Testing of Mechanical Properties

- Compression and flexural testing of cement paste/mortar
- Uniaxial compression test of fresh concrete
- Compression testing of concrete
- Modulus of elasticity
- Uniaxial compressive test of concrete
- Uniaxial tensile test of textile
- Flexural test of textile reinforced concrete composite
- Uniaxial tensile test of rebar/strand
- Pull-out test of reinforcing bars/stands
- Three-point and four-point bending test
- Pre-peak and post-peak flexural fatigue test
- Prestressing of strands
- Abrasion resistance of concrete under water
- Non - Destructive testing

Testing of Fresh Properties

- Mini Sump Test
- Flow Table Test
- Slump Flow Test
- Marsh Cone Test
- Pressure Bleed/Filter Test
- Vane Shear Test
- Viscosity Test

- Rheology Test
- Green Strength Study
- Mixing and vibration equipment
- SCC equipment
- Foam generator
- Puntke Test

Compression and flexural testing of cement paste/mortar

Working Principle

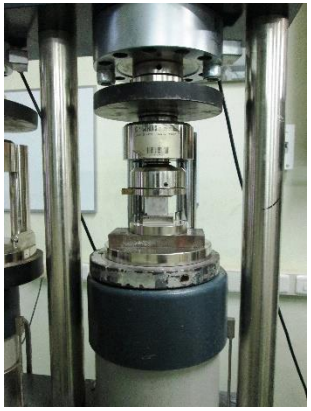
Load controlled testing machine that applies a constant loading rate until failure

Applications

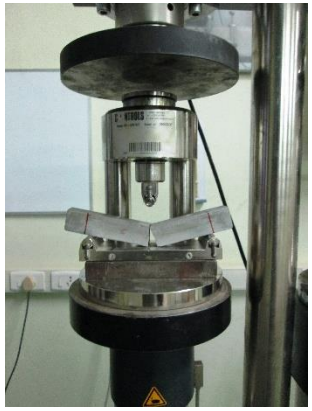
- Characterization of cement paste/mortar, gypsum, etc. at different age

Mechanical properties

- Compressive strength
- Flexural strength



Compression test setup



Flexural test setup

Controls compression testing machine

Uniaxial compression test of fresh concrete

Working Principle

Closed-loop control system that can control variables such as specimen displacement and strain.
Specimen is subjected to monotonic loading until failure

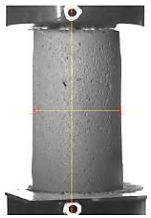
Applications

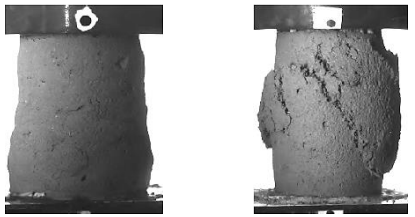
- Characterization of early-age properties of concrete systems

Mechanical properties

- Compressive strength at fresh state

ZwickRoell Electro-mechanical testing machine





Specimen

Compression testing of concrete

Working Principle

Load controlled testing machine that applies a constant loading rate until failure

Applications

- Design of concrete elements
- Evaluation of strength of an existing concrete structure by performing compressive test on cores

Mechanical properties

- Compressive strength

Controls compression testing machine

Modulus of elasticity

Working Principle

The load ramp applied in three cycles, between 5% and 40% of expected ultimate compressive load.
Load vs. time and stress vs. strain are recorded by a computer-based data acquisition system.

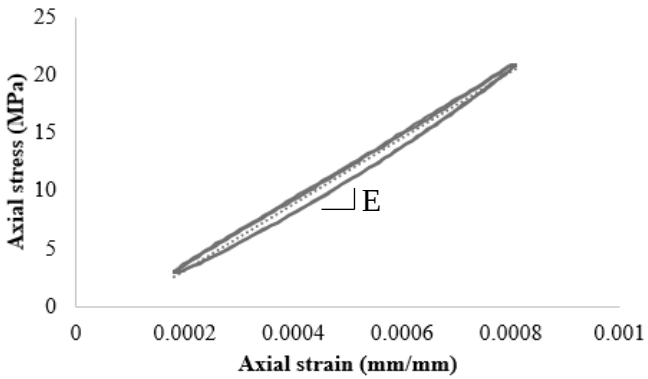
Applications

- Characterization of concrete of grades ranging from M20 to M100 and high performance concrete at different ages

Mechanical properties

- Elastic modulus

Controls compression testing machine



Stress-strain behaviour

Uniaxial compressive test of concrete

Working Principle

Closed-loop control system that can control specimen displacement and strain.

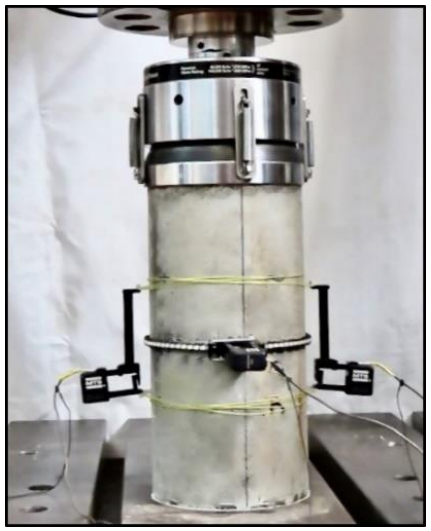
Specimen is subjected to monotonic loading by circumferential displacement control

Applications

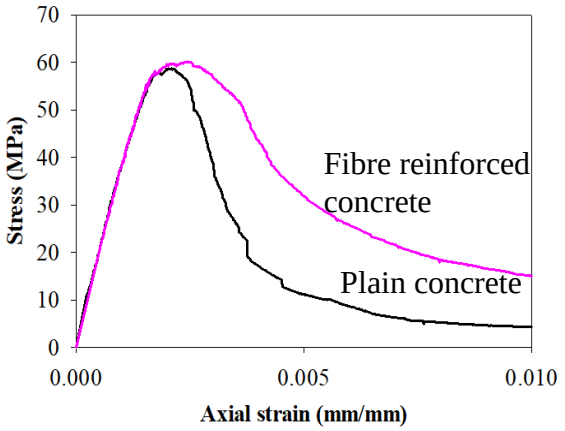
- Finite element modelling and design of elements made of quasi-brittle materials such as plain concrete, fibre reinforced concrete, masonry blocks, asphalt, gypsum, etc.

Mechanical properties

- Elastic modulus and Poisson's ratio
- Compressive strength
- Compressive toughness
- Complete compressive stress-strain curve



MTS servo-hydraulic compression machine

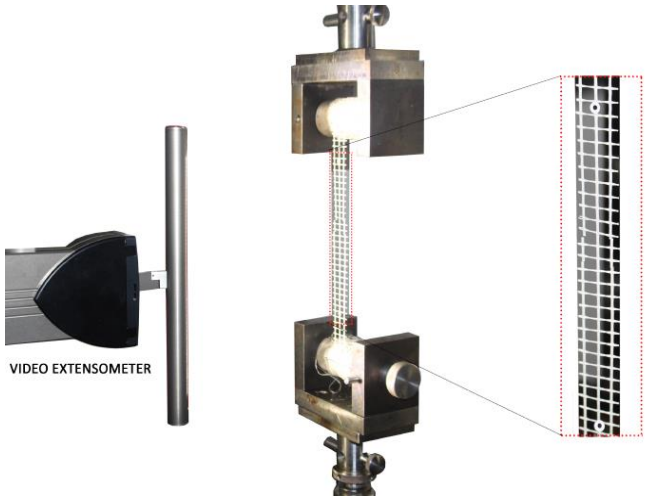


Stress-strain behaviour

Uniaxial tensile test of textile

Working Principle

Closed-loop control system that can control variables such as specimen displacement, and strain.
Video extensometer and axial extensometer are used to study the stress-strain behavior.



ZwickRoell Electro-mechanical testing machine

Applications

- Design of cement and concrete composites such as textile reinforced concrete under varied temperatures (-10 to 280 deg. C) and under fatigue loading.

Mechanical properties

- Elastic modulus
- Tensile strength
- Tensile stress-strain curve

Uniaxial tensile test of textile

Working Principle

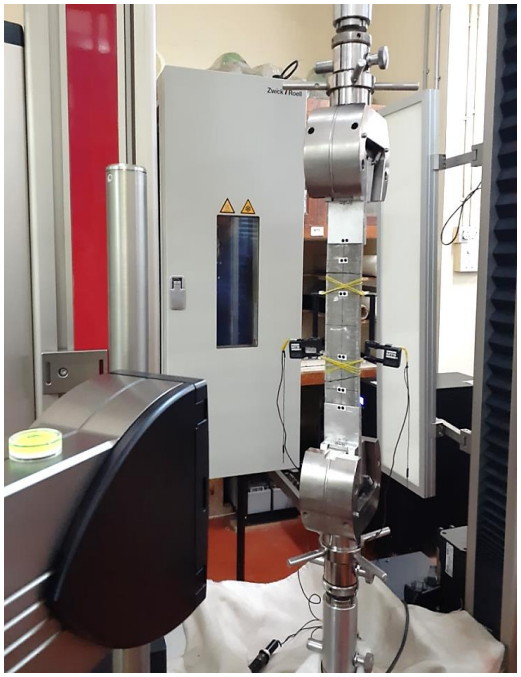
Closed-loop control system that can control variables such as specimen displacement, and strain.
Video extensometer and axial extensometer are used to study the stress-strain behavior.

Applications

- Design of cement and concrete composites such as textile reinforced concrete under varied temperatures (-10 to 280 deg. C) and under fatigue loading.

Mechanical properties

- Elastic modulus
- Tensile strength
- Tensile stress-strain curve



ZwickRoell Electro-mechanical testing machine

Pull-out test of textile yarn in textile reinforced concrete composite

Working Principle

Closed-loop control system that can control variables such as specimen displacement, and strain.
Video extensometer and axial extensometer are used to study the stress-strain behavior.

Applications

- Design of cement and concrete composites such as textile reinforced concrete under varied temperatures (-10 to 280 deg. C) and under fatigue loading.

Mechanical properties

- Bond strength

ZwickRoell Electro-mechanical testing machine

Flexural test of textile reinforced concrete composite

Working Principle

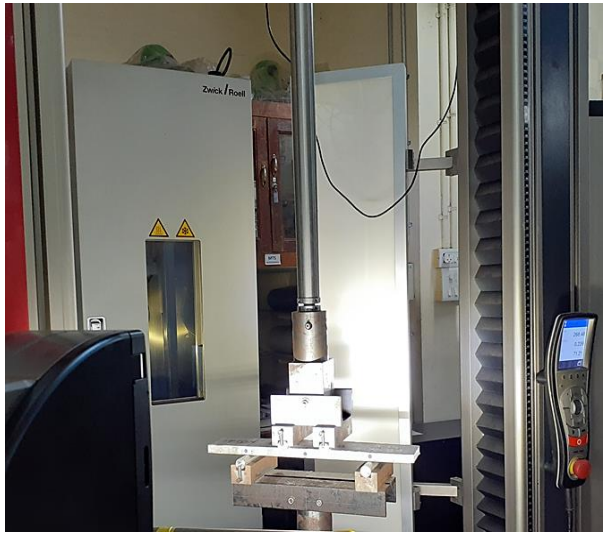
Closed-loop control system that can control variables such as specimen displacement, and strain.
Video extensometer and axial extensometer are used to study the stress-strain behavior.

Applications

- Design of cement and concrete composites such as textile reinforced concrete under varied temperatures (-10 to 280 deg. C) and under fatigue loading.

Mechanical properties

- Flexural strength
- Load-deflection curve



ZwickRoell Electro-mechanical testing machine

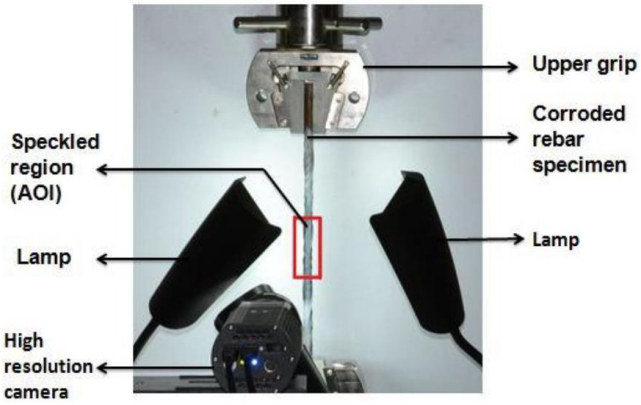
Uniaxial tensile test of rebar

Working Principle

Closed-loop control system that can control variables such as specimen displacement and strain.

The rebar is gripped at both ends and tensile load is applied.

Deformation is monitored using video extensometer



MTS servo-hydraulic tension machine

Applications

- Characterization of concrete systems with damaged rebar

Mechanical properties

- Elastic modulus
- Yield strength
- Breaking strength
- Maximum elongation

Uniaxial tensile test of strand

Working Principle

Closed-loop control system that can control variables such as specimen displacement, and strain.

The strand is gripped at both ends and tensile load is applied

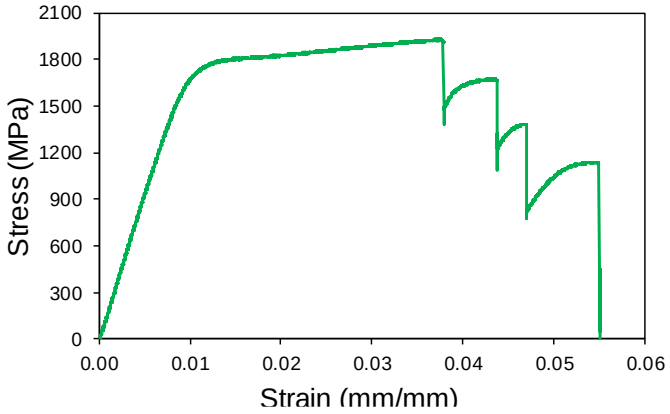
Applications

- Design of prestressed concrete systems

Mechanical properties

- Elastic modulus
- Yield strength
- Breaking strength
- Maximum elongation

MTS servo-hydraulic tension machine



Stress-strain behaviour

Pull-out test of reinforcing bars

Working Principle

Closed-loop control system that can control variables such as specimen displacement, and strain.

The rebars are gripped at one end and the concrete is pulled apart

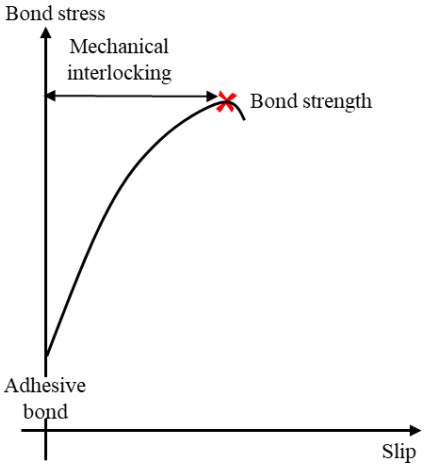
Applications

- Design of reinforced concrete systems

Mechanical properties

- Bond strength
- Bond stress- slip curve

MTS servo-hydraulic tension machine



Stress-strain behaviour

Pull-out test of prestressing strand

Working Principle

Closed-loop control system that can control variables such as specimen displacement and strain.

The strands are gripped at one end and the concrete is pulled apart

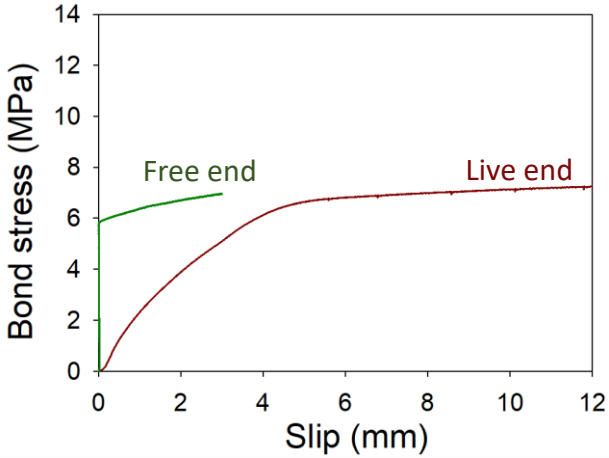
Applications

- Design of prestressed concrete systems

Mechanical properties

- Bond strength
- Bond stress-slip curve

MTS servo-hydraulic tension machine



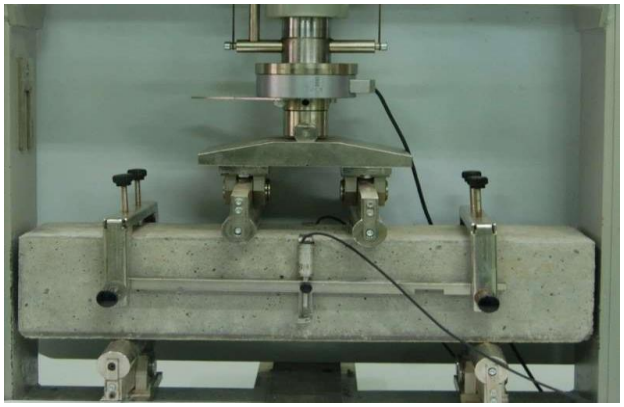
Stress-slip behaviour

Four-point bending test

Working Principle

Closed-loop control system that can control specimen displacement.

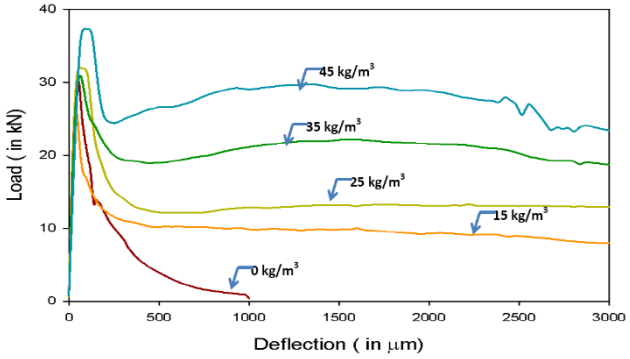
Specimen is subjected to monotonic loading by displacement control.



Controls flexural testing machine

Applications

- Design of fibre reinforced concrete elements such as pavements and slabs-on-grade.



Load displacement behaviour

Mechanical properties

- Flexural strength
- Residual flexural strength

Three-point bending test

Working Principle

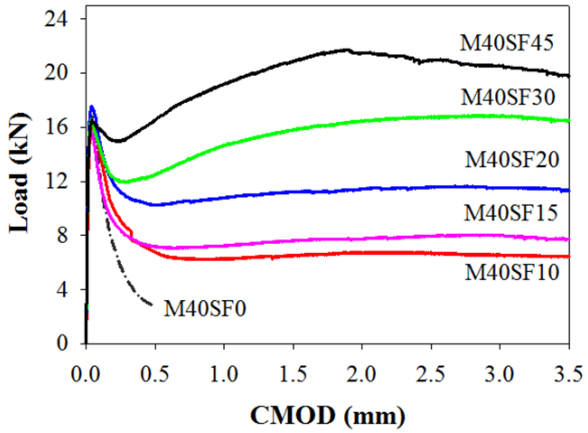
Closed-loop control system that can control variables such as specimen displacement and crack opening.

Specimen is subjected to monotonic loading at mid-span by CMOD control.

Controls flexural testing machine

Applications

- Fracture study of advanced concrete materials
- Design of fibre reinforced concrete elements such as industrial floors, tunnel linings, elevated slabs, etc.



Load displacement behaviour

Mechanical properties

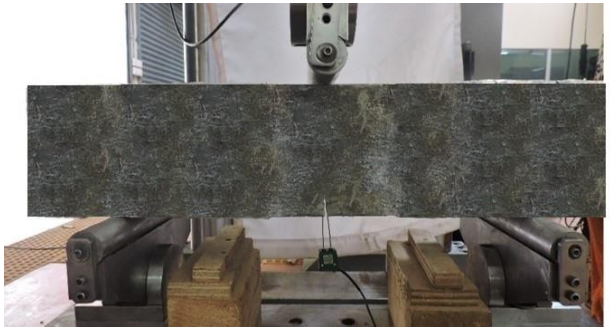
- Flexural strength
- Residual flexural strength

Pre-peak and post-peak flexural fatigue test

Working Principle

Closed-loop control system that can control variables such as specimen displacement, strain and crack opening.

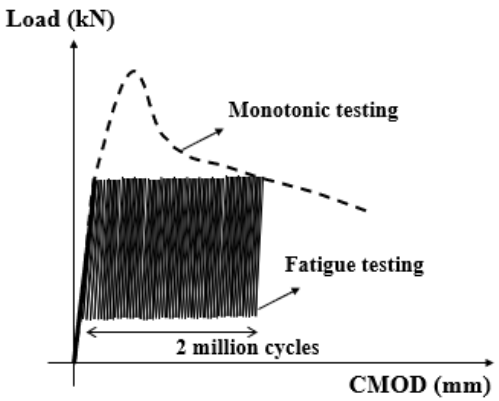
Fatigue cycles are applied by load-control and the displacement is monitored



MTS servo-hydraulic compression machine

Applications

- Design of concrete elements such as pavements, industrial floors, bridges, etc. that are subjected to long-term fatigue loading
- Design of steel pipes



Load-displacement behaviour

Mechanical properties

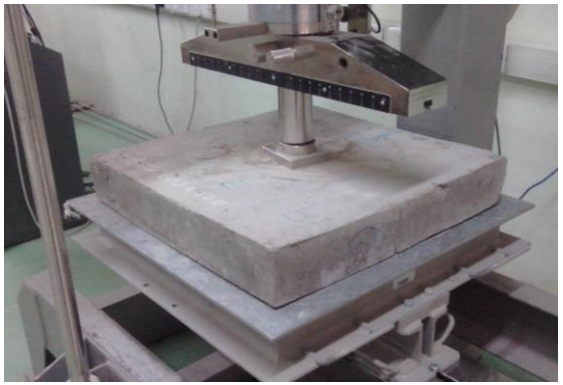
- Fatigue strength
- Fatigue life

Energy absorption test

Working Principle

Closed-loop control system that can control specimen's central deflection.

Specimen is subjected to monotonic loading at center of the square/round panel by displacement control



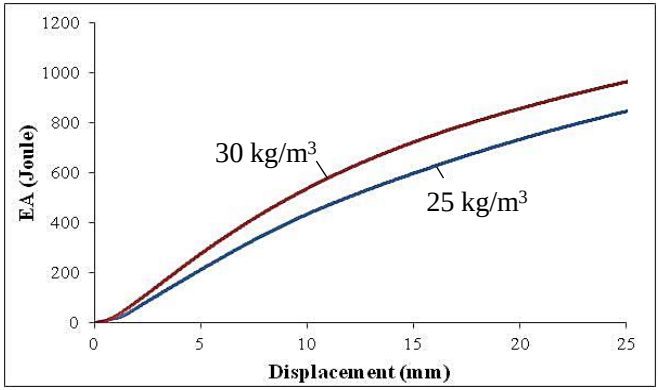
Controls flexural testing machine

Applications

- Design of plain and fibre reinforced concrete shotcrete tunnel linings

Mechanical properties

- Energy absorption capacity



Energy absorption-displacement behaviour

Prestressing of strands

Working Principle

Strand is prestressed using hydraulic jack and prestress is transferred released using stress adjusting system

Strain on the concrete surface is obtained using brass embedded pins and DEMEC gauge

Prestressing setup

Stressing end

Releasing end

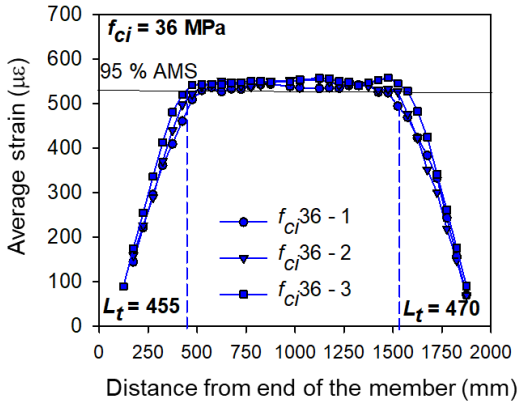
Applications

- Design of pretensioned concrete

Measurements using DEMEC

Mechanical properties

- Transmission length
- Effective prestress force
- Prestress loss



Strain profile on the concrete surface

Abrasion Resistance of Concrete Underwater

Working Principle

Abrasion of concrete surface by abrasive charges (steel balls) suspended in water, simulating the abrasive action of waterborne particles like silt, sand and gravel on the surface of concrete.

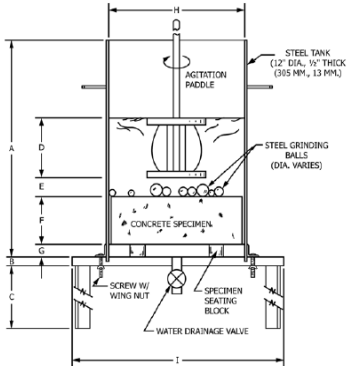
Applications

- Design of concrete for hydraulic structures, overlays and impregnated concrete

Mechanical properties

- Hydraulic Abrasion Resistance of Concrete

Test setup



Schematic diagram

Non-Destructive Testing

Rebound Hammer

Wenner 4-porbe

Moisture Meter

Pendulum Hammer

Ultrasonic Pluse Velocity

Resonant Frequency