Irrigation Research Institute (IRI) was established in the year 1928 as a small research unit in Lucknow (U.P.). The activities of the unit were expanded in 1945 when the unit was shifted to Bahadrabad. Later on it rose to a full fledged Institute in 1954 at Roorkee. Since then the Institute is engaged in the research, development and testing works related to irrigation, flood and hydroelectric projects. The Institute also undertakes problems of basic and fundamental research having immediate applicability in the field. The institute is headed by Chief Engineer/ Director and functions with three Circles and twelve Divisions having following facilities for Model Studies / Material Testing in its well equipped Laboratories.

1.0 Hydraulic Modeling

Hydraulic Modeling is conducted at Field Research Station, Bahadrabad situated at 18 Km on Roorkee-Haridwar Road. The F.R.S is spread over 36 hectares of land and provides more than 6.5 m gravity fall for model studies. The station has facility of 300 Cusec canal water to feed models. Hydraulic Model studies for following parameters are conducted.

1.1 Developing Gauge Discharge Curves
1.2 Back Water Curves
1.3 Siting of :-
(a) Dams
(b) Barrages / Weirs / Trench Weir
(c) Intakes
(d) Bridges
1.4 Evolving Optimal hydraulic Design of :-
(a) River Training Works
(b) Flood Protection and Anti Erosion Works
1.5 Hydraulic Design and Testing of :-
(a) Spillways-Chute, Vertical drop, Ogee & Shaft etc.
(b) Air Demands and requirement of Aerators
(c) Tail Race System, Fore bay and Bye pass Channels of Power house
(d) Canal Junctions and Bifurcations
(e) Sediment Excluders
(f) Sediment Ejectors
(g) Sedimentation Chamber
(h) Desilting Basins (Hoppers & Flushing ducts)
(i) Anti vortex Devices at Intakes
1.6 Hydraulic Design of Energy Dissipation Devices viz. :-
(a) Ski Jump Bucket
(b) Stilling Basin
(c) Roller Buckets
(d) Impact Type Energy Dissipaters
(e) Interaction of Jets in space
(f) Swirling Device in Vertical Drop Shaft
1.7 Physical & Mathematical Model Studies for :-
(a) Surge Tanks
(b) Office Profile
(c) Water Hammers in Head Race Tunnel
1.8 Estimation of Hydrodynamic forces on gates
1.9 Discharge measurement of Rivers and canals
2.0 Reservoir Capacity Survey :-
(a) Capacity survey of Reservoirs by Hydrographic method
(b) Computation of Live / Dead Capacity at different Reservoir levels.
(c) Determination of Rate of sedimentation

2.0 SOIL TESTING

In Soil laboratories of the institute at Roorkee the tests are conducted in accordance with prevailing I:S Specification. A list of various Tests conducted in the institute is as follows :-

(A) Laboratory Test (As Per IS Codes)

2.1 Soil Classification
2.2 Grain Size (Sieve & Hydrometer) Analy
2.3 Atterberg Limits
2.4 Specific Gravity
2.5 Natural Moisture Content and Density
2.6 Compaction Test
2.7 Maximum and Minimum Density of Cohesion less Soils
2.8 Swelling Test
2.9 Permeability Test
2.10 Consolidation Test
2.11 Free Swell
2.12 Direct Shear Test (60x60x25mm)& (300x300x150mm)
(a) At NMC/OMC/Dry State
(b) At Saturation
2.13 Unconfined Compression Test
2.14 Triaxial Shear Test
(a) (3.75mm dia x150mm high)
(b) (1200mm dia x 400mm high)
2.15 Unconsolidated Undrained Test with/without Pore Pressure Measurement
(a) At OMC/NMC
(b) At Saturation
2.16 Consolidated Undrained Test with/without Pore Pressure Measurement
(a) At OMC/NMC
(b) At Saturation
2.17 Consolidated Drained Test with/Without Pore Pressure Measurement
(a) AT OMC/NMC
(b) At Saturation
2.18 Triaxial Compression Test (100mm dia x200 mm high)
2.19 Gradation Analysis and classification of coarse material
2.20 Large Size Permeability Test (50 cm dia)
2.21 Compressibility and Particle Breakage Test (50cm dia)
2.22 Crushability Test
2.23 Dispensability Test
2.24 Erodibility Test
2.25 Silt factor
2.26 Fineness Modulus
2.27 Calibration of :-
(a) Pressure Gauge
(b) Proving Ring

(B) Field Test (As Per IS Codes)

2.28 Bearing Capacity
2.29 Plate Load Test
2.30 Standard Penetration Test
2.31 Undisturbed Samples
2.32 Static Cone Penetration Test
2.33 Dynamic Cone Penetration Test
(a) Without Bentonite Slurry
(b) With Bentonite Slurry
2.34 Field Permeability Test
(a) Pumping in Permeability Test
(b) Pump out Permeability Test
2.35 Vane Shear Test
2.36 Prototype load test (on well already Sunk and Plugged)
2.37 Modulus of Subgrade reaction test
2.38 Block Shear test

(C) CHEMICAL TEST

2.39 Chemical Analysis of Water samples for Irrigation and Construction Purpose
2.40 Chemical Analysis of Cement Mortar/Cement concrete to find out proportional ratio of its gradient
2.41 Alkali Aggregate reactivity test of aggregate Samples
2.42 Chemical Analysis of Different types of Cement
2.43 Silt content in ppm
2.44 Grain Size distribution of Silt samples

3.0 CEMENT CONCRETE LABORATORY

Testing of physical properties of different types of construction materials such as bricks, brick tiles, cement, aggregates, steel bars etc. are mainly carried out in this laboratory. The laboratory also undertakes design of concrete mix including roller compacted concrete, high performance concrete for construction of dams and other structures.

(A) Laboratory Test(As Per IS Codes)

3.1 Standard Consistency,Setting Time, Soundness (by Lechatlier Method), Fineness, Specific Gravity, Compressive Strength of Cement
3.2 Lime Reactivity, Setting Time, Soundness (by Lechatlier Method), Fineness, Specific Gravity, Compressive Strength of Fly ash
3.3 Compressive strength of Cement Concrete Cube & Flexural Strength of Cement Concrete beam or brick-tile
3.4 Unit Weight and Slump of Concrete
3.5 Erosion by High Velocity Water Jet
3.6 Testing of Concrete admixture or Air Entraining Agents (28 days/90 days basis)
3.7 Concrete Mix Design
(a) Up to 40 mm (28 days/90 days basis)
(b) Up to 80 mm (28 days/90 days basis)
3.8 Sieve Analysis of coarse / fine aggregate
3.9 Crushing Value of coarse aggregate
3.10 Impact Value of coarse aggregate
3.11 Abrasion Value of coarse aggregate
3.12 Flakiness Index of coarse aggregate
3.13 Elongation Index of coarse aggregate
3.14 Specific Gravity & Water Absorption of coarse/ fine aggregate
3.15 Soundness of coarse / fine aggregate
3.16 Unit Weight of coarse / fine aggregate
3.17 Organic impurities of fine aggregate
3.18 Material finer than 75 micron & Mortar making properties of fine aggregate
3.19 Compressive Strength & Warpage of brick and brick-tile
3.20 Water absorption of brick and brick-tile
3.21 Ultimate Tensile Strength of steel bar up to 25 mm dia.
3.22 Ultimate Tensile Load of welded joints up to 25 mm dia.
3.23 Calibration of proving ring or load cell
3.24 Calibration of Hydraulic compression testing machine
3.25 Roller Compacted Concrete Mix Design
3.26 Tests for Sheathing Ducts
(a) Workability
(b) Tension Load
(c) Transverse load Rating
(d) Water Loss

4.0 ROCK MACHENICS

(A) Laboratory Test.

4.1 Crushing Strength
4.2 Modulus of Elasticity & Poission Ratio
4.3 Unconfined Comprehensive Strength
4.4 Shear Parameters – Cohesion 'c' and angle of internal friction Φ
4.5 Point Load strength Index
4.6 Tensile/Compressive Strength
4.7 Weathering/ Durability/Permeability Test of Natural Building Stone
4.8 Abrasion Test by Dorry's Machine
4.9 Dynamic Modulus of Elasticity
4.10 Water absorption, specific gravity and porosity of Natural Building Stone
4.11 Soundness of Natural Building Stone
4.12 Water Content, Porosity & Density of Rock Material.

(B) Field Test.

4.13 Bearing Capacity by Plate Load Test
4.14 Block Shear Test (Cohesion 'c' and angle of internal friction Φ)
4.15 Flat Jack Test
4.16 Pull Out Tests (Anchor Bar & Rock Bolts)
4.17 U. J. Test (Modulus of Deformation)
4.18 Load Test for Bridges

5.0 GROUND WATER

(A) Laboratory Test.

Physical / Mathematical modeling for the determination of :
5.1 Uplift pressures beneath the hydraulic structures
5.2 Exit gradient at the releasing end of structures
5.3 Quantum of seepage and seepage pressure on underground power houses
5.4 Optimal under drainage arrangement
5.5 Testing Hydraulic Performance of Pressure Release Valves

(B) Field Test.

5.6 Flow- Rate Measurement of Mountainous River by Radioactivity Tracer Technique.
5.7 Seepage Measurement from Canals by
(i) Radioactive Tracer Technique
(ii) Pounding Method
5.8 Estimation of Recharge to Groundwater Due to Rainfall or Applied Irrigation by Tritium Tagging Technique.
5.9 Estimation of Seepage/Leakage Through Reservoirs by Isotope Technique.
5.10 Movement of Soil Moisture in Vadose Zone by Radio Active Tracer Technique
5.11 Evaluation of Direction and Velocity of Groundwater Flow by Radio-Active Tracer Technique
5.12 Studies Regarding Lining of Canals, Field Performance and their Economic Viability

6.0 SURFACE HYDROLOGICAL STUDIES

6.1 Fitting various types of Curves e.g. Linear, Power, Exponential, Polynomial etc.
6.2 Determining Statistical Parameters of Events
6.3 Flood frequency analysis by various methods
6.4 Regional Flood frequency analysis by various methods
6.5 Stage-Discharge Relationship (Least square technique)
6.6 Regional Unit Hydrograph method (Clark's Model, Snyders's Method)
6.7 Unit Hydrograph Analysis (Conventional Method)
6.8 Extrapolation of Data(Langbein Log Deviation Method)
6.9 Linear and curvilinear regression analysis(Least square Method)
6.10 Plotting Positions
(a) Weibul's Method
(b) Blom's Method
(c) Gringorton's Method
(d) N.E.R.C. Method
6.11 Mathematical Modeling – Multiple Regression Analysis.

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अपार शक्तेः स्रोतः गंगेयम

RESEARCH & TESTING FACILITIES

AT

IRRIGATION RESEARCH INSTITUTE

ROORKEE -247667 (UTTARAKHAND)

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