



# Centre for Construction Development and Research



**NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS**  
Under the Administrative Control of Ministry of Commerce & Industry, Government of India



## About the Council

National Council for Cement and Building Materials (NCB), set up in 1962, then known as Cement Research Institute of India, is the apex body in India under the administrative control of Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, government of India, devoted to research, technology development and transfer, education and industrial services for cement, building materials and construction industries. Its multi-disciplinary activities are performed in an integrated and coordinated manner through its units that are located at Ballabgarh (Near Delhi), Hyderabad, Ahmedabad and Project Office at Bhubaneswar. The six corporate centres of the council guide the activities at different units. The Centre and their main areas of activity are:

**Centre for Construction Development & Research (NCB-CDR)** - Concrete Technology, Structural Assessment and Rehabilitation, Structural Optimization & Design and Construction Technology & Management

**Centre for Cement Research & Independent Testing (NCB-CRT)** - Fundamental and Basic Research, Cement and other Binders, Waste Utilization, Refractories & Ceramics and Testing Services.

**Centre for Mining, Environment, Plant Engineering & Operation (NCB-CME)** - Geology, Mining & Raw Materials, Process Optimization & Productivity Enhancement, Energy Management, Plant Maintenance, Project Engineering & System Design, Environmental Management.

**Centre for Industrial Information Services (NCB-CIS)** - Industrial Information and Data Bank, Integrated IT Solutions, Publication, Seminars & Conferences, International & National Linkages, Image Building.

**Centre for Continuing Education Services (NCB-CCE)** - Long-Term & Short-Term Courses, Special Group Training Programmes, Simulator Based Courses, Workers Development Programmes.

**Centre for Quality Management, Standards & Calibration Services (NCB-CQC)** - Total Quality Management, Calibration Services, Development and Supply of Certified Reference Materials.

### **Centre for Construction Development and Research (CDR)**

Centre for Construction Development & Research (CDR) is at the fore front in the service of concrete and construction industry. Strategic goal of the CDR is to contribute in developing durable and sustainable civil infrastructure for the nation. CDR anticipates and meets the critical requirements and technology needs and solve contemporary and emerging engineering problems of the concrete and construction industries through state-of-the-art interdisciplinary research and consultancy services.

#### Area of Research & Services Offered

Concrete Technology  
Structural Assessment and Rehabilitation  
Structural Optimization & Design  
Construction Technology and Management

## Services offered:

### Evaluation of Concrete Making Materials:

- Cement and cementitious Materials such as OPC, PPC, PSC, Fly ash, GGBS, Silica-fume, Ultrafine GGBS, Ultrafine Flyash, LD Slag etc.
- Aggregates - Complete physical and chemical analysis, Petrography, Soundness and Alkali-aggregate reactivity of Natural aggregates, Crushed fine aggregate, recycled aggregate and manufactured aggregate like electric arc furnace slag aggregate etc.
- Chemical Admixture: Effectiveness and compatibility studies of Super-plasticizers, accelerators, VMA, Anti washout admixture, Anti shrinkage compounds, water proofing chemicals etc.
- Complete Evaluation of Corrosion inhibitors as per different Indian and international standards like JIS Z1535, ASTM G1, ASTM G3, AASTHO T259 etc.
- Mixing and curing water & Curing compounds

### Special Concrete, Advance Concrete Composite & Standard Concrete Mix Designs:

- Ordinary concrete, Standard Concrete, High Strength Concrete using OPC, PPC, PSC, OPC + fly ash, OPC + Fly ash + Silica Fume etc.
- Development of Special Concrete such as High Performance Concrete, Pervious concrete, Plastic concrete High Volume Fly ash Concrete, Self-Compacting Concrete, Pavement Quality Concrete, Dry Lean Concrete, Roller Compacted Concrete, Under water concrete, Fiber Reinforced Concrete, Controlled Low Strength Material (CLSM), Ultra high strength concrete (UHPC) etc.
- Shotcrete & Non Shrink Grout

### Mechanical properties and Durability Studies of Concrete Through Accelerated Test:

- Accelerated Carbonation test and measurement of carbonation induced reinforcement corrosion
- Creep testing and coefficient of thermal expansion of concrete.
- Stress strain behavior of concrete and determination of poisson's ratio for concrete
- Water permeability test for concrete.
- Chloride induced reinforcement corrosion through test like chloride immersion test, impressed current voltage test.
- Abrasion resistance of concrete as per revolving disk method and under water resistance test
- Performance of concrete against Sulphate attack
- Alkali-Aggregate Reaction and other aggressive environment to cause deterioration of concrete

## Studies Undertaken:

- Development & Design of high Abrasion resistance concrete in Laboratory & Quality assurance services at site for its production and placement for Maneri Dam Site, Uttarkashi & Ichari Dam site, Uttrakhand.
- Use of flyash, copper slag, bottom ash and recycled aggregate in concrete
- Evaluation of Low Density Aggregates (LDA) and Structural Lightweight Concrete using LDA.
- Study on Use of ferrochrome slag as a fine aggregate (water cooled) and coarse aggregate (air cooled) in concrete
- Development of high abrasive strength materials for spillway and glacis
- Studies for Preparation of Specifications and Guidelines for use of Coal based Bottom Ash as Replacement of Fine Aggregate in Concrete.
- Evaluation of concrete making materials like cement, water, mineral/chemical admixtures & aggregates for alkali-aggregate reactivity and other properties for hydroelectric & thermal power plants (more than 25 projects per annum).
- Concrete mix proportions for various grades of concrete for different projects across the country (more than 150 mix designs per annum).



Workability Measurement of Roller Compacted Concrete



V-Funnel & L-Box Test for SCC



Abrasion Resistance test for Concrete



Creep testing in loaded condition



Corrosion rate measurement



Accelerated Carbonation Induced Corrosion Study

# Concrete Technology

- Investigation on application of Carbon Nanotubes for improving performance of cement concrete and concrete based precast building products.
- Durability Studies on PSC made using composite slag (mix of BF slag and LD slag).
- Development of Ultra High-Performance Concrete (UHPC) – Including use of Nano Technology for UHPC.
- Fresh hardened and durability performance evaluation of concrete made with Portland limestone cement (PLC).
- Studies on Mechanical and Thermal Properties of Mass Concrete.
- Durability test on hardened concrete to ascertain the suitability of aggregate to be used in concreting work of tunnel lining for hydroelectric project.
- Performance and durability assessment of crystalline water proofing compounds for structural use.



Abrasion Value Test for Aggregate



Accelerated Chloride Induced Corrosion Studies

## Structural Assessment and Rehabilitation

### Services offered:

- In-situ quality assessment, durability investigation and condition assessment of concrete structures
- Non-Destructive Testing of concrete
- Distress investigations of buildings, bridges, dams, power plants, chimney, silo etc. deteriorated due to aggressive environment or fire damage
- Consultancy for repairs/rehabilitation & retrofitting including third party quality assurance services during execution of repair
- Study of Micro-structure of Concrete using SEM, OM, XRD, TG-DTA-DSC

### Studies Undertaken:

- In-situ testing of concrete structures for assessment of quality and distress evaluation of concrete structures of various types across the country.
- Condition assessment of civil structures including field and laboratory studies using state-of-the-art equipments covering recommendations for repair and remedial measures for restoration and rehabilitation of aging structures to ensure the structural integrity, restoration of strength and health of RCC structures like Turbine Generator Foundation, Boiler Mill Foundation, FD & ID Foundations, Chimney Shell, Silos, residential buildings, cooling towers, hospital building etc.
- Study on field and laboratory investigations of concrete dam.
- Evaluation of cementitious repair products conforming to EN 1504-2005 for NHPC.
- Seismic evaluation of load bearing structure.
- Performance evaluation for Steel Fibre Reinforced Shotcrete (SFRC) Lining of the underground Desilting Chambers of a hydro power project
- Condition Assessment Study using Non Destructive & Partial destructive Evaluation Technique including repair methodology and schedule of items for repair & restoration work of Minor Bridges/culverts & Major Bridges at NTPC Rihand
- Assessment of fire damaged Reinforced Concrete Structures
- Third party quality assurance services during execution of repair work for structures such as cooling towers, chimneys, residential colonies, etc.
- Experimental investigation on effectiveness of sacrificial anode based cathodic protection in reinforced concrete.



UPV test of Concrete Structure for Quality Assessment



Pull-Off Test Being done to check bonding of PMM with substrate concrete



Condition Assessment of RCC Bridges



Core extraction from RCC foundation



Half-cell Potential Measurement of Corrosion Damaged Structure

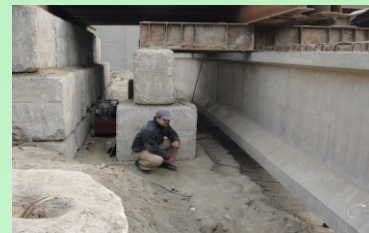


Carbonation depth being measured on freshly extracted core at site

# Structural Optimization and Design

## Services offered:

- Evaluation of Structural adequacy and Seismic load carrying capacity of structures
- Proof Checking of Structural Design
- Service Life Design for concrete structures
- Load testing and assessment of load-carrying capacity of structural elements
- Detailed investigation on mechanical, thermal, chemical & mineralogical properties of aged concrete dams



*Load Test on Prestressed Concrete I Girder*

## Studies undertaken

- Performance and durability studies on Pre-stressed Concrete made with PPC
- Effect of Supplementary Cementitious Materials (single and Multi blends) on the service life design of concrete structures
- Studies on fracture behaviour of High Strength Concrete
- Effectiveness of different repair systems for the repair, restoration and strengthening of corrosion damage structures
- Performance evaluation of fibre reinforced concrete for performance improvement of concrete structures
- Field and laboratory investigations of aged concrete dams for Finite Element Analysis and deciding repair/rehabilitation strategy.
- Studies on mechanical and time dependent properties of Very High Strength Concrete (100 to 130 MPa) and Ultra High Strength Concrete (130 To 180 MPa)



*Testing of notched beam in progress for the study of fracture behaviour of High Strength Concrete*



*Test for Determination of Creep Coefficient (In Compression)*



*Concrete Core extraction of 150 mm diameter & 1 metre length from gallery of Gravity Dam*



*Flexure toughness test on Steel Fibre Reinforced Concrete*



*Flexural test setup for Geopolymer Reinforced Concrete Beams (In Flexure)*

# Construction Technology and Management

## Services offered:

- NCB - Inspection Body is carrying out Third Party Quality Assurance/Audit (TPQA) of new construction projects in construction scope sector for Buildings, Roads, Bridges & Tunnels, Construction of Utility projects, Other civil Engineering Projects, Special construction activities etc.
- Consultancy for fly ash based building products such as fly ash bricks, paver blocks, kerb stones, aerated concrete block etc.
- Precast Concrete Technology
- Use of Advanced Electronics in Construction and Condition Assessment of Concrete Structures
- Studies on Mechanical and Durability Properties of High Strength Geopolymer Concrete
- Developed optimized concrete mixes and customized lab scale 3D Printer for printing intricate concrete elements

## Studies undertaken

- Third Party Quality Assurance/Audit for more than 2200 projects across the country in construction scope sector for CPWD, PWD, Municipal Corporations of Delhi, DDA, ITPO, IICC, AIIMS, LUVAS, PGCIL, etc.

Major projects:

- ☞ Buildings - Housing projects in CPWD & DDA, AIIMS
- ☞ Roads – Various road projects in MCD
- ☞ Bridges – ROB Sultanpuri, VIKASPURI and Barapullah flyovers
- ☞ Tunnels – Transit development at Pragati Maidan, PWD
- ☞ Utility Projects – Transmission lines foundations, PGCIL
- ☞ Special Construction Activities – Convention Centre's, IICC and ITPO

Technical Audit and Quality Assurance including testing of materials, repairs, retrofitting, capability building etc. for major reconstruction projects of earthquake affected areas for Gujarat State Disaster Management Authority (GSDMA), construction of 7000 classrooms by PWD, New Delhi, irrigation projects in Karnataka state etc.

## Some Major Projects



India International Convention & Expo Centre, Dwarka-New Delhi



Conventional Centre in Pragati Maidan – ITPO, New Delhi



Underpasses / Tunnel works in Pragati Maidan- PWD, New Delhi



Museum at Noida- CPWD



Central Public Works Dept. (Srinivaspuri, Delhi)



Non-Residential Buildings using Pre-Engineered Construction Technology at KG Marg and Africa Avenue, Delhi



Quarters at Jasola- DDA, Delhi



Central Revenue Quarters– CPWD, Chennai



Construction of VC & Administration Building for Lala Lajpat Rai University for Veterinary and Animal Science at Hisar, Haryana



3D Printed Concrete object manufactured using indigenous developed 3D customized printer



Inauguration of Trial Stretch made using Geopolymer paver blocks



Trial Stretch made using Geopolymer Concrete

# Laboratory facilities added in CDR

To enhance the experimental capability of the centre, several testing equipment related to study of cement and concrete characteristics and its behavior have been added. These equipment are procured under plan grant for different R&D and Sponsored Projects. The laboratory comprises of advance equipment for testing mechanical and durability parameter of various research projects.



Lab scale 3D concrete printer



Initial surface absorption test (ISAT) apparatus to evaluate the rate of water absorption by concrete samples



Creep testing apparatus to evaluate creep coefficient



BET Apparatus for determining fineness of ultra-fine powder materials such as silica fume, metakoline, ultrafine fly ash, ultrafine slag etc.



Mercury Intrusion Porosimeter test is used to study the pore size distribution and porosity of aggregate, concrete and mortar.



Test for Stress Strain Characteristics in progress for High Strength Concrete



Modulus of Elasticity and Poisson's ratio determination through high precision servo controlled Compression Testing Machine-3000kN



Strain Controlled Flexural Testing Machine-300kN for determination of flexural toughness of fiber reinforced concrete and crack mouth opening gauge for measurement and control of crack width in concrete samples



Confined Compressive strength of Concrete and Rock Specimens



Water Permeability Test on concrete samples.



Net Transverse strength of Cement concrete tile using Flexure Testing Machine of 10kN



Rapid Chloride Penetrability Test for concrete Samples to study the chloride ions penetrability.

Nondestructive Testing and Distress Investigation Lab with state of the art equipment such as digital Rebound Hammer, UPV tester, Corrosion Analyzer, Endoscopy, Pile Integrity Tester, Ground Penetrating Radar, Impact Echo Tester etc.



State of art Non-Destructive Testing Laboratory at NCB Ballabgarh



Extraction of Concrete Core of 150 mm diameter from Gallery Portion of Dam structure



PUNDIT Lab Plus (UPV Tester) for Quality Assessment



## SOME OF OUR VALUED CUSTOMERS

- ACC Limited, Mumbai
- Agricultural Produce Marketing Committee, Gujarat
- Airport Authority of India
- All India Institute of Medical Sciences, New Delhi
- BASF India Limited
- BSES Rajdhani Power Limited
- Cement Corporation India Limited
- Central Water Commission
- Delhi Development Authority
- Delhi Metro Corporation Limited
- Delhi Tourism & Transport Development Corporation Limited
- Delhi Urban Shelter Improvement Board
- Fosroc Chemicals (India) Pvt. Ltd.
- GAIL (India) Limited
- Gannon Dunkerley and Company Limited
- Garrison Engineer (AF), Air Force
- Gujarat Maritime Board
- Haryana Urban Development Authority
- Himachal Pradesh Power Corporation Limited
- India International Convention & Exhibition (IICC) at Dwarka, New Delhi
- India Trade Promotion Organization, New Delhi
- Indian Agricultural Statistical Research Institute, New Delhi
- Indian Institute of Public Administration, New Delhi
- Indian Oil Corporation Limited
- Jindal Power Limited
- JSW Cement Limited
- JSW Limited
- Kolkata Port Trust
- Lala Lajpat Rai University of Veterinary & Animals Science
- Larsen & Toubro Limited
- Mangdechhu Hydroelectric Project Authority, Bhutan
- Municipal Corporations of Delhi
- National Highways Authority of India
- National Informatics Centre, Hyderabad
- National Remote Sensing Centre
- National Small Scale Industries Corporation, New Delhi
- NBCC Limited
- Neyveli Uttar Pradesh Power Limited
- NHPC Limited
- NTPC Limited.
- Odisha Industrial Infrastructure Development Corporation,
- Omnibus Industrial Development Corporation, Daman
- Power Grid Corporation India Limited
- Public Works Department, Govt. of Delhi
- Public Works Department, Govt. of Meghalaya
- Rajasthan Rajya Vidyut Utpadan Nigam Limited
- Ratnagiri Gas & Power Company Limited
- Reliance Energy Limited
- Reliance Infrastructure Limited
- Reserve Bank of India
- RITES Limited
- Sardar Sarovar Narmada Nigam Ltd, Gujarat
- Simplex Infrastructure Pvt. Ltd.
- SINTEF Building and Infrastructure, Norway
- SJVN Limited
- Sport Authority Gujarat
- TATA Power Delhi Distribution Ltd
- Tata Steel Limited
- THDC India Limited
- U P Rajya Vidyut Utpadan Nigam Ltd
- UJVN Limited
- Vardhman Special Steels Limited
- Visvesvarya National Institute of Technology
- Central Public Works Department, IIT Roorkee

### FOR FURTHER DETAILS, PLEASE CONTACT

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