NATIONAL INSTITUTE OF TECHNOLOGY GOA

Department of Civil Engineering

CONSULTANCY WING

MATERIAL TESTING AND CHARACTERIZATION FACILITIES

Kottamoll Plateau, Cuncolim Municipal Area,

Salcete Taluka, South Goa District, Goa – 403703

ABOUT NIT GOA CIVIL DEPARTMENT

The National Institute of Technology Goa (NIT Goa) is a premier national-level technical institute in India established in 2010 by an act of parliament (NIT Act, 2007, and NIT (Amendment) Act, 2012). NIT Goa is an autonomous institute functioning under the aegis of the Ministry of Education (MoE), Government of India, and has been declared an "Institute of National Importance". The Campus is located at Kottamoll Plateau, Cuncolim Municipal Area, Salcete Taluka, South Goa District. The Civil Engineering Department has been functioning since 2018 and presently offers B. Tech. and Ph. D. programmes in Civil Engineering.

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CONSULTANCY SERVICES OFFERED

Sl. No.	Name of the lab	Tests on
1	Material Testing	• Testing of construction materials (cement, aggregates, bricks, tiles, steel, timber etc.) as per IS/ASTM/BS standards in compression, tension, flexure, impact, shear, torsion and hardness. • Non-destructive testing (NDT) of concrete structures (rebound hammer, ultrasonic pulse velocity) • Quality assessment and certification of construction materials
2	Concrete Technology	• Characterization of Cement, aggregate, concrete and mix design. • Design and optimization of concrete mixes using mineral and chemical admixtures • Concrete workability, setting time, and shrinkage testing • Assessment of hardened concrete properties • Durability studies on concrete
3	Geotechnical Engineering	• Soil classification and index property testing • Compaction, permeability, and shear strength analysis • Plate load test, CBR test, and field density tests • Slope stability analysis and bearing capacity estimation • Laboratory and field geotechnical investigation for foundation design • Soil stabilization studies using chemical and natural additives • Ground improvement techniques and recommendations
4	Transportation Engineering	• Pavement material testing (bitumen, bituminous mixes, aggregates) • Marshall stability and indirect tensile strength tests • Evaluation of subgrade and base course materials • Traffic volume and axle load surveys • Pavement design and performance evaluation studies • Skid resistance and surface texture measurement • Mix design for flexible and rigid pavements
5	Environmental Engineering	• Water and wastewater quality analysis • Solid waste characterization and management studies • Design and evaluation of water and sewage treatment systems

TEST FACILITIES AT THE DEPARTMENT OF CIVIL ENGINEERING, NIT GOA

Sl. No.	Lab Name	Equipment Name
1	Material Testing	Universal Testing Machine, 1000 kN
		Brinell cum Rockwell hardness test
		Torsion testing machine
		Impact testing machine
		Vickers hardness testing machine
		spring testing machine
2	Concrete Technology	Compression testing machine 2000 kN
		Vee Bee consistometer
		Vibrating table
		Flexural testing machine
		Hot air oven
		Concrete mixers
		Mortar, cube, beam and cylinder moulds
		curing tank
		SCC flowability
		L box
		U-Box
		V funnel
		Flow table
		Digital compressometer with extensometer
		Vicat apparatus
		Slump test apparatus
		Le-Chateliers test apparatus
		Rapid Chloride Penetration Test
3	Geotechnical Engineering	Vane shear apparatus
		Consolidation Apparatus
		Hot air oven
		High speed stirrer
		CBR testing apparatus
		Static and Cyclic Triaxial testing apparatus
		Mechanical sieve shaker
		Direct shear apparatus
		Universal automatic compactor
		Hydraulic extractor
		Static and Cyclic plate load test setup
4	Transportation Engineering	Mechanical sieve shaker
		Hot air oven
		Los Angeles abrasion testing machine
		Aggregate Impact testing machine

		Ring and Ball apparatus
		Ductility testing machine
		Universal penetrometer
		Modified Marshall Apparatus with ITS test jig
		Water bath
		Flash and fire point apparatus
		Saybolt viscometer
		Automatic Marshall Compactor
		Automatic asphalt mixer
		Pavement core drilling machine
		Benkelman beam
		MERLIN-Modified roughness indicating machine
		Fifth wheel bump indicator
		Rolling thin film oven
		Absolute and Kinematic viscosity testing equipment
		Asphalt mixtures-theoretical density meter
5	Surveying	Survey chain 30 m
		Prismatic compass
		Cross staff
		Measuring tape 30m
		Plane table with accessories
		Dumpy level
		Levelling staff
		Vernier transit theodolite
		Electronic Total Station
		Electronic Theodolite
		Auto Level
		GNSS receiver full set (1 base, 1 rover, 1 controller)
		Hand Held GPS
		Laser Distance meter
6	Environmental Engineering	Conductivity meter
		BOD incubator
		Digital Nephelometer
		COD Digester
		Digital pH meter
		Magnetic stirrer
7	Fluid Mechanics	Base Module for experiments
		Pipe friction apparatus
		Stability of floating bodies
		Bernoulli's principle
		Measurement of Jet forces
		Losses in pipes system
		Flow measurement in pipes

		Osborne Reynolds experiment
		Plate weirs
8	Software available	Plaxis 2D
		ESRI Indo ArcGIS Pro
		MIDAS GTS Nx
		MIDAS GEN
		MIDAS D shop

DESCRIPTION OF SIGNIFICANT TESTING INSTRUMENTS

I. MATERIAL TESTING LAB

1. UNIVERSAL TESTING MACHINE

- Capacity: 1000 kN
- Least count: 100 kN
- Hydraulic grip system
- Output of Load vs Extension, Stress vs strain can be directly obtained
- Maximum clearance for tensile test: 50-850 mm
- Microprocessor based touch panel and data acquisition system
- Suitable for conducting tension test on steel rebars upto 40 mm diameter, compression tests and shear tests on specimen upto 20 mm diameter.

2. HARDNESS TESTS

2a. Rockwell and Brinell Hardness Test

- Hardness Tests on metallic materials, alloys of all types, hard or soft & of all shapes
- Load change options 60,100,150 kgf for Rockwell Test (HRA, HRB, HRC) and 187.5 kgf (BHN) for Brinell Test
- Samples upto 230mm high & 155mm throat depth can be tested

2b. Vicker's Hardness Test Rig

- Confirms to IS:1754-2002 and ISO:6507-2
- Vickers Hardness Tests on metallic materials, alloys of all types, hard or soft & of all shapes
- Test Loads : 1 to 250 kgf
- Magnification of optical projection:70x

3. IMPACT TEST RIG

- Determination of toughness of materials
- Izod and Charpy impact tests with pendulum drop angles of 140° and 85°.

4. SPRING TESTING MACHINE

- Test springs in tension, compression and determine stiffness
- 200 kN capacity, load sensitivity:1N
- Displacement sensitivity: 0.1 mm

II. CONCRETE TECHNOLOGY LAB

1. DIGITAL COMPRESSION TESTING MACHINE

- Capacity: 3000 kN
- Determination of compressive strength of construction materials such as concrete, bricks, paver blocks etc.
- Complying to IS -516 & IS 14858, and other ASTM, EN and BS Standards
- Display of peak load, stress withholding capacity for 15 minutes
- Least count: 0.1 kN
- Suitable for testing 150-300 mm cube and upto 300 mm dia. cylinder

2. FLEXURE TESTING MACHINE

- Capacity: 100 kN
- Conforming to IS: 516,9399, BS:1881, ASTM C78 standards
- Least count: 0.5 kN
- Suitable for testing flexural strength of concrete/steel/timber beams of 100 x 100 x 500 mm and 150 x 150 x 700 mm

3. REBOUND HAMMER

- Determination of compressive strength of concrete
- Confirming to IS:13311 (II)
- Suitable for testing structural components of thickness >100 mm
- Range of measurable compressive strength: 10-100 MPa

4. ULTRASONIC PULSE VELOCITY TESTER

- Determination of concrete quality and homogeneity
- Confirming to IS:1779
- Minimum trigger in 145 mV
- Maximum capacity of measurement: 3000 µS

5. HALF CELL POTENTIAL

- Condition assessment of existing RCC structures such as buildings, bridges, flyovers, and pavements
- Evaluation of corrosion risk in reinforcement exposed to chlorides, carbonation, or aggressive environments
- Pre- and post-rehabilitation assessment to verify effectiveness of repair and protection systems

6. RAPID CHLORIDE PENETRATION TEST SETUP

- Evaluation of chloride ion permeability of concrete for durability assessment
- Quality control of concrete mixes, especially for marine, coastal, and aggressive environments
- Assessment of service life and corrosion resistance of reinforced concrete structures
- Consultancy and compliance testing as per ASTM C1202 / equivalent standards

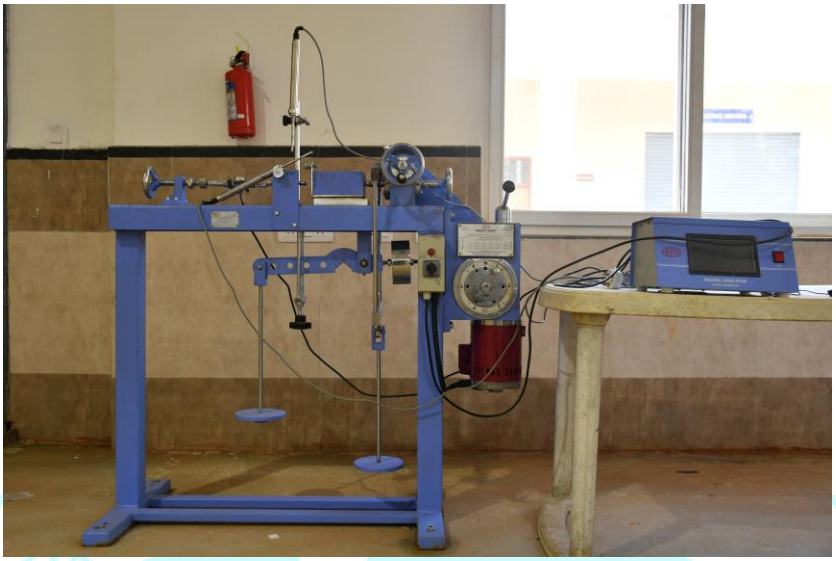
III. GEOTECHNICAL ENGINEERING LAB

1. STATIC AND CYCLIC TRIAXIAL TEST SYSTEM

- Determination of dynamic properties of soil
- Confirming to IS:2720 (XII) and ASTM D5311/D3999
- Vertical load/displacement: up to 10kN / ±25mm
- PID vertical load/displacement closed loop loading
- Upto 100 mm dia specimen
- Cell pressure and back pressure upto 1000kPa
- Double acting hydraulic actuator
- 0.01-10 Hz frequency
- Load application through sine, triangular and square waveforms

2. DIGITAL DIRECT SHEAR TEST RIG

- 2kN capacity
- Determination of shear strength parameters of soil
- Motorized operation
- Rates of strain (mm/min): 1.25, 0.625, 0.25, 0.125, 0.05, 0.025,0.01, 0.005, 0.002, 0.001, 0.0004, 0.0002



3. CONSOLIDATION TEST RIG

- Determination of consolidation parameters of soil
- Three gang
- 50-100 mm dia specimen
- Confirming to: IS:2720 (Part-XV), IS:12287, BS:1377, ASTM, D2435
- Suitable for testing samples of varying sizes from 50-100 mm dia.

4. CALIFORNIA BEARING RATIO TEST RIG

- Determination of strength of subgrade soils and use in pavement design
- Confirming to standards: IS: 2720 (Part XVI), BS 1377; 1924; EN 13286-47/ASTM D 1883; AASHTO 193
- 50 kN capacity

IV. TRANSPORTATION ENGINEERING LAB

1. MODIFIED MARSHALL TEST RIG

- Measurement of resistance to plastic flow of bituminous specimen
- Digital load and displacement indicator
- Load cell: 100 kN and LVDT:50 mm travel
- Compaction moulds of size 101.6 mm and 152.4 mm dia samples
- Automatic compactor with blow counter

2. ROLLING THIN FILM OVEN

- Measurement of effect of heat and air on a moving film of semi solid asphalt binder and simulate short-term aging of bitumen.
- Double walled electrically heated convection oven for rolling thin film oven tests on asphalt
- Digital indicating thermostat to control oven temperature at 163°C ± 0.5°C
- Calibrated flow meter to control air flow at 4000L/min

3. PAVEMENT CORE DRILLING MACHINE

- 6HP Petrol engine powered road
- building drill for extracting cores from roads, airport runways, bridges
- Bit diameter varying from 50-150 mm with different lengths

4. FIFTH WHEEL BUMP INTEGRATOR

- Measurement of longitudinal road profiles and roughness
- Determination of unevenness index
- Standard Operation Speed: 32 ± 0.5 Km/hr
- Microprocessor-based indicator with suitable leads
- Readings of the bumps given directly in centimeters, with a least count of 1 cm
- Digital display to enable testing at night

5. MERLIN-MODIFIED ROUGHNESS INDICATING MACHINE

- Measurement of roughness of road
- Used for direct measurement or for calibrating other instruments such as Vehicle Mounted Bump Integrator

6. BENKELMAN BEAM

- Determination of rebound deflection of a flexible pavement under moving wheel loads
- Confirming to IRC:81
- Dimensions : 1397mm x 2400mm x 3700mm

7. ASPHALT MIXTURES THEORETICAL DENSITY METER

- Determination of the theoretical maximum specific gravity of void less bituminous mix in the loose state.
- Confirming to ASTM D2041 or AASHTO T 209

8. ABSOLUTE AND KINEMATIC VISCOSITY TESTING EQUIPMENTS

- Determination of Dynamic and Kinematic viscosity of bitumen at 60°C and 135°C, respectively, required for characterisation of bitumen.
- Confirming to IS 1206:2022

V. SURVEYING LAB

1. GNSS BASE+ROVER

- Field surveying and mapping applications
- Accurate calculation of grade, exact locations and elevations, as built points
- Accuracy (RTK): 8mm+1ppm (H) and 15 mm+1 ppm(V)
- Compatible with GPA/GLONASS/Gailelo/BeiDou signals
- Equipped with Leica CS20 controller

2. LASER DISTANCE METER

- Maximum measurement distance: 300 m
- Resolution: 1 mm
- Inclination sensor
- Suitable for quick and accurate measurement of sloped objects, 3D distances, height profile, area, volume etc.
- Capture to DXF files directly

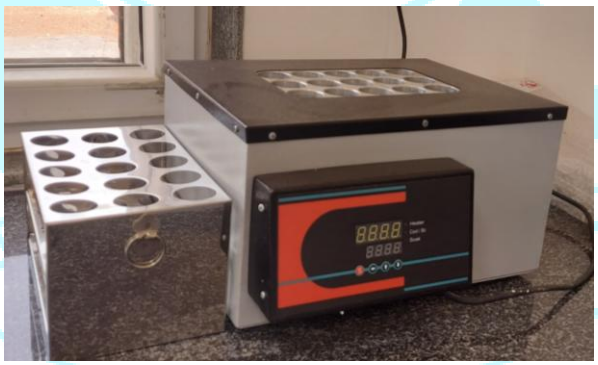
VI. ENVIRONMENTAL ENGINEERING LAB

1. DIGITAL TURBIDIMETER

- Determination of turbidity of water
- Ranges: 0-1 NTU; 0-10 NTU; 0-100 NTU; 0-1000 NTU
- Accuracy: +/- 2%

2. COD DIGESTER

- Measurement of COD of water
- Temperature range upto 180°C
- Resolution: 1°C
- Digital electronic temperature controller



3. BOD INCUBATOR

- Used in determination of BOD of water
- Temperature range upto 60°C
- Accuracy:+/- 2°C
- Digital electronic temperature controller

4. DIGITAL CONDUCTIVITY METER

- Measurement of electrical conductivity of water
- Range: 0.01 micromhos to 1000 millimhos
- Resolution: 0.01 micromhos