &amp; digital temperature controller</li> <li>• Los Angeles Abrasion Testing Machine with Counter</li> <li>• Laboratory California Bearing Ratio Test Apparatus: Motorized with 3 Speed</li> <li>• Concrete Mixer Pan Type: Capacity 40L</li> <li>• Vibration Machine with built in digital timer NABL Calibrated</li> <li>• Digital Marshall Apparatus: 50kN Single speed new model for testing 100 mm dia sample inclusive of 3 moulds</li> <li>• Universal Penetrometer with Timer</li> <li>• Ductility Testing Machine with digital temperature indicator</li> <li>• Concrete Permeability Apparatus: 3 Cell model 150mm cube</li> <li>• Compaction Factor Apparatus</li> <li>• Vee-bee Consistometer</li> <li>• Flexure Test Attachment Apparatus: 100kN capacity with Software</li> <li>• Electronic Weighing Balance: FB 300 Capacity 3kg, Accuracy of 0.01gm : DS-852 Capacity 30kg, Accuracy of 500gm : DS415 Capacity 150kg, Accuracy of 20gm</li> <li>• Vibrating Table: 75X75cm for 4 moulds of 150 mm cube</li> </ul> <p>Mallasandra, Karnataka, India Ks Boys Hostel Rd, Bengaluru, Mallasandra, Ka India Lat 12.859484° Long 77.543836° 09/04/2025 12:14 PM GMT +05:30</p>

# SURVEYING PRACTICE LAB

**K. S. SCHOOL OF ENGINEERING AND MANAGEMENT**  
**Department of Civil Engineering**  
**Surveying Practice (18CVL57)**

**LIST OF EXPERIMENTS**

- a) Measurements of distances using tape along with horizontal planes and slopes, direct ranging. b) Setting out perpendiculars. Use of cross staff, optical square.
- Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass.
- Determination of distance between two inaccessible points using compass.
- Determination of reduced levels of points using dumpy level/auto level.
- Determination of reduced levels of points using dumpy level/auto level (differential levelling and inverted levelling).
- To determine the difference in elevation between two points using reciprocal levelling and to determine the collimation error.
- To conduct profile levelling, cross sectioning and block levelling. Plotting profile and cross sectioning in excel. Block contour on graph paper to scale.
- Measurement of horizontal angle by repetition and reiteration methods and Measurement of vertical angles using theodolite.
- Determination of horizontal distance and vertical height to a base in accessible object using theodolite by single plane and double plane method.
- To determine distance and elevation using tachometric surveying with horizontal and inclined line of sight.
- Closed traverse surveying using Theodolite and applying corrections for error of closure by transit rule and Bowditch rule.
- To locate the points using Radiation and Intersection method of Plane table surveying.
- To solve three-point problem in plane table using Bessel's graphical solution.
- Demonstration of Minor instruments like Clinometer, Ceylon Ghat tracer, Box sextant, Hand level, Planimeter, Nautical extant and Penta graph



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GPS Map Camera

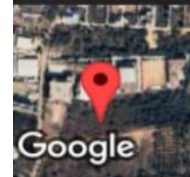
**K. S. SCHOOL OF ENGINEERING AND MANAGEMENT**  
**Department of Civil Engineering**  
**Surveying Practice**

**DO's**

- Students should wear proper attire while in the laboratory (college uniform and shoes).
- Carry scientific calculator, observation book and other accessories required to the lab.
- Count all accessories while receiving and returning equipments and sign the lab ledger.
- Handle the instruments carefully and place them in the case provided after use.
- Complete the calculations in the observation book pertaining to the experiment and get the signature of faculty in-charge in the same class.
- Submit the laboratory record for previous experiment before the start of new experiment.


**DON'Ts**

- Do not use mobile phones during lab hours.
- Do not try to repair any faulty instrument.
- Never sight sun with a theodolite.




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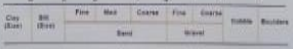
GPS Map Cam



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### Soil Classification (IS:1498-1970)



The Indian Standard system broadly classifies soils into three divisions:


- Coarse grained soils:** In this type of soils, more than 50% of the soil particles are larger than 75μ.
- Fine grained soils:** In this type of soils, more than 50% of the soil particles are smaller than 75μ.
- Highly Organic and other soils:** These soils contain larger percentage of fibrous organic matter such as peat, decomposed vegetation etc.
- The soils possessing the characteristics of more than one group are called "Boundary Soils" and are designated by

**Group Symbol**

GW: Well graded gravel  
 GP: Poorly graded gravel  
 GM: Silty gravel  
 GC: Clayey gravel

**Boundary Soils**  
 GW-GM  
 GW-GC  
 GP-GC  
 GP-GM  
 GM-GC

**Dual group symbols**



**Group Symbol**


SW: Well graded sand  
 SP: Poorly graded sand  
 SM: Silty sand  
 SC: Clayey sand

**Boundary Soils**  
 SW-SM  
 SW-SC  
 SP-SC  
 SP-SM  
 SM-SC

**Group Symbol**

ML: Inorganic silts of low plasticity  
 MI: Inorganic silts of medium plasticity  
 MH: Inorganic silts of high plasticity

OL: Organic silts of low plasticity  
 OI: Organic silts of medium plasticity  
 OH: Organic Clays of high plasticity



**Group Symbol**

CL: Inorganic clays of low plasticity  
 CI: Inorganic clays of medium plasticity  
 CH: Inorganic clays of high plasticity

**Grading Curve**  
 Coefficient of curvature (Cc)  
 The shape of the particle size curve is represented by coefficient of curvature.  


$$Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

For well graded soil, Cc is between 1-3.  
 Uniformity coefficient (Cu)  
 It is a measure of particle size range and is calculated as follows:  

$$Cu = \frac{D_{60}}{D_{10}}$$

For well graded soils,  
 Cu > 4 for Gravels,  
 Cu > 6 for Sands.

where,  
 D<sub>60</sub> = particle size at 60% finer  
 D<sub>30</sub> = particle size at 30% finer  
 D<sub>10</sub> = particle size at 10% finer.



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**K. S. SCHOOL OF ENGINEERING AND MANAGEMENT**  
**Department of Civil Engineering**  
**Geotechnical Engineering Laboratory**

### LIST OF EQUIPMENTS

- Unconfined Compression Testing Machine
- Tri-axial shear testing machine
- Direct Shear Testing Machine
- Vane shear testing apparatus
- Consolidation testing apparatus
- Permeability testing apparatus
- Swell pressure test apparatus
- Compaction testing apparatus
- Oven
- Weighing balance
- Sample extruder
- Sieve shaker




**Dr. AREKAL VIJAY**  
**Mallasandra, Karnataka, India**  
 , Bengaluru, Mallasandra, Karnataka 560062, India  
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 FACULTY INCHARGE

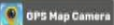
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**Department of Civil Engineering**  
**ENVIRONMENTAL ENGINEERING LABORATORY (18CVL67)**

**LIST OF EXPERIMENTS**

- Preparation chemical solutions required for analysis and sampling methodologies
- Determination of pH, Conductivity, TDS and Turbidity
- Determination of Acidity and Alkalinity
- Determination of Calcium, Magnesium and Total Hardness
- Determination of Dissolved Oxygen
- Determination of BOD
- Determination of Chlorides
- Determination of percentage of % of available chlorine in bleaching powder sample, Determination of Residual Chlorine and chlorine demand
- Determination of Solids in Sewage: i) Total Solids, ii) Suspended Solids, iii) Dissolved Solids, iv) Volatile Solids, Fixed Solids v) Settle able Solids
- Determination of optimum coagulant dosage using Jar test apparatus
- Determination Nitrates and Iron by spectrophotometer
- Determination of COD (Demonstration)
- Air Quality Monitoring (Demonstration)
- Determination of Sound by Sound level meter at different locations (Demonstration)



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**WATER HARDNESS TEST**


Water Hardness Scale		
Grains/Gallon	mg/L & ppm	Classification
Less than 1	Less than 17.1	Soft
1 to 3.5	17.1 to 60	Slightly hard
3.5 to 7.0	60 to 120	Moderately hard
7.0 to 10.5	120 to 180	Hard
10.5 and over	180 and over	Very hard

Note - one grain per gallon = 17.1 parts per million (ppm)


It is the property of water which prevents the lathering of soaps. It is due to presence of carbonates, bicarbonates, sulphates, chlorides and nitrates of calcium and magnesium. It leads to scale formation in the boilers and consumption of large amount of soap for domestic use, causing corrosion, incrustation of pipes and making food tasteless. The hardness is known as temporary hardness if it is due to the bicarbonates of calcium and magnesium as this can be easily removed by boiling of water or by adding the lime to it. If the sulphates chlorides and nitrates present that cannot be easily removed by boiling and so such water requires water softening methods and this type of hardness is known as permanent hardness.

**DISSOLVED OXYGEN TEST**

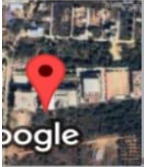
The Winkler Method is a technique used to measure dissolved oxygen in freshwater systems. Dissolved oxygen is used as an indicator of the health of a water body, where higher dissolved oxygen concentrations are correlated with high productivity and little pollution. This test is performed on-site, as delays between sample collection and testing may result in an alteration in oxygen content.




**CHLORIDE TEST FOR WATER**



Chlorides of Ca, Mg and Na are present commonly in natural waters as they are highly soluble. Excessive concentrations may be due to sea water intrusion or contamination from the domestic sewage or industrial wastes. If water containing chlorides is titrated with silver nitrate solution, chlorides are precipitated as white silver chloride. Potassium chromate is used as indicator, which supplies chromate ions. As the concentration of chloride ions approaches extinction, silver ion concentration increases to a level at which reddish brown precipitate of silver



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# ENGINEERING GEOLOGY LAB

**K. S. SCHOOL OF ENGINEERING AND MANAGEMENT**  
**Department of Civil Engineering**  
**Engineering Geology Laboratory (18CVL47)**

**LIST OF EXPERIMENTS**

- Physical properties of minerals
- Engineering Properties of Rocks
- Borehole problems
- Dip and Strike problems
- Calculation of Vertical, True thickness and width of the outcrops
- Study of Toposheets and Interpretation, Extraction of Drainage Basin and its Morphometric Analysis
- Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities
- Interpretation of Satellite Images
- Field work- To identify Minerals, Rocks, Geomorphology and Structural features with related to the Civil Engineering projects

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**Mapping the World**  
**संसार का मानचित्रण**

**Latitude**  
 अक्षांश रेखा

**Longitude**  
 देशांतर रेखा

**LATITUDES & LONGITUDES**  
 अक्षांश रेखाएँ व देशांतर रेखाएँ

**Map Projections**  
 मानचित्र-प्रक्षेप

**Cylindrical**  
 बेलनाकार

**Azimuthal**  
 दिग्गोचर

**Conic**  
 शंकु-प्रक्षेप

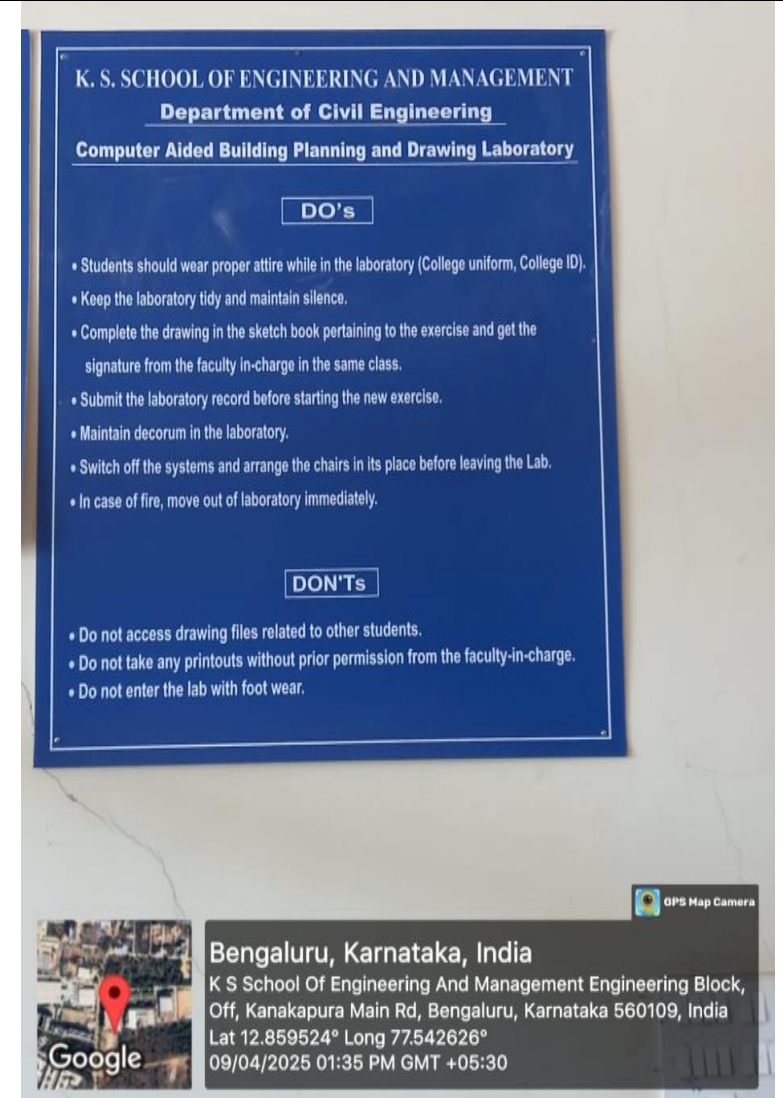
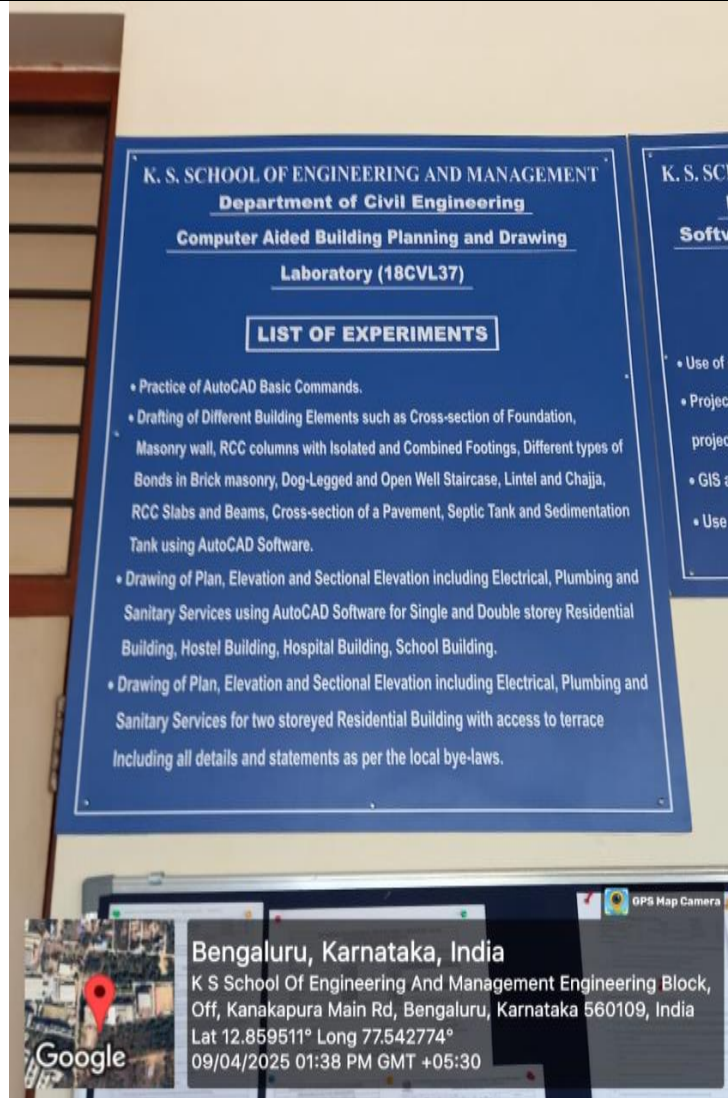
**Statement of scale**  
 पैमाने का विवरण  
 1 centimeter = 10 kilometers  
 1 सेंटीमीटर = 10 किलोमीटर

**Linear scale**  
 रेखीय पैमाना

**Representative Fraction**  
 प्रतिनिधिक भिन्नता  
 1:1,000,000

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## COMPUTER AIDED DESIGN LAB



# STRUCTURAL ENGINEERING LAB

**K. S. SCHOOL OF ENGINEERING AND MANAGEMENT**  
**Department of Civil Engineering**  
**Structural Engineering Laboratory**

**LIST OF EQUIPMENTS**

- **LOADING FRAME** With facility For x & y traverse of loading point of the following specifications, Size -Width 3.5mts, Depth 3mts Height 3mts. Range -50 Tons
- **SHAKE TABLE Type 1** for vertical seismic waves with signal conditioning amplifier and accessories. Maximum payload=30kg, Sliding table dimension= 400mm\*360mm, Circular mounting plate dimension = 390mm, Motor = 1H.P. Variable speed D.C Frequency control=3%
- **SHAKE TABLE Type 3** for vertical seismic waves with signal conditioning amplifier and accessories. Maximum payload = 30kg, Sliding table dimension = 400mm\*30mm, Circular mounting plate dimension = 390mm, Motor = 1H.P. Variable speed D.C Frequency control =3%, Amplitude = 0.8mm
- **FOUR SOREY BUILDING FRAME -WITH STIFFNERS** with 5 Aluminium Slabs-1 base slab and 4 floor slabs, 4 aluminium columns, 16 aluminium stiffeners - 4 each for each floor
- **SILVER SCHMIDT PCN (34131000) - REBOUND HAMMER**
  1. PC type N,
  2. Full Hammer link software functionality
- **PUNDIT LAB + (32620001)-ULTRASONIC PULSE VELOCITY TESTING INSTRUMNET**
  1. Line data acquisition, wave form analysis and remote control of all transmission parameters
  2. Range (0.1-7930µs)
  3. Resolution 0.1 µs (<793µs), 1µs(>793µs)
- **PROFOMETER PM 630 (39220001)**
  1. Locating rebar
  2. Measuring concrete cover (upto 185mm)
  3. Diameter Estimation (upto 63mm).
  4. Data Acquisition
  5. Universal probe with probe chart

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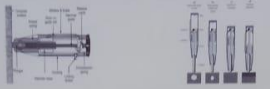
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**NON DESTRUCTIVE TEST (NDT) Techniques**

Nondestructive testing (NDT) is a wide group of analysis techniques used in science and technology industry to evaluate the properties of a material, component or system without causing damage.

**REBOUND HAMMER TEST**


Rebound Hammer test is a Non-destructive testing method of concrete which provide a convenient and rapid indication of the compressive strength of the concrete. The rebound hammer is also called as Schmidt hammer that consist of a spring controlled mass that slides on a plunger within a tubular housing.



When the plunger of rebound hammer is pressed against the surface of the concrete, the spring-controlled mass rebounds and the extent of such rebound depends upon the surface hardness of concrete. The surface hardness and therefore the rebound are taken to be related to the compressive strength of the concrete. The rebound is read off along a graduated scale and is designated as there bound number or rebound index.

**ULTRASONIC PULSE VELOCITY TEST**

Ultrasonic testing of concrete or ultrasonic pulse velocity test on concrete is a nondestructive test to assess the homogeneity and integrity and soundness of concrete.



**Concrete Quality Based on Ultrasonic Pulse Velocity Test**

Ultrasonic Pulse Velocity (km/sec)	Concrete Quality (Grade)
Below 3.0	Unsatisfactory
3.0 to 4.5	Satisfactory
4.5 to 5.5	Good
5.5 to 6.5	Very Good
Above 6.5	Excellent


When ultrasonic pulse travelling through concrete meets a concrete-air interface, there is a negligible transmission energy across this interface, which reflects the presence of cracks and air voids which reduce the pulse velocity which helps in identifying the defective zone of concrete.

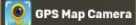
**PROFOMETER TEST**

Profometer is a non-destructive testing technique used to detect location and size of reinforcements and concrete cover quickly and accurately.

**Principle of Profometer Test**

The instrument based upon measurement of change of an electromagnetic field which is caused by steel bars embedded in the concrete.



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