

Annual Report 2016-17



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Cement and Building Materials

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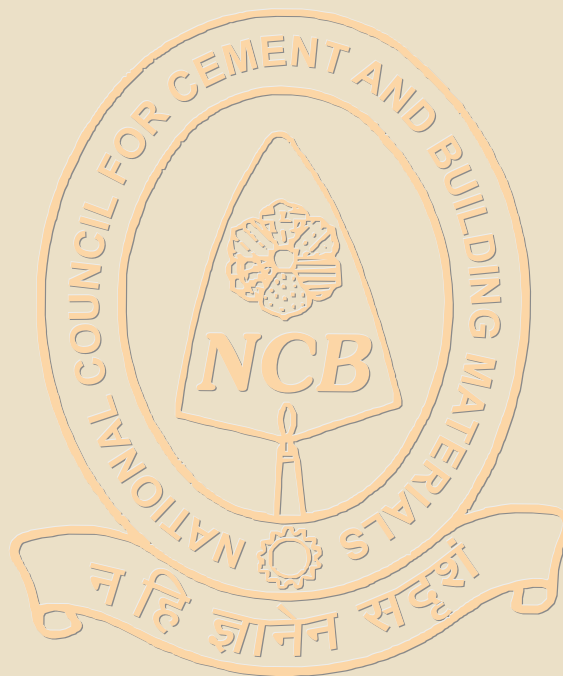
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* Till 24 July 2017

** Since 25 July 2017

*** Till 07 March 2017

Since 08 March 2017

Till 31 March 2017

Since 01 April 2017

@ Till 30 April 2017

@@ Since 01 May 2017

@@@ Since 01 July 2017

Annual Report 2016 - 17

1 APRIL 2016 TO 31 MARCH 2017



National Council for Cement and Building Materials
(Under the Administrative Control of Ministry of Commerce & Industry, Govt of India)
34 Km Stone, Delhi-Mathura Road (NH-2), Ballabgarh-121 004, Haryana

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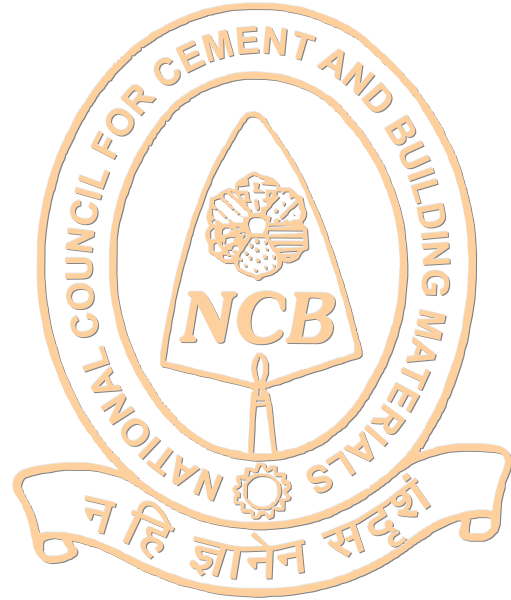
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FOREWORD



It gives me immense pleasure in presenting the Annual Report, 2016-17 of National Council for Cement and Building Materials (NCB), the premiere Research & Development and consultancy organization of our nation and of International repute in cement, concrete, construction and building materials sectors.

It is my honour to be associated with this esteemed organization which through its continuous innovative developments has been rendering its high quality technical services to the said industries. It is equipped with modern laboratories and highly efficient scientists and engineers. Maintaining standards, quality, timeliness and keeping pace with latest technology with future vision are its virtues which need special mention. The organization's Ballabgarh, Hyderabad and Ahmedabad Units are now ISO 9001:2015 (earlier ISO 9001:2008) certified.

NCB, through its six Centres spread across India is providing research and development support to Building Materials Industry and especially to Indian cement industry which being the second largest globally has a responsibility to fulfil in the areas of environment protection, sustainability and energy efficiency. NCB has been a great support to the cement industry towards this end. NCB's work includes improving operational parameters including energy efficiencies and conservation of valuable mineral resources. Besides, NCB is also supporting construction industry through its various projects, aiming to improve the life of structures and use of alternative materials in construction.

In the Cement Research programme, development of chemical formulations for enhancing and achieving desired properties of cements, investigations on Portland limestone cement, development of composite cements, Nano-particles blended cements, evaluation of high volume fly ash cements, development of geo-polymeric cements etc. are the few projects where NCB has been carrying out intense research work.

Utilization of low grade/marginal grade limestone for cement manufacture through various ways, updating National Inventory of Cement Grade Limestone, environmental management in cement & building materials industries, quality management etc. are the important and crucial areas where NCB's efforts are praiseworthy.

NCB has been rendering its high quality technical services to the cement and building material industries by executing projects on sponsored basis, testing materials in its ISO 17025 accredited (by NABL) and BIS recognized laboratories, calibrating equipment in ISO 17025 accredited (by NABL) laboratories, providing calibration, reference material and proficiency testing services, training and solving problems wherever required. NCB has completed 276 sponsored projects during the year 2016-17.

NCB has been carrying out significant work for the concrete and construction industries, including for various mega projects. It has its own well developed advanced concrete research laboratory with state-of-the-art equipment. Development of design parameters for high strength concrete, evaluation of concrete making materials and mix design, alkali aggregate reaction (AAR) studies of aggregates, development of accelerated mix design method for concrete using PPC or OPC with fly ash etc. are the important areas where NCB has contributed to the industries. NCB has also developed number of special concretes for different uses. It has completed number of projects on structural assessment of buildings, bridges, dams, flyovers etc. Third Party Quality Assurance/Audit (TPQA) programme has assisted various organizations to ensure delivering quality constructed facilities.

In the area of human resources development, NCB conducted 56 training programmes during the year 2016-17 benefiting 1073 participants from various organizations in India and abroad. In the area of quality management, NCB conducted 12 inter laboratory proficiency testing schemes through its Inter-Laboratory Services programme (ISO 17043 accredited by NABL). NCB developed 2 new reference materials during the year and continued the delivery of reference materials to the industries. ISO 17025 accredited (by NABL) calibration services were also provided.

NCB is organizing 15th NCB International Seminar on Cement, Concrete and Building Materials during 05-08 December 2017 in New Delhi. It has been seen and experienced from its earlier 14 seminars that participants from a wide spectrum of fields of expertise from India and abroad join the seminar. Technical presentations, deliberations and discussions are being held during the seminar. The Technical Exhibition during the seminar is a fruitful event for both manufacturers and users. Overall, a most successful event is being organized by NCB. It benefits the cement and building material Industries.

I wish to extend my sincere thanks to my colleagues on the Board of Governors and its Committees for their valuable advice and the inputs which they provided which in turn clarifies the path on which NCB's research activities have to be undertaken. Our sincere most thanks are also due to the Secretary, Additional Secretary and other officials of Department of Industrial Policy and Promotion (DIPP), Government of India for their continuous support and guidance for improving its performance year on year and also ensuring adherence to the government norms.

Dr S Chouksey
Chairman

03 November 2017

INTRODUCTION



I am delighted to present the Annual Report of National Council for Cement and Building Materials (NCB) for the year 2016-17, containing the various activities carried out during the year including the achievements of NCB through its Research and Development Programmes. NCB has executed a number of R & D projects covering a wide spectrum of research areas, and maintaining highest standards of quality and maintaining timeliness, with a view to meeting current and emerging needs of cement, concrete, construction and building material industries. It has also rendered its high quality technical services and imparted updated training to the cement, construction and allied industries.

The spectrum of areas in cement research undertaken by NCB and executed efficiently for industrial implementation are investigation on Portland Limestone Cement, development of chemical formulations for enhancing and achieving desired properties of cements, development of composite cements, technical suitability of Performance Improver in PPC and PSC, evaluation of high volume fly ash cements, application of nanotechnology in cement and concrete and development of geopolymers cements.

The developments through research projects in the areas of upgradation of low grade/ marginal grade limestone through dry beneficiation technology, best practices for reduction of NO_x and SO_2 emissions for Indian Cement industry, water footprint assessment for cement plants, development of design parameters for high strength concrete, development of methods for service life design for concrete structures, evaluation of concrete making materials and mix designs, designing of self compacting concrete, designing of abrasion resistant concrete with and without steel fibre, evaluation of corrosion inhibitor, development of alternatives to natural sand for use in concrete etc. are being carried out through its research and development programmes.

Sponsored projects have been carried out in the areas of beneficiation of low grade limestone, performance assessment of air pollution control equipment, environment management, monitoring of environmental parameters, diagnostic study for minimizing excessive coating and ring formation, and improving burnability, pyro-processing and grinding operations, energy audits of cement plants, TFR for modernization of packing plant, petrographic and mineralogical analysis and alkali aggregate reaction (AAR) studies, development of special concretes like anti-washout underwater concrete, shotcrete and self compacting concrete have been developed for different hydel projects, building structures and irrigation projects etc.

NCB has conducted diagnostic and prognosis evaluation of distress and condition assessment on variety of structures such as Turbo Generator Foundation, Dam Structure, Cooling Towers, Bridges and Residential, Commercial and Industrial Buildings in different states in India. Third Party Quality Assurance/Audit (TPQA) programme of the centre has assisted various organizations to ensure quality workmanship to meet their specified quality standards in delivering quality constructed facilities. TPQA was carried out for roads and bridges construction; residential, commercial and institutional buildings; canal lining work; concrete drain projects; boundary wall construction etc. for construction industry.

In quality management area, projects relating to quality improvement and accreditation are undertaken. NCB assisted one coal testing laboratory of a power plant in documentation and implementation of quality management system in line with ISO 17025:2005 and NABL accreditation. An interlaboratory comparison study of 3 quality control laboratories of a cement company was carried out. Laboratory assessment and proficiency improvement study was carried out for four quality control laboratories of a cement company.

Under Inter laboratory services, 12 new schemes have been completed on materials like: steel bar, fly ash, coal, limestone, PPC, building brick, ceramic tile, aggregate and water used in construction. Of the 12 new schemes, concrete admixture, chequered tile and paver block PT scheme have been conducted for the first time in India.

During the year, NCB successfully upgraded its Quality Management System from ISO 9001:2008 to ISO 9001:2015. Inter Laboratory Services has been reassessed for accreditation as per ISO 17043, by NABL, with enhanced scope.

NCB has so far developed 77 certified reference materials and during the year 2016-17, 2 new types have been developed and made available to the industries. Delivery of CRMs was continued to the cement and construction industry laboratories and a total of 9571 vials of different CRMs and 1418 sets of standard lime were supplied to 588 customers. The calibration laboratories continued to implement Quality Management System as per ISO 17025:2005 requirements. During the year a total number of 1778 equipment/apparatus including proving rings, compression testing machines, vibrating machines, dial gauges, Blaine cells, pressure gauges, sieves, thermometers, environmental chambers, ovens, furnaces, balances and weighing scales of a RMC plant were calibrated for 497 clients.

Under its Continuing Education Services, NCB has been organizing and conducting training programmes in the areas of cement, mining, environment, process, concrete, construction etc. through long term, short term, special group, contact and simulator based courses. During the year, 56 training programmes were conducted benefiting 1073 participants from various organizations in India and abroad.

It gives me immense pleasure to mention that NCB is organizing its 15th NCB International Seminar on Cement, Concrete and Building Materials during 05-08 December 2017 in New Delhi.

I extend my sincere thanks to my colleagues for their support, cooperation and commitments in completing the projects. I am grateful to the Board of Governors and its Committees, Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, Govt. of India for their support, guidance and encouragement. I also thank industry in general for reposing faith in NCB's services and their continued patronage without which no achievements would have been possible.

03 November 2017

Ashutosh Saxena
Director General (Actg.)

NCB'S PROGRAMMES AND THEIR FULFILMENT

The Corporate Programmes

*N*ational Council for Cement and Building Materials (NCB) has been rendering its high quality services to the cement and construction industries through its Research & Development Programmes and Consultancy Services. It has achieved many milestones in the subject areas and fulfilled targets in providing innovative technological solutions to the industry, and as whole to the Nation. NCB has modern laboratories which are well equipped with sophisticated and latest equipment and has well trained highly efficient scientists and engineers to carryout the innovative research and development projects as well as giving technical know-how to the said industries. Technical Services are provided in the areas of Raw Material Resources, Utilization of Industrial Wastes, Development of Newer Products, Process Optimization, Co-processing, Techno-economic Feasibility Studies, Environmental Studies, Plant Maintenance, Structural Assessment and Rehabilitation, Quality Assurance in Construction, Concrete Technology, Materials Evaluation, Application of Nano Technology, Total Quality Management, Development of Reference Materials, Calibration and Proficiency Testing Services and providing industrial information.

Investigations on Portland Limestone Cement using deferent grades of limestone are carried out to formulate new Indian Standard for commercialization of Portland Limestone Cement. Studies have been carried out to develop and design chemical formulations with different chemical additives dosages for achieving the required properties in the cement. Use of mechanical mixer in Physical Testing and Fixed w/c ratio for compressive strength testing of cements are studied. Under its waste utilization programme, investigations on technical suitability of Performance Improver in PPC and PSC, and preparation and evaluation of high volume fly ash cements are studied. Investigations on cement containing nanoparticles, development of Geopolymeric Cements and development of Composite Cements are carried out. National Inventory of Cement Grade Limestone Deposits in India has been updated as on 31st March 2017. Investigations on beneficiation of low/marginal grade limestone on laboratory scale has been carried out for a cement plant. Under its Environment Management Programme, environment monitoring studies for a construction site, cement plants, performance assessment of existing Air Pollution Control Equipment for a cement plant, best practices fro reduction of NO_x and SO₂ emissions for Indian Cement Industry, and water foot print assessment for a cement plant are carried out. In the Process Optimization and Productivity area diagnostic studies were carried out. Mandatory energy audit under the Bureau of Energy Efficiency was conducted for a cement plant in India. In the field of Project Engineering and System Design, consultancy services for setting up a 600 tpd cement plant including DPR preparation in Republic of Congo, technical feasibility study for fly ash handling system of a cement plant in India, feasibility study for automation of cement silo feeding system for better control of the operation, feasibility study for installation of cement bag counting system and feasibility study for coal handling system for a cement plant are successfully executed. Developments are continued in design parameters for high strength concrete and in development of methods for service life design for concrete structures. Evaluation of concrete making materials and

mix design and petrographic & mineralogical analysis and alkali aggregate reaction (AAR) studies are carried out. More than 25 numbers of self compacting concrete were designed for an organization. NCB carried out research on utilization of various waste based materials such as C&D waste, bottom ash, copper slag and blast furnace slag in concrete and mortar in place of natural sand. NCB has conducted diagnostic and prognosis evaluation of distress and condition assessment in variety of structures. The Third Party Quality Assurance/ Audit was taken up for various projects. In the area of Total Quality Management services, assistance was provided in ISO17025 accreditation of coal testing laboratory of a power plant, and training workshop on laboratory management system and internal audit as per ISO 17025:2005 was conducted. An interlaboratory comparison study of 3 quality control laboratories of a cement plant was carried out. During the year, NCB successfully upgraded its Quality Management System (QMS) from ISO 9001:2008 to ISO 9001:2015. Interlaboratory services completed 12 proficiency testing schemes. Calibration services are continued. Reference materials have been developed and provided to the end users. NCB has a wide range of CRMs for chemical and mechanical parameters of cement, fly ash and other materials. So far, 77 types of CRMs have been developed.

NCB's Rolling Plan of Missions is given in Appendix-I. During the year, projects with time target, cost and assured end product were pursued under six Corporate Centres which are responsible for delivering the needed technological support services to the user industries. Close liaison was maintained with Cement Manufacturers Association (CMA), Ministry of Environment and Forests (MoEF), Central Pollution Control Board (CPCB), Indian Bureau of Mines (IBM), Bureau of Energy Efficiency (BEE), Bureau of Indian Standards (BIS) and concerned departments of the state governments on aspects related to the development of cement and construction industries including availability of raw materials, quality assurance, modernization, energy management, environment, consumer protection, human resources development etc.



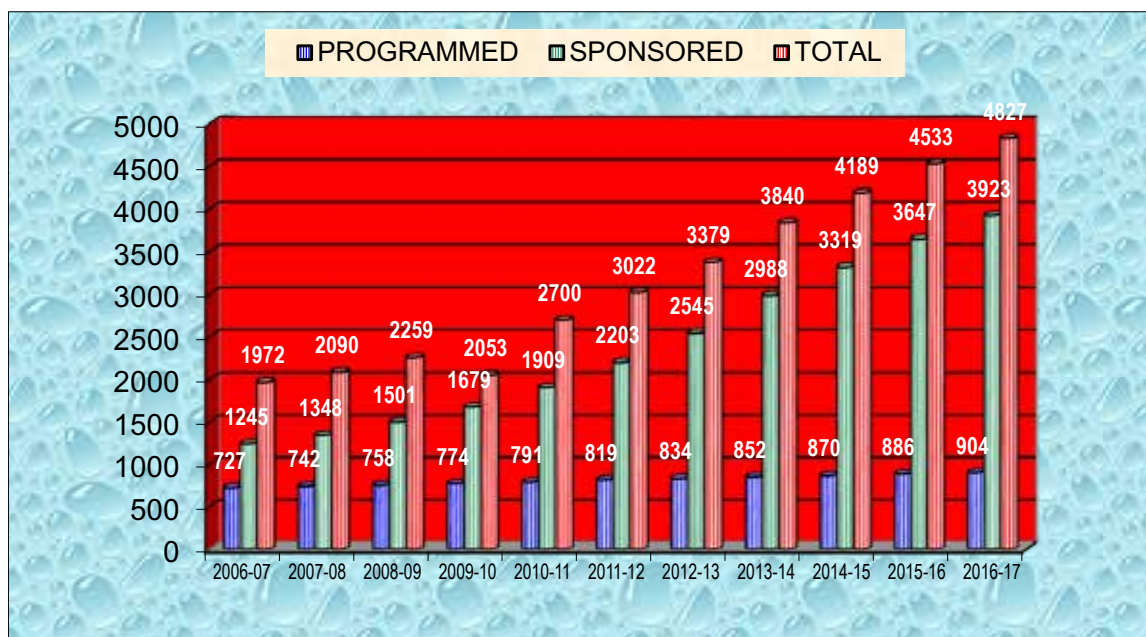
110th Board of Governance Meeting in Progress

Framework of Institutional Efforts

The activities of the Council were carried out under the six Corporate Centres at NCB's Units situated in Ahmedabad, Ballabgarh, Hyderabad and Odisha. While the infrastructure is physically distributed over these Units, all the Units are involved in the execution of projects or services as necessary, following the matrix approach.

During the year, 18 Programmed Projects and 276 Sponsored Projects were completed as listed in Appendices II and III, respectively. The Programmed Projects carried forward along with the new ones taken up comprised the R&D Programme for 2016-17, as given in Appendix-IV.

The broad activities carried out by the six Corporate Centres during 2016-17 are highlighted in the following sections.



Projects Completed by NCB (Cumulative)

CENTRE FOR CEMENT RESEARCH AND INDEPENDENT TESTING - CRT

The Centre executes its activities through five programmes viz. Cements and Other Binders; Wastes Utilization; Refractories and Ceramics; Fundamental and Basic Research; and Independent Testing. The Centre has completed 04 Programmed Projects and 27 Sponsored Projects during the year.

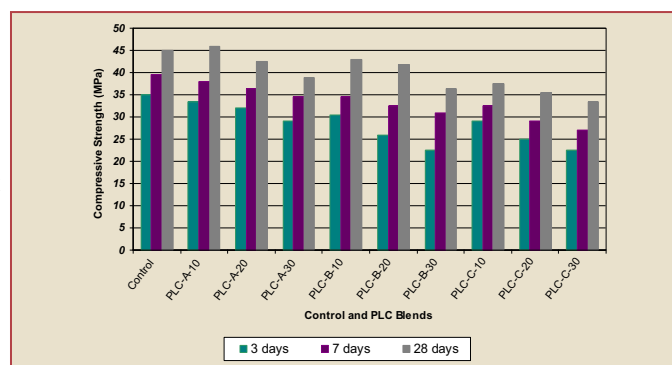
Cements and Other Binders

Establishing Limestone Consumption Factor (LCF)

LCF studies are very important from the point of view of rationalization of limestone consumption in production of cement, estimating royalty payable to state for the limestone mined from their respective captive mines, besides internal material audit of the concerned cement plants. NCB has carried out Limestone Consumption Factor (LCF) studies for cement plants from all over the country and so far established the same for 187 cement plants. During the year, LCF studies were completed for 07 cement plants in Rajasthan, Maharashtra, Andhra Pradesh, Tamilnadu, Gujarat and Madhya Pradesh.

Investigations on Portland Limestone Cement

European Standard EN-197-1 permits the use of maximum 35% limestone in the manufacture of Portland Limestone Cement. Presently, in India, there is no standard on Portland Limestone Cement. The main objective of the study is to investigate the feasibility of using different grades of limestone in development of Portland Limestone Cement in order to formulate new Indian standard for its commercialization along with lowering in clinker factor in cement for environmental sustainability. To carry out the study, different Portland Limestone Cement blends were prepared by inter-grinding of 10, 20 and 30 wt. % cement grade of limestone, dolomitic limestone and low grade limestone with OPC clinker and gypsum. The cement blends were designated as PLC-A, PLC-B and PLC-C corresponding to cement grade limestone, dolomitic limestone and low grade limestone. The trend of compressive strength development showed marginal reduction in strength development with increasing dosages of limestone in cement mix as shown in the *figure*.

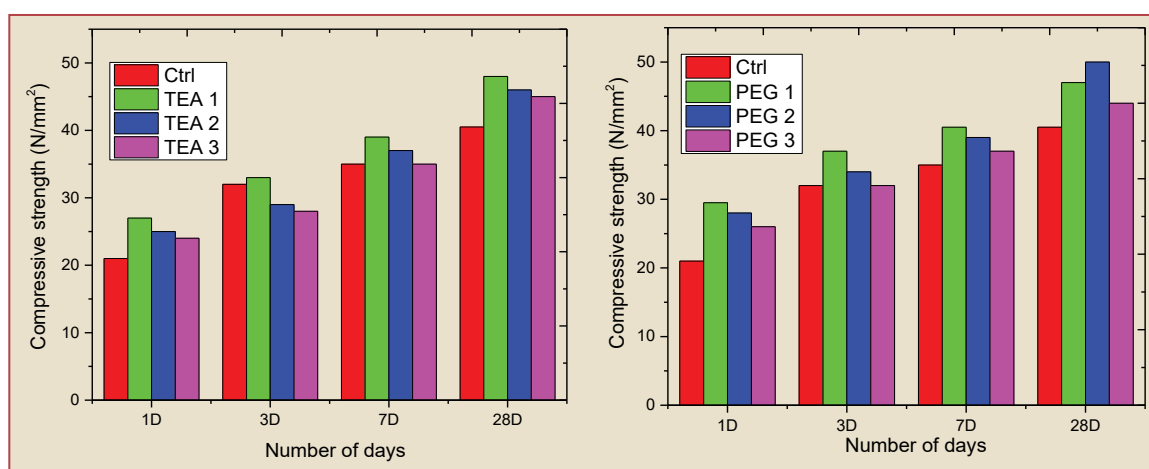


Trend of Compressive Strengths of PLC Blends

Development of Chemical Formulations for Enhancing and Achieving Desired Properties of Cements

This project was taken up with the aim to develop and design chemical formulations with different chemical additives dosages for achieving the required properties in the cement. Three different sources of clinker and gypsum were procured for the project studies. As the fineness of the finished cement is one of the main factors that affects the early strength development, experimentations were performed in utilizing the chemical additives as grinding aids to enhance the grinding efficiency of clinker in cement production. During grinding of clinker, the free energy of the surface increases and the non-equilibrium becomes significant. The aggregation and agglomeration, therefore, becomes increasingly significant and the efficiency of the mill is reduced. Thus, the energy consumption increases progressively due to agglomeration in the cement mill and a higher amount of energy is lost in heat. The use of optimized quantity of grinding aids reduces the formation of agglomerates in the cement mill resulting in reduced clinker size.

Higher additions of chemical additives will lead to lubrication effects that will decrease the breakdown of the particles and the efficiency of the mill will decrease. The experimental results obtained by the addition of 0.02, 0.03 and 0.04 wt% of derivative of amine and glycol is depicted in *Figures (a)* and *(b)*. The results show that the addition of chemical additives enhances the compressive strength at all the ages from 1 day to 28 days, compared to control sample. The enhancement in compressive strength is due to acceleration of hydration of both the silicate and aluminate phases.

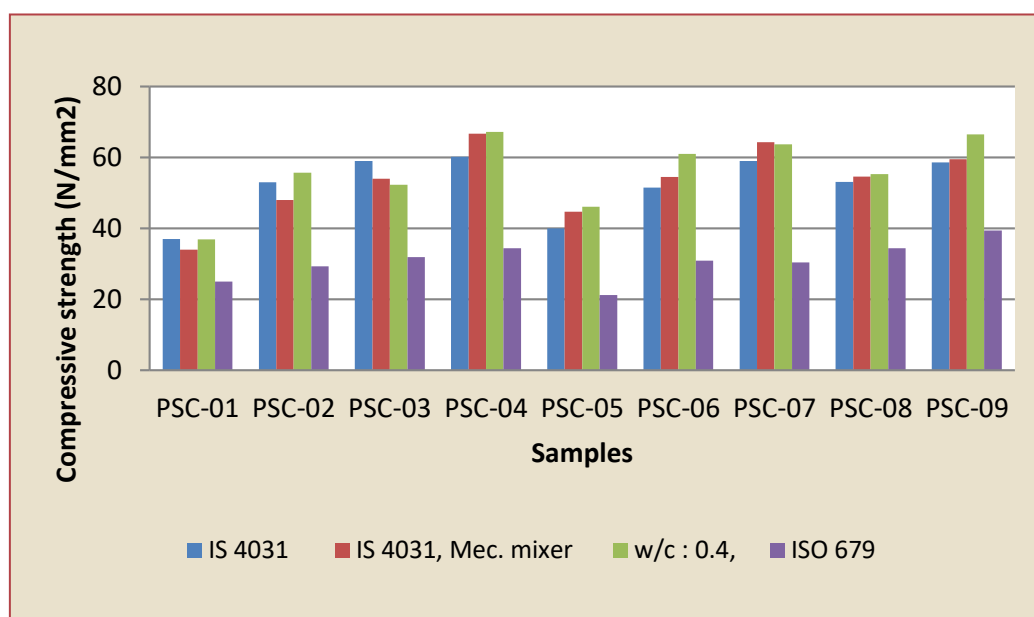


(a) Compressive Strength for 1,3,7 and 28-days for Fixed Fineness: $\sim 300 \text{ m}^2/\text{kg}$
(a) TEA (b) PEG

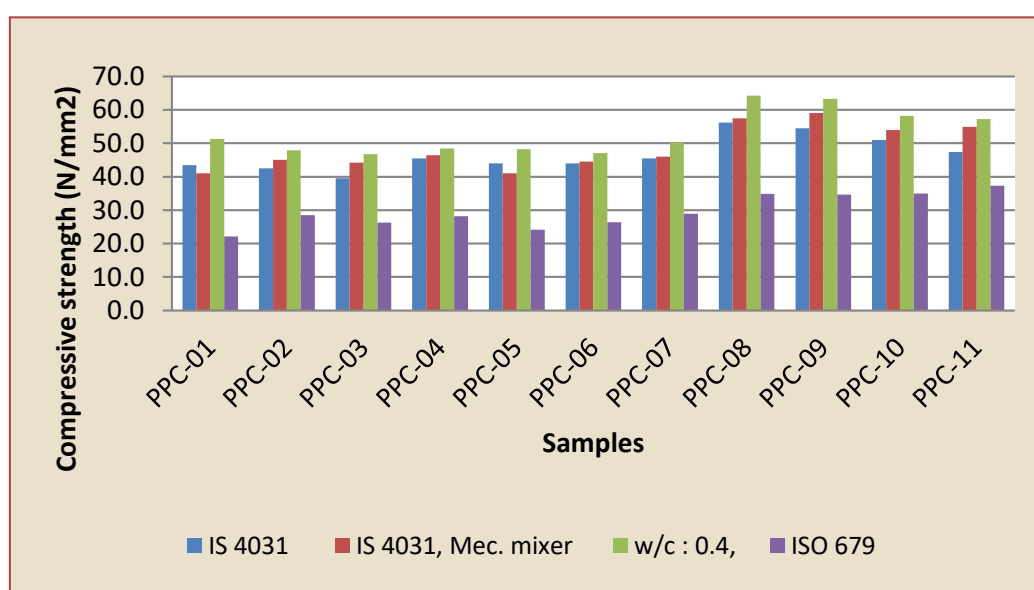
Use of Mechanical Mixer in Physical Testing and Fixed w/c Ratio for Compressive Strength Testing of Cements

Studies were taken up on use of mechanical mixer and fixed w/c ratio in physical testing of cements. OPC, PPC and PSC samples were tested as per Indian standard test methods using manual gauging as well as mechanical mixer for preparation of paste and mortar. These cement samples were also tested for compressive strength using mechanical mixer and fixed water/cement (w/c) ratio of 0.4. Use of mechanical mixer is already specified in

IS 4031 (Part 7) for preparation of mortar for testing of compressive strength of masonry cement. A similar mechanical mixer is also specified in IS 1727 for preparation of mortar for the determination of lime reactivity of pozzolanic materials as well as for determination of compressive strength of pozzolana cement. Use of mechanical mixer resulted in lower values of normal consistency from current practice of manual gauging for OPC, PPC and PSC. Use of mechanical mixer showed relatively lower setting times of OPC but relatively higher setting time of PPC and PSC. Le-Chatelier and autoclave expansion were not affected by use of mechanical mixer. Use of mechanical mixer resulted in higher values of compressive strength of OPC, PPC and PSC. Use of fixed w/c ratio of 0.4 resulted in higher values of compressive strength of OPC, PPC and PSC samples at all ages as shown in the *figures*.



Compressive Strength of PSC Samples at 28-days



Compressive Strength of PPC Samples at 28-days

Development of Composite Cements

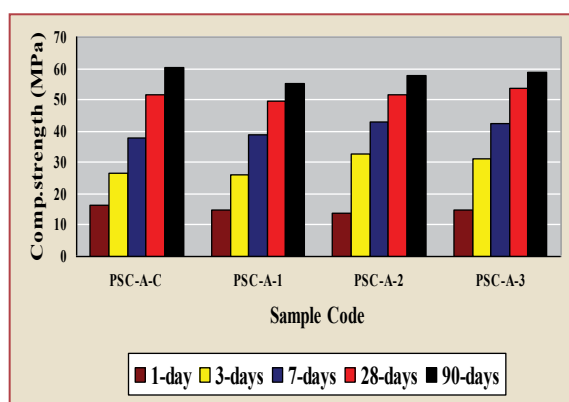
Composite cement blends containing up to 60% clinker and 55% combined mixes of fly ash and granulated blast furnace slag (GBFS) have been prepared and evaluated for their physical properties up to the period of 360-days. At the above clinker replacement level, the values of compressive strength of composite cements were lowered up to 28-days and improved at later ages as compared to control cements. The hydration characteristics of these composite cement blends indicated formation of different hydrated products and dense microstructure at later ages. Compressive strengths of concrete specimens prepared using above composite cement blends were found to be comparable to the concrete specimens prepared using PPC and PSC blends. Regarding durability against chloride induced corrosion, concrete specimens of composite cement blends show far better resistance in comparison to OPC concrete.

Waste Utilization

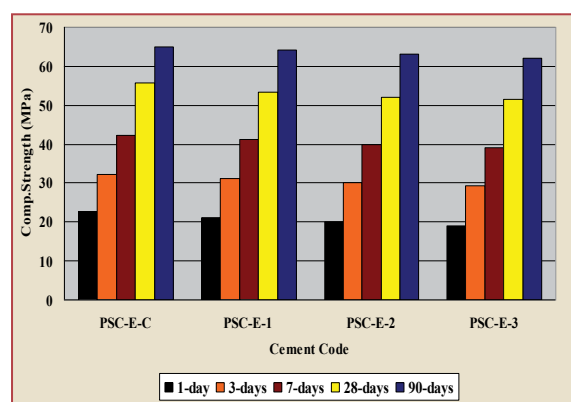
Investigations on Technical Suitability of Performance Improver in PPC and PSC

Bureau of Indian Standards (BIS), through IS:269-2015 permits the use of 5% maximum different mineral additives such as limestone, fly ash, granulated BF etc as performance improver in the manufacture of Ordinary Portland Cement (OPC) to enhance the properties of cement and concrete in fresh and hardened state. Presently, use of performance improvers is not permitted in blended cements; Portland Pozzolana Cement (PPC) and Portland Slag Cement (PSC). Therefore, in view of above, investigations have been carried out for evaluating technical suitability of performance improvers in PPC and PSC to enable revision of Indian standards to make the provision for using performance improvers in PPC and PSC production.

Different PSC blends were prepared by inter-grinding of OPC clinker, mineral gypsum and 50% granulated BF slag (control cement, PSC-C) with addition of 5%, max fly ash, high grade and dolomitic limestone as performance improvers replacing equal clinker content, maintaining Blaine's fineness at $380 \pm 10 \text{ m}^2/\text{kg}$ (Set-I). PSC blends were also



(a)

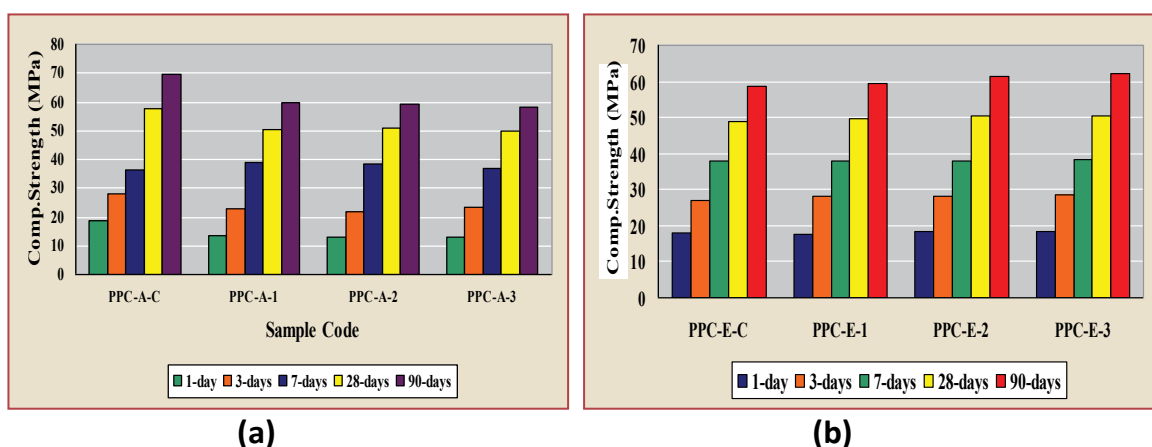


(b)

Compressive Strengths of PSC Blends Prepared by (a) Replacing Equal Clinker Content
(b) Maintaining Constant Clinker Content

prepared by maintaining constant clinker content and incorporating 5% above performance improvers by replacing blending component, BF slag, to counter the dilution effect (Set-II). These blends were designated as PSC-1, PSC-2 and PSC-3 corresponding to addition of fly ash, high grade limestone and dolomitic limestone, respectively. The trend of compressive strength development of PSC blends prepared in Set-I showed marginal reduction in compressive strength, particularly at early ages (*Figure-a*), whereas compressive strength of PSC blends prepared in Set-II was found to be comparable to control counterpart (*Figure-b*). Therefore, the reduction in compressive strength could be attributed to the lowering in clinker content.

Similarly, different PPC blends were prepared by inter-grinding of OPC clinker, mineral gypsum and 30% fly ash (control cement, PPC-C) with addition of 5%, max BF slag, high grade and dolomitic limestone as performance improvers replacing equal clinker content, maintaining Blaine's fineness at $330 \pm 10 \text{ m}^2/\text{kg}$ (Set-I). PPC blends were also prepared by maintaining constant clinker content and incorporating 5% above performance improvers by replacing blending component, fly ash, to counter the dilution effect (Set-II). These blends were designated as PPC-1, PPC-2 and PPC-3 corresponding to addition of BF slag, high grade and dolomitic limestone, respectively. The trend of compressive strength development of PPC blends prepared in Set-I showed reduction in compressive strength at all ages, particularly at early ages (*Figure-a*), whereas compressive strength of PPC blends prepared in Set-II was found to be comparable to control counterpart (*Figure-b*).

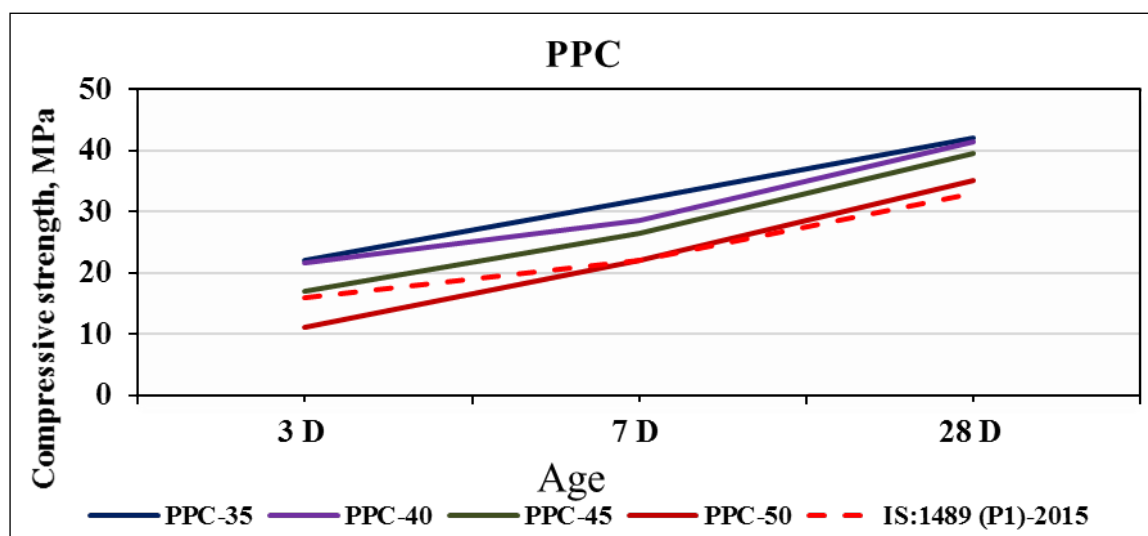


Compressive Strengths of PPC Blends Prepared by (a) Replacing Equal Clinker Content (b) by Maintaining Constant Clinker Content

Investigations on Preparation and Evaluation of High Volume Fly ash Cements

The Indian standard specification IS: 1489 (I)-2015 for Portland Pozzolan Cement (PPC) permits 35% max fly ash addition in PPC. In view of enhancing the use of fly ash in PPC in order to achieve resource conservation, a study has been taken up on preparation and evaluation of high volume fly ash cements (HVFAC) in line with European standard EN-197-1 that permits the use of up to 55% pozzolan content, including fly ash, in pozzolanic cements. Different approaches are being adopted for achieving desired strength development and other physical characteristics of HVFAC. The studies presently under progress include evaluation of PPC prepared using up to 50% fly ash to adopt a national

approach, the studies are being carried out using clinker from cement plants located in different regions/clusters in the country. Blends of PPC containing higher contents of fly ash up to 50% have been prepared and investigated for their chemical and physical properties. The studies conducted so far showed that at higher fineness levels and with use of good quality clinker and fly ash, the PPC prepared with 40-45% fly ash fulfilled the requirements of compressive strength, as specified in Indian standard as shown in the *figure*. Studies on effect of use of mechanically activated fly ash on the performance HVFAC blends are in progress. Investigations were also taken up on the use of performance enhancers to attain desirable performance in the HVFAC blends.



Trend of Compressive Strength Development of HVFAC

Fundamental and Basic Research

Investigations on Cement Containing Nanoparticles

Investigations on the applications of nanotechnology in cement and concrete were taken up with a view to achieve a substantial reduction in the clinker component of cement without compromising on performance. The benefits expected from application of nanotechnology to cement & concrete on improvement in performance characteristics of cement and concrete at lower clinker contents, enhanced utilization of waste materials in cement manufacture, savings in raw materials and energy through reduction of clinker content of cement and longer service life of structures. The aim of this project was to study from nanoparticle blended cements and cement based nanocomposites to investigations on nanosilica, nano- Fe_2O_3 and nano- TiO_2 as blending components in cement. Use of carbon nanotube (CNT) has also been investigated for achieving improvements in cement performance.

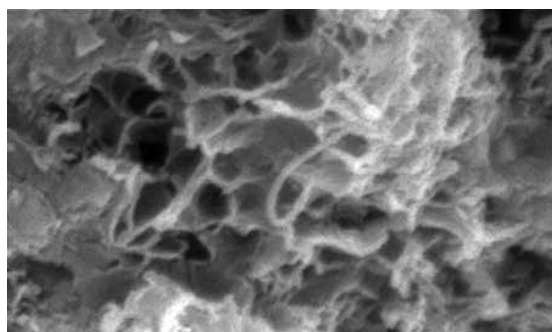
CNTs are excellent reinforcing materials due to extremely high strength, toughness and aspect ratios. The application of CNT in mortar enhances the strength and toughness in structures resulting in rationalization in the use of material. The major challenge for use of CNT as a reinforcing fiber is to achieve its proper dispersion in cementitious matrix. CNTs normally exist in agglomerated state and their homogeneous dispersion in any given

matrix is a challenging task. The dispersion of CNT in aqueous solutions was achieved with the different surfactants or super plasticizers by using ultra sound sonication.

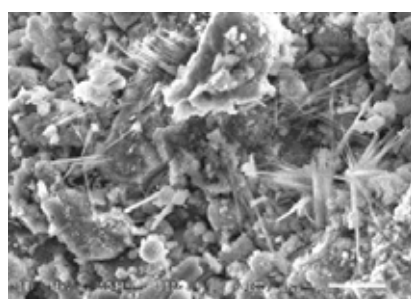
Development of Geopolymeric Cements

Study has been continued on fly ash based geopolymeric cements. Earlier investigations reported that performance of geopolymeric cementitious materials is associated with initial thermal curing conditions of alkali treated fly ash samples. At high initial thermal curing i.e. at 90°C in oven, the rapid gain in strength was observed but these specimens showed dimensional instability and retrogression in strength at later ages. The specimens were cured at 27°C and 50% RH up to a period of 75-days for compressive strength study after initial thermal curing. At low temperature curing i.e. 60°C, specimens showed volume stability up to a certain period of thermal curing but the strength development was found to be much slower. The initial thermal curing conditions have also been found to influence the micro-structural developments in the specimens (*see figure*).

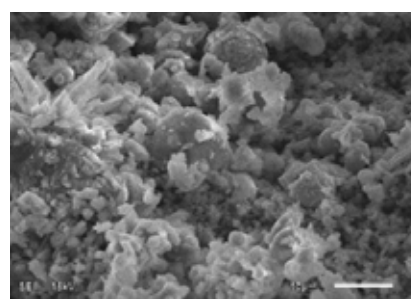
Formulations were prepared by addition of standard sand of two different grades in fly ash to obtain volume stability with consistent strength property in the alkali activated products by applying rationalized initial thermal curing at 90°C in oven. Investigations were carried out on preparation of cementitious materials by alkali activation of fly ash mixed with bottom ash, initially cured at 90°C. Studies indicated that cementitious binders with



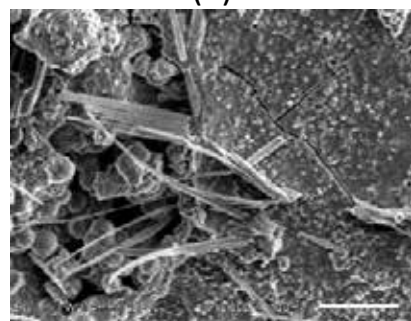
SEM image of CNTs dispersed in cement paste



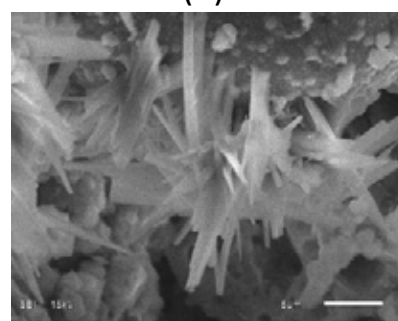
(a)



(b)

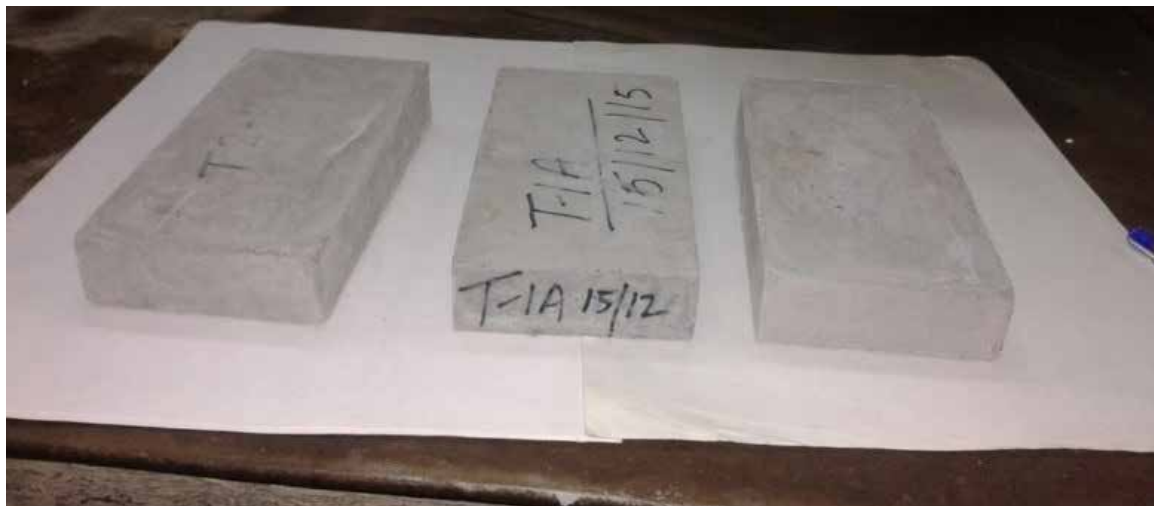


(c)



(d)

SEM Images of (a) Coarse Fly ash Based Specimen Cured at 60°C for 4d, (b) Fine Fly ash Based at 60°C for 3d, (c) Coarse Fly ash Based Specimen Cured at 90°C for 24h (d) Fine Fly ash Based Cured at 60°C for 5d followed by Curing at 27°C & 50% RH up to 75d



Laboratory Prepared Tiles

consistent strength property may be prepared using rationalized formulations and curing conditions. Based on studies, pre-cast bodies like tiles (150x75x25mm), meeting test limits of IS 2690 (Part 2):1992, were prepared (*see figure*).

Preparation of cementitious binders cured at 27°C under rationalized conditions by alkali activation of blends of fly ash with granulated blast furnace slag has also been investigated. The fly ash and slag characteristics were found to have effect on strength development along with other parameters like proportion of fly ash and slag in the blend, Na₂O content in formulation etc. Studies revealed formation of CSH gel along with NASH in this system resulting in development of compressive strength.

Independent Testing

Independent Testing Laboratories of NCB undertake complete physical, chemical, mineralogical and micro-structural analyses of various types of raw materials, cement, clinker, pozzolana, aggregate, concrete, admixtures, water, refractory, bricks, coal, lignite etc as per National and International standards.

The INT laboratories established in 1977 on a Test House pattern, undertake testing jobs for cement, construction and allied industries. NCB testing laboratories achieved a landmark when NABL accredited them in the year 1997 as per ISO 17025 quality system. The quality of testing services is maintained through complying with system criteria and accreditation. The laboratories are equipped with state-of-art instruments to carry out the tests as per National and International standards. During the year, assignments were carried out for samples from neighboring countries also. The number of samples tested during the period was more than 7800.



CENTRE FOR MINING, ENVIRONMENT, PLANT ENGINEERING & OPERATION – CME

The Centre for Mining, Environment, Plant Engineering and Operation carried out its activities through six Programmes viz. Geology, Mining & Raw Materials; Environmental Management; Process Optimization and Productivity; Energy Management; Plant Maintenance, and Project Engineering & System Desig. The Centre completed 16 Sponsored Projects during the year.

Geology, Mining and Raw Materials

Updating National Inventory of Cement Grade Limestone Deposits in India

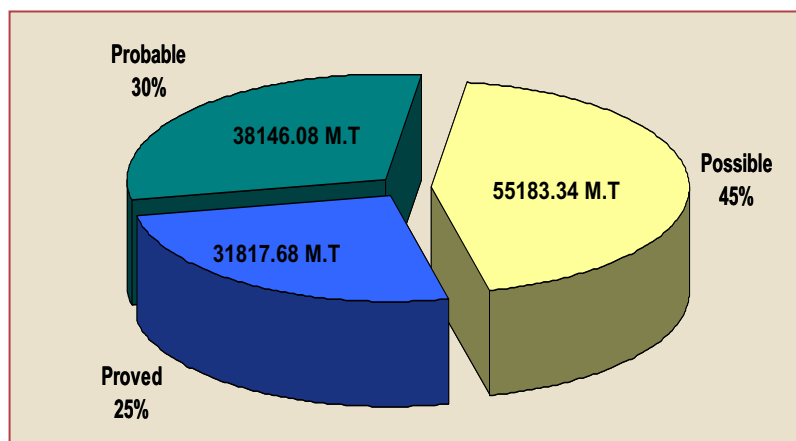
NCB under its continuous activity 'Updating of National Inventory of Cement Grade Limestone Deposits in India' has been kept updated through regular interaction with various state DGM's for collection of exploration data. The total limestone resources of all categories is estimated at 125147.10 million tonnes as on 31st March 2017 out of which the proved, probable and possible categories are of 31817.68 million tonnes, 38146.08 million tonnes and 55183.34 million tonnes, respectively.

Preliminary Investigation for Beneficiation on Laboratory Scale for Low/Marginal Grade Limestone

Preliminary Investigation for Beneficiation on Laboratory Scale for Low/ Marginal Grade Limestone for Sailaiya limestone mine, Tehsil Maihar, Dist Satna, Madhya Pradesh has been carried out for M/s Reliance Cement Company Pvt. Ltd The objective of the study is to upgrade the limestone through beneficiation by reducing the $\text{SiO}_2\%$ and $\text{MgO}\%$ content and

enhancing the $\text{CaO}\%$ content, so that this can be utilized for cement manufacture. A total weight of 675.22 kg of low grade limestone bulk samples was received having CaO 38.91%, SiO_2 18.55% and MgO 3.85% which is a mixture of clay and limestone fragments of various sizes.

The Physico-mechanical properties such as average compressive strength, density, porosity and average true specific gravity of the limestone were determined. The mineralogical studies through X-ray diffraction, optical microscopy and dry beneficiation studies of coarse size



National Inventory of Cement Grade Limestone Resources

fraction through sieve analysis of representative sample of limestone feed was carried out. The bulk sample as received passed through 75 mm sieve and the further sieving was carried out for sieve sizes of 50mm, 40mm, 20mm, 12.5mm, 10mm and 6.3mm and was chemically analysed.

In set-1, the cumulative recovery of upgraded limestone was 86.67% at +10mm sieve size and the grade retained was CaO 42.56%, SiO₂ 15.00% and MgO 3.14% which indicated the enrichment of CaO by 3.65%, SiO₂ reduction by -3.55% and reduction in MgO by -0.71% from the limestone feed quality of CaO 38.91%, SiO₂ 18.55% and MgO 3.85%.

Whereas in set-2, the cumulative recovery of 73.38% was retained at +10mm sieve size having the quality of CaO 42.80%, SiO₂ 14.52% and MgO 3.12% which was higher in quality from limestone feed quality by enrichment in CaO by 3.89%, reduction in SiO₂ by -4.03% and reduction in MgO content by -0.73%.

There is a reversal trend observed in the individual size fraction of -10+6.3mm where the CaO% is 37.42 and 38.17 and SiO₂% is 19.50 and 18.64 and MgO is 3.96 and 4.0, respectively for set and 1 and 2, and which is lower in quality than the feed quality. Therefore the cut off sieve size of 10mm was suggested for beneficiating this type of limestone.

Environmental Management

Performance Assessment of Existing Air Pollution Control Equipment (APCE)

Performance Assessment of Existing Air Pollution Control Equipment (APCE) at one of the Cement plants in Meghalaya was carried out, wherein 9 major (APCE) were monitored. This included 6 Bag House/filters and 3 ESPs. Various process parameters, dust concentration at inlet and outlets of APCE were measured to evaluate the performance.

Environment Monitoring Studies

- Environment Monitoring Studies were carried out for a construction site in Delhi during three seasons under which ambient air, construction water, soil quality and ambient noise were monitored.
- Environment Monitoring Studies were carried out at two cement plants in Rajasthan under which ambient air quality, point source emissions, water quality and noise level near plant machinery and ambient noise were monitored.

Best Practices for Reduction of NO_x and SO₂ Emissions for Indian Cement Industry

Studies on *Best Practices for Reduction of NO_x and SO₂ Emissions for Indian Cement Industry* have been taken up. Study on various technologies currently available and their efficacy in reducing the emissions of NO_x and SO₂ are being evaluated.

Water Footprint Assessment for Cement Plants

Studies on *Water Footprint Assessment for Cement Plants* have been taken up. Literature Survey on methodology for carrying out water footprint assessment (as per ISO 14046), studies



Monitoring of Dust Concentration at Inlet of APCE



Flow Measurement in a Duct of a Cement Plant

carried out worldwide on water footprint assessment, water consumption in different sections of cement plant carried out. Data format for collection of plant data prepared and being circulated among the industry.

Process and Productivity

Diagnostic study for minimizing excessive coating and ring formation and improving the burnability of the clinker in cement rotary kiln was carried out for M/s JK Lakshmi Cement Ltd

Plant Performance Audit

Plant Performance Audit was carried out for M/s Meghalaya Cement Ltd and recommendations were given for improving performance of plant.

Strengthening Capabilities in the areas of Pyro-processing and Grinding Operation

A programme was organized for strengthening capabilities in the areas of Pyro-processing and grinding operation for the officials of M/s Prism Cement Ltd, Satna (D), Madhya Pradesh.

Energy Management

Mandatory Energy Audit

Project on '*Mandatory Energy Audit*' was completed for M/s Malabar Cements Ltd, Walayar, Kerala.

Project Engineering and System Design

Project Monitoring and Control (PMC) Consultancy Services for setting up a 600 tpd Cement Plant in RoC for Government of Republic of Congo (RoC)

Under this project, NCB is working as a project management consultant to Republic of Congo (RoC) for preparation of EPC tender, offers evaluation, participation in bid opening, monitoring and controlling the project implementation activities and providing the support for project supervision.

Consultancy Services for DPR preparation of a 600 tpd Cement Plant in RoC for Government of RoC

Technical Feasibility Study for Fly ash Unloading from Rail Browsers, Storage, Feeding System and Bulk Cement Truck Loading System

For utilizing BCFC type wagons for Flyash transport, M/s Malabar Cements Ltd has sponsored a project to carry out a technical feasibility study for fly ash unloading, storage, feeding and loading system for their plant at Walayar.

Technical Feasibility Study for Fly ash Handling System

A study has been carried out for M/s Saurashtra Cement Limited, Ranavav, Gujarat for installation of flyash unloading, storage and feeding system with evaluation of various possible cost effective and environmentally sustainable options.

Technical Feasibility Study for Automation of Cement Silo Feeding System for Better Control of the Operation

To control the operation of cement transport, feeding and storage of different grades of cement in multiple silos, M/s Saurashtra Cement Limited, Ranavav, Gujarat has sponsored a project for Technical Feasibility Study for automation of cement silo feeding system.

Technical Feasibility Study for Installation of Cement Bag Counting System

To ensure accuracy in packed cement bags dispatched from the plant, M/s Malabar Cements Ltd has sponsored a project to carry out a technical feasibility study for efficient and highly accurate bag counting system for their cement plant located at Walayar, Kerala.

Technical Feasibility Study for Coal Handling System at M/s Saurashtra Cement Limited, Ranavav, Gujarat

For separate grinding of coal & petcoke as well as avoiding high demurrages for rake unloading from railway, M/s Saurashtra Cement Limited, Ranavav, Gujarat has appointed NCB as consultant to prepare technical feasibility report, including, various technically feasible & cost effective solutions.

CENTRE FOR CONSTRUCTION DEVELOPMENT AND RESEARCH - CDR

Goal of Centre for Construction Development and Research (CDR) is to contribute in developing durable and sustainable civil infrastructure for the nation. The Centre provides services to the cement, concrete and construction industries through four programmes, namely, Structural Optimization and Design; Concrete Technology; Structural Assessment and Rehabilitation; and Construction Technology and Management. The Centre completed 223 sponsored projects during the year.

Structural Optimization and Design

Development of Design Parameters for High Strength Concrete

Worldwide research on High Strength Concrete is going on since about one and half decade or more. Still, the structural design parameters in various international codes are different. The high strength concrete is generally defined as concrete above M55 to M100. The present Bureau of Indian Standard (BIS) code IS: 456-2000 permits use of higher strength concrete grades up to M80 with a note which states that for concrete of grades higher than M55, structural design parameters given in the code of practice may not be applicable and values may be obtained from specialized literatures and experimental results. In the absence of structural design parameters in the codes, structural designers are not able to use high strength concrete in concrete structures on full swing even though the RMC plants in the countries have the expertise to design and produce high strength concrete.

In this project, studies on Mechanical Properties of Normal and High Strength Concrete using different types of indigenous aggregates for concrete grades from M35 to M100 were carried out at NCB. This included comparison of various mechanical properties obtained experimentally from testing like Compressive Strength, Modulus of Elasticity, Poisson's Ratio, Split Tensile Test, Flexure Strength and Bond Strength with the empirical formulae of current Euro code, BIS code & other International Codes. Effect of Supplementary Cementitious Materials (SCMs) on various Mechanical Properties for Normal and High Strength Concrete was also studied. One outcome of the study on High Strength Concrete revealed that the strength and fracture behaviour of concrete for a given



Test setup for Flexural Strength of Reinforced Concrete Beams

water / cement ratio depends on the type of aggregate. Study on flexural behaviour of RCC members was carried out and experimentally obtained moment capacity were compared with theoretically predicted moment capacity by Euro code, BIS code & other International Codes.

Based on the experimental study, Modulus of Elasticity, Flexural Strength, Bond Strength, Stress Block parameters for flexural design etc. will be recommended for inclusion in the relevant IS standards. The outcomes of study were disseminated through papers published in Journals. In continuation to this, Experimental Study on Shear & Compression Design of High Strength Concrete, including, effect of Fibre on enhanced ductility & fire resistance has been recently taken up by NCB.

Development of Methods for Service Life Design for Concrete Structures

The current approach for durability design of concrete structure is based on prescriptive deem-to-satisfy rules (for example minimum cover, maximum water/binder ratio, and crack width limitation) and the assumption that if these rules are met, the structure will achieve an acceptably long but unspecified service life. In order to quantify the durability, the concept of a service life design is being introduced. As per ISO 16204, the design service life is defined as the “assumed period for which a structure is to be used for its intended purpose with anticipated maintenance, but without major repair being necessary”. The service life design takes into account the probabilistic nature of the environmental aggressiveness, the degradation processes and the material properties involved. Durability requirements are integrated into structural design, construction, operations & maintenance. The assessment of service life is done through accelerated test.

The objective of the project is to develop methods to assess the service life of new structures as well as the residual life of existing structures against deterioration due to carbonation and chloride induced corrosion. The effect of chloride ingress and carbonation on concrete was studied by using different durability testing techniques/test methods. The role of three types of binders i.e. OPC, PPC (fly ash based) and PSC (slag based) in concrete against the chloride ingress and carbon dioxide ingress at six water-cement ratios ranging from 0.36 to 0.60 have been studied.

Correlations were developed on the basis of laboratory studies of chloride diffusion and accelerated carbonation, with the actual rate of chloride ingress and actual rate of carbonation respectively, obtained from field study under different environmental conditions. The study also included Carbonation induced Corrosion at different chloride contents. Accelerated carbonation test and chloride diffusion (unidirectional) tests were conducted to determine the rate of Carbon dioxide and Chloride ingress, respectively.

Field condition of concrete deterioration was simulated through laboratory testing. Various accelerated durability tests were conducted at NCB laboratory and correlated with the natural phenomenon of concrete deterioration. For example, RCPT test which is an accelerated chloride migration technique was correlated with the chloride immersion test/ chloride ponding test for studying the effect of chloride penetration into the concrete.

In chloride laden environment, it was found that the relationship between long term chloride immersion test with short term/accelerated test methods like RCPT, Air permeability and Electrical Resistivity could be achieved and these accelerated durability test methods could be used for predicting the service life of concrete structures, whereas

in non-coastal environment, long term standard durability test i.e. accelerated carbonation test can be replaced with short term/quick test methods like Air permeability and Electrical resistivity.

Few field studies have also been carried out in order to study the effect of carbonation on the concrete structures and correspondingly Carbonation coefficients have been worked out. During the study, it was found that the reliability of carbonation depth as the function of square root of time does not hold valid/true but it actually varies depending upon binder type. Investigation of laboratory results indicates that in case of concrete made with OPC, rate of carbonation is the function of $t^{0.55}$ to 0.60 , in case of concrete made with PPC, rate of carbonation is the function of $t^{0.45}$ to 0.40 , whereas in case of concrete made with PSC, rate of carbonation is the function of $t^{0.50}$ to 0.45 . It is observed that the rate of increase of carbonation in case of concrete made with PPC and PSC is somewhat lesser in comparison to OPC made concrete. However, predicted depth of carbonation is still higher in concrete made with PPC and PSC at the age of 30-45 years. Based on the studies carried out and available literature, NCB has developed Service life Design model using semi probabilistic approach for different structures for different exposure conditions in coastal/non-coastal areas.

Concrete Technology

Evaluation of Concrete Making Materials and Mix Design

Evaluation of concrete making materials, analysis of test results and establishing its correspondence with fresh, hardened and durability properties of concrete is an important and crucial step before carrying out concrete mix designs. Centre has evaluated various concrete making materials such as cement, fly ash, silica fume, GGBS, water, fine and coarse aggregates, and chemical admixtures and carried out concrete mix designs for various grades for Thermal power project structures (TG Deck, Cooling Tower, Chimneys etc.) of NTPC and its subsidiaries. Material evaluation and mix designs were also carried out for different hydroelectric projects of SJVN Limited, NHDC Limited, THDC India Limited, Koteshwar Hydroelectric Project, UP irrigation Department, Loktak Downstream HE Corporation Ltd, UJVN Limited etc. More than 330 concrete mix designs of various grades up to M90 were carried out for various important structures. Material evaluation and concrete mix designs were also carried out for CPWD, PWD, DDA, Delhi Jal Board, DSIDC and various commercial RMC suppliers in National Capital Region. More than 25 numbers of Chemical admixtures were tested and evaluated.

Petrographic and Mineralogical Analysis and Alkali Aggregate Reaction (AAR) Studies of Aggregates

Alkali – silica reaction (ASR) is the most common form of alkali–aggregate reaction (AAR). ASR is a chemical reaction between the alkalis in Portland cement and certain siliceous aggregates which form a silica gel. It is well known that alkaline components of Portland cement chemically react with silica in certain forms found in certain aggregates. Over the years, NCB has developed expertise and competencies to evaluate aggregates for potential alkali aggregate reaction which includes both alkali silica reaction and alkali carbonate

reaction. Petrographic and Mineralogical Analysis and Alkali Aggregate Reaction (AAR) studies were carried out on different fine and coarse aggregates by conducting accelerated mortar bar testing and long term testing like mortar bar testing and concrete prism test as per national and international standards, for various projects of NTPC and its subsidiaries and NHPC and its JV's. More than 65 numbers of aggregates have been evaluated using petrographic analysis and Accelerated Mortar Bar Test.

Concrete Mix Design for Special Application

- *Self-compacting Concrete*

More than 25 numbers of Self Compacting Concrete (SCC) were designed by NCB for various clients such as Public Works Department, Delhi Development Authority and Water Resource Department, Govt. of Maharashtra, with grades varying from M25 to M50.

- *Abrasion Resistant Concrete with and without Steel Fiber*

While concrete is designed primarily to withstand structural loads, it must have abrasion resistant properties when it is to be used for hydraulic structures such as dam spillways and high water velocities creating cavitation at the concrete surface. NCB has designed more than 6 numbers of such concrete mixes for NHPC Dhulhasti, NHPC Dhauliganga, NHPC Tanakpur and UJVN Limited. Abrasion resistance properties of these concrete mixes have been evaluated using under water abrasion resistance test. Further, abrasion resistance properties of these mixes have also been evaluated using revolving disc method test. These concrete mixes are mainly M60 and above grades. For UJVN Limited, M90 grade of concrete using steel fiber has been designed.

- *Shotcrete*

Shotcrete is the concrete which is pneumatically sprayed onto a surface at high velocity. This is used in tunnel lining and concrete restoration work. Centre has designed one M25 grade wet shotcrete for THDC (India) Ltd, Koteshwar and one M35grade dry shortcrete for repair work at Gurgaon (Haryana).

Concrete Mix Design of Various Grades in year 2016-17

Grade	M10 and 15	M20	M25-M35	M40 –M55	M60-M80	M90
Nos.	15	20	239	45	10	1

Evaluation of Corrosion Inhibitor

Centre has developed the facility for evaluation of corrosion inhibitors through Modified Accelerated Corrosion Test as per JIS Z 1535 and Rebar Weight loss by Immersion method as per ASTM G-1 and Polarization Test as per ASTM G-3. The Centre has evaluated 23 samples of different brands of corrosion inhibitors being used in construction.

Development of Alternatives to Natural Sand for Use in Concrete/ Masonry/Plaster

There is huge requirement of concrete making materials to fulfill the requirement of construction industry, especially in developing country like India. Natural resources are fast depleting due to large scale quarrying, which consumes a lot of energy and results in enormous carbon emission. To make the environment sustainable, use of available alternate materials such as Bottom ash, Copper slag, C&D waste, Blast Furnace Slag and Steel Slag should be considered as replacement of natural aggregate in concrete.

Quality of cement on one hand affects the durability of concrete, and on the other hand, quality of coarse aggregate, fine aggregate and other concrete making material also affects the service life of concrete in long term. IS 383-2016 'Coarse and fine aggregate for concrete –Specification' now permits the use of various alternatives of natural fine aggregate such as Bottom Ash, Copper Slag, C&D waste (recycled concrete aggregate) etc. in partial utilization in concrete. There is further scope to increase the utilization of alternatives natural fine aggregate in concrete which will result in more consumption of alternate aggregates. Enhancing the use of these materials beyond the current permissible limit shall be allowed without compromising the durability of concrete and concrete structures.

NCB carried out the research on utilization of various waste based materials such as C&D waste, Bottom Ash, Copper Slag and Blast Furnace Slag in concrete and mortar. Various Durability and mechanical properties were studied such as Compressive strength, Flexural strength, Split tensile strength, RCPT, Carbonation, Chloride depth, Water permeability, Volume of permeable voids, Acid resistance test and Sulphate resistance test. Findings of the study are mentioned below:

- *Study with Bottom Ash:* The durability properties such as RCPT, Chloride Penetration depth using Chloride Migration Test, Carbonation Depth and Water Permeability are comparable up to 40% replacement of natural sand by Bottom ash. The mechanical Properties of concrete such as compressive strength and flexural strength are comparable up to 60% replacement of natural sand by Bottom Ash.
- *Study with Copper Slag:* The durability properties such as RCPT, Water permeability, Chloride Penetration depth using Chloride Migration Test, Carbonation, Leaching studies, Acid Resistance and Sulphate Resistance is improved up to 75% replacement of natural sand by Copper Slag. Similarly, mechanical properties also are comparable up to 75% replacement.
- *Study with Recycled Concrete Aggregate:* The durability properties such as RCPT, Chloride Penetration Depth using Chloride Migration Test, Water Permeability, Carbonation is comparable up to 50% replacement of natural sand by recycled concrete aggregate. Mechanical properties of concrete are comparable up to 100% replacement by recycled concrete aggregate.
- *Study with Blast Furnace Slag:* The durability properties such as RCPT, Water permeability, Chloride Penetration Depth, Carbonation, Leaching studies, Acid Resistance and Sulphate Resistance is comparable up to 60% replacement of natural sand by Blast Furnace Slag. Similarly, mechanical properties are comparable up to 100% replacement by Blast Furnace Slag.

Evaluation of M40, M60 & M80 Grade Fiber Reinforced Concrete (FRC) for Performance Improvement of Concrete Structures

The primary objective of this R&D study was to investigate and evaluate the

performance of Fiber Reinforced Concrete for new construction & repairs/rehabilitations of hydraulic structures' overlays to sustain impact load, abrasion-erosion & cavitation caused by high velocity flow of water borne solids containing silts, gravel sand rolling boulders over the dams, glacis, buckets & other associated hydraulic structures during floods. Some test methods adopted to qualitatively simulate the field condition are under water abrasion test, revolving disc method test and impact strength test etc.

The R&D study determined various engineering properties in its fresh and hardened state of standard & high strength concrete and its corresponding fiber reinforced concrete (FRC) using indigenously available steel fibers satisfying, Silica fumes and Polycarboxylic ether based superplasticizers.

Based on the experimental study and available literature, NCB has developed a high performance fiber reinforced concrete that has high impact strength, more toughness/energy absorption capacity, strain hardening and abrasion-erosion & cavitation resistant concrete for potential application in construction & repairs/rehabilitations of dams & associated hydraulic structures during floods to solve abrasion-erosion & cavitation problems.

Based on flexural performance test in a servo controlled closed-loop system, to study the post-cracking behavior, addition of steel fibers in concrete shows ductile response in load deflection curve. This property of FRC has potential application in structural members of multistoried/tall buildings.

Structural Assessment and Rehabilitation

Since 1950, the construction activity in India has been increasing geometrically. The distress evaluation, condition assessment, repair and rehabilitation of existing structures such as buildings, bridges, tunnels, dams and Industrial structures are becoming increasingly important to make them functional and conforming to the safety and serviceability requirements as these structures are aging.

The centre has conducted diagnostic and prognosis evaluation of distress and condition assessment on variety of structures such as Turbo Generator Foundation, Dam Structure, Cooling Towers, Bridges and residential, commercial and industrial buildings in different states in India. These assignments were taken up as sponsored R&D assignments. Assessments have been carried out for NTPC, U P Jal Nigam, State Public Works Departments, National Fertilizers Limited, Reserve Bank of India, GAIL (India) Limited, Central Public Works Department, All India Institute of Medical Science, Railway etc.

The structures were investigated by using visual observation, nondestructive evaluation technique (NDE) and other field tests followed by laboratory tests on extracted core samples and chemical analysis of hardened concrete. Various NDE techniques employed are: Ultrasonic pulse velocity testing, rebound hammer test, half-cell potential measurement, carbonation depth, rebar locator, cover meter, resistivity testing, air permeability, pull-off testing and core sampling. NCB undertakes the field and laboratory investigations of concrete structure keeping the requirement of structure in view. The studies are carried out to determine engineering and chemical properties of aged concrete, including, Petrographic studies, Scanning Electron Microscopy (SEM) studies, X-ray



UPV Testing by Surface Probing on TG Deck Slab at APCPL, Jharli



Extraction of Core from Bridge Deck Slab at EC Railway, Patna

Diffraction (XRD) studies, Alkali Aggregate Reaction (AAR) studies etc. The reasons for unusual behaviour are identified from the study and critical parameters for repair and rehabilitations are assessed. The investigations are generally followed by recommendations for repair and rehabilitation, with state-of-art repair materials and implementation techniques for distressed RC structures covering specifications, cost estimates and bill of quantities.

Construction Technology and Management

The Inspection for Third Party Quality Assurance/Audit (TPQA) was taken up for various projects duly following the Quality Management System as per ISO 17020:2012 accreditation standards. Services provided to various organizations to ensure quality workmanship to meet their specified quality standards in delivering quality constructed facilities. TPQA was carried out for Construction of Buildings (Residential and Non-residential), Roads, Bridges & Tunnels, Construction Utility projects, other Civil Engineering Projects, Special construction activities etc for various clients *viz* Govt. of India, State Govt. organizations, Autonomous units, Under-takings etc. on PAN India basis. NCB entered into MOU with Odisha Industrial Infrastructure Development Corporation (IDCO) during this year for TPQA services for an initial period of 5 years.

The methodology of Third Party Quality Assurance/Audit (TPQA) is as per project specific Quality Assurance Plan which includes physical inspection of work at various stages: final inspection, in-service inspection, review of reports, review of documents, measurements on site by the inspector or witnessing the tests, random sampling and testing of materials for verifications as per contract specifications / relevant codes / standards such as IS codes, CPWD, IRC & MORTH specifications, limited non-destructive testing as and when needed, review of quality system & quality assurance measures. Performance testing of RCC structures with NDT included ultrasonic pulse velocity (UPV) test, Rebound Hammer Test (RHT), Core testing, Rebar locator, cover meter etc.



Inauguration of Multi storeyed Residential Quarters at G-Point (President's Estate) by Honourable President of India



Inspection of Brick Work at President's Estate Project



Non-destructive Testing at Western Court Annexee MP Hostel, Janpath



Inspection of Pier at Flyover Project at Barapulla



Checking Reinforcement of Pile at Flyover Project at Barapulla



Checking Reinforcement at Strip Footing of Recreation Centre



Checking of Reinforcement of Slab at School site



Inspection of Pier at Pedestrian Bridge Project

CENTRE FOR INDUSTRIAL INFORMATION SERVICES – CIS

The Centre pursued its activities through six programmes viz. Industrial Information and Data Bank; Integrated IT Solutions; Publications; Seminars and Conferences; International and National Linkages, and Image Building. CIS collects and disseminates information to cement, building materials and construction industries. Besides other facilities, the Centre includes a modern library and a computer centre.

Industrial Information and Data Bank

NCB Library at Ballabgarh Unit serves as the national information centre for cement, building materials and construction industries. The holdings of the Library have grown to 46,535 documents. The library has a bibliographic database consisting of about 41,865 entries derived from the journals received. NCB scientists as well as cement plants and other user industries utilize it for interactive searches. A library automation system called 'LIBSYS' has been installed. The system is user-friendly and compatible to network communication.



NCB Ballabgarh Library

Memberships of Indian and Overseas professional institutions, as listed below, were served.

MEMBERSHIPS	
Indian	Overseas
<ul style="list-style-type: none"> ● Construction Industry Development Council (CIDC), New Delhi ● Indian Roads Congress (IRC), New Delhi ● Indian Mining & Engineering JI, Bhubaneswar ● Materials Research Society of India, Bengaluru 	<ul style="list-style-type: none"> ● The American Concrete Institute (ACI), USA ● Precast / Prestressed Concrete Institute (PCI), USA

Integrated IT Solutions

NCB continued modernizing its IT infrastructure with MS windows 8.1/10 based PCs and laptops. Web Technology based Laboratory Information Management System (LIMS) covering ~5 Laboratories & 50 users (Max.), common database, Hardware & Software/Data redundancy is implemented and operational.

After Proof of Concept (PoC), Video conferencing, Bulk e-mailing and Firewall Data Security Solutions were implemented. The Windows Deployment Services for Maintenance & Installation continued with BackUP Exec. Rain Mail Intranet Server is updated; it provides central email solution. e-NCB Abstracts and e-NCB News have been circulated for sharing knowledge and recent technical developments in cement, concrete, building materials and construction sectors. The Internet connectivity bandwidth enhanced to 4 mbps Internet Leased Line (ILL) in Radio Frequency (RF) mode. The Website was uploaded with Technical Papers published by NCB Officials in various seminars/workshops, e-Abstracts and e-NCB News and various promotional information, including:

- Symposium on Composite Cement for Resource Conservation, Environmental Protection & Enhanced Sustainability, 30 September, 2016, NCB Ballabgarh.
- Symposium on Blended Cements for Sustainable Development, 24 January, 2017, Hyderabad.
- NCB Seminar on Durability and Service Life Design of Concrete Structures, 07 April, 2017, NCB Ballabgarh.
- 15th NCB International Seminar on Cement, Concrete and Building Materials, 05-08 December 2017, New Delhi.

Following services were continued:

- Indexing Services from Library, through Intranet site and www.ncbindia.com site.
- Uploading website with highlights of 15th NCB International Seminar
- Various Training Course announcements, quality related schemes' announcements, recommendations of various workshops
- Employment opportunities & RTI related documents.

Provision is made for E-Registration for 15th NCB International Seminar in ncbindia.com website. E-Payment facility is created through SB Collect, additionally.

Publications

Efforts to widely popularize and promote NCB activities, technologies and consultancy services among the cement, construction and related building materials industries continued. During the year, the documents published were: NCB Annual Report 2015-16 (*English and*



A Few NCB Publications

Hindi), Seminar Bulletin 1 of 15th NCB International Seminar, NCB Training Programme 2017-18, Leaflet and Registration form for:

- Symposium on Composite Cement for Resource Conservation, Environmental Protection & Enhanced Sustainability, 30 September 2016, NCB Ballabgarh
- Symposium on Blended Cements for Sustainable Development, 24 January 2017, Hyderabad
- NCB Seminar on Durability and Service Life Design of Concrete Structures, 07 April 2017, NCB Ballabgarh.

Seminars and Conferences

Symposium on Composite Cement for Resource Conservation, Environmental Protection & Enhanced Sustainability

- The one day Symposium was organized at NCB Ballabgarh Unit on 30 September 2016. The symposium was supported by CMA.
- About 200 delegates including 2 from abroad (1 German, 1 Chinese) from cement and construction industries, and academic institutions participated in the event.
- 17 technical papers (out of which 6 invited papers from eminent experts in the field) on raw materials including industrial waste, specifications, quality, chemistry, properties, performance, resource and energy conservation, environmental impact and enhanced sustainability were presented. *E-book* of the full technical papers were published in the CD form and distributed at the Symposium venue to all participants.
- In the concluding session, a panel discussion was also organized wherein the need of composite cement for reduction of energy, emission and conservation of natural resources were discussed. Concrete durability aspects, incentives for producers of composite cement, consumer education, commercial competitiveness of composite cement and the future prospects were also discussed. The discussions were well received by the participants from industries.

Symposium on Blended Cements for Sustainable Development

- The one day Symposium was organized at Hyderabad on 24 January 2017.
- About 110 delegates from cement and construction industries, and academic institutions participated in the event.



Dr K C Narang lighting up lamp at the inauguration of symposium on composite cement at Ballabgarh Unit



Sh V S Narang, Director Technical, My Home Industries speaking at the Inaugural Session of Symposium on Blended Cement for Sustainable Development

- 17 technical papers (out of which 4 invited papers from eminent experts in the field) on Chemistry and Quality, Manufacture and Performance & Durability Aspects of Blended Cements for Sustainability were presented. E-book of the full technical papers was published in the CD form and distributed at the Symposium venue to all participants.

Other Institutional Events

National Technology Day: NCB celebrated the 'National Technology Day' by organizing technology related programmes on 11 May 2016 at its Ballabgarh and Hyderabad units.

World Environment Day: Special functions were organized on 5 June 2016 to celebrate 'World Environment Day' at Ballabgarh and Hyderabad Units.

Hindi Pakhwada: Hindi Pakhwada was organized during 14-28 September 2016 at Ballabgarh. Dr S K Breja, Head of Centre (CIS), expressed his Satisfaction on growth and development of Hindi in the organization. He exhorted NCB officials to further promote use of Hindi in their day-to-day interaction. Sh Vinod Kumar, Hindi Officer summarized the activities organized for promoting the use of Hindi in NCB during the year in the concluding celebration. On this occasion, NCB staff members also presented their views on the importance of Hindi language. The Best two speakers Ms Jyotsna Panchal and Dr (Ms) Pinky Pandey were declared as first and second winners, respectively, on the occasion.

Quami Ekta Week: 'Quami Ekta Week' was observed during 19-25 November 2016 and National Integration Pledge was administered to the staff as a part of it.

NCB Day 2016: NCB Day 2016 was celebrated on 24 December 2016. Sh Ashutosh Saxena (HoC-CME) and Dr S K Breja (HoC-CQC) delivered their lectures on the occasion.

New Year Day 2017: New Year Day 2017 was celebrated on 01 Jan 2017. Sh Ashwani Pahuja,



Sh S K Chaturvedi, Jt Director NCB speaking on the occasion of World Environment Day at Ballabgarh Unit



Sh Ashutosh Saxena, Jt Director NCB making presentation on NCB Day occasion. Sh A V S Manion, General Manager NCB and Dr S K Breja, Jt Director NCB are sitting on dais



Hindi Pakhwada Celebration at Ballabgarh Unit in Progress. Dr S K Breja, Head of Centre-CIS and Sh Vinod Kumar, Hindi Officer are sitting on dais



Best Scientist/Engineer/Supporting Staff Awardees with Sh Ashwani Pahuja, DG NCB (Center)

Director General NCB, addressed the staff on the occasion. Director General gave away NCB Day Awards to NCB officials who made outstanding contributions during the year in their respective fields of activities. The 'Best Scientist Award' was given to Sh Kapil Kukreja and Sh Puneet Kaura and the 'Best Supporting Staff' Award was given to Sh Janardan Reddy in the Technical Stream and Ms Yashika Bhardwaj in the Administrative Stream, respectively.

Participation in Workshops, Seminars and Conferences

The following NCB officials participated in Seminars & Conferences shown against their names during the period.

Sl.No.	Participant(s)	Event
1.	Dr S K Breja	NABL-AOIL Workshop on ISO/IEC 17025 revision CD-2, 14 April 2016, New Delhi, Organized by Association of Indian Laboratories (AOIL) and National Accreditation Board for Testing and Calibration Laboratories
2.	Sh Amit Trivedi Sh B Pandu Ranga Rao	7th Annual Conference on Tunnel Construction in India - Risks and Challenges, Technologies and Solutions, 17-18 May 2016, Mumbai, Organized by India Infrastructure Publishing Pvt Ltd
3.	Sh Puneet Kaura Sh Ajay Kumar	Conference & Exhibition on Concrete & Structure, 18-20 May 2016, New Delhi, Organized by Indian Association of Structural Engineers (AStructE) and Indian Concrete Institute (ICI)
4.	Sh Satish Sharma Sh Suresh Kumar	6th International Conference on Concrete Repair, 20-24 June 2016, Organized by Concrete Solutions (GR Technologie Ltd), Thessaloniki, Greece.
5.	Sh Amit Trivedi Sh Puneet Kaura	National Road & Highways Summit-2016, 19 July 2016, New Delhi, Organized by PHD Chamber of Commerce and Industry.
6.	Sh V V Arora Sh P N Ojha	11th International Conference on Concrete Pavements, San Antonio, Texas USA, 28-31 August 2016.
7.	Sh Satish Sharma Sh Nitin Chowdhary Sh Amit Sagar Sh Manvender Singh Sh Rizwan Anwer	Conference & Exhibition in Repair & Retrofting of Concrete Structures, 9-10 September 2016, New Delhi, Organised by Indian Concrete Institute.

Sl.No.	Participant(s)	Event
8.	Sh B S Rao Sh Ankit Sharma Sh Mantu Gupta	Managing Corrosion Prevention, Inspection and Mitigation from the Inside Out - CORCON, 18-21 September 2016, New Delhi Organised by National Association of Corrosion Engineers (NACE) International Gateway India Section (NIGIS).
9.	Sh TVG Reddy Sh Lalit Yadav Sh Arup Ghatak	1st Biennial Conference on Bridge Management System - IBMS, 04-05 October 2016, New Delhi, Organised by Team IBMS with the Support of Ministry of Road Transport & Highway.
10.	Sh V K Mathur Sh Amit Sagar Sh Y N Daniel	5th Annual Conference on Smart Cities India on 25-26 October 2016, New Delhi, organized by India Infrastructure Publishing Pvt Ltd
11.	Sh V V Arora Sh Amit Trivedi	PHD Chamber – DRDO Workshop on Transfer of Technology to Industry – 11 November 2016, New Delhi, organized by PHD Chamber of Commerce and Industry jointly with Defence Research & Development Organisation (DRDO).
12.	Sh Amit Prakash Sh Suresh Kumar	6th Annual Conference on Bridges Flyovers and Elevated MRTS Structures on 28-29 November 2016, Gurugram, organized by India Infrastructure Publishing Pvt Ltd
13.	Sh Lalit Yadav Sh Ankit Sharma Sh Suresh Vanguri	One Day Workshop on Introduction to Geopolymer Composites Technology on 7 December 2016, organized by Indian Concrete Institute Tamil Nadu Centre at IIT-Chennai.
14.	Sh Arup Ghatak Sh Vaibhav Chawla	Conference on Planning and Design of Tall Buildings including Earthquake and Wind Effects 6-7 December 2016, New Delhi, organized by IASE.
15.	Sh Y N Daniel	Indo-Norwegian Training Programme on Seismic Design of Multi-Storey Building IS: 1893 vs. Eurocode 8, 08-10 December 2016 organized by Building Materials & Technology Promotion Council (BMTPC)
16.	Dr S K Breja	Cement Expo-2016, 9th International Exhibition Conference and Awards, 08-09 Dec 2016, Mumbai, Organised by ASAPP Media, India
17.	Dr S K Breja	India International Science Festival (IISF), 08-11 December 2016, New Delhi, Organised by CSIR - National Physical Laboratory, Industry Academia Interaction.
18.	Sh Amit Trivedi Sh Gourav	"International Workshop – Inclusive Cities 2016", 19-20 December 2016, New Delhi organized by Deptt. of Architecture & Deptt. of Civil Engineering.

Sl.No.	Participant(s)	Event
19.	Sh Amit N Gandhi	Eighth Edition of the Vibrant Gujarat Summit, 10-13 January 2017, Gandhi Nagar, Gujarat. (Participation in Exhibition)
20.	Sh V Naga Kumar Sh Abhishek Agnihotri	Laboratory Accreditation – A Perspective from Government, Regulators and Industries, 20 January 2017, New Delhi, organized by NABL, a constituent Board of Quality Council of India
21.	Sh T V G Reddy Sh Brijesh Singh Sh Adarsh Kumar N S	Latest Repair & Rehabilitation Technologies for Dams, 23-24 January 2017, organized by Sri Lanka National Committee on Large Dams (SLNCOLD) in association with Aqua Foundation Academy, India at Colombo Sri Lanka.
22.	Dr S K Breja	5 th National Seminar on Advances in Metrology (Admet-17), 23-25 March 2017, Gurugram, Organised by Metrology Society of India and NorthCap University.

Papers Presented in Workshops, Seminars and Conferences

SYMPOSIUM ON COMPOSITE CEMENTS

30 September 2016, Ballabgarh, Haryana

- 1 *Investigations on Composite Cement containing Indian Fly Ash and GBFS*– S K Chaturvedi, D Yadav, S Vanguri, S Harsh & A Pahuja, NCB.
- 2 *Hydration of Composite Cement containing Indian Fly Ash and GBFS– A Case Study*, S K Chaturvedi, V P Chatterjee, D Yadav, S Harsh & S Vanguri, NCB.
- 3 *Characteristics and Performance of OPC, Binary and Ternary Blend Composite Cement– A Case Study*, P N Ojha and V V Arora, NCB.
- 4 *Environmental and Sustainability Aspects Associated with Composite Cements – A Case Study*, N K Tiwary, Anand Bohra, K R P Nath, M Selvarajan, Ankur Mittal & A Saxena, NCB.

SYMPOSIUM ON BLENDED CEMENTS FOR SUSTAINABLE DEVELOPMENT

24 January 2017, Hyderabad

- 5 *Reactivity of Fly ash and GBFS in the Hydrated Composite Cement–A Case Study*, S K Chaturvedi, S Harsh, D Yadav & S Vanguri, NCB.
- 6 *Strength Development in the Composite Cement Prepared Using Indian Fly Ash and GBFS–A Case Study*, A Pahuja, S K Chaturvedi, S Harsh, D Yadav & S Vanguri, NCB.

7. *Mechanical and Durability Properties of Concrete made with Composite Cement—A Case Study*, V V Arora, PN Ojha, Puneet Kaura & Suresh Vanguri, NCB.
8. *Durability of Concrete Made with Blended Cement Against Reinforcement Corrosion –A Case Study*, V V Arora, Satish Sharma & Puneet Kaura, NCB.

WORLD ENERGY CONGRESS

October 2016, Istanbul, Turkey

9. *Process Optimization and Thermal Energy Audit in Indian Cement Industry – A Solution for Energy Efficiency and Conservation of Coal (E-proceedings)*, by Rabindra Singh, M V Ramachandra Rao, Prateek Sharma, V Naga Kumar.
10. *Improving Electrical Energy Efficiency in Cement Industry through Efficient & Innovative Equipment-NCB Experiences (E-proceedings)*, by Ashutosh Saxena, V Venkatesh, Vinay Kant.
11. *NCB Experiences in increasing Alternative Fuels in Indian Cement Industry*, by Ankur Mittal, Kapil Kukreja, Suresh K Shaw, A Banerjee & Ashutosh Saxena; **CMA 3rd International Conference on AFR in Cement Industry**, March 2017, New Delhi.
12. *Condition Assessment of Reinforced Concrete Structures Including Case Studies - Conference on Repair, Rehabilitation & Retrofitting of Concrete Structures Concrete 2016*, by Brijesh Singh & V V Arora; **Indian Concrete Institute**, 09-10 September 2016, New Delhi.

WORKSHOP ON LATEST REPAIR & REHABILITATION TECHNOLOGIES FOR DAMS

23-24 January 2017, Colombo, Sri Lanka

13. *Detailed Investigation of Ageing Effect in Concrete Arch Dam*, by Brijesh Singh, V V Arora & Satish Sharma.

WORKSHOP ON LATEST REPAIR & REHABILITATION TECHNOLOGIES FOR DAMS

23-24 January 2017, Colombo, Sri Lanka

14. *Application and Performance Evaluation of High Strength Steel Fibre Reinforced Concrete for Improving the Abrasion / Erosion Resistance of Dam Structures*, by Satish Sharma, V V Arora, Y Daniel and Brijesh Singh.

INDIAN POWER STATIONS-2017

13-15 February 2017 in New Delhi

15. *Repair, Restoration and Retrofitting of in Service Concrete Structures in Power Plants - International O&M Conference*, by Satish Sharma, T V G Reddy and Ankit Sharma.

CEMENT EXPO 2016, 4TH INDIAN CEMENT REVIEW CONFERENCE

8-9 December 2016, Mumbai

16. *Composite Cement – Opportunities and Challenges*, by S K Breja (Invited Speaker).

INDIA INTERNATIONAL SCIENCE FESTIVAL (IISF)

11 December 2016, National Physical Laboratory, New Delhi

17. *Sustainable Development and Role of National Organisations (Talk)*, by S K Breja (Invited Speaker).

NATIONAL CONFERENCE ON ADVANCES IN METROLOGY (ADMET-17)

23-25 March 2017, NorthCap University, Gurugram

18. *Quality Excellence in Laboratories through PT Participation and Use of Reference Materials- Case of Cement and Construction Sector*, by S K Breja (Invited Speaker).

Papers Published

The following papers were contributed by NCB scientists to outside technical journals:

1. S K Agarwal, S Harsh, S K Chaturvedi and A Pahuja: *Clinker Mineralization Using By-Product Jarosite*, **Cement, Energy and Environment**, Volume 15, No. 3 & 4, p.11-18, July-December 2016.
2. S K Agarwal, S Harsh, S K Chaturvedi and A Pahuja: *Zinc Industry By-Product Jarosite' as Set Controller in OPC*, **Cement, Energy and Environment**, Volume 15, No. 3 & 4, p.19-24, July-December 2016.
3. N K Tiwary, Anand Bohra, K R P Nath, M Selvarajan and A Saxena: *Environment Performance of Indian Cement Industry*, **Cement, Energy and Environment**, Journal of Cement Manufacturers Association, April 2016.
4. N K Tiwary, Anand Bohra, K R P Nath, M Selvarajan and A Saxena: *Carbon Dioxide (CO₂) sequestration methods for cement industry*, **Cement, Energy and Environment**, Journal of Cement Manufacturers Association, April 2016.
5. V V Arora, Brijesh Singh and Lalit Yadav: *Flexural and Fatigue Behavior of Prestressed Concrete Beams made with Portland Pozzolana Cement*, **Journal of Asian Concrete Federation**, ISSN 2465-7964 / ISSN 2465-7972, Vol. 2, No. 1, pp.15-23, June 2016.
6. V V Arora and Brijesh Singh: *Durability Studies on Prestressed Concrete made with Portland Pozzolana Cement* - **Indian Concrete Journal**, Vol. 2, No. 1, pp. 15-23, August 2016.
7. V V Arora, Brijesh Singh and Shubham Jain: *Experimental Studies on Short Term Mechanical*

- Properties of High Strength Concrete* - **Indian Concrete Journal**, Vol. 90, No. 10, pp. 65-75, October 2016.
8. V V Arora, B R K Pillai, Brijesh Singh and V P Chatterjee: *Assessment of Cause of Distress in Concrete Arch Dam- A Case Study* – **Indian Concrete Journal**, Vol. 90, No. 12, pp. 39-47, December 2016.
 9. V V Arora and Brijesh Singh: *Use of Fly Ash Concrete and Recycled Concrete Aggregates - A Cost Effective Solution and Durable Option for Construction of Concrete Roads*– **Indian Concrete Journal**, Vol. 91, No. 1, pp. 24-33, January 2017.
 10. V V Arora, Brijesh Singh and Shubham Jain: *Effect of Indigenous Aggregate Type on Mechanical Properties of High Strength Concrete*, **Indian Concrete Journal**, Vol. 91, No. 1, pp. 34-44, January 2017.

Important Visitors

Name of the Visitor	Organisation
Sh Shailendra Singh	Joint Secretary (Cement), DIPP MoCI, Govt. of India
Dr S Chouksey	President - CMA & Wholetime Director - JK Lakshmi Cement Ltd
Mr Daniel Lamarchand Mr Peiter Du Toit Ms Cornelia Bauer Ms Layse Harada	Experts from UNIDO
Board of Governors - NCB	NCB, Ballabgarh
Ms Dong Lingping	Chief Representative (South Asia) Nanjing C-HOPE Cement Engineering Group, P.R.China
Mr A K Pillai	CEO & Director, JSW Cement
MsL Sengupta	Vice President - Technical Services, JSW Cement
Mr Jamshed N Cooper	Managing Director, Heidelberg Cement India Ltd & Zuari Cement Ltd
Mr Mubarak Al Mantheri Dr Ali Salim Al Rajhi Mr Ismail Khamis Al Harrasi	Member, Board Of Directors, Oman Cement Company (SAOG)
Mr Hilal Al Dhamri	Senior Production Manager
Mr Deepak Dikshit	Chief Finance Officer
Mr Adam Tan	Head of Human Resources, Hume Industries, Malaysia
Mr Vipul Goyal	Member of Legislative Assembly, Haryana

International Linkages / Collaboration Programmes

NCB has been actively interacting and liaising with a number of international bodies and exchanging knowledge and experience, particularly in the area of cement and building materials industries.

Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, Government of India has approved a UNIDO project titled “Development & Adoption of Appropriate Technologies for Enhancing Productivity in the Cement Sector in India” to be implemented jointly by UNIDO and NCB. The objective of the project is to strengthen the global competitive position of the Indian Cement Sector by enhancing the technical capacities and capabilities of NCB. UNIDO cement project has started in Dec 2015 and will be executed in time bound manner within 22 months and is being monitored by steering committee constituted for UNIDO Cement project. It has three phases, namely, Inception, Implementation and Post Implementation phases. During the year, four technical workshops have been organized for the scientists/engineers of NCB by UNIDO international experts in the areas of Alternate fuels and raw materials, Best available technologies, Key performance indicators and Patents and intellectual property rights. Besides, nine scientists and engineers have undergone study tours in various laboratories, plants and organizations such as Verein Deutsche Zementwerk (VDZ), Germany; European Cement Research Academy (ECRA), Germany; Vereinigung Österreichischer Zementindustrie (VÖZ), Smart Mineral, Lafarge Cement plant and UNIDO Headquarters in Austria, CBR Heidelberg Cement at Lixhe, Belgium; Recyfuel Plant, Belgium; Walloon Business Federation, Belgium; Schwenk Cement Plant, Allmendingen, Poland; Kujawy Plant in Bielawy, Poland; NOVAGO Recycling Center, Kosiny, Poland and Polish Cement Association, Krakow.



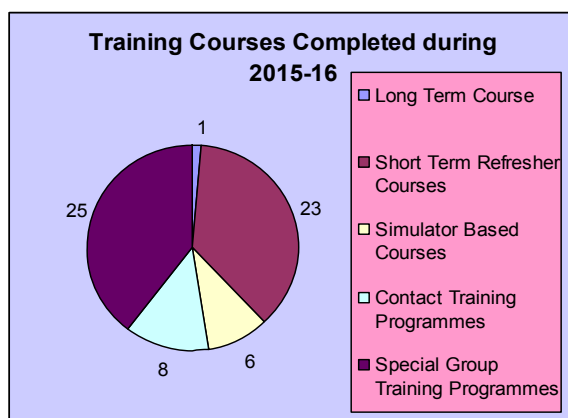
Director General NCB and Managing Director -VDZ along with other members of UNIDO delegation at VDZ/ECRA, Dusseldorf, Germany

CENTRE FOR CONTINUING EDUCATION SERVICES - CCE

Centre for Continuing Education Services (CCE), has been organizing variety of need-based, industry-oriented training programmes at entry and post-entry levels, for the participants from cement, concrete and construction industries since its inception in 1972. So far, 2460 training programmes have been organized. A total number of 40990 participants comprising of industry professionals and fresh graduates/post-graduates in science and different disciplines of engineering have been benefited. A number of Govt./Semi-govt./Private organizations both from India and abroad have availed the training services of NCB for their engineers and professionals.

During the year under report, 56 training courses were successfully organized with a total of 1073 participants attending the programmes.

The highlights of the training programmes conducted are as under:



Long Term Course	1
Short Term Refresher Courses	23
Simulator Based Courses	6
Contact Training Programmes	8
Special Group Training Programmes	25

Long Term Course

Post-Graduate Diploma in Cement Technology

In its efforts to develop technological talent for the cement industry, NCB has been regularly conducting Post-Graduate Diploma in Cement Technology since 1983. The course is duly approved by All India Council for Technical Education (AICTE), Ministry of Human Resource Development, Govt. of India.



A group photograph of Senior Officials of Indian Air Force along with faculty members during Special Training Programme organised at NCB Ballabgarh

Eight self-sponsored participants admitted for 2015-16 session, comprising of one chemical engineer and seven post graduates in chemistry, have successfully completed the course in July 2016. In the session 2016-17, four students were admitted in the course.

Work Place and NCB Based Course in Cement Technology

For the benefit of engineers/graduates and working professionals in cement and related industries, work place and NCB based course of one year duration in cement technology has been successfully carried out. Twenty-seven participants were admitted for 2016-17 session. Out of these, 20 participants opted for NCB-Ballabgarh Unit and 7 participants opted for NCB-Hyderabad Unit, for the course.

Short-Term Refresher Courses

During the year, 24 Short-Term Training Courses were organized wherein 524 professionals from cement and construction industries participated. In Cement Technology related area, special emphasis was given to courses such as Technologies for Reducing PM, NO_x, SO_x and CO₂ in Cement Industry; Advances in Pyroprocessing in Cement Industry; Calibration of Laboratory Equipment and Quality Assurance in Cement, Construction and Process Industries; Advancements in Grinding Technology in Cement Industry; Improving Performance of Coolers; Sampling and Testing of Cement as per BIS Standards; Use of Blended Cements and Manufactured Sand in Concrete Construction; Modern Grinding Practices in Cement Industry; Condition Monitoring and Predictive Maintenance; Testing Quality of Cement as per BIS Standards.

In Concrete and Construction related areas, the training programmes on specific topics were organized such as Sampling, Testing and Evaluation of Concrete making Materials and Concrete; Use of Fly Ash and Blended Cements for Durable Concrete; Prevention and Repair of Cracks and Leakages in Building; Concrete Mix Design and Acceptance Criteria of Concrete for Different Types of Mixes; Corrosion in RCC Structures: Prevention and Repair; Quality Control and Quality Assurance in Concrete Construction including Extreme Weather Concreting; Green Building: Design & Construction; High Performance Concrete and its Application; Non-Destructive Testing and Evaluation of Concrete Structures; Concrete-Mix Proportioning and Quality Control; Modern Construction Practices; Repair and Rehabilitation of Concrete Structures, including Water proofing Materials and Techniques.



A Lecture Session in Progress in Training Hall at NCB-Ballabgarh Unit



Participants of M/s NHPC Ltd During a Special Group Training Programme Visiting Reference Materials and Calibration Laboratory at NCB-Ballabgarh Unit

Simulator-Based Courses

With the aim of providing comprehensive training on various aspects of kiln and mill operations, two training courses on Advanced Simulator trainer were organized at NCB's Ballabgarh and Hyderabad units for 5 professionals from cement plants and 49 participants from educational institutions. The participants were trained on Operation, Control and Optimization of Modern Grinding System based on Vertical Roller Mills; Operation, Control and Optimization of kilns.



Participants from Cement Plants getting Simulator-based Training

Contact Training Programmes

On the request of industry, three tailor-made practice oriented contact training programmes for the professionals from cement and construction industries were organized to suit the specific requirement covering following areas:

- Evaluation of kiln-feed clinker and slag by Optical Microscopy
- Calibration of Blaine Apparatus
- Chemical Evaluation of Cement by Analytical Methods



Participants visiting Analytical Services Laboratory at NCB-Ballabgarh Unit



Participants of AKS University after successful completion of a Special Group Simulator-based Training Programme at Ballabgarh Unit

Special Group Training Courses

Twenty five special group training courses on specific topics for the group of engineers/ professionals were organized for the following organizations either at NCB's units or sponsors' sites:

Sl No.	Organization	Topics of the Courses Organized
1	Dalmia Cement (Bharat) Ltd	<ul style="list-style-type: none"> ➤ Cement Manufacturing Technology for GET's ➤ Cement Manufacturing Technology and Quality Control for the Senior Executives
2	TANCEM	<ul style="list-style-type: none"> ➤ Cement Plant Operation and Maintenance Practices
3	Shree Cement Ltd	<ul style="list-style-type: none"> ➤ Developments in Cement Manufacturing Technology for the Executives ➤ Sampling Techniques for Sample Collectors & Helpers
4	Lafarge India Ltd	<ul style="list-style-type: none"> ➤ Cement Manufacturing Technology and Quality Control for the Senior Executives
5	Andhra Cement Works	<ul style="list-style-type: none"> ➤ Lab Oriented Training on EDTA Methods of Analysis for Cement and Raw Materials and Physical Testing of Cement
6	AKS University	<ul style="list-style-type: none"> ➤ Simulator based course on Operation, Control and Optimization of Kilns for the students
7	Delhi Metro Rail Corporation Ltd (DMRC)	<ul style="list-style-type: none"> ➤ Quality Control and Quality Assurance in Concrete Construction
8	National Hydroelectric Power Corporation Ltd (NHPC)	<ul style="list-style-type: none"> ➤ Construction Planning and Construction Management ➤ Non-destructive Testing and Evaluation of Concrete Structures ➤ Quality Management and Trends in Construction
9	Military Engineering Services (MES)	<ul style="list-style-type: none"> ➤ Quality Control and Quality Assurance in Concrete Construction
10	Indian Air Force (IAF)	<ul style="list-style-type: none"> ➤ Concrete Construction, Project Management, Quality Assurance and Quality Control
11	National Hydroelectric Power Corporation Ltd (NTPC)	<ul style="list-style-type: none"> ➤ Quality Control and Quality Assurance in Concrete Construction
12	Hindustan Petroleum Corporation Ltd (HPCL)	<ul style="list-style-type: none"> ➤ Construction Practices for Petrol Pumps
13	Quality Control Circle, Water Resources Department, Govt. of Maharashtra	<ul style="list-style-type: none"> ➤ Quality Assurance and Quality Control in Concrete Structures
14	National Buildings Construction Corporation Ltd (NBCC)	<ul style="list-style-type: none"> ➤ Concrete Technology



Participants of Indian Air Force during a Special Group Training Programme visiting Non-destructive Testing Laboratory at NCB-Ballabgarh



Participants of TANCEM After Successful Completion of a Special Group Training Programme at NCB-Hyderabad Unit

Technology Meet

At the request of China Building Material Machinery Association (CBMMA), a One-day Technology Meet on Chinese Cement Technology and Machinery was organized at NCB's Hyderabad unit to share common concerns faced by both countries in the areas of economy, energy and environment which are primarily directed towards controlling and minimizing the country's carbon footprint. The Meet was attended by twenty five Members of CBMMA representing several machinery manufacturers, equipment suppliers and Research Institutes. A large number of senior executives representing cement plants in India also took part in the Meet.

Various speakers from China Cement Machinery Manufacturers made technical presentations on various themes which evoked good response from the delegates and several technical issues were discussed and deliberated. The discussions focused on available modern, cost-effective, energy-efficient cement equipment and production technologies, quality and environmental improvement solutions and their possible implementation.



Participants of Technology Meet on Chinese Cement Technology and Machinery Organized at NCB- Hyderabad Unit

Training / Retraining of NCB Personnel

Sl No	Name of the Officials	Title of course	Name & Address of Training Organisation	Duration and Period
1	Dr S Harsh	In Pursuit of Excellence	Jurom Management Consulting, Gurgaon Organised by: Centre for Continuing Education Services (CCE)	1 day 21 April 2016
2	Sh S K Chaturvedi			
3	Dr V P Chatterjee			
4	Sh P S Sharma			
5	Dr D Yadav			
6	Dr Asok Dikshit			
7	Dr R S Gupta			
8	Sh U S Sinha			
9	Sh A Saxena			
10	Sh Ravindra Singh			
11	Sh N K Sharma			
12	Sh M Selverajan			
13	Sh O P Grover			
14	Sh Anupam			
15	Sh K A Shah			
16	Sh A K Dubey			
17	Sh V V Arora			
18	Sh Satish Sharma			
19	Sh B Pandu Ranga Rao			
20	Sh Amit Trivedi			
21	Sh P N Ojha			
22	Sh T V G Ranga Rao			
23	Sh V G Reddy Tamma			
24	Dr D K Panda			
25	Sh A V S Manian			
26	Sh R K Goswami			
27	Sh Vinod Kumar			
28	Sh S Agarwal			
29	Dr N K Tiwary			
30	Sh A K Mishra			
31	Sh Rajendra Singh			
32	Sh Raj Singh			

Sl No	Name of the Officials	Title of course	Name & Address of Training Organisation	Duration and Period
33	Dr N K Tiwary	Air and Water Quality Monitoring	Dr S K Tyagi, Scientist 'E', CPCB Organised by: Centre for Continuing Education Services (CCE)	1 day 21 May 2016
34	Sh R K Goswami			
35	Sh M Selvarajan			
36	Sh Anand Bohra			
37	Sh K R P Nath			
38	Sh Rayees Ahmed			
39	Sh K P K Reddy			
40	Sh V Naga Kumar			
41	Sh M V Ramachandra Rao			
42	Sh Prateek Sharma			
43	Sh S C Sharma			
44	Sh Munish Kumar			
45	Ms Mithlesh Sharma			
46	Ms Mamta Pawar			
47	Ms Vijay Laxmi Vishkarma			
48	Sh Firoz Ahmed			
49	Sh Gaurav Bhatnagar			
50	Ms Beauty Chopra			
51	Ms Rashmi Gupta			
52	Sh C K P Sharma			
53	Sh Ashish Goyal			
54	Sh Puneet Sharma			
55	Ms Kalpna Sharma			
56	Sh Pravin Kumar			
57	Ms Deepa Kumari			
58	Ms Anita Rani			
59	Sh Amit Gandhi	Laboratory Quality Management System and Internal Audit	Electronics Test and Development Centre, STQC, Pune	4-days 13-16 June 2016
60	Sh Dipesh Tailor			
61	Sh Akash Badoni	Sampling, Testing and Evaluation of Concrete Making Materials and Concrete	Centre for Continuing Education Services (CCE)	4-days 21-24 June 2016
62	Sh Gourav			
63	Sh Vaibhav Chawla			
64	Sh N Kiran Kumar			
65	Sh S Kamalakkannan			
66	Sh Shiba Shankar Satapathy			
67	Sh Harishankar Prasad			
68	Ms Kshama Rani			
69	Ms Suruchi			

Sl No	Name of the Officials	Title of course	Name & Address of Training Organisation	Duration and Period
70	Sh A K Tripathi	Basic Computer Operation and MS Office	Centre for Industrial Information Services (CIS)	4 days 30th June 2016 & 1st, 4th & 5th July 2016
71	Sh Ajay Rana			
72	Sh Mahesh Mishra			
73	Sh Chanderpal			
74	Ms Poonam			
75	Ms Kshama			
76	Ms Rekha			
77	Ms Manju			
78	Ms Suruchi			
79	Sh Narender Singh			
80	Sh Gautam			
81	Sh Vaibhav Chawla	Use of Fly Ash and Blended Cements for Durable Concrete	Centre for Continuing Education Services (CCE)	3 days 19-21 July 2016
82	Sh Akash Badoni			
83	Sh Rizwan Anwar			
84	Sh G J Naidu	Improving Performance at Work Place	Sh Deepak Jindal, Management Consultant Organised by Centre for Continuing Education Services (CCE)	1 day 22nd July 2016
85	Sh S K Agarwal			
86	Sh S C Sharma			
87	Sh S Vanguri			
88	Dr (Ms) V Liju			
89	Ms K Bhatnagar			
90	Dr T M Rajan			
91	Dr S Palla			
92	Sh G Ahmed			
93	Sh Anil Kumer Popuri			
94	Sh Kapil Kukreja			
95	Sh Ankur Mittal			
96	Sh Akashneel Banerjee			
97	Sh Suresh K Shaw			
98	Sh Rayees Ahamed			
99	Sh Vinay Kant			
100	Sh Prateek Sharma			
101	Sh K R P Nath			
102	Sh Anand Bohra			
103	Sh V Venkatesh			
104	Sh A V S Manian			
105	Sh Amit Sagar			
106	Sh Arup Ghatak			
107	Sh Shubham Jain			
108	Ms Komalpreet Kaur			

Sl No	Name of the Officials	Title of course	Name & Address of Training Organisation	Duration and Period
109	Sh K P K Reddy			
110	Sh V Naga Kumar			
111	Sh Manjit Singh			
112	Sh Nikhil Kaushik	Measurement Uncertainty	National Institute of Training for Standardization, BIS	3 days 25-27 July 2016
113	Dr (Ms) Pinky Pandey	Calibration of Laboratory Equipment and Quality Assurance in Cement, Construction, Process and Power Industries	Centre for Continuing Education Services (CCE)	3 days 26-28 July 2016
114	Sh P Srikanth			
115	Sh Bharat Ram			
116	Sh Rishi Raj			
117	Sh C.K.P. Sharma			
118	Sh Ram Prasad Vijayvergia			
119	Sh Munish Kumar			
120	Ms Kalpna Sharma			
121	Sh Gaurav Bhatnagar			
122	Ms Mamta Pawar			
123	Sh Prasad Gonthi			
124	Sh V Ramaswamy			
125	Sh E Kista Reddy			
126	Sh Bipin Bihari Nayak			
127	Sh Lalit Yadav	Design, Construction and Maintenance of Flexible Pavements	The Central Road Research Institute (CRRI), New Delhi	5 days 08-12 August 2016
128	Ms Kalpana Sharma	In-house Training on Microsoft Excel	Centre for Industrial Information Services (CIS)	2 days 16 & 17 August 2016
129	Sh Gaurav Bhatnagar			
130	Sh Mahesh Mishra			
131	Sh Ravendra Singh			
132	Ms Mamta Pawar			
133	Sh Chander Pal			
134	Ms Meenu Verma			
135	Ms Vijay laxmi			
136	Ms Poonam Rani			
137	Dr N K Tiwary	Technologies for Reducing PM, NO _x , So _x and CO ₂ in Cement Industry	Centre for Continuing Education Services (CCE)	2 days 07-08 September 2016
138	Sh M Selvarajan			
139	Sh Anand Bohra			
140	Sh KRP Nath			

Sl No	Name of the Officials	Title of course	Name & Address of Training Organisation	Duration and Period
141	Sh B Pandu Ranga Rao	Earthquake Resistant Design of Buildings	D-CAD Technologies, New Delhi	2 days 07-08 October 2016
142	Sh Sanjay Mundra			
143	Sh Sanjay Mundra	Rigid Pavements: Design, Construction and Quality Control Aspects	Central Road Research Instt., New Delhi	2 days 17-21 October 2016
144	Sh M P Shukla	Improving Performance at Work Place	Sh Deepak Jindal, Management Consultant Organised by Centre for Continuing Education Services (CCE)	1 Day 7 November 2016
145	Sh Madhusudan Prasad			
146	Sh Munish Kumar			
147	Sh Sandeep Gupta			
148	Sh Gaurav Bhatnagar			
149	Sh Bhupinder Singh			
150	Sh Ajay Kumar			
151	Sh Puneet Sharma			
152	Md M Jamali			
153	Sh Rohit Yadav			
154	Sh Bishan Singh			
155	Sh Soma Verma			
156	Sh P K Chawla			
157	Sh D Kumar			
158	Sh S R P Gupta			
159	Ms Rashmi Gupta			
160	Ms Mamta Pawar			
161	Sh C K P Sharma			
162	Ms Vijaylaxmi Vishwakarma			
163	Ms Mitlesh Sharma			
164	Sh Palvinder Singh			
165	Sh B S Rawat			
166	Sh Ravi Kumar Yadav			
167	Sh Vishnu Dutt			
168	Sh Naresh Kumar			
169	Ms Suruchi			
170	Sh Harekrishana Sharma			
171	Sh Mahesh Mishra			
172	Sh Gautam			
173	Sh Rakesh Chandra			

Sl No	Name of the Officials	Title of course	Name & Address of Training Organisation	Duration and Period
174	Sh Shyam Singh Bohra			
175	Sh Rishi Raj			
176	Sh Ashish Goyal			
177	Sh O P Sharma			
178	Sh Raj Kumar			
179	Ms Poonam Rani			
180	Ms Yashika Bhardwaj			
181	Sh Manoj Khandai			
182	Sh M Iqbal			
183	Sh Raj Singh			
184	Ms Rashmi Gupta	Sampling and Testing of Cement as per BIS Standards	Centre for Continuing Education Services (CCE)	3 days 23-25 November 2016
185	Ms Mamta Pawar			
186	Sh C K P Sharma			
187	Sh Madhusudan Prasad			
188	Md M Jamali			
189	Sh Puneet Sharma			
190	Md Firoz Ahmed			
191	Sh Harishankar Prasad	Non-destructive Testing and Evaluation of Concrete Structures	Centre for Continuing Education Services (CCE)	3 days 29 November to 01 December 2016
192	Sh Vaibhav Chawla			
193	Sh Gaurav			
194	Sh Rahul Bansal	Quality Control & Quality Assurance in Concrete Construction	Centre for Continuing Education Services (CCE)	5 days 26-30 December 2016
195	Sh Reton Goal			
196	Sh Satish Sharma	Project Management and Quality Assurance and Quality Control in Concrete Construction	Centre for Continuing Education Services (CCE)	2 weeks 27 February to 10 March 2017
197	Sh Ankit Sharma			
198	Sh V Naga Kumar	(CTP) Mechanical Testing of Cement, Concrete and other Building Materials	Centre for Continuing Education Services (CCE)	5 days 06-10 March 2017
199	Sh Abhishek Agnihotri			

CENTRE FOR QUALITY MANAGEMENT, STANDARDS AND CALIBRATION SERVICES- CQC

The activities of the Centre for Quality Management, Standards and Calibration Services were organized under four programmes: Total Quality Management; Interlaboratory Services, Standard Reference Materials, and Calibration Services. These activities address all aspects of quality management and provide the entire range of Standardization, Calibration and Quality related services to cement industry, R&D institutions, Concrete and Allied Building Materials laboratories in India and abroad. The activities of Interlaboratory Services were given a boost and twelve new Proficiency Testing (PT) schemes were completed in accordance with ISO17043:2010. The Centre has completed ten sponsored projects this year.

Total Quality Management

Under this programme, Centre for Quality Management, Standards and Calibration Services (CQC) took up projects relating to quality improvement and accreditation etc. Assistance was provided in ISO 17025 accreditation of coal testing laboratory of a power plant and a 4-day training workshop on laboratory management system and internal audit as per ISO 17025:2005 was also conducted for this laboratory. This laboratory was successfully accredited by NABL as per ISO 17025:2005. Quality audit of coal testing laboratory of another power plant was also carried out.

An interlaboratory comparison study of 3 quality control laboratories of a cement company was carried out. This sponsored study was taken up for checking the proficiency of the laboratories. Laboratory assessment and proficiency improvement study was carried out for four quality control laboratories of a cement company. The scope of work included



Dr S K Breja (HoC-CQC) Delivering Lecture During Training Session in a Cement Plant



Parallel Testing at a Govt. Testing Laboratory, Odisha, under Laboratory Assessment and Proficiency Improvement Project

assessment of facilities and manpower skills and calibration check of equipment. These studies resulted in improvement of quality management system, proficiency and infrastructure of their laboratories.

During the year, NCB successfully upgraded its Quality Management System (QMS) from ISO 9001:2008 to ISO 9001:2015. The scope of certification now covers all the three units of NCB. The upgradation of QMS of NCB as per ISO 9001:2015 reflects NCB's commitment to ensuring excellence of processes and products and customer satisfaction.



NCB Official Demonstrating Proper Gauging Procedure

Inter Laboratory Services

In 2013, Interlaboratory Services (ILS) programme of Centre for Quality Management, Standards and Calibration Services (CQC) of NCB received first NABL accreditation for PT provider as per ISO/IEC 17043: 2010 in the country, and successfully completed several PT schemes thereafter.

ILS implemented QMS in line with ISO 17043:2010 as per accreditation norms. The present scope of accreditation covers: cement, fly ash, limestone, coal/pet coke, clinker, granulated slag and water for concrete in chemical field, and cement, fly ash & aggregate in mechanical field. ILS has been reassessed for reaccreditation by NABL in February 2017 with enhanced scope. The NABL team has recommended (by the time this report has been completed) enhancement of PT scope by including concrete admixture in chemical and mortar/concrete cube, tile (ceramic), burnt clay building brick and steel bar in mechanical field. In 2016-17, ILS completed twelve PT schemes. These schemes were implemented in accordance with ISO 17043:2010.

Sl. No.	PT Item	Field	Parameters	Method of Test	No. of Labs
1.	Fly ash	Mechanical	Blaine fineness; Fineness by wet sieving (45 µm); lime reactivity; compressive strength	IS 1727:1967	13
2.	Concrete admixture	Chemical	Dry material content; Ash content; pH; Chloride ion content	IS 9103:1999; IS 6925:1993	10

Sl. No.	PT Item	Field	Parameters	Method of Test	No. of Labs
3.	Aggregate	Mechanical	Coarse Aggregate: Apparent specific gravity; Water absorption Impact value Fine Aggregate: Sieve analysis Apparent specific gravity; Water absorption Bulk density	2386 (Part III): 1963; 2386 (Part IV):1963 2386 (Part I): 1963; 2386 (Part III): 1963	33
4.	Limestone	Chemical	Loss on ignition; SiO ₂ ; Fe ₂ O ₃ ; Al ₂ O ₃ ; CaO; MgO; Na ₂ O; K ₂ O; Free silica	IS 1760 (Part 1): 1991; IS 1760 (Part 2): 1991; IS 1760 (Part 3): 1992; NCB standard procedure, MS-13- 2010; IS 1760 (Part-6) : 2001	18
5.	Clinker	Chemical	Loss on ignition SiO ₂ ; Fe ₂ O ₃ ; Al ₂ O ₃ ; CaO; MgO; SO ₃ ; Cl Na ₂ O; K ₂ O	IS 4032:1985 IS 4032:1985 NCB standard procedure, MS-13-2010	15
6.	Chequered Tile	Mechanical	Water absorption; Wet transverse strength	IS 13801:2013	9
7.	Water for concrete	Chemical	Organic (volatile) filterable residue; Inorganic (fixed) filterable residue; Sulphates (as SO ₃); Chlorides (as Cl); Suspended (non- filterable) matter; pH; Alkalinity	IS 3025 (Part 18) IS 3025 (Part 18) IS 3025 (Part 24) IS 3025 (Part 32) IS 3025 (Part 17) IS 3025 (Part 11) IS 3025 (Part 23)	11
8.	Paver block	Mechanical	Water absorption; Compressive strength	IS 15658:2006	26

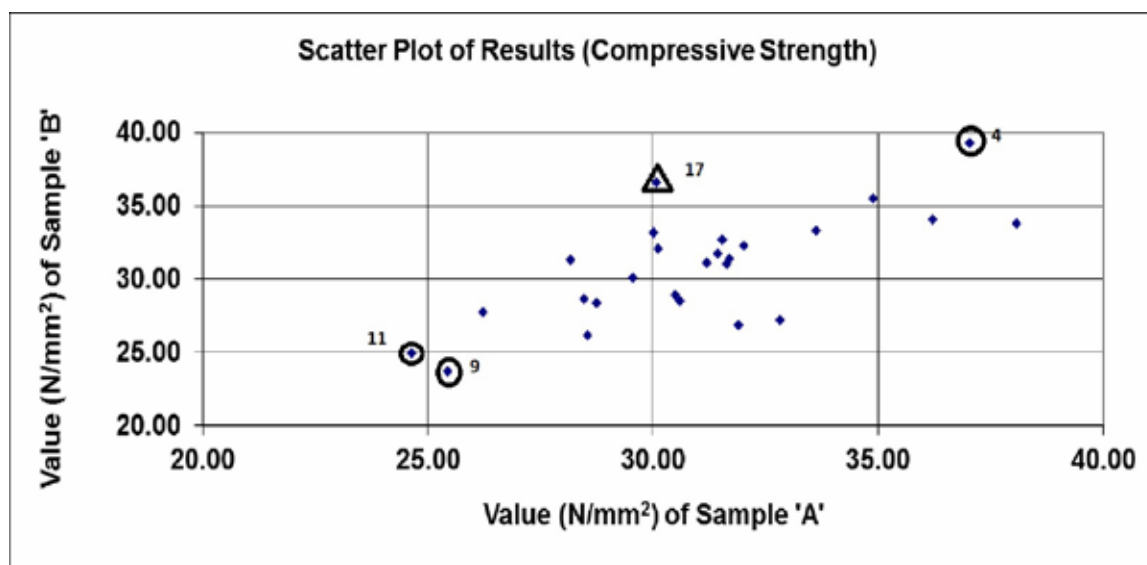
Sl. No.	PT Item	Field	Parameters	Method of Test	No. of Labs
9.	Granulated Slag	Chemical	Loss on ignition; SiO ₂ ; Fe ₂ O ₃ ; Al ₂ O ₃ ; CaO; MgO; SO ₃ ; IR; S Manganese oxide (Mn ₂ O ₃)	IS 4032:1985 NCB standard procedure, MS-14- 2010 IS12423;	6
10.	OPC	Chemical	Loss on ignition; SiO ₂ ; Fe ₂ O ₃ ; Al ₂ O ₃ ; CaO; MgO; SO ₃ ; IR; Cl Na ₂ O; K ₂ O	IS 4032:1985 NCB standard procedure, MS-13- 2010	17
11.	OPC	Mechanical	Specific surface (Blaine fineness); Normal Consistency; Initial setting time; Final setting time; 3-day (72 hrs.) CS; 7-day (168 hrs.) CS; 28-day (672 hrs.) CS	IS 4031:1999 IS 4031:1988	23
12.	Coal	Chemical	Moisture Volatile Matter Ash Gross Calorific Value Sulphur	IS 1350 (Part I):1984/ASTM/ EN/ISO IS 1350 (Part II):1970/ASTM/ EN/ISO IS 1350 (Part III):1969/ASTM/ EN/ISO	30

Of the new 12 schemes, concrete admixture, chequered tile and paver block PT schemes have been conducted for the first time in India. The participating laboratories were provided homogenized samples of PT items for testing in their laboratories. The test data reported by the laboratories were statistically evaluated for central tendency (median), spread and Z-score. The robust average and standard uncertainty for each parameter were calculated after normalizing the data as per ISO 13528:2015 (E).

Laboratories were evaluated for two types of variation – between laboratories and within laboratory, for both parameters. Between laboratories variation represents reproducibility and within laboratory repeatability of a test. N represents number of results

considered in evaluation. As per the above standard, performance of the laboratories with $|Z| \geq 2.0$ is considered satisfactory. The laboratories getting $|Z| \geq 3.0$ are considered outliers and those getting $2.0 < |Z| < 3.0$ score are considered questionable performers. Outliers are encountered due to lack of statistical control and increase in variation in data.

Data received from the laboratories were studied for distribution and scatter. The scatter of results in paver block scheme show presence of bias. In the scatter plot of results, code number of the outlier laboratory is mentioned along with the data point. Reproducibility outliers are put in circle and repeatability in triangle. The scatter of results for compressive strength test of paver block is shown in the following figure.



Scatter Plot of Test Results – Compressive Strength (N/mm²) – Paver block

In water absorption test, there is no questionable performer in both reproducibility and repeatability check. In compressive strength test, there are 3 questionable performers each in both checks. As regards outliers, in water absorption test, there is no outlier in reproducibility checking; however, there are 3 outliers in repeatability checking. There are three outliers in reproducibility and one in repeatability checking in compressive strength test.

Performance Status in Paver Block PT Scheme

Parameter	N	No. of Questionable Performers ($2 < Z < 3$)		No. of Outlying Performers ($ Z < 3$)	
		Between Labs	Within Lab	Between Labs	Within Lab
Water absorption (%)	26	Nil	Nil	Nil	3
Compressive strength (N/mm ₂)	26	3	3	3	1

11 laboratories participated in water for concrete scheme. The performance of the laboratories has been compared with previous scheme conducted in March 2015 for 4 parameters namely - organic residue, inorganic residue, chlorides and SO₃. Comparison

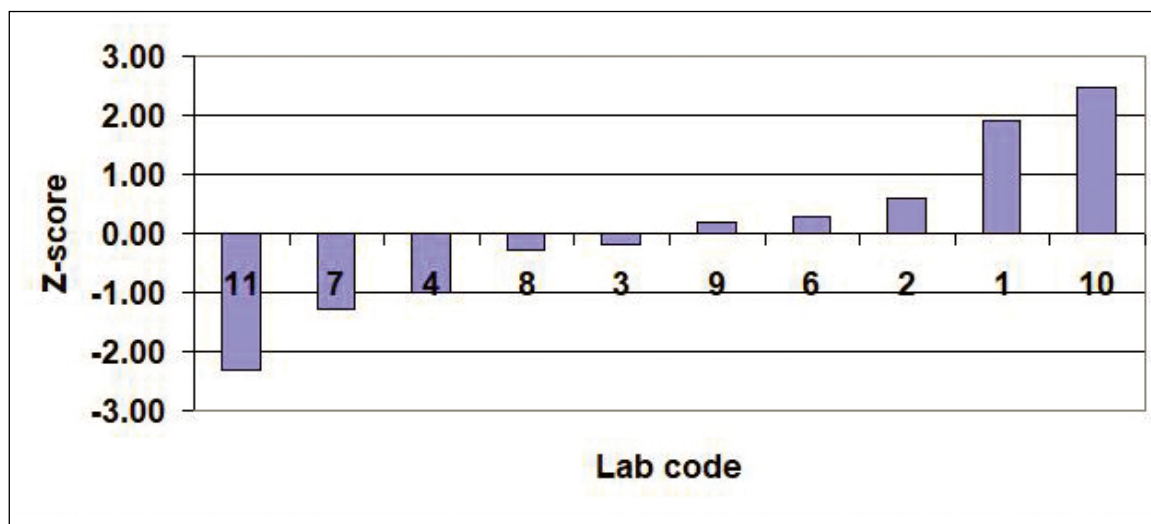
with previous scheme shows that number of outliers has reduced in SO₃ and chloride in repeatability check. The number of outliers has remained same/almost same for organic and inorganic residue for both reproducibility and repeatability check, and SO₃ and chlorides in reproducibility check. Comparison with the previous scheme is given in *Table* below.

Comparison with Previous Water for Concrete Scheme

Parameter	N	No. of Questionable Performers (2 < Z < 3)		No. of Outlying Performers (Z ≥ 3)	
		Between Labs	Within Lab	Between Labs	Within Lab
Organic residue (mg/l)	10 (16)	2 (1)	1 (Nil)	Nil (1)	1 (Nil)
Inorganic residue (mg/l)	9 (15)	Nil (1)	Nil (2)	Nil (Nil)	Nil (1)
SO ₃ (mg/l)	11 (18)	Nil (Nil)	Nil (1)	3 (4)	Nil (2)
Chlorides (mg/l)	11 (19)	1 (1)	Nil (Nil)	Nil (1)	1 (3)

Note: Data of previous scheme are presented in parenthesis.

Ordered Bar charts presenting 'between' and 'within' laboratory Z-scores were prepared for all the parameters in all schemes and included in the study report. The charts show code-wise location of the laboratories in terms of performance. Laboratories were given the feedback of their performance. Bar chart of between laboratories variation (reproducibility) for organic residue in water scheme is presented in the following *figure*.



Bar-chart of Reproducibility Z-score for Organic Residue in Water for Concrete

Standard Reference Materials

CQC/SRM developed and commercialized 2 new types of certified reference materials during the year. These CRMs can be used for checking proficiency of analysts, monitoring the quality of testing in the laboratories, maintaining product quality to manufacturing standards and maintaining accreditation as per ISO/IEC 17025 requirements.

During the year, 2 new types of CRMs – composite cement for Blaine fineness and chemical parameters were developed. These have now been commercialized. In addition, seven CRMs were developed for replenishing exhausted stock. Now, NCB has a wide range of CRMs for chemical and mechanical parameters of cement, fly ash and other materials. So far, 77 types of CRMs have been developed.

New CRMs Developed During the Year

Sl. No.	Material	CRM Code	Parameters
1.	Composite cement	1002E	Blaine fineness
2.	Composite cement	1043	LOI, SiO ₂ , Fe ₂ O ₃ , Al ₂ O ₃ , CaO, MgO, SO ₃ , IR, Na ₂ O, K ₂ O & Cl

CRMs Developed for Replenishing Exhausted Stock

Sl. No.	Material	CRM Code	Parameters
1.	OPC	1001A	Blaine fineness
2.	OPC Higher fineness	1001A-400	Blaine fineness
3.	PPC	1002A	Blaine fineness
4.	Fly ash	1001FC	Blaine fineness
5.	OPC Clinker	1015F2	LOI, SiO ₂ , Fe ₂ O ₃ , Al ₂ O ₃ , CaO, MgO, SO ₃ , Na ₂ O, K ₂ O, Mn ₂ O ₃ , TiO ₂ , P ₂ O ₅ and Cl
6.	Raw meal	1022A2	LOI, SiO ₂ , Fe ₂ O ₃ , Al ₂ O ₃ , CaO, MgO, SO ₃ , Na ₂ O, K ₂ O, Cl, Mn ₂ O ₃ , TiO ₂ and P ₂ O ₅
7.	Hydrated lime	1010	CaO, MgO, SiO ₂ , Insoluble residue, Specific gravity and Residue on 212 µm sieve

Supply of developed Certified Reference Materials (CRMs) was continued to the cement and construction industry laboratories. A total of 9571 vials of different CRMs and 1418 sets of standard lime were supplied to 588 customers from cement plants, testing laboratories and R&D institutions. Satisfaction of customers showed improvement in all quality dimensions.

Under this programme, three sponsored studies relating to development of reference standards based on material provided by user plants were also completed. Standards were developed for calibration of X-ray analyzer for a cement plant. Assistance was also rendered in development of clinker standards for calibration of XRD for two cement plants of a company. The sponsors were provided standards meeting traceability requirements for calibration of equipment.

Calibration Services

The calibration laboratories continued to implement Quality Management System as per ISO 17025:2005 requirements. The laboratories satisfactorily underwent reaccreditation audit by NABL. 1778 equipment/apparatus including proving rings, compression testing machines, vibrating machines, dial gauges, Blaine cells, pressure gauges, sieves, thermometers, environmental chambers, ovens, furnaces, balances and weighing scales of a RMC plant were calibrated for 497 clients. Satisfaction of customers from the calibration services showed significant improvement on timeliness, work quality and interaction dimensions.

A sponsored project relating to calibration of laboratory equipment of five coal testing laboratories of a coal mining (Public Sector) company was completed. Another project for calibration of laboratory equipment of ten numbers of material testing laboratories in government sector in Gujarat was also completed. The above projects ensured traceability of the laboratory equipment to SI units and reliability of the results of various tests carried out using these equipment.



Calibration of Hot Air Oven in QC Laboratory of a Cement Plant

PATENTS

NCB has been filing applications for patents on processes, products, systems, machinery, equipment and accessories developed by it from time to time. Details of NCB patents presently in force and the applications filed, which are in different stages of processing, are given in Appendix V.

ORGANISATIONAL FORUMS

Society

General Meeting

The Annual General Meeting of the Society for the year 2016 was held on 6 December 2016 in New Delhi when it adopted the Annual Report, the Audited Accounts and Balance Sheet for the year 2015-16.

Board of Governors

The composition of the Board for the year 2017 is given in the beginning of the report.

Corporate Advisory Committees

Research Advisory Committee (RAC)

To advise on all aspects pertaining to Programmed R&D and industrial support services in NCB, with particular reference to technology forecasting, technology planning, programmes, strategies and

methodologies and the overall project programme of NCB. The composition of the committee for the year 2017 is:

Chairman

Sh V S Narang
Director (Technical)
My Home Industries Ltd
Hyderabad

Members

Dr Ashok Kumar
Energy Economist
Bureau of Energy Efficiency (BEE)
New Delhi

Prof A K Tiwari
Vice President- Concrete Research
UltraTech Cement Ltd,
Mumbai

Sh J S Kalra
Senior Joint President
Birla Corporation Ltd,
(Satna Cement Works),
Satna, MP



53rd Annual General Meeting in Progress

Dr G V K Prasad
Senior President (CPU-I, II & CCP)
The KCP Ltd
KCP Cement Unit –II,
Krishan Distt, AP

Dr Nahar Singh
Head, Metrology in Cemeistry
National Physical Laboratory
New Delhi

The Director
Central Soil & Materials Research
Station (CSRMS),
New Delhi

Dr K Mohan
Faridabad

Sh Ashwani Pahuja
Executive Director
Dalmia Bharat Enterprises Limited
New Delhi

Sh C K Jain
Head Manufacturing Operations
(Cement Division)
Vasavdadatta Cement
Kesoram Industries Limited
Karnataka

Dr S A I Mujtaba
Suptdg Geologist
Geological Survey of India
Faridabad
(Haryana)

Dr D Venkateswaran
Sr Vice President (R&D)
The India Cements Ltd,
Chennai

Dr Manoranjan Hota
Director (IA)
Ministry of Environment,
Forests & Climate Change
New Delhi

Sh Kamal Kumar
Chief General Manager
Holtec Consulting Pvt Ltd
Gurgaon, Haryana

The Chief Mineral Economist
Indian Bureau of Mines,
Nagpur

Sh J K Prasad
Consultant – Building Materials
Building Materials and Technology
Promotion Council (BMTPC)
New Delhi

Dr K Ramanjaneyulu
Chief Scientist
Structural Engineering Research
Centre (SERC), Chennai

The Chairman and Managing Director
National Research Development Corpn.
New Delhi

Sh Rakesh Bhargava
Chief Climate and Sustainability Officer
Shree Cement Ltd
Dist. Ajmer, Rajasthan

The Deputy Director General
National Productivity Council
New Delhi

Dr S K Handoo
Advisor (Technical)
Cement Manufacturers' Association
Noida, UP

Sh Sanjay Pant
Director (Civil Engg) & Head
Bureau of Indian Standards
New Delhi

Dr Bibekanand Mohapatra
VP (New product development and
product quality management)
Ambuja Cements Ltd, Mumbai

The Member Secretary
Central Pollution Control Board, Delhi

Dr Lakshmy Parameswaran
Chief Scientist
Bridges and Structures Division
Central Road Research Institute, New Delhi

Sh Ashwani Gupta
Scientist 'G'
Department of Scientific and
Industrial Research (DSIR)
New Delhi

Sh S A Khadilkar
Director-Quality & Product Development
ACC Ltd
Thane, Maharashtra

Prof B Bhattacharjee
Prof of Civil Engineering
Indian Institute of Technology, Delhi

Sh Sushil Kumar Rathore
Unit Head
J K Cement Works
Distt Chittorgarh, Rajasthan

Sh S K Saxena
Vice President (Jhajjar Unit and QA)
J K Lakshmi Cement Ltd
Dist. Jhajjar, Haryana

Sh Gopi Ranganathan
Sr. GM (TPE)
Zuari Cement Ltd
Bangalore

Sh V K Pandey
GM (Project & Technical)
Cement Corporation of India Ltd
New Delhi

Sh Narendra Singh
Head - Plant
Saurashtra Cement Ltd
Gujarat

Sh S K Tiwari
Technical Director
Heidelberg Cement India Limited
Heidelberg Cement Technology Centre
Gurgaon

Sh R K Khandekar
Addl General Manager
Ash Utilization Group
NTPC Ltd,
NOIDA

Sh Sivakumar Subramaniam
Country Head Supply Chain Management
& SVP- Industrial
Lafarge India Pvt. Ltd
Kolkata

DG, Directors,
HOC's and Joint Directors

Member-Secretary

Dr S Harsh
Jt. Director, NCB

Infrastructure Development Committee (IDC)

To advise the Board of Governors on various aspects of land, building services, equipment and facilities at the various NCB Units and to cause these infrastructural developments to be carried out at the various NCB Units and to assist in conducting the affairs of the unit in such a manner as to fulfill the set objectives with the programmes, policies and guidelines laid down by the board. The composition of the committee for the year 2017 is:

Chairman

Sh Mahendra Singhi
Group CEO
Dalmia Cement (Bharat) Ltd
New Delhi

Members

The Director (Cement)
Dept. of Indl. Policy & Promotion
Ministry of Commerce & Industry
Udyog Bhawan
New Delhi

Sh S K Deshpande
Scientist 'G' & Advisor
Dept. of Scientific & Indl. Research
Ministry of Science & Technology
Technology Bhawan
New Delhi

Ms Saraswati Devi
Addl General Manager (Operations)
Cement Corporation of India Ltd
New Delhi

Sh V K Hamirwasia
President
Birla Corporation Ltd
Birla Cement Works
Chittorgarh, Rajasthan

Dr Rakesh Kumar
Head of Deptt (Rigid Pavements)
Central Road Research Institute
New Delhi

Sh S K Tiwari
Technical Director
Heidelberg Cement India Ltd
Heidelberg Cement Technology centre
Gurgaon

Sh Anil Shukla
Vice President
UltraTech Cement Ltd
Haryana

Sh Shashi Ranjan
General Manager – PE-Civil
NTPC Ltd
Engineering Office Complex
Noida

Sh Naveen Kumar Sharma
Vice President(Grinding Plant)
JK Lakshmi Cement Ltd
Distt. Gandhi Nagar,
Gujarat

DG-NCB, Directors, Joint Directors
and Heads of Concerned Services Groups in NCB

Member-Secretary

Sh Rabindra Singh
Jt. Director, NCB

Administration & Finance Committee (AFC)

To advise the Board of Governors on issues relating to financial planning, budgets, accounts, manpower growth plan and service matters including various rules of NCB. To take decisions on behalf of the Board of Governors on individual personnel cases and on issues of administrative nature as may be referred to it by the Board or by the Director General-NCB. All such decisions shall be reported to the Board at its immediate next meeting through the relevant status report. The composition of the committee for the year 2017 is:

Chairman

Sh M S Gilotra
Managing Director
Gujarat Sidhee Cement Ltd &
Saurashtra Cement Ltd
Agrima Business Centre
Mumbai

The Director (Cement)
Department of Indl Policy & Promotion
Ministry of Commerce & Industry
Udyog Bhawan
New Delhi

The Director
Integrated Finance Wing
Department of Indl Policy & Promotion
Ministry of Commerce & Industry
Udyog Bhavan
New Delhi

Sh C K Bagga
Vice President (Fin. & A/Cs)
JK Lakshmi Cement Ltd
Nehru House
New Delhi

Sh Dharmender Tuteja
Executive Director
F&A & Commercial
Dalmia Cement (Bharat) Ltd
New Delhi

DG-NCB, Directors, Joint Directors and Heads of
concerned Service Groups

Member-Secretary

Sh S K Chaturvedi
Jt. Director, NCB

Regional Advisory Committee

Advisory Committee for NCB- Hyderabad

To advise the Board of Governors and RAC, AFC and IDC on various aspects of development of NCB Hyderabad and its activities, and in particular on matters concerning the development and utilization of infrastructural facilities of the Unit and the industrial services rendered by it, and to assist in conducting the affairs of the Unit in such a manner as to fulfill the set objectives within the programmes, policies and guidelines laid down by the Board. The composition of the Committee for the year 2017 is:

Chairman

Sh D Muruganandam
President (Manufacturing)
The India Cements Ltd
Chennai,
Tamilnadu

Members

Sh P Anantham
President (Operations)
My Home Cements Ltd
Hyderabad

Sh D Lakshmikantham
Director (Technical)
Penna Cement Ind. Ltd
Hyderabad

Sh Anubhav Varma
Vice President (Mfg.)
Kalburgi Cement Pvt. Ltd
Kalburgi Dist.,
Karnataka

Sh R V R Murthy
Vice President (Operations)
Devapur Cement Works
(Unit of M/s Orient Cement Ltd)
Adilabad Distt
Telangana

Sh K Bikshapathi
Director General
National Academy of Construction (NAC)
Hyderabad

Sh Shailendra Sharma
The Chief Engineer
Southern Zone – II
Central Public Works Department (CPWD)
Hyderabad

Sh S Bhowal
The Scientist 'E' & Head
Bureau of Indian Standards
Hyderabad

Sh V Anil Kumar
The Member Secretary
Telangana State Pollution Control Board
Sanathnagar, Hyderabad

Sh B R V Susheel Kumar
Director
Dept. of Mines & Geology
Govt. of Telangana
Hyderabad

Dr Sreedhar Cherukuri, IAS,
Commissioner
Andhra Pradesh Capital Region Development
Authority (APCRDA)
Govt. of Andhra Pradesh
Vijayawada
Andhra Pradesh

Sh N Sudhakar
Regional Manager
L & T Ltd (ECC Division)
Madhapur, Hyderabad

Dr P Rathish Kumar
Associate Dean (P & D)
Civil Engineering Dept
National Institute of Technology (NIT)
Warangal, Telangana

Sh S Eshwaraiah
Chief Engineer
Telangana State Housing Corporation Ltd,
Himayatnagar
Telangana

Sh A Narender Reddy
Chief Engineer
Irrigation Dept (Designs) – I & CAD
Govt of Telangana
Hyderabad, Telangana

Director General-NCB

Member - Secretary

Ms K V Kalyani
Joint Director NCB and
Unit-in-Charge of NCB Hyderabad

Executive Committee

With a view to achieve the objectives of collegiate management and to assist the Director General to deal with various functions, the Executive Committee, comprising Heads of various Centres of Activities with the Director General as its Chairman, held 07 meetings and deliberated upon important issues including approving proposals for 621 sponsored projects.

Forum for Science and Technology

During the period, 8 meetings of FST were held. The meetings provided interactive discussions among the scientific staff of NCB. The meetings have served very well for keeping the scientists and engineers informed on the latest developments in the area.

1	01 July 2016	Role of Scientists in NCB's Perspective	Dr K Mohan, Former DG -NCB
2	11 July 2016	Effect of High MgO Limestone and Cement Expansion	Dr K Mohan, Former DG -NCB
3	18 July 2016	Coating formation/buildups in Cement Rotary Kiln System	Dr K Mohan, Former DG -NCB
4	25 July 2016	Effect of Particle Size Distribution of Cement/Concrete performance	Dr K Mohan, Former DG -NCB
5	9 August 2016	Supplementary Cementitious Materials and Green Concrete	Dr K Mohan, Former DG -NCB
6	16 August 2016	Repair and Retrofitting of Concrete Structures – A Global View	Sh V V Arora, Joint Director-NCB Sh Satish Sharma, Joint Director-NCB
7	23 September 2016	Application of Thermo Analytical Techniques in the Study of Cement Hydration Reaction	Sh Giasuddin Ahamed, Dy Manager-NCB
		Earthquake Resistant Construction & Practicing IS Codes	Sh Sanjay Mundra, Group Manager-CDR
8	17 November 2016	Development and Adoption of Appropriate Technologies for Enhancing Productivity in the Cement Sector – Study tour to Germany and Austria under UNIDO Project	Dr S Harsh, Joint Director -NCB

ORGANISATIONAL MATTERS

Staff Particulars

NCB had strength of 198 Cadre Officials comprising of engineers, scientists and technical and administrative support staff as on 31st March 2017 engaged in the activities of the organisation.

Staff Welfare

NCB continued to look after the welfare of its staff through several activities. During 2016-17, 77 NCB officials availed facility of staff quarters in NCB Housing Colony. The Group Personal Accident Insurance Policy to cover risks arising out of accidents was continued for the year 2016-17.

Activities of NCB Staff Club, working for fostering social and fraternal relations amongst the officials, included maintenance of library, indoor games and other cultural activities. The Club also involved the family members of staff, especially children, in celebration of Independence Day and Republic Day.



NCB Staff Club organised activities during the Year 2016-17 at Ballabgarh Complex

INFRASTRUCTURE

NCB - Ahmedabad

Ahmedabad unit of NCB has essential facilities for testing of cement, concrete, steel and soil in order to provide Quality Assurance and Quality Control (QA-QC) and Third Party Quality Assurance (TPQA) services to the construction industry. Facilities includes Universal Testing Machine (UTM), Automatic Compression Testing Machine (ACTM), Physical Testing Laboratory, Spectrophotometer, Flame photometer, RCPT, Triaxial Testing Machine, CBR Testing Machine, Consolidation Testing Machine, Cone penetrometer and Non-Destructive Testing (NDT) equipment such as Rebound hammer and Feroscan. Unit is using these facilities to provide QA-QC and TPQA services to various government agencies of Gujarat, Daman & Diu and Dadra & Nagar Haveli.

NCB - Ballabgarh

The technical infrastructure at NCB's Ballabgarh Unit, developed in a planned manner and upgraded over the years, makes it one of the most modern R&D laboratories for cement and building materials.

Major equipment facilities available here are:

Scanning Electron Microscopy & Energy Dispersive Analysis of X-rays (SEM & EDX) Laboratory, Advanced X-ray Diffractometer, Multi-dispersive X-ray Fluorescence Spectrometer with large auto sample changer, Fused Bead Making Machine and sample preparation unit, Inductive Coupled Plasma Spectrometer for minor heavy elements, Fourier Transform Infrared Spectroscopy, fully automatic CHNS Analyser, Computerized Bomb calorimeter, Optical Microscope with image analysing system, Pyrometric Cone-Equivalent Furnace, equipment for non-destructive evaluation of concrete structures, Flexural and Transverse

Strength Testing Machine for concrete samples, Abrasion Testing Machine, Automatic Compression Testing Machines (various capacities), Universal Testing Machines, Permeability Tester, Heavy Test Floor for testing of large size structural elements and light weight concrete elements, Computerized Laser Beam Particle Size Analyser, Ultrasonic Pulse Velocity Apparatus, Concrete Pile Integrity Tester, Endoscopic Test Apparatus for Hardened Concrete, Bridge Testing Equipment, Impact Echo Test, and Underground Radar Equipment, Computer Aided Image Analyser System for satellite imageries, Global Positioning System, high temperature testing for clinkerisation and refractories, Differential Thermal Analyser, pollution monitoring equipment facility including High Volume Air Samplers, Respirable Dust Samplers, Multi-gas Analyser, Portable Flue Gas Analyser, Opacity Monitor, Noise Measurement System, CO₂ Gas Analyser, Ultrasonic Gas Leak Detector and Low Level BTX Hydrocarbon Analyser for ambient air etc. Simulator based training system for kiln and mill operation of cement plants with two PC-based trainer stations and five trainee stations each.

NCB has an Independent Test House equipped with an extensive range of sophisticated analytical instruments and a computer based Laboratory Information Management System (LIMS).

Construction of a new laboratory block for test house and new hostel building with cafeteria for trainees is under progress.

During the year, important equipment facilities added were Servo Controlled Compression testing machine, Ultrasonic Pulse Velocity testing equipment and Flexural Testing Machine for RCC beam (as per ASTM C 1609) with displacement rate control upto 0.025mm/min.

LIMS (Laboratory Information Management System), Creep Test Rig 2000 KN, Autoclave

-38-Model Code –EL 38-3800/01 ,Microsoft Language/ Multilingual Software OFFICESTD 2016 INC OLP D Gov. , Software's , Stain controlled ACTM 3000 KN ,Computer and Laptops, Isothermal Calorimeter , Rebar Detector , Half Cell Potential Equipment , Pull off Tester Equipment , Air Permeability Test Equipment , Carbonation Chamber , Environmental Chamber, Portable Surface Resistivity Meter, Low and High Temp. Range Bath.

NCB - Hyderabad

The range of equipment facilities at NCB's Hyderabad unit cover testing and evaluation facilities for cement, cement raw materials, coal, concrete making materials besides calibration facilities for related physical and mechanical testing equipment.

The advanced instruments laboratory of the unit is equipped with XRF Spectrometer, X-Ray Diffractometer, DTA-TG-DSC equipment, CHNS elemental analyser, laser beam (based) particle size analyser and optical microscope with image analyser. The unit also has a concrete laboratory with a wide

range of equipment facilities for testing of cement and concrete making materials and conducting concrete mix proportioning.

The unit has modern instruments and equipment for in-plant studies including gas analysers, pyrometers and velocity/pressure measuring instruments for energy audit and process diagnostic studies. A modern PC based simulator trainer covering different grinding and pyro-processing systems is available in the unit for providing hands-on training to mill and kiln operators of cement plants.

The unit is equipped with a training complex including training block, hostel and canteen to facilitate residential programmes.

NCB - Odisha

During the year, important equipment facilities added were Servo Controlled Compression Testing Machine, Ultrasonic Pulse Velocity testing equipment and Flexural Testing Machine for RCC beam (as per ASTM C 1609) with displacement rate control upto 0.025mm/min.



A few Newly added equipments

LIAISON AND CO-ORDINATION

NCB maintained liaison with a large number of overseas and Indian organizations, through membership or otherwise.

The Director General and other officials continued to serve on a number of committees constituted by the Government of India, the Bureau of Indian Standards and other organizations as follows:

Sh Ashwani Pahuja Director General

- (a) Chairman, CPCB Standing Committee & National Task Force for Cement Industries
- (b) Member, Governing Body, Bureau of Indian Standards (BIS)
- (c) Member of Standards Advisory Committee, Laboratory Advisory Committee, Certification Advisory Committee of Bureau of Indian Standards (BIS)
- (d) Member, Programme Advisory Committee (PAC) for Fly Ash, Department of Science & Technology, New Delhi
- (e) Member, Standing Committee for Innovative Building Material and Technology (BMTPC), New Delhi
- (f) Member, PAT Sectoral Expert Committee (Cement Sector), Bureau of Energy Efficiency, New Delhi
- (g) Member, American Concrete Institute
- (h) Member, Indian Roads Congress
- (i) Member, Editorial Board, J Cement Energy and Environment, Cement Manufacturers' Association
- (j) Member, Technical Committee, Cement Manufacturers' Association
- (k) Member, Research Council of CSIR-CRRI
- (l) Member, Expert Committee on Technological

Intervention for Addressing Societal Needs (TIASN)

- (m) Member, Technical Committee on Cement, Concrete & Mortars for the establishment of Products Environmental Protocols for the Indian Market of Indo-Italian Chamber of Commerce & Industry, Mumbai.

Dr Shri Harsh Joint Director

- (a) Member, Panel for Work Relating to ISO/TC71 and ISO/TC74 (CED2/P1), Bureau of Indian Standards, New Delhi.
- (b) Member, Cement, Pozzolana and Cement Additives Subcommittee (CED 2:1), Bureau of Indian Standards, New Delhi.
- (c) Member, Panel for Revision of Cement Standards (CED 2:1/P1), Bureau of Indian Standards, New Delhi.
- (d) Member, Methods of Analysis Sub Committee (PCD 7:4), Bureau of Indian Standards, New Delhi.

Dr V P Chatterjee Joint Director

- (a) Member, Stones Sectional Committee (CED 6), Bureau of Indian Standards, New Delhi.

Sh S K Chaturvedi Joint Director

- (a) Member, Refractories Sectional Committee (MTD 15), Bureau of Indian Standards, New Delhi.

Dr R S Gupta General Manager

- (a) Building Lime Sectional Committee (CED 4), Bureau of Indian Standards, New Delhi.

Sh A K Mishra**Joint Director**

- (a) Member, Bulk Handling Systems and Equipment Sectional Committee (MED 7), Bureau of Indian Standards, New Delhi.
- (b) Member, Coal Benefication & Lignite Sub Committee (PCD 7:6 & PCD 7:9), Bureau of Indian Standards, New Delhi.
- (c) Member, Working Group on Technical Sector of Standard Promotion and Consumer Affairs Deptt. (SP & CAD), Bureau of Indian Standards, New Delhi.

Sh Rabindra Singh**Joint Director**

- (a) Member, Solid Mineral Fuels Sectional Committee (PCD 7), Bureau of Indian Standards, New Delhi.
- (b) Member, Coke Sub Committee (PCD 7:2), Bureau of Indian Standards, New Delhi.
- (c) Member, Coal Sub Committee (PCD 7:3), Bureau of Indian Standards, New Delhi.

Sh N K Tiwari**General Manager**

- (a) Member, Environmental Protection and Waste Management Sectional Committee (CHD 32), Bureau of Indian Standards, New Delhi.
- (b) Member, Solid Waste Management Sectional Committee (CHD:33), Bureau of Indian Standards, New Delhi.
- (c) Member, Environmental Management Sectional Committee (CHD 34), Bureau of Indian Standards, New Delhi.
- (d) Member, Life Cycle Assessment Sub Committee (CHD 34:P7), Bureau of Indian Standards, New Delhi.
- (e) Member, Air Quality Sectional Committee (CHD 35), Bureau of Indian Standards, New Delhi.

Sh V V Arora**Joint Director**

- (a) Chairman, Cement Matrix Products Sectional Committee (CED 53), Bureau of Indian Standards, New Delhi.
- (b) Convener, Panel for Masonry (CED 46:P7), Bureau of Indian Standards, New Delhi.
- (c) Convener, Working Group for Revision of IS 9103:1999, CED 2:2/WG1 Specification for Admixture for Concrete, Bureau of Indian Standards, New Delhi.
- (d) Convener, Panel for Revision of IS:457, CED 2:2/P6, Code of Practice for General Construction of Plain and Reinforced Concrete for Dams and other Massive Structures, Bureau of Indian Standards, New Delhi.
- (e) Member, CIVIL Engg. Divisional Council (CEDC), Bureau of Indian Standards, New Delhi.
- (f) Member, Cement and Concrete Sectional Committee (CED 2), Bureau of Indian Standards, New Delhi.
- (g) Member, Panel for work relating to ISO/TC71 and ISO/TC74 (CED2/P1), Bureau of Indian Standards, New Delhi.
- (h) Member, Panel for Revision of Handbooks (CED 2/P2), Bureau of Indian Standards, New Delhi.
- (i) Member, Panel for Aggregates from other than Natural Sources (CED 2/P3), Bureau of Indian Standards, New Delhi.
- (j) Member, Concrete Sub Committee (CED 2:2), Bureau of Indian Standards, New Delhi.
- (k) Member, Panel for Revision of IS 3370 (Part I & Part II) (CED 2:2/P1), Bureau of Indian Standards, New Delhi.
- (l) Member, Panel for Revision of IS: 456 and IS: 1343 (CED 2:2/P5), Bureau of Indian Standards, New Delhi.
- (m) Member, Panel for Revision of Indian Standards on Test Methods for Concrete (CED

2:2/P7), Bureau of Indian Standards, New Delhi.

- (n) Member, Structural Safety Sectional Committee (CED 37), Bureau of Indian Standards, New Delhi.
- (o) Member, Earthquake Engineering Sectional Committee (CED 39), Bureau of Indian Standards New Delhi.
- (p) Member, National Building Code Sectional Committee (CED 46), Bureau of Indian Standards New Delhi.
- (q) Member, Panel for Fire protection (CED 46:P2), Bureau of Indian Standards, New Delhi.
- (r) Member, Panel for Load, Forces and Effects (CED 46:P4), Bureau of Indian Standards, New Delhi.
- (s) Member, Panel for Soil and Foundation/Panel for Plain Reinforced & Prestressed Concrete (CED 46:P5), Bureau of Indian Standards, New Delhi.
- (t) Member, Panel for Plain Reinforced & Prestressed Concrete (CED 46:P8), Bureau of Indian Standards, New Delhi.
- (u) Member, Panel for Prefabrication and Systems Building (CED 46:P10), Bureau of Indian Standards, New Delhi.
- (v) Member, Fibre Reinforced Cement Product Sub Committee (CED 53:1), Bureau of Indian Standards, New Delhi.
- (w) Member, Precast Concrete Products Sub Committee (CED 53:3), Bureau of Indian Standards, New Delhi.
- (x) Member, Concrete Reinforcement Sectional Committee (CED 54), Bureau of Indian Standards, New Delhi.
- (y) Co-Convener, H-3 Rigid Pavement Committee, Indian Road Congress, New Delhi.
- (z) Member, H-5 Rural Roads Committee, Indian Road Congress, New Delhi

Sh Satish Sharma

Joint Director

- (a) Member, Panel for Revision of IS 457 (CED 2:2/P6), Bureau of Indian Standards, New Delhi.
- (b) Member, Construction Plant and Machinery Sectional Committee (MED 18), Bureau of Indian Standards, New Delhi.
- (c) Member, Planning, Housing and Prefabricated Construction Sectional Committee (CED 51), Bureau of Indian Standards, New Delhi.
- (d) Member, Panel for Administration, Development Control Rules and General Buildings (CED 46:P1), Bureau of Indian Standards, New Delhi.
- (e) Member, Concrete Pipes Sub Committee (CED 53:2), Bureau of Indian Standards, New Delhi.

Dr S K Breja

Joint Director

- (a) Member, Sieves, Sieving and other Sizing Methods Sectional Committee (CED 55), Bureau of Indian Standards, New Delhi.
- (b) Member, Flooring, Wall Finishing and Roofing Sectional Committee (CED 5), Bureau of Indian Standards, New Delhi.

Sh Brijesh Singh

Manager

- (a) Member, B-4 Concrete (Plain, Reinforced and Pre-stressed) Structure Committee, Indian Road Congress, New Delhi.
- (b) Member, Panel for Asset and Facility Management (CED:46:P22), Bureau of Indian Standards, New Delhi

Appendix - I

Rolling Plan of Missions within the Framework of Centres

A. CENTRE – CEMENT RESEARCH AND INDEPENDENT TESTING (CRT)

- Mission 1 : Utilization of Marginal Grade Raw Materials in the Manufacture of Cement and Building
- Mission 2 : Development of Newer Cements, Composites and Alternate Binding and Building Materials
- Mission 3 : Development of Newer Processes of Manufacturing Cement and other Binding and Buildings Materials
- Mission 4 : Raw Mix Design Optimization
- Mission 5 : Utilization of Industrial and other Wastes for Cement and Building Materials
- Mission 6 : Development of Newer Refractories
- Mission 7 : Improved Refractory Engineering Practices
- Mission 8 : Study of Fundamental Concepts in Material Science and Fundamental Studies Relating to Areas of Fuel Combustion, Pyro-processing, Size Reduction, etc
- Mission 9 : Independent Testing

B. CENTRE – MINING, ENVIRONMENT, PLANT ENGINEERING AND OPERATION (CME)

- Mission 1 : Compilation and Updating of National Inventory of Cement Grade Limestone Deposits
- Mission 2 : Identification, Exploration, Evaluation and Assessment of Limestone Deposits and other Cement Raw Materials
- Mission 3 : Upgradation and Quality Establishment of Limestone (at Quarries) and Mineral Conservation
- Mission 4 : Application of Remote Sensing Techniques
- Mission 5 : Advanced Survey Techniques including Geographical Information System (GIS) and Global Positioning System (GPS)
- Mission 6 : Application of Geophysical Techniques for Mineral Exploration, Ground Water Investigation, etc.

- Mission 7 : Mine Planning and Scheduling
- Mission 8 : Improved Machinery Application and Improved Technological Upgradation for Mining Practices
- Mission 9 : Sustainable Development through Environmental Improvement including Survey of Land and Water Resources.
- Mission 10 : Pollution Control Technologies for Particulate Gaseous Emissions and Liquid Effluents
- Mission 11 : Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for Industrial Projects and Mines
- Mission 12 : Environmental Management System (EMS) and ISO - 14001 Certification for Process Industries
- Mission 13 : Utilization of Hazardous Wastes as Supplementary Fuel
- Mission 14 : Monitoring of Environmental Parameters for Water, Ambient Air Quality, Noise and Vibration Studies
- Mission 15 : Rehabilitation and Reclamation of Mined out Areas
- Mission 16 : Improving Capacity Utilization and Increasing the Rate of Production in Kilns and Mills towards Improving Total Factor Productivity in Cement Industry through Process Optimization, Diagnostic Studies and Trouble Shooting and Improvement in Operation
- Mission 17 : Benchmarks, Best Practices, Operational Norms and Technical Audit including Plant Monitoring
- Mission 18 : Productivity Enhancement Programme (PEP)
- Mission 19 : Technological Upgradation
- Mission 20 : Improving Utilization of Coals
- Mission 21 : Utilization of Alternate Fuels such as Lignite, Natural Gas, Combustible Wastes etc.
- Mission 22 : Improvements in Fuel Combustion Efficiency
- Mission 23 : Optimization of Energy (Both Thermal and Electrical) Consumption
- Mission 24 : Energy Auditing, Management and Monitoring
- Mission 25 : Waste Heat Utilization including Cogeneration
- Mission 26 : Creating Awareness and Motivation for Energy Conservation
- Mission 27 : Total Productive Maintenance (TPM)
- Mission 28 : Preventive/Predictive Maintenance Programme, Condition Monitoring Techniques and Tribology including Computerised Maintenance
- Mission 29 : Inventory Control and Spare Parts Management
- Mission 30 : Risk Analysis and Improving Safety in Cement Plants
- Mission 31 : Turnkey Consultancy for Setting up Modern Medium and Large Cement Plants from Concept to Commissioning including Fund Sourcing

- Mission 32 : Establishing Modern Energy Efficient CRI-MVSK and Rotary Kiln based Mini Cement Plants from Concept to Commissioning
- Mission 33 : Improvements in System Design and Engineering of Plant and Machinery (including CRI designed indigenous Preheater System, Burners for High Ash Coals, Refractory Lining System and Coal Quality Modulation System)
- Mission 34 : Modernization and Technological Upgradation in Cement Plants
- Mission 35 : Upgradation and Modification of VSK based Cement and Lime Plants
- Mission 36 : Developing Systems Designs for Bulk Movement of Cement by Rail, Road and Waterways
- Mission 37 : Marketing Strategies and Logistics
- Mission 38 : Improvements in Packaging of Cement

C. CENTRE – CONSTRUCTION DEVELOPMENT AND RESEARCH (CDR)

- Mission 1 : Analysis and Design of Structures for Safety and Economy and Development of Related Software Packages
- Mission 2 : Rationalizing Designs of Structures and Foundations in Cement Plants and Other Constructions
- Mission 3 : Performance Evaluation of Structures including Machine Foundations through Site Inspection and Testing
- Mission 4 : Formulation and Evaluation of Protective System for Enhancing the Service Life of Concrete Structures
- Mission 5 : Evaluation of Concrete Construction through Non-Destructive Investigations
- Mission 6 : Improving Durability of Concrete Construction through Distress Investigations and Rehabilitation Procedures
- Mission 7 : Improved Quality Control Procedures for Enhancing Durability
- Mission 8 : Rational Utilization of Cement and other Ingredients in Concrete, including Admixtures
- Mission 9 : Promotion of Ready Mix Concrete Technology in India
- Mission 10 : Development of Concrete for Special and Newer usages such as Underwater Concreting, Special Concrete Exposed to Extreme Temperature etc
- Mission 11 : Development and Evaluation of Prefab Systems Appropriate for Housing Programmes
- Mission 12 : Application of Alternative Building Materials and Development of Construction Techniques

for Low Cost Housing

- Mission 13 : Improvements in Construction Technology of Cement Concrete Pavements and Canal Linings
- Mission 14 : Development of Precast Architectural Concrete Elements and Concrete Finishes
- Mission 15 : Preventive Maintenance Programme for Enhancing Service Life of Buildings
- Mission 16 : Extended Application of Concrete for Non-Structural Usage
- Mission 17 : Improvement in Construction Management Techniques
-

D. CENTRE – INDUSTRIAL INFORMATION SERVICES (CIS)

- Mission 1 : Collection, Documentation and Retrieval of Information for Development of Cement and Building Materials Industries
- Mission 2 : Establishing National Data Bank for the Cement and Building Materials Industries
- Mission 3 : Providing Library Services
- Mission 4 : Establishing Display Centre and Sample Museum and Participation in Exhibition and Trade Fairs
- Mission 5 : Publication of R & D Projects, Technology Digests, R & D Journals, Trend Reports, Promotional Literature etc
- Mission 6 : Organising Workshops and Seminars at National and International Levels on Topical Subjects in the Areas of Cement and Building Materials
- Mission 7 : Promoting International Linkages for Development of Technologies in the Field of Cement and Building Materials
-

E. CENTRE – CONTINUING EDUCATION SERVICES (CCE)

- Mission 1 : Improving the Talent of Personnel at Entry Level to Cement Industry
- Mission 2 : Improving Technical and Managerial Skills/Knowledge of NCB Officials through Inhouse/ External Programmes
- Mission 3 : Manpower Planning and Human Resource Development Strategies for Cement and Building Material Industries

- Mission 4 : Upgrading Technological Talent of Personnel in the Cement and Building Materials Industries
- Mission 5 : Improving Operational Skills of Personnel in the Cement Industry through Simulator Based Courses
- Mission 6 : Training of Personnel in Computer Programming, Application and Information Technology at Different Levels of Participation
- Mission 7 : Training of Personnel in Software Development, System Analysis and Information Technology Applicable to Cement Manufacturing Process Industry, Structural Design and Investigations
-

F. CENTRE – QUALITY MANAGEMENT, STANDARDS AND CALIBRATION SERVICES (CQC)

- Mission 1 : Providing Traceable Calibration Services to the Industry for Ensuring Manufacture of Quality Product
- Mission 2 : National and International Standardization
- Mission 3 : Quality Management, Quality Assessment and Quality Improvement in Cement and Building Materials Industries
- Mission 4 : Development of Improved Methodologies for Testing and Quality Control including Rapid Methods of Testing and Quality of Cement and Other Building Materials in the Field
- Mission 5 : Inter-Laboratory Proficiency Testing
- Mission 6 : Quality Related Services
- Mission 7 : Development of New Standard Reference Materials
- Mission 8 : Providing Standard Reference Materials (SRMs), Developed by NCB, to the Industry for Ensuring Accuracy of Testing for Quality Control
-

These Programmes and Missions are proposed to be achieved through the pursuit of specific projects with specified targets of time, cost and assured end products

Appendix - II

Programmed Projects Completed During the Year 2016-17

Sl. No.	Project No.	Project Title	Date of Commencement	Target Date of Completion
1	INT-02	Testing Services as per Standard Specifications and Established Procedures	April 2016	March 2017
2	GMR-08	Updating of National Inventory Cement Grade Limestone Deposits	April 2016	March 2017
3	EMG-01	Study of Energy, Environment and Quality Performance Achievements and Creating Conditions for their Consistent Improvement	April 2016	March 2017
4	INF-01	Collection, Storage, Retrieval and Dissemination of Bibliographical and Other Technical Information	April 2016	March 2017
5	PBL-01	Dissemination of Research Results and Information on NCB	April 2016	March 2017
6	SMC-01	Organization of National and International Seminars/Conferences	April 2016	March 2017
7	HRD-01	Long Term Courses	April 2016	March 2017
8	HRD-02	Updating Knowledge and Skills of NCB Officials	April 2016	March 2017
9	CCE-02	Short Term Courses	April 2016	March 2017
10	CCE-03	Contact Training Programmes for Industrial Personnel	April 2016	March 2017
11	CCE-06	Special Programmes for Industry Personnel from India and Abroad	April 2016	March 2017
12	SBC-01	Simulator Based Courses	April 2016	March 2017
13	CLS-01	Calibration Services	April 2016	March 2017
14	SRM-01	Development of Standard Reference Materials	April 2016	March 2017
15	SRM-02	Supply of Standard Reference Materials	April 2016	March 2017

Appendix - III

Sponsored Projects Completed During the Year 2016-17

Sl. No	SP No.	Project Title	Sponsor
CENTRE FOR CEMENT RESEARCH AND INDEPENDENT TESTING (CRT)			
1.	3276	Long Term Performance Evaluation Including Durability Studies of Cement Mortar and Concrete Samples Prepared Using Granulated LD Converter Slag and Replacing Natural Sand.	M/s Jindal Steel Ltd, Distt: Bellary, Karnataka
2.	4181	Testing of Samples of Imported Coal, Pet Coke, Carbon Slurry, Coal dust and Burnability of Kiln Feed Samples.	M/s ACC, Gagal, Bilaspur, HP
3.	4189	Characterization of Limestone, Clinker and Kiln Feed Samples.	M/s Ambuja Cements Ltd (Maratha Cement Works)
4.	4203	Elimination of White Pieces and White Powder Formation in Clinker and Ball Formation in Kiln by Optimization of Raw Mix Design.	M/s Gorahi Cement Industry Pvt Ltd, Nepal
5.	4209	Establishing Limestone Consumption Factor.	M/s Trinetra Cements Ltd, Banswara, Rajasthan
6.	4240	Technical Suitability of Utilization of Slag in the Manufacture of Cement.	M/s Reliance Industries Limited, Jamnagar
7.	4229	Use of Mechanical Mixer for Testing of Compressive Strength (at fixed w/c ratio) and Other Properties of Cement Samples and Comparative Evaluation with Test Results Obtained as per Indian Standard.	M/s UltraTech Cement, Mumbai
8.	4241	Technical Suitability of BOF/LD Slag in the Manufacture of Portland Slag Cement (PSC).	M/s Tata Steel Ltd, Jamshedpur
9.	4271	Exploratory Studies on Development of Ordinary Portland Cement-Carbon Nano tube (OPC-CNT) Composites.	M/s Indian Oil Corporation Limited, Faridabad
10.	4320	Establishing Limestone Consumption Factor.	M/s Manikgarh Cement, Maharashtra

Sl. No	SP No.	Project Title	Sponsor
11.	4321	Burnability Study of Kiln Feed and Evaluation of Limestone, Clinker and Coal for Grindability Index.	M/s Manikgarh Cement, Korpana, Maharashtra
12.	4326	Burnability Investigations of Raw Mix Samples and Testing of Limestone and Coal Samples.	M/s ACC, Madukkarai, TN
13.	4329	Establishing Limestone Consumption Factor.	M/s Sanghi Cement, Gujrat
14.	4340	Preparation and Evaluation of Paste Fills for Mine Backfilling.	M/s Hindustan Zinc Ltd, Udaipur
15.	4371	Establishing Limestone Consumption Factor.	M/s J K Cement, Mangrol, Nimbahera Rajasthan
16.	4380	Limestone Evaluation Study for Raw Mix Design and Potential Clinker Design.	M/s Udaipur Cement Works Ltd
17.	4388	Establishing Limestone Consumption Factor.	M/s Prism Cement, MP
18.	4400	Burnability Study of Kiln Feed.	M/s Dalmia Cement Ltd, Ariyalur, TN
19.	4417	Testing of Samples of Coal, Petcoke and Limestone Bond Index and Burnability of Kiln Feed Samples.	M/s ACC Ltd, Gagal
20.	4424	R& D Trials for Artificial Stone Samples.	M/s Midwest granites Pvt. Ltd
21.	4446	Petrographic Testing of Rock Sample.	M/s KARUMA, HPP, Uganda for Energy Infratech Private Limited, NOIDA, UP
22.	4634	Training on Optical Microscopy.	M/s Birla Cement Works, Chanderia, Chittaurgargh
23.	4655	Burnability Evaluation of Raw Mix.	M/s J K Cement, Nimbahere
24.	4771	Establishing Limestone Consumption Factor.	M/s BMM Cements, Gudipadu Works AP BMM Cements, Gudipadu works, AP
25.	4775	Establishing Limestone Consumption Factor.	M/s Tamil Nadu News Print & Papers Limited, Tamilnadu
26.	4794	Cryatalline/ Morphology Study of Chryso CWA 10 in Cement Concrete and Mortar.	M/s Chryso India Private Limited, New Delhi
27.	4824	Burnability Evaluation of Raw Mix.	M/s J K Cement, Mangrol

Sl. No	SP No.	Project Title	Sponsor
CENTRE FOR MINING, ENVIRONMENT, PLANT ENGINEERING & OPERATION (CME)			
28	4568	Preliminary Investigation for Beneficiation on Laboratory Scale for Low/ Marginal Grade Limestone for Sailaiya limestone mine, Tehsil Maihar, Dist. Satna, Madhya Pradesh.	M/s Reliance Cement Company Pvt Ltd
29	4569	Performance Assessment of Existing Air Pollution Control Equipments (APCE).	M/s Meghalaya Cements Ltd, Lumshnong, East Jaintia Hills, Meghalaya
30	4591	Environmental Monitoring at M/s South Asian. University, Maidan Garhi, Delhi (Summer Season).	M/s Ahluwalia Contracts (India) Ltd
31	4736	Environmental Monitoring at M/s South Asian. University, Maidan Garhi, Delhi (Monsoon Season).	M/s Ahluwalia Contracts (India) Ltd
32	4908	Environmental Monitoring at M/s South Asian. University, Maidan Garhi, Delhi (Winter Season).	M/s Ahluwalia Contracts (India) Ltd
33	3707	Monitoring of Environmental Parameters.	M/s JK White Cement Works, Gotan, Rajasthan
34	3708	Monitoring of Environmental Parameters.	M/s JK Cement Works, Gotan, Rajasthan
35	4297	Diagnostic Study for Minimizing Excessive Coating and Ring Formation and Improving the Burnability of the Clinker in Cement Rotary Kiln.	M/s JK Lakshmi Cement Ltd
36	4383	Strengthening Capabilities in the Areas of Pyro-processing and Grinding Operation.	M/s Prism Cement Ltd, Satna (D), MP
37	4614	Plant Performance Audit.	M/s Meghalaya Cement Ltd
38	4341	Mandatory Energy Audit.	M/s Malabar Cements Ltd, Walayar, Kerala
39	4635	PAT Advisory Services.	M/s Wonder Cements Ltd, Nimbahera, Rajasthan
40	4636	Technical Concept Report Preparation for Flyash Handling System.	M/s Saurashtra Cement Limited
41	4476	TEFR for Automation of Cement Silo Feeding System.	M/s Saurashtra Cement Limited
42	4409	TEFR for Installation of Bag Counting Machine.	M/s Malabar Cement Limited, Walayar
43	4310	Technical Feasibility Study for Fly ash Unloading from Rail Bowsers, Storage, Feeding System and Bulk Cement Truck Loading system.	M/s Malabar Cement Limited, Walayar

Sl. No	SP No.	Project Title	Sponsor
CENTRE FOR CONSTRUCTION DEVELOPMENT AND RESEARCH (CDR)			
44.	2244	Third Party Quality Assurance/Quality Audit for Improvement of Footpath at S K Krishnan Marg (LHS), S K Krishnan Marg (RHS), Shanker Road Jagannath Madhok Marg to Pusa Rotary (both side), Shanker Road from Ahinsa Bhawan to Jagannath Madhok Mars (LHS), Shanker Road from Sir Ganga Ram Hospital Xing to A-Block Old Rajender Nagar (RHS), Sir Ganga Ram Hospital Marg (LHS) and Sir Ganga Ram Hospital Marg (RHS).	M/s Executive Engineer (Project) KBZ, North Delhi Municipal Corporation, Karol Bagh Zone, New Delhi
45.	2288	Third Party Quality Assurance/Quality Audit for Upgradation of Road, Footpath, Electrification, Central Verge, Rotaries etc for CWG-2010 S.H: Improvement of Footpath, Drainage System and Providing Duct for Utility Services at Ravi Das Marg from D B Gupta Road to Pusa Road.	M/s Executive Engineer (Project) KBZ, North Delhi Municipal Corporation, Old Rajinder Nagar, Delhi
46.	2350	Third Party Quality Assurance/Quality Audit for Construction of RUB in Lieu of Level Crossing No.8C at Km 17/29-31 on DAL near Kirti Nagar S.H: Construction Approaches Road to Road Under Bridge, Sump cum Pump House, Footpath and Drainage.	M/s Executive Engineer (Project) West-I, North Delhi Municipal Corporation, Moti Nagar, New Delhi
47.	2863	Third Party Quality Assurance/Quality Audit for Construction of Balak Ram Hospital at Timarpur S.H: Construction of Internal Roads and Approach Road of Balak Ram Hospital.	M/s Executive Engineer (Project)-I CLZ, North Delhi Municipal Corporation, Shakti Nagar, Delhi
48.	2921	Third Party Quality Assurance/Quality Audit for Construction of out fall drain Jan Suvidha Parisar Gali No.10 to DTC Nallah near NDPL Transformer near Survodiya Kanaya Vidhialaya F-Block New Ranjeet Nagar KBZ.	M/s Executive Engineer (Project) KBZ, North Delhi Municipal Corporation, Rajinder Nagar, New Delhi
49.	2930	Third Party Quality Assurance/Quality Audit for work of Improvement and construction of 17 ROBs/RUBs in Delhi GT road Industrial Area approaching towards Sawan Park (on Delhi Ambala Line).	M/s Executive Engineer (Project)-I CLZ, North Delhi Municipal Corporation, Shakti Nagar, Delhi
50.	3022	Third Party Quality Assurance/Quality Audit for work of Re-modeling of drain by constructing box type drain from Rajdharm house to Mahavir house(Near Hanuman Mandir) on Matiala Phirni in Ward No. 136/NGZ.	M/s Executive Engineer (Project)-NGZ, South Delhi Municipal Corporation, Kashmere Gate, Delhi
51.	3025	Third Party Quality Assurance/Quality Audit for work of Re-modeling of drain by constructing box type drain from Sunil Sharma house to Subhash Solanki house on Matiala Phirni in Ward No. 136/NGZ.	M/s Executive Engineer (Project)-NGZ, South Delhi Municipal Corporation, Kashmere Gate, Delhi

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52.	3077	Third Party Quality Assurance/Quality Audit for work of Reconstruction of Community Hall at Village Mochi Bagh in Ward no. 168/SZ.	M/s Executive Engineer (Project), South-I, South Delhi Municipal Corporation, Sewa Nagar, Delhi
53.	3245	Third Party Quality Assurance/Quality Audit for work of covering of Nallah from Pusp Vihar, Press enclave road passing through Sheikh Sarai Chirag Delhi Panchsheel Enclave GK-I Andrews Ganj upto ring road behind police station Defence colony.	M/s Executive Engineer (Project) Central Zone, South Delhi Municipal Corporation, Lajpat Nagar, New Delhi
54.	3282	Third Party Quality Assurance/Quality Audit for work of remodeling and covering of Subhash Nagar Drain Starting form Najafgarh road to NGZ Drain.	M/s Executive Engineer (Project-I), West Zone, South Delhi Municipal Corporation, Moti Nagar, Delhi
55.	3331	Evaluation of Materials and Concrete Mix Design for Main Work Package of NETRA Complex at Greater Noida.	M/s NTPC Limited Noida
56.	3365	Third Party Quality Assurance/Quality Audit for Work of "Construction of 10 classrooms in M C Pry. School Katwaria Sarai in Ward No. 161 South Zone.	M/s Executive Engineer (Project-I), South, South Delhi Municipal Corporation, Sewa Nagar, Delhi
57.	3426	Third Party Quality Assurance/Quality Audit for Work of Construction of Gymnasium and Swimming Pool at M C Pry. School at BK-II block, Shalimar Bagh in Rohini Zone.	M/s Executive Engineer (Project-I), Rohini Zone, North Delhi Municipal Corporation, Rohini, Delhi
58.	3477	Distress Assessment of 32 years old Cast in-Situ RCC Conduit (2800mm internal dia) carrying discharge of 200 Cusec of Ganga Water from Muradnagar to Gokulpuri, Delhi (Total 26 Km Stretch).	M/s Delhi Water Supply Maintenance Unit U P Jal Nigam, Raj Nagar, Ghaziabad
59.	3504	Third Party Quality Assurance/Quality Audit for Work Construction of M.C. Pry. School at Tusli Nagar W.NO. 74 in KBZ. SH: Construction of one Hall, Development of Ground & Water Harvesting.	M/s Executive Engineer (Project), KBZ, North Delhi Municipal Corporation, Old Rajender Nagar, Delhi
60.	3532	Third Party Quality Assurance/Quality Audit for Work of Construction of lanes by providing and laying RMC in Village Ranhulla in C-121 in West Zone.	M/s Executive Engineer (Project-II), West Zone, South Delhi Municipal Corporation, Zakhira, Delhi
61.	3715	Third Party Quality Assurance/Quality Audit for Improvement and Strengthening of Roads and Drainage System of RBI Colony GH-4, GH-1, A-2/B (Ekta Apartment), A2-48 to A2-61 and Police Station Road, Paschim Vihar in C-57/RZ, Paschim Vihar (South).	M/s Executive Engineer (M-I) RZ, North Delhi Municipal Corporation, Keshavpuram, Delhi

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62.	3757	Third Party Quality Assurance/Quality Audit for Work of Construction of Community Hall/Basti Vikash Kendra SH: Construction of Community Hall at Block B Raghbir Nagar JJ Colony.	M/s Executive Engineer, C-4 Delhi Urban Shelter Improvement Board, Ranjit Nagar, New Delhi
63.	3773	Third Party Quality Assurance/Quality Audit for Work of Construction of Building for ANM training School at Khichripur MCW Centre at Ward No.213, Shahdara South Zone.	M/s Executive Engineer (Project-I), Shah-S, East Delhi Municipal Corporation, Laxmi Nagar, Delhi
64.	3799	Third Party Quality Assurance/Quality Audit for Work of Improvement of existing approach road M C Pry. School from M B Road to Suraj Kund Road in Vishkarma Colony at W.NO.198/CNZ.	M/s Executive Engineer (M-III), Central Zone, South Delhi Municipal Corporation, Lajpat Nagar, Delhi
65.	3870	Study of abrasion resistance of different grades of concrete using normal & low strength coarse aggregate for use in wearing surfaces of Naitwar Mori Hydro Electric Project (NMHEP).	M/s SJVN Limited Shimla, Himachal Pradesh
66.	3883	Third Party Quality Assurance/Audit for Work of "Construction of M C Pry. School at A-4, Paschim Vihar in Rohini Zone".	M/s Executive Engineer (Project-I), Rohini, East Delhi Municipal Corporation, Sector-17, Rohini
67.	3892	Third Party Quality Assurance/Audit for Work of "Construction of M and CW Centre (--) by pdg from at Vacant Land of abounded CTC between Sewerage Treatment Plant and Ambedkar College Kadimi Kabristan in Ward No. 258 Shahdara (North) in Kardampuri".	M/s Executive Engineer (Project-I), North Delhi Municipal Corporation, G T Road, Delhi
68.	3922	Third Party Quality Assurance/Audit for Work of "Construction of Mini Stadium / Sports Complex at M C Pry. School Kakrola Village no. 1 in NGZ".	M/s Executive Engineer (Project) NGZ, South Delhi Municipal Corporation, Near Dhansa Stand, Delhi
69.	3934	Third Party Quality Assurance/Audit for Work of "Construction of M C Pry. School at Shakarpur Extn.- II in Ward No. 223 AC-58 in Shahdara South Zone".	M/s Executive Engineer (Project-II), Shah-S, East Delhi Municipal Corporation, Lalita Park, Delhi
70.	3937	Third Party Quality Assurance/Audit for Work of "Construction of Integrated Ward Office Complex at D-Block Laxmi Nagar in Ward No. 221 Shahdara South Zone, Now this site changed to JE (Store) Ward No. 218 Mandawli Delhi".	M/s Executive Engineer (Project-II), Shah-S, East Delhi Municipal Corporation, Lalita Park, Delhi
71.	3945	Evaluation of Materials and Concrete Mix Design for the Work of Main Plant and Offsite Civil Works Package for NTPC-Darlipali STPP.	M/s NTPC Limited, Darlipali Super Thermal Power Project, Sundargarh, Orissa

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72.	3959	Third Party Quality Assurance/Audit for Work of “Construction of Technical Laboratory for EDMC at Gazipur in Shahdara South Zone”.	M/s Executive Engineer (M-IV), Rohini, East Delhi Municipal Corporation, Krishna Nagar, Delhi
73.	3961	Third Party Quality Assurance/Audit for Work of “Construction of Community Hall at Greater Kailash-II Ward No. 189 South Zone, New Delhi”.	M/s Executive Engineer (Project-I) South, South Delhi Municipal Corporation, Sewa Nagar, Delhi
74.	3962	Third Party Quality Assurance/Audit for Work of “Remodeling & Construction of Cunnit of Nallah No. 6 from MSN Marg to Outer Ring Road along Sector-8 & Sector-9 R.K Puram in Ward No. 168 South Zone”.	M/s Executive Engineer (Project-I) South, South Delhi Municipal Corporation, Sewa Nagar, Delhi
75.	4003	Third Party Quality Assurance/Audit for Work of “Construction of M C Pry. School at Kalyanpuri-7-II in Ward No. 219 Shahdara South Zone”.	M/s Executive Engineer (Project-II), Shah-S, East Delhi Municipal Corporation, Laxmi Nagar, Delhi
76.	4005	Third Party Quality Assurance/Audit for Work of “Construction of Maternity Centre in Kondli in Ward No. 215 Shahdara South Zone”.	M/s Executive Engineer (Project-II), Shah-S, East Delhi Municipal Corporation, Laxmi Nagar, Delhi
77.	4013	Third Party Quality Assurance / Audit for the Work of “Improvement and Development of Road from Basti Vikas Kendra in Bindapur JJ Colony Pkt-IV in Ward No. C-128/WZ”.	M/s Executive Engineer (M-II), WZ, South Delhi Municipal Corporation, Peera Garhi, Delhi
78.	4022	Third Party Quality Assurance / Audit for Work of “Construction of Senior Citizen Recreation Centre at C-Block in Jahangirpuri in C-20/CLZ”.	M/s Executive Engineer (Project-II) CLZ, North Delhi Municipal Corporation, Shakti Nagar, Delhi
79.	4043	Third Party Quality Assurance/Audit for Work of “Construction of Science Museum in M C Pry. School at J J Colony Tagore Garden in C-105 in WZ”.	M/s Executive Engineer (Project-II) West, South Delhi Municipal Corporation, Zakhira, Delhi
80.	4044	Third Party Quality Assurance/Audit for Work of “Construction of 10 Classroom in M C Pry. School at Siras Pur (Boys) in C-18/CLZ”.	M/s Executive Engineer (Project-II) CLZ, North Delhi Municipal Corporation, Shakti Nagar, Delhi
81.	4046	Third Party Quality Assurance/Audit for Work of “Construction of M C Pry. School at Vishwakarma Park in Ward No. 221 AC-58, Shahdara South Zone”.	M/s Executive Engineer (Project-II) Shah-S, East Delhi Municipal Corporation, Laxmi Nagar, Delhi

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82.	4054	Third Party Quality Assurance/Audit for Work of “Construction of Polyclinic Building at Hudson Lane in C-12/CLZ”.	M/s Executive Engineer (Project-II), CLZ, North Delhi Municipal Corporation, Shakti Nagar, New Delhi
83.	4060	Third Party Quality Assurance/Audit for Work of “Imp. of Link Road between Ramesh Park and Vishkarma Park by pdg. RMC and Making Opening for Cleaning of RCC Box Drain Along MB Road in Kishan Kunj in Ward No. 221/AC-58 Shah(S) Zone”.	M/s Executive Engineer (M-IV), Shah-S, East Delhi Municipal Corporation, Delhi
84.	4092	Third Party Quality Assurance/Audit for Work of “Construction of Maternity Home at Shiv Puri near Anarkali M and CW Center in Ward No. 231 in Shahdara South Zone”.	M/s Executive Engineer (Project-I) Shah-S, East Delhi Municipal Corporation, Krishna Nagar, Delhi
85.	4117	Third Party Quality Assurance/Audit for Work of “Construction of Hall & Development of Open Ground in M C Pry. School A Block Vivek Vihar Ph-II in Ward No. 238 AC-62 Shahdara South Zone”	M/s Executive Engineer (Project-I) Shah-S, East Delhi Municipal Corporation, Krishna Nagar, Delhi
86.	4127	Evaluation & Performance Study on Low Density Aggregates (LDA)	M/s Indian Metals & Ferro Alloys Ltd (IMFA), Bhubaneswar, Odisha - India
87.	4128	Evaluation of Materials and Concrete Mix Design for the Work of CW & Makeup Water System Package of NTPC Ltd, Darlipali STTP, Odisha.	M/s NTPC Limited, Darlipali Super Thermal Power Project, Sundargarh, Odisha
88.	4130	Third Party Quality Assurance/Audit for Work of “JSC (Pay & Use)”. SH: Construction of JSC in JJC F-Block, New Seema Puri.	M/s Executive Engineer C-8, Delhi Urban Shelter Improvement Board, New Seemapuri, Delhi
89.	4135	Third Party Quality Assurance/Audit for Work of “Construction of Dhobi Ghat in Block-1 Khichripur in Ward No. 213, Shahdara South Zone”.	M/s Executive Engineer (Project-II) Shah-S, East Delhi Municipal Corporation, Lalita Park, Delhi
90.	4137	Third Party Quality Assurance/Audit for Work of “Reconstruction of M & CW Centre, Staff Quarters and Construction of Policlinic at Fatehpur Beri in Ward No. 176, South Zone”.	M/s Executive Engineer (Project-II), South, South Delhi Municipal Corporation, Sewa Nagar, Delhi

Sl. No	SP No.	Project Title	Sponsor
91.	4142	Third Party Quality Assurance/Audit for Work of “Improvement and Strengthening of Carriageway of 45 ROW Roads by Bituminous Concrete in Prashant Vihar, Rohini.” SH: Imp. and Dev. of Drain and Berms from Technia Institute to Fire Station, Bal Bharti A-205 to Community Hall, H.No. C1/14 to C-1/40 to Park, H.No. C-2/21 to C-3/5, H.No. C-2/1 to F-250, H.No. E-9 to E-174, H.No. G-192 to Gittaratan Jindal School.	M/s Executive Engineer (Project-III), Rohini, North Delhi Municipal Corporation, Sector -17 Rohini- Delhi
92.	4143	Third Party Quality Assurance/Audit for Work of “Improvement and Strengthening of Carriageway of 45 ROW Roads by Bituminous Concrete in Sector 8, Rohini”. SH: Imp. and Dev. Of Drain and Berms Block A-1, A-2, B-4, B-6 C-9, C-7 D-11 to Park, E-15 to E-16 and F-17 to Park at Sec-8 in Rohini.	M/s Executive Engineer (Project-III), Rohini, North Delhi Municipal Corporation, Sector -17 Rohini- Delhi
93.	4149	Third Party Quality Assurance/Audit for Work of “Construction of Community Hall at Shakurpur Village in C-62/CLZ”.	M/s Executive Engineer (Project-II) CLZ, North Delhi Municipal Corporation, Shakti Nagar, Delhi
94.	4157	Third Party Quality Assurance/Audit for Work of “Improvement Development of Road along Park from Lalita Park to DJB Rainy Well (DDA Park at Gali No. 12 Lalita Park DJB Rainy Well Opposite Community Hall Ramesh Park) by Pdg. RMC from in Kishan Kunj in W. No. 221/AC-58 Sh (S) Zone in Kishan Kunj	M/s Executive Engineer M(IV), East Delhi Municipal Corporation, Shakarpur, Delhi
95.	4194	Evaluation of Materials and Concrete Mix Design for the Work of Supply, Installation, Testing & Commissioning of EPC Package for NTPC North Karanpura STPP (3X660MW) (Sub Agency: Zuberi Engineering Co.).	M/s NTPC Limited, North Karanpura, Hazaribagh, Jharkhand
96.	4195	Evaluation of Materials and Concrete Mix Design for the Work of Modification & Reconstruction of Energy Dissipation Arrangement (EDA) of Main Spillway of Indira Sagar Power Station Dam, NHDC Ltd Narmada Nagar (MP).	M/s NHDC Limited, Indira Gandhi Power Station, Khandwa (Madhya Pradesh)
97.	4196	Third Party Quality Assurance / Audit for Work of Construction of Additional 18 Class Rooms in M C Pry. School Nithari No. 1 in Ward No. 34 in Rohini Zone.	M/s Executive Engineer (Project-II), Rohini Zone, North Delhi Municipal Corporation, Rohini, Delhi

Sl. No	SP No.	Project Title	Sponsor
98.	4197	Third Party Quality Assurance / Audit for Work of Construction of Pucca School Building C-Block, Shahabad Dairy in Ward No. 26 in Rohini Zone.	M/s Executive Engineer (Project-II), Rohini Zone, North Delhi Municipal Corporation, Rohini, Delhi
99.	4199	Third Party Quality Assurance/Audit for work of Construction of Community Hall at Khanpur JJ Colony in Ward No. 181 South Zone.	M/s Executive Engineer (Project-I) South, South Delhi Municipal Corporation, Sewa Nagar, New Delhi
100.	4201	Third Party Quality Assurance/Audit for Work of "Construction of Four Rooms for Library and One Hall at M C Pry. School Kanti Nagar in Ward No. 235 Shahdara South Zone.	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Krishna Nagar, Delhi
101.	4206	Third Party Quality Assurance / Audit for Work of Construction of M C Pry. School Building at Vijay Nagar (Double Storey) in C-12/CLZ.	M/s Executive Engineer (Project-II), CLZ, North Delhi Municipal Corporation, Shakti Nagar Delhi
102.	4207	Third Party Quality Assurance/Audit for Work of Construction of Community Hall in Sector-9, Block A-1, Behind Delhi International School, Rohini, Ward No. 50 in Rohini Zone.	M/s Executive Engineer (Project-I), Rohini Zone, North Delhi Municipal Corporation, Rohini, Delhi
103.	4218	Third Party Quality Assurance/Audit for Work of Construction of Som Bazar Road Room H. No. WZ-294 to H. No. WZ-165 in Virender Nagar by Construction Both Side RCC Drain and RMC Road in Ward No. C-117/WZ in Janak Puri West.	M/s Executive Engineer (M)/ West-III, South Delhi Municipal Corporation, New Delhi
104.	4223	Structural Quality Assessment of RCC Members of Meghalaya House, Navi Mumbai.	M/s Public Works Department (B), Meghalaya House Sub-Division, Govt. of Meghalaya, New Delhi
105.	4226	Third Party Quality Assurance/Audit for the of Construction of M.C. Pry. School Building at Gopal Nagar in NGZ.	M/s Executive Engineer (Project) NGZ, South Delhi Municipal Corporation, Delhi
106.	4227	Third Party Quality Assurance / Audit for Work of Construction of Ayurvedic Dispensary at Plot No. 272 in Village Kapashera, NGZ.	M/s Executive Engineer (Project) NGZ, South Delhi Municipal Corporation, Delhi

Sl. No	SP No.	Project Title	Sponsor
107.	4243	(i) Environmental Improvement of Urban Slums SH: Providing and Laying RMC in Lanes and Construction of Open Surface Drain in JJC at Saheed Sukhdev Nagar, Wazirpur Industrial Area (ii) Pay and Use JSC SH: Construction of 40 Seater Double Storied Toilet Block in JJC at Saheed Sukhdev Nagar Wazirpur Industrial Area (iii) Pay and Use JSC SH: Construction of 40 Seater Double Storied Toilet Block in JJC at Saheed Udhham Singh Nagar Wazirpur Industrial Area (iv) Pay and Use JSC SH: Upgradation and Renovation of Toilet Block (101 Seater) in JJC C-65/2 Chander Shakar Azad Colony, Wazirpur Industrial Area (v) SC/ST Basti SH: Construction of Basti Vikas Kendra (Harizan Chaupal) at Village Wazirpur.	M/s Executive Engineer, C-4, Delhi Urban Shelter Improvement Board, Delhi
108.	4247	Third Party Quality Assurance/Audit for Construction of SDMC Pry. School Building at Palam Village (G) NGZ.	M/s Executive Engineer (Project) NGZ, South Delhi Municipal Corporation, Najafgarh, New Delhi
109.	4250	Third Party Quality Assurance / Audit for Work of Rehabilitation of Existing Waiting Hall Near Old Ward Block in SDN Hospital Shahdara (North).	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Delhi
110.	4261	Evaluation of Materials and Concrete Mix Design for the Work of Supply, Installation, Testing & Commissioning of EPC Package for NTPC North Karanpura STPP (3X660MW) (Agency: M/s Bygging India Ltd).	M/s NTPC Limited, North Karanpura Super Thermal Power Project, Hazaribagh, Jharkhand
111.	4267	Third Party Quality Assurance/Audit for Work of Renovation of Community Hall at Begampur Village in Ward No. 161 South Zone.	M/s Executive Engineer (Project), South-I, South Delhi Municipal Corporation, New Delhi
112.	4274	Third Party Quality Assurance / Audit for Work of Construction of Gym/Fitness Centre at Community Hall at Karkardooma Village Ward No. 225 AC-59 Shahdara South.	M/s Executive Engineer (Project-I), SSZ East Delhi Municipal Corporation, Krishna Nagar, Delhi
113.	4281	Third Party Quality Assurance / Audit for Work of Improvement and Strengthening of Roads in BCEGNRS and W Blocks in Greater Kailash-I in Ward No. 192, Central Zone SH: Improvement of Roads Berms and Improvement of Drainages System in B, C,M,N,S and W blocks in Greater Kailash in Ward No. 192, Central Zone.	M/s Executive Engineer (Project-1)/Central Zone, South Delhi Municipal Corporation, Najafgarh, New Delhi

Sl. No	SP No.	Project Title	Sponsor
114.	4283	Third Party Quality Assurance / Audit for Work of Construction of M C Pry. School Building in Gali NO. 12 Kailash Nagar in Ward No. 234 AC-61.	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Krishna Nagar, Delhi
115.	4285	Third Party Quality Assurance / Audit for Work of (i) C/o JSC Pay & Use” SH: JSC: C/o 20 Seater JSC in JJ cluster at A2 Block was WHS Kirti Nagar (ii) C/o JSC Pay & Use” SH: JSC: C/o 20 Seater JSC in JJ Cluster in Harijan Camp Chunna Bhatti Kirti Nagar.	M/s Executive Engineer/C-4, Delhi Urban Shelter Improvement Board, Ranjit Nagar, Delhi
116.	4287	Third Party Quality Assurance / Audit for Work of construction of Pucca School Building at MC Pry School at Seelampur Phase-III (Hindi) Ward No. 248 Shahdara (North Zone).	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Shahdara, Delhi
117.	4290	Third Party Quality Assurance / Audit for Work of Improvement and Strengthening of Roads in A to I Block Lajpat Nagar-I in Ward No. 155, Central Zone.	M/s Executive Engineer (Project-I)/Central Zone, South Delhi Municipal Corporation, Lajpat Nagar, New Delhi
118.	4294	Third Party Quality Assurance / Audit for Work of Construction of M. C. Pry. School Building at Kadipur Kaushak in C-5/CLZ.	M/s Executive Engineer (Project-II)/Central Zone, North Delhi Municipal Corporation, Shakti Nagar, New Delhi
119.	4295	Third Party Quality Assurance / Audit for Work of Construction of Pay and Use JSC SH: Construction of 20 Seater Conventional JSC at JJC, Block c, Bhim Basti Jaunapur.	M/s Executive Engineer, C-6, Delhi Urban Shelter Improvement Board, Maharani Bagh, New Delhi
120.	4299	Third Party Quality Assurance / Audit for Work of Construction of M. C. Pry. School at Pocket IV in Mayur Vihar Phase-I, Ward No. 220/AC-57 Shahdara South Zone.	Executive Engineer (M)-IV, East Delhi Municipal Corporation, Shakarpur, Delhi
121.	4304	Evaluation of Granulated BF Slag (GBFS) as per revised IS: 383.	M/s JSW Steel Ltd, Bellary, Karnataka
122.	4306	Third Party Quality Assurance / Audit for Work of “Construction of building for M C Pry. School at Pandav Road in Ward No. 237 AC-62 Shahdara South Zone”.	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Krishna Nagar, Delhi

Sl. No	SP No.	Project Title	Sponsor
123.	4307	Third Party Quality Assurance / Audit for Work of I/S of Roads having ROW varying from 13 meter to 18 meter in Commercial Complex (Ch. Lokbir Singh Tanwar Complex) Nangal Raya in C-110/SDMC SH: Imp. To the Boundary Wall of Parks in Ch. Lokbir Singh Tanwar Complex at C-110/SDMC.	M/s Executive Engineer (M)/ West-I, South Delhi Municipal Corporation, Rajouri Garden, New Delhi
124.	4312	Part 1: Condition Assessment Using Non Destructive Evaluation Technique Including Preparation of BOQ/ Specifications/Cost Estimate Part 2: Third Party Services of Repair & Restoration Work of Housing Society Quarters (5 Blocks Covering 180 Nos Quarters) at Ordnance Factories Offices Co-operative Group Housing Society Ltd Dwarka, New Delhi.	M/s Ordnance Factories Officers Co-operative, Group Housing Society Ltd Dwarka Phase-I, New Delhi
125.	4331	Evaluation of Corrosion Inhibiting Admixture Samples for the Work of Construction of Elevated Road over Barapullah Nallah Starting from Kale Khan to Mayur Vihar, New Delhi.	M/s Public Works Department, Flyover Project Division F-121, Ramesh Park, Delhi
126.	4333	Evaluation of Materials and Concrete Mix Design for the Balance Work of Site Levelling & Infrastructure Works Package for NTPC-Gadarwara STPP of 2x800 MW (Stage-I).	M/s NTPC Limited, Gadawara Super Thermal Power Project, Narsinghpur (Madhya Pradesh)
127.	4334	Third Party Quality Assurance / Audit for Work of Construction of Pucca School Building in M. C. Pry. School at Shivaji Park in West Zone (Part-B: Dismantling of Existing Old Structural).	M/s Executive Engineer (Project-II), West Zone, South Delhi Municipal Corporation, Under Dabri Flyover, New Delhi
128.	4339	Third Party Quality Assurance / Audit for Work of Improvement Development of Lane by Pdg. RMC and Drain from Main Road to M. C. Pry. School in Chanchal Park in Ward No. C-122/WZ.	M/s Executive Engineer (M-IV)/West Zone, South Delhi Municipal Corporation, Moti Nagar, New Delhi
129.	4343	Third Party Quality Assurance / Audit for Work of "Imp. Dev. of Lane by. Pdg. RMC in Sri Nagar at Ward No. C-62/CLZ. SH: 1) Imp. Dev. of Lane by pdg. RMC from H.No. 372 to Railway Road in Sri Nagar Gali No. 2 at Ward No. 62, Rampura. 2) Imp. Dev. of Lane by pdg. RMC from H.No. 450A to 540, 451 to 478 and 467A to 527 in Sri Nagar behind Sharma Sweet at Ward No. 62, Rampura.	M/s Executive Engineer (M-IV), Civil Line Zone, North Delhi Municipal Corporation, Shakti Nagar, Delhi

Sl. No	SP No.	Project Title	Sponsor
130.	4344	Third Party Quality Assurance / Audit for Work of Construction of Community Hall at Bhalaswa Dairy in C-19/CLZ.	M/s Executive Engineer (Project-II), CLZ, North Delhi Municipal Corporation, Shakti Nagar, Delhi
131.	4347	Third Party Quality Assurance / Audit for Work of Improvement of Existing Building for Dhir Pur M.C Primary School by Providing Marble Wash Finish, Additional Stair case, Rain Water Harvesting etc. in C-11/CLZ.	M/s Executive Engineer (Project-I), C.L. Zone, North Delhi Municipal Corporation, Sawan Park, New Delhi
132.	4349	Third Party Quality Assurance / Audit for Work of Providing RMC on Road and Construction of RCC Open Drain from Samunder Plot near Transformer to Kirani Flood Drain in Ward No. C-34 Rohini Zone.	M/s Executive Engineer (Project-II), Rohini Zone, North Delhi Municipal Corporation, Rohini, Delhi
133.	4352	Testing of Abrasion Resistance of Concrete (Underwater Method) as per ASTM C1138.	M/s NTPC Limited, Tapovan-Vishnugad Hydro Electric Project, Chamoli, Uttrakhand
134.	4353	Design of M35A20 Concrete Mix and M25A10 Shotcrete Mix.	M/s THDC India Limited, Koteswar Hydro Electric Project, Tehri Garhwal, Uttrakhand
135.	4356	Evaluation of Materials and Concrete Mix Design for NTPC-Gadarwara STPP of 2x800 MW (Stage-I).	M/s NTPC Limited, Gadawara Super Thermal Power Project, Narsinghpur (Madhya Pradesh)
136.	4359	Distress/Condition Assessment for Repair & Restoration Works of Urea Concrete Prilling Tower at NFL, Bathinda, Punjab.	M/s National Fertilizers Limited, Bathinda, Punjab
137.	4364	Evaluation of Materials and Concrete Mix-Design for the Work of Construction of 311 m Length Spillway.	M/s UP Irrigation Department Kanhar Construction Division-3 Pipri, Sonbhadra, Uttar Pradesh
138.	4365	Evaluation of Materials and Concrete Mix Design for the Work of Construction of High Level RCC Bridge over Banne River for approach to NTPC-Barethi STPP.	M/s NTPC Limited, Barethi Super Thermal Power Station, Barethi, Madhya Pradesh

Sl. No	SP No.	Project Title	Sponsor
139.	4367	Third Party Quality Assurance / Audit for Work of (i) Construction of JSC Pay & Use. SH: Re-Construction of 102 Seater Conventional JSC Including Demolition of Existing Deteriorated JSC at JJ Cluster Bhoomiheen Camp Kalkaji (Project ID 000003362). (ii) Construction of JSC Pay & Use. SH: Pay & Use (JSC) SH: Construction of 20 Seater Conventional JSC at Dr Ambedkar Colony, Satbari Mehrauli (Project ID 000005008).	M/s Executive Engineer/ C6, Delhi Urban Shelter Improvement Board, Maharani Bagh, New Delhi
140.	4368	Condition Assessment Using Non Destructive Evaluation Technique Including Preparation of Bill of Quantities (BOQ), Cost Estimate & Third Party Quality Assurance During Repair of Old Annex Building (G+1) at Jeedimetla, NRSC Hyderabad.	M/s Head CMD (Construction and Maintenance Division) National Remote Sensing Centre (NRSC) ISRO, DOS Balanagar, Hyderabad
141.	4370	Third Party Quality Assurance / Audit for Work of Construction of Multipurpose Hall in M C Primary School at J Block Pandav Nagar in Ward No.224/AC-58 Sh.(S).	M/s Executive Engineer Project (M) IV, East Delhi Municipal Corporation, Shakarpur, Delhi
142.	4373	Condition Assessment Using Non-Destructive Evaluation Technique of Concrete in RCC Column Foundation of Over Head Tank (OHT) at RBI Staff Quarters, Char Imli, Bhopal.	M/s Reserve Bank of India, Bhopal
143.	4374	Third Party Quality Assurance / Audit for Work of Const. of dustbin/Dhalao at Vasundhara enclave adjacent to BSES Station in Ward No. 214/AC-56 Shahdara South Zone.	M/s Executive Engineer (Project-II), East Delhi Municipal Corporation Shakarpur, Delhi
144.	4375	Concrete Mix Design for Construction of 24,660 LIG and 4,855 EWS House by Prefab Technology (having structural RCC Members i.e. Columns, Beams & Slabs all Precast) in Narela & Rohini, Delhi.	M/s Executive Engineer, Northern Division No.12, Delhi Development Authority, Narela, New Delhi
145.	4376	Evaluation of Materials and Concrete Mix Design for the Work of Composite Work for Construction of UIDAI Head Quarter Building at Delhi.	M/s Engineers (India) Ltd, Infrastructure Division, Gurgaon, Haryana

Sl. No	SP No.	Project Title	Sponsor
146.	4377	Detail Visual Inspection, Quality Assessment using Non Destructive Testing Technique and Verification of Design for Repair, Restoration and Seismic Strengthening of (i) GAIL Jubilee Tower Building (Basement+Ground+22 floors) at Sector-1, Noida; (ii) GAIL staff quarters (09 blocks, 234 quarters) at Sector-23, Noida.	M/s GAIL (India) Limited, Gurgaon, Haryana
147.	4386	Condition Assessment of RCC Members of Structure for Setting up Back Pressure Micro Turbine (BP-MST) on Concrete Roof Top at NTPC Vindhyachal Super Thermal Power Station (VSTPS), Vindhyachal, Madhya Pradesh.	M/s NTPC Limited, NTPC-NETRA, EOC Office, Noida
148.	4389	Third Party Quality Assurance / Audit for Work of Restoration of Road cut made by Bharti Airtel Ltd in Sector-15, A-4 Block Sai Mobile Shop to Block C-2, C-6, B-Block, Gurudwara DDA Market C-8 Near Vidya Bharti School area Rohini in C-49, M-IV/RZ by Pdg. RMC and Interlocking Tile.	M/s Executive Engineer (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, Delhi
149.	4390	Third Party Quality Assurance / Audit for Work of Construction 100 Bedded Poornima Sethi Multispecialty Hospital in Ward No. 194, Central Zone.	M/s Executive Engineer (Project-I)/Central Zone, South Delhi Municipal Corporation, Lajpat Nagar, New Delhi
150.	4392	Condition Assessment using Non-Destructive Technique including Preparation of Bill of Quantities (BOQ), Cost Estimate & Third Party Quality Assurance during Repair of Cooling Tower in Power Plant-II at NSPCL-Bhilai.	M/s NTPC SAIL Power Company (P) Ltd, Bhilai, Chattisgarh
151.	4393	Condition Assessment using Non-Destructive Evaluation Technique of New Hostel Building at Indian Statistical Institute Campus, Katwaria Sarai, New Delhi.	M/s Indian Statistical Institute, Katwaria Sarai, New Delhi
152.	4397	Evaluation of Materials and Concrete Mix Design for the Work of Main Plant Offsite and Chimney & Chimney Elevator Package for NTPC Tanda TPP, Stage-II (2x660 MW).	M/s NTPC Limited, Tanda Thermal Power Station, Ambedkar Nagar, Uttar Pradesh

Sl. No	SP No.	Project Title	Sponsor
153.	4406	Evaluation of Coarse and Fine Aggregate Samples for Loktak Downstream Hydroelectric Corporation Ltd, Manipur.	M/s Loktak Downstream Hydroelectric Corporation Ltd, (A Joint Venture of Govt. of Manipur & NHPC Ltd), Manipur
154.	4407	Testing and Evaluation of Coarse Aggregate for Static Load Bearing RCC Flooring and Concrete of Drain Work of Plant Area of MUNPL-Allahabad.	M/s Meja Urja Nigam (P) Limited, (A Joint Venture of NTPC & UPRVUN Ltd), Allahabad, Uttar Pradesh
155.	4408	Evaluation of Materials and Concrete Mix Design for the Work of Supply, Installation, Testing & Commissioning of EPC Package for NTPC-North Karanpura STPP (3x660MW).	M/s NTPC Limited, North Karanpura Super Thermal Power Project, Hazaribagh, Jharkhand
156.	4410	Concrete Mix Design of M10, M15, M20 M35(Piling), M35(RCC) & M45(RCC) Grade for (i) Construction of Underpass Including Corridor Development Works & Intersection Development for Benito Juarez Marg (ii) Construction of Three Laned Parallel Flyover Linking Munirka, New Delhi.	M/s Executive Engineer, Flyover Project Division F-41, Public Works Department, Rao Tula Ram Marg New Delhi
157.	4411	Third Party Quality Assurance / Audit for Work of Improvement of Development of Road by Pdg. RMC from Jwala Nagar Chowk to Indira Park Opp. M. C. Pry School Jwala Nagar in Ward No. 238 AC-62 Shahdara South Zone.	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Shahdara South Zone, Delhi
158.	4412	Third Party Quality Assurance / Audit for Work of Improvement of Development of Road by Pdg. RMC from Babu Ram School Nagar Bada Bazar to 172, 173 Farsh Bazar, Anaj Mandi in Ward No. 237, AC-62 Shahdara South Zone.	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Shahdara South Zone, Delhi
159.	4413	Third Party Quality Assurance / Audit for Work of Improvement of Development of Road by Pdg. RMC from Indira Park Opp. M. C. Pry. School Jwala Nagar to Pandav Road Crossing near Ambedkar Park in Ward No. 238 AC-62 Shahdara South Zone.	M/s Executive Engineer (Project-I), East Delhi Municipal Corporation, Shahdara South Zone, Delhi
160.	4414	Condition Assessment using Non-Destructive Technique including Preparation of Bill of Quantities (BOQ), Cost Estimate & Third Party Quality Assurance during Repair of Turbine Foundations (3 Nos.), ID Fan Foundations (6 Nos.) and FD Fan Foundations(6 Nos.) in Power Plant-II at NSPCL-Bhilai.	M/s NTPC SAIL Power Company (P) Ltd, Bhilai, Chattisgarh

Sl. No	SP No.	Project Title	Sponsor
161.	4415	Condition Assessment using Non-Destructive Technique including Preparation of Bill of Quantities (BOQ), Cost Estimate & Third Party Quality Assurance during Repair of CHP 2 Nos. of Underground Galleries (G3-300mtr.and G4-60mtr.) in Power Plant-II at NSPCL-Bhilai.	M/s NTPC SAIL Power Company (P) Ltd, Bhilai, Chattisgarh
162.	4416	Concrete Mix Design of M30 grade for Piles and Pile Caps etc for the Work of Provision of Multistory Type IV(S) Accommodation at Timarpur, Delhi.	M/s Col. Project Manager, Defence Research and Development Organisation, Timarpur, Delhi
163.	4420	Third Party Quality Assurance / Audit for Work of Construction of Bardari, Wood Shed, Asthi Ghar, Drinking Water Trough and Footpath in Cremation Ground in Dwarka in Ward No. 136/NGZ.	M/s Executive Engineer (Project) NGZ, South Delhi Municipal Corporation, Kashmere Gate, Delhi
164.	4423	Condition Assessment using Non-Destructive Technique including Preparation of Bill of Quantities (BOQ), Cost Estimate & Third Party Quality Assurance during Repair of ECR Building, TG Hall, ASG and MSG Structures in Power Plant-II at NSPCL-Bhilai.	M/s NTPC SAIL Power Company (P) Ltd, Bhilai, Chattisgarh
165.	4426	Evaluation of Materials and Concrete Mix-Design for the Work of Supply, Installation, Testing & Commissioning of EPC Package for NTPC North Karanpura STPP (3X660MW).	M/s NTPC Limited, North Karanpura Super Thermal Power Project, Hazaribagh, Jharkhand
166.	4427	Ultrasonic Pulse Velocity (UPV) Testing of TG Deck Slab and Supporting RCC Columns of TG Foundation of Unit # 3 (250MW) of NTPC - Bongaigaon Thermal Power Project, Bongaigaon, Assam as per IS: 13311 (Part-I)-1992.	M/s NTPC Limited, Bongaigaon Thermal Power Project, Bongaigaon, Assam
167.	4429	Third Party Quality Assurance / Audit for Work of Construction of Semi Pucca M.C. Pry. School Building at Prem Nagar, Ward No. 87 SPZ.	M/s Executive Engineer (Project) SPZ, North Delhi Municipal Corporation, Kashmere Gate, Delhi
168.	4431	Third Party Quality Assurance / Audit for Work of Improvement Development of Road and Drain in E-block East Vinod Nagar in W. No. 219/AC-57 Sh (S) Zone in Mayur Vihar Phase-II.	M/s Executive Engineer (M)-IV, Shah (S) Zone, East Delhi Municipal Corporation, Shakarpur, Delhi
169.	4432	Evaluation of Cement & Chemical Admixture and Concrete Mix Design for the Work of Supply, Installation, Testing & Commissioning of EPC Package for NTPC North Karanpura STPP (3X660MW).	M/s NTPC Limited, North Karanpura Super Thermal Power Project Hazaribagh, Jharkhand

Sl. No	SP No.	Project Title	Sponsor
170.	4437	Third Party Quality Assurance / Audit for Work of Improvement Development of Road and Drain from CTC Toilet Block (Chilla Village) Trilok Puri Main Road by pdg. RCC Box Drain in W. NO. 211/AC-55 Sh (S) Zone.	M/s Executive Engineer (Project-II), Shah (S) Zone, East Delhi Municipal Corporation, Shakarpur, Delhi
171.	4439	Condition Assessment of Gas Plant Structure (RCC Structure) using Non Destructive Evaluation Technique at NTPC Limited, National Capital Power Station, (NCPS)-Dadri.	M/s NTPC Limited, National Capital Power Station, Gautam Budh Nagar, Dadri , Uttar Pradesh
172.	4445	Third Party Quality Assurance/Audit for Work of Construction of RCC Boundary Wall Towards RHS from Entry Gate to end of Ghazipur Dairy farm at SLF Site Ghazipur EDMC in Ward No. 214 Shahdara South Zone.	M/s Executive Engineer (SLF), East Delhi Municipal Corporation, Laxmi Nagar, Delhi
173.	4449	Third Party Quality Assurance/Audit for Work of Improvement of Development of Central Road Drain from Block No. 19 to Block 25 Trilokpuri by Pdg. RCC Item from in Box Drain by Covering Precast RCC slab in Ward No. 209/AC-55 in Mayur Vihar Phase-I Shah (S) Zone.	M/s Executive Engineer (Project-II), East Delhi Municipal Corporation, New Usmanpur, Delhi
174.	4450	Third Party Quality Assurance/Audit for Work of Improvement & Development of Road Drain from H. No. 5/29 to B-231 and H. No. 9/146 to 12/15 in Trilokpuri by Pdg. RCC Box Drain by Covering Precast RCC Slab in Ward No. 2140/AC-55 Shah South Zone.	M/s Executive Engineer (Project-II), East Delhi Municipal Corporation, New Usmanpur, Delhi
175.	4453	Third Party Quality Assurance/Audit for Work of Improvement of Drain from H. No. 13/280 to 19/30 Trilokpuri by pdg. RCC Item from in Box Drain by Covering Precast RCC Slab in W. No. 210/AC-55 Shah South Zone.	M/s Executive Engineer (Project-II), East Delhi Municipal Corporation, New Usmanpur, Delhi
176.	4454	Third Party Quality Assurance/Audit for Work of Improvement & Development of Drain from H. No. 26/57 to 30/189 in Trilokpuri by Pdg. RCC Box Drain in W. No. 211/AC-55 Shah (S) Zone.	M/s Executive Engineer (Project-II), East Delhi Municipal Corporation, New Usmanpur, Delhi

Sl. No	SP No.	Project Title	Sponsor
177.	4459	Third Party Quality Assurance / Audit for Work of Improvement Development of Lane by Pdg. RMC in JJ Colony Wazirpur at Ward No. 65/CLZ SH: (i) Improvement Development of lane from H. No. G-129 to 150, G-45 to G-65, G-300 to G-281 and G-251 to G-236 in JJ Colony Wazirpur by Pdg. RMC in JJ Colony Wazirpur C-65/CLZ (ii) Imp. Dev. of lane from E-45 to E-65, E-66 to E-86, E-87 to E-107 and E-108 to E-128 in JJ Colony Wazirpur by Pdg. RMC in from Nimri Colony C-65/CLZ (iii) Imp. Dev. of lane from E-173 to E-193, E-194 to E-214, E-259 to E-279 and E-280 to E-300 in JJ Colony Wazirpur by Pdg. RMC in from in Nimri Colony C-65/CLZ.	M/s Executive Engineer (M-IV) CLZ, North Delhi Municipal Corporation, Shakti Nagar, Delhi
178.	4462	Third Party Quality Assurance / Audit for Work of Improvement Development of Road/Lane by Providing RMC from H. No. 164 to 99, Pocket C-8, Sector-8, Rohini in C-51, M-IV/RZ.	M/s Executive Engineer (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, Delhi
179.	4463	Third Party Quality Assurance / Audit for Work of Improvement Development of Road/Lane by Providing RMC from H. No. 530 to 465, Pocket C-8, Sector-8, Rohini in C-51 M-IV/RZ.	M/s Executive Engineer (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, Delhi
180.	4464	Third Party Quality Assurance / Audit for Work of Restoration of Road Cut made by Delhi Jal Board for Providing Sewerage Facilities in Left out Portion of Shahabad Daulatpur in C-28, M-IV/Rohini Zone.	M/s Executive Engineer (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, Delhi
181.	4466	Third Party Quality Assurance/Audit for Work of Construction of CC Road from Balaji Dharmkanta to Railway Fatak No. 14 in Ward No. 31 at Nangloi Narela Zone.	M/s Executive Engineer (Project), Narela, North Delhi Municipal Corporation, Delhi
182.	4467	Third Party Quality Assurance / Audit for Work of Improvement of Lane by Providing Cement Concrete Pavement at Khazan Basti in C-110 in West Zone (i) from C-2, Maya Vihar to Mayapuri Road (ii) H. No. 241 to Mayapuri Road (iii) House No. D-45 to E/1288 (iv) D-2/63 to D-2/208 (v) Temple to D-1/177 (vi) D-2/53 to D-2/24 (vii) D-2/16 to D-2/24 (viii) D-208 to D-1/92 (ix) D-1/120 to D-1/114 & (x) D-2/82 to D-2/90.	M/s Executive Engineer (Project-II) West Zone, South Delhi Municipal Corporation, New Delhi

Sl. No	SP No.	Project Title	Sponsor
183.	4471	Third Party Quality Assurance / Audit for Work of Pay and Use JSC SH: Construction of 28 Seater JSC at Janamashtmi Park Kothi No. 40, SBI Nagar, Paschim Vihar (Building Work including Internal Sanitary Work, Water Supply, Drainage, Septic Tank & Tube well boring etc. complete.	M/s Delhi Urban Shelter Improvement Board, Malka Ganj, Delhi
184.	4474	Third Party Quality Assurance / Audit for Work of Deficiency of Services of Bhikaji Cama Place Handing over by DDA SH: Improvement of Drainage System, Flooring Parking and Footpath at Bhikaji Cama Place in Ward No. 167 South Zone.	M/s Executive Engineer (M-South)-I, South Delhi Municipal Corporation, Delhi
185.	4475	Testing and Evaluation of Coarse Aggregate for the work of Renovation & Retrofitting of ESP of U#1&2 at NTPC SAIL POWER SERVICES Pvt. Ltd Durgapur, West Bengal.	M/s NTPC Sail Power Company Pvt. Ltd CPP-11, Durgapur, West Bengal
186.	4478	Third Party Quality Assurance/Audit for Work of Providing & Laying of RMC from Flood drain to RZ-93/1 in West Sagarpur (for the length of 1000 mtr. width of 5m and thickness of RMC 0.15mtr) in Ward No. 132, NGZ.	M/s Executive Engineer (Project), NGZ, South Delhi Municipal Corporation, Delhi
187.	4480	Third Party Quality Assurance/Audit for Work of Improvement and Development of Road/Drain in Old Seemapuri in Ward No. 240 Shah-N-Zone SH: Imp/Dev of Lane/Road, fixing of MS board, fixing of Gully Grating Chamber and Pre-caste SFRC Slabs at various location in Ward No. 240 Dilshad Colony Shah. North Zone.	M/s Executive Engineer (M Shah (N))-I, East Delhi Municipal Corporation, Delhi
188.	4482	Assess the Structural Stability using Detailed Visual Inspection (DVI) & Condition Assessment using Non Destructive Evaluation Technique for repair & rehabilitation of 315 Staff Quarters at Shalimar Bagh, New Delhi.	M/s Reserve Bank of India, Estate Department, New Delhi
189.	4483	Condition Assessment using Non Destructive Evaluation Technique and Providing Repair/Restoration Measures including preparation of Material Specifications for Total 107 Quarters of Type-I, Type-II, Type-III & Type-IV at Krishi Niketan Colony of Indian Agricultural Research Institute (IARI), Paschim Vihar, New Delhi.	M/s Executive Engineer, Central Public Works Department, CD-IV, Pusa, New Delhi
190.	4485	Evaluation of Materials and Concrete Mix Design for the work of DM & Chemical Treatment Package for Tanda Thermal Power Plant, Stage-II (2X660MW).	M/s NTPC Limited, Tanda Thermal Power Plant, Ambedkar Nagar, Uttar Pradesh

Sl. No	SP No.	Project Title	Sponsor
191.	4486	Testing and Evaluation of Coarse Aggregate for Potential Alkali Reactivity by Mortar Bar Method for THDC India Limited, Tehri.	M/s THDC India Limited, Tehri Dam Project, Bhagirathipuram, Uttarakhand
192.	4538	Third Party Quality Assurance / Audit for Work of Construction of M. C. Pry. School at Surakhpur in NGZ.	M/s Executive Engineer (M Shah (N)-I, East Delhi Municipal Corporation, SDN Hospital, Delhi
193.	4545	Third Party Quality Assurance / Audit for Work of Construction of Senior Citizen Recreation Centre at Sector-24 Rohini.	M/s Executive Engineer (Project-II) Rohini Zone, North Delhi Municipal Corporation, , Delhi
194.	4548	Third Party Quality Assurance / Audit for Work of Improvement Development of Nalla at Tukhmipur Road from H. No. 23 Dayalpur (Sweet Shop) to Shiv Temple by Pd. 0 from in Tukhmipur in Ward No. 270 (N) Zone.	M/s Executive Engineer, SNZ, East Delhi Municipal Corporation, Delhi
195.	4549	Evaluation of Boulders of Plant Area Material.	M/s NTPC Limited, Khargone Super Thermal Power Project, Vishnupuri, Khargone, Madhya Pradesh
196.	4551	Third Party Quality Assurance / Audit for Work of Construction of Boundary Wall of Nizamuddin West Along Mathura Road from Barapulla Nallah to Petrol Pump in Ward No. 154, Central Zone.	M/s Executive Engineer (M)-I Central Zone, South Delhi Municipal Corporation, , Delhi
197.	4553	Third Party Quality Assurance / Audit for Work of Improvement Development of Drain from H. NO. 3/280 to 4/281 Trilok Puri by Pd. RCC Item from in Box Drain by Covering Pre-Cast RCC Slab in Ward No. 210/AC.55 Shah South Zone.	M/s Executive Engineer, (Project-II), SSZ, East Delhi Municipal Corporation, Delhi
198.	4555	Third Party Quality Assurance / Audit for Work of Improvement Development of DDA Market in New Rajdhani Enclave by Pd. RMC from Kota Stone etc. in Ward No. 228 Preet Vihar Shah. South.	M/s Executive Engineer, (M)-II, SSZ, East Delhi Municipal Corporation, Delhi
199.	4556	Third Party Quality Assurance / Audit for Work of Improvement Development of road from H. No. 296 to H. No. 141 by Pd. RMC from in Gagan Vihar Ward No. 228 Shah South Preet Vihar.	M/s Executive Engineer, (M)-II, SSZ, East Delhi Municipal Corporation, Delhi
200.	4577	Testing of Abrasion Resistance of Concrete by Underwater Method as per ASTM C1138 and Abrasion Resistance of Horizontal Concrete by Revolving Disks Methods as per ASTM C779.	M/s NPTC Limited, Tapovan Vishnugad Hydro Power Project, Joshimath, Distt. Chamoli

Sl. No	SP No.	Project Title	Sponsor
201.	4580	Testing of CEMWET SRA 2, Shrinkage Reducing Admixture (Batch No. 1100).	M/s Asian Laboratories, Okhla Industries Complex, DSIIDC Shed, New Delhi
202.	4581	Designing of M50A10 Dry Shotcrete Mix Design.	M/s S N Engitech Development Pvt. Ltd Green Field Colony, Faridabad
203.	4582	Condition Assessment Using Visual Inspection and Non-Destructive Evaluation Techniques, b) Structural Provisions as per Available Drawings/Design details c) to Provide Recommendations on Material Specification & Cost Estimate for Repair of Distressed RCC.	M/s YMCA University of Science and Technology, Sector-6, Faridabad Haryana
204.	4583	Ultrasonic Pulse Velocity (UPV) Testing of TG Raft of Unit # 1 of 3X660MW NTPC-North Karanpura STPP, Jharkhand as per IS: 13311 (Part-1)-1992.	M/s M/s Sunil Hi-Tech Engineers Limited, Noida, Uttar Pradesh
205.	4584	Condition Assessment using Non Destructive Technique to Study Strength, Durability & Subsurface Condition of RCC Rafts of Two 200 Cusec, Silt Setting Basin I&II at Muradnagar Water Works, Ghaziabad.	M/s UP Jal Nigam, DWSM Unit, Raj Nagar, Ghaziabad
206.	4588	Concrete Mix Design & Third Party Quality Assurance for Production and Placement of Concrete at Maneri Dam Site, Uttarkashi.	M/s UJVN Limited, Maneri Dam, Uttarkashi
207.	4592	Water Penetration Test as per DIN-1048.	M/s Central Public Works Department New Delhi
208.	4598	Ultrasonic Pulse Velocity (UPV) Testing of TG Raft of Unit # 2 of 3X660MW NTPC-North Karanpura STPP, Jharkhand as per IS: 13311 (Part-1)-1992.	M/s Sankaranarayan Construction Pvt. Ltd, C/o NTPC-North Karanpura, Jharkhand
209.	4600	Evaluation of 2 Nos Fine Aggregate (River Sand) Samples for Township Package of NTPC Gadawara Super Thermal Power Project.	M/s NTPC Limited, Gadawara Super Thermal Power Project, Narsinghpur, Madhya Pradesh
210.	4601	Condition Assessment using Non-Destructive Technique including Preparation of Bill of Quantities (BOQ), Cost Estimate & Third Party Quality Assurance during Repair of Cooling Tower (9 nos. cells) in CPP-II at NSPCL, Durgapur.	M/s NTPC SAIL Power Company Private Limited, CPP-II, DSP Complex, Durgapur
211.	4602	Evaluation of Material and Concrete Mix Design for the Work of Switchyard Package Tanda Thermal Power Plant Stage-II (2X660MW).	M/s NTPC Ltd, Tanda Thermal Power Plant, Distt Ambedkar Nagar, Uttar Pradesh

Sl. No	SP No.	Project Title	Sponsor
212.	4605	Evaluation of Aggregate for Potential Alkali Aggregate Reactivity for Harduaganj Thermal Power Station Extension-II (1X660MW), Kasimpur, Aligarh, UP.	M/s ACC Limited, Udyog Kendra, Greater Noida, Uttar Pradesh
213.	4609	Ultrasonic Pulse Velocity (UVP) Testing of Top Deck of Unit-2 for NTPC-Lara STPP as per IS:13311 (Part-I)-1992 to Ascertain Homogeneity and Integrity of Concrete.	M/s NTPC Limited, Lara Super Thermal Power Plant, Raigarh, Chhattisgarh
214.	4610	Third Party Quality Assurance / Audit for Work of Improvement and Development of Drain from H. No. 26/481 to 31/31 Both Side in Trilok Puri by Pdg. RCC item from in Box Drain by Covering Pre-cast RCC Slab in Ward No. 211/AC-55 Shah South Zone.	M/s Executive Engineer (Project-II) SSZ, East Delhi Municipal Corporation, Delhi
215.	4618	Concrete Mix Designs based on Permeability Criteria for NPCL – Kudankulam Nuclear Power Reactor Works.	M/s BU- Construction & Environment TATA Projects Limited, Secunderabad
216.	4620	Third Party Quality Assurance / Audit for Work of Construction of Boundary Wall of the Land Adjacent to the Chest Clinic on SPM Marg (Pilli Kothi), City Zone.	M/s Executive Engineer (Project), City Zone, North Delhi Municipal Corporation, Delhi
217.	4626	Concrete Mix Design for M65A20 and M80A20.	M/s NHPC Limited, Dhauliganga Power Station Tapovan-Dharchula, Chhattisgarh
218.	4633	Ultrasonic Pulse Velocity (UPV) Testing of TG Deck Slab and its Supporting RCC Columns of Unit#2 of Nabinagar Super Thermal Power Project (3X660MW) at Shivanpur, Distt. Aurangabad, Bihar.	M/s Gannon Dunkerley & Co. Ltd, New Delhi
219.	4639	Third Party Quality Assurance / Audit for Work of Construction of Gymnasium/Multipurpose Community Hall at D-950, Sant Ravi Das Nagar Jahangirpuri in C-5/CLZ.	M/s Executive Engineer (Project-II), CLZ, North Delhi Municipal Corporation, Delhi
220.	4643	Evaluation of Materials and Concrete Mix Designs for the work of EPC Package for NTPC North Karanpura STPP (3x660 MW).	M/s NTPC Limited, North Karanpura Super Thermal Power Project, Hazaribagh, Jharkhand
221.	4645	Third Party Quality Assurance / Audit for Work of RR cut made by DJB Department for Replacement of Old/Damaged CI Water lines in Sainik Vihar in Ac-15 at Ward No. C-59/RZ SH: Restoration of Cut and Improvement of Lanes by CC.	M/s Executive Engineer (M-RZ)-I, North Delhi Municipal Corporation, Delhi

Sl. No	SP No.	Project Title	Sponsor
222.	4651	Third Party Quality Assurance / Audit for Work of Improvement Development of Main Road Shanti Mohalla and Chameli Dev Mandir Lane from Raghubarpura Road to Fatak Chowk by Pdg. RMC in Shanti Mohalla Ward No. 236/AC 61.	M/s Executive Engineer (M-I), S South Zone, East Delhi Municipal Corporation, Delhi
223.	4653	(1) Condition assessment using Non Destructive Evaluation Technique including preparation of Bill of Quantities (BOQ), Cost Estimate of Cooling Tower (8nos. cells) in Rajiv Gandhi Combined Cycle Power Plant at NTPC, Kayamkulam, Kerala (2) Condition assessment of TG Bay Roof of Rajiv Gandhi Combined Cycle Power Plant, Kayamkulam Kerala.	M/s NTPC Rajiv Gandhi Combined Cycle Power Plant, Kayamkulam, Kerala
224.	4656	Testing and Evaluation of Coarse Aggregate (20mm and 10mm) from Selda Quarry Outside Plant Boundary for the Work of Ash Dyke Package for 2X660 MW NTPC-Khargone Thermal Power Project.	M/s NTPC Limited, Khargone Super Thermal Power Project, Khargone , Madhya Pradesh
225.	4657	Evaluation of Materials and Concrete Mix Designs for the Work of Switchyard Package Gadarwara Super Thermal Power Plant of 2 * 880 MW (Stage-I) NTPC Limited at Gadarwara in Narsinghpur District of Madhya Pradesh.	M/s NTPC Limited, Gadarwara Super Thermal Power Project, Narsinghpur, Madhya Pradesh
226.	4658	Testing and Evaluation of Coarse and Fine Aggregate Including Potential Alkali-Aggregate Reactivity for the Work of Construction of Dam and other Hydraulic Structures for 118 MW Nikachhu Hydropower Project, Bhutan.	M/s Tangsibje Hydro Energy Limited (THyE), Trongsa, Bhutan
227.	4665	Third Party Quality Assurance / Audit for Work of Construction of Road from Nursing College to back Gate at SDN Hospital by Pdg. from in Shahdara (North) Zone in Dilshad Garden.	M/s Executive Engineer, (Project-1) Shahdara North, East Delhi Municipal Corporation, Shahdara, New Delhi
228.	4667	Third Party Quality Assurance / Audit for Work of Making Good Deficiency of Drains Handed Over by DDA to MCD vide Code No. RZ-09-10-46 in Pocket-2, 3 and 4 in Sector-25, Rohini in Ward No. C25, M-IV/RZ.	M/s Executive Engineer, (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, New Delhi
229.	4668	TPQA for work of "Restoration of road cut made by Indraprastha Gas Ltd for laying of Natural Gas Pipe line at Sector-18 and Sector-17, Rohini in C-21, M-IV/RZ by pdg. RMC and Cement concrete interlocking pavers".	M/s Executive Engineer (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, New Delhi

Sl. No	SP No.	Project Title	Sponsor
230.	4671	Third Party Quality Assurance / Audit for Work of Making Good the Deficiency of Drains Handed Over by DDA to MCD vide Code No. RZ-09-10-46, Sector-25, Rohini, C-25, M-IV/RZ.	M/s Executive Engineer, (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, New Delhi
231.	4674	Third Party Quality Assurance / Audit for Work of Making Good the Deficiency of Drains Handed Over by DDA to MCD vide Code No. RZ-09-10-45, Sector-20/24, Rohini in Ward No. C-25, M-IV.RZ.	M/s Executive Engineer, (M-RZ)-IV, North Delhi Municipal Corporation, Pitampura, New Delhi
232.	4675	Condition Assessment for Observation/investigation of Distress RCC Structures of Hostel Building 3 & 4 at BHC Ballabgarh.	M/s All India Institute of Medical Science, New Delhi
233.	4676	Condition Assessment of Reinforced Concrete Structures viz. Grout Portion of Tower Foundation in Switch Yard Area, MCC-B Structure at CHP Area, ET-Hostel (02 Nos) and make up Water Pimp House & Connecting Bridge on Champawati River at NTPC BGTPP.	M/s NTPC Limited, Bongaigaon Thermal Power Project, Assam
234.	4680	Evaluation of Hardened Concrete Cores after 28-Days for the Work of Construction of Pavement Quality Concrete Road along with RCC Drains for Connecting Labour Gate Complex to Main Road Going to Shaktinagar at NTPC Vindhyachal.	M/s NTPC Limited, Vindhyachal Super Thermal Power Station, Vindhyachal, Singrauli, Madhya Pradesh
235.	4682	Assessment of Quality and Integrity of Segment 3 & 5 of Raft Foundation for 275m RCC Chimney of Unit No. 2 at North Karanpura Block, Hazaribagh, Jharkhand by using UPV, RH & Core Testing.	M/s NBCC Limited, NTPC North Karanpura, Chatra, Jharkhand
236.	4683	Ultrasonic Pulse Velocity (UPV) Testing of TG Raft & one Column of Unit # 3 of 3x660MW North Karanpura STPP, Jharkhand as per IS: 13311 (Part-I)-1992.	M/s Sunil Hi-Tech Engineers Limited, Sector-9, Noida
237.	4684	Third Party Quality Assurance / Audit for Work of Construction of Science Museum at M C Pry. School at Tagore Garden in C-105 in West Zone SH: Providing Aluminum Composite Panel Cladding and Structural Grazing in External Finish.	M/s Executive Engineer, (Project-II) /West Zone, South Delhi Municipal Corporation, Dabri Flyover, New Delhi
238.	4692	Concrete Mix Proportions & Self Compacting Concrete(SCC) (total 3 Nos) for various civil works of Strengthening of Approaches of Aqueduct at R.D. 45660m on Gosikhurd Right Bank Canal – Agreement No.: B1/02/DL/2016-17.	M/s Executive Engineer, Gosikhurd, Right Bank Canal Division, Bramhapuri

Sl. No	SP No.	Project Title	Sponsor
239.	4707	Condition Assessment using Non Destructive Evaluation Technique of Main Building & Maleria Ward Building of RTRM Hospital, Jafferpur, Delhi.	M/s Executive Engineer, Health (South West), Maintenance M-123, Public Work Department, Dwarka, Delhi
240.	4708	Third Party Quality Assurance / Audit for Work of Construction of Drainage System along the B/Wall of YP Block Market and Jiapuria Public School and Pdg. Missing and Damaged Slabs on the Drains from Flat No. 4A to 27A and 240A to 230A (Both Sides) and Pdg. RMC in the Lane from 240 240A to 230A and Parking in WP-Block Pitampura (S) in C-53/RZ.	M/s Executive Engineer, (M-RZ)-I, North Delhi Municipal Corporation, Keshav Puram, Delhi
241.	4710	Third Party Quality Assurance / Audit for Work of Improvement Development of Unauthorized colony at Najafgarh, Jaffarpur Kalan, Jharoda Kalan, Dichaon Kalan. At Village Badusarai in NGZ. (5 sites).	M/s Executive Engineer, (M)-I, NGZ, South Delhi Municipal Corporation, Najafgarh, New Delhi
242.	4716	Third Party Quality Assurance / Audit for Work of Improvement Development in Subhash Mohalla by Pdg. RMC in Ward No. 233/AC 61 Shah (South) in Dharampura.	M/s Executive Engineer, M Shah (S)-I, East Delhi Municipal Corporation, Geeta Colony, New Delhi
243.	4722	Third Party Quality Assurance / Audit for Work of Improvement of Development Drainage System by Constructing Missing Portion of Drain from Rajeev Ratan Awas Yojna to Chand Ram House in Baprolla Village by Pdg. from in Ward No. C-122/WZ.	M/s Executive Engineer, (M-IV), West Zone, South Delhi Municipal Corporation, Moti Nagar, New Delhi
244.	4725	Verification of Quality of concrete laid and compacted in RCC Pedestals, Footings and Columns using Non Destructive Evaluation (NDE) techniques at NTPC-North Karanpura, Hazaribagh, Jharkhand.	M/s Bharat Heavy Electricals Limited C/o NTPC Limited, North Karanpura Super Thermal Power Project, Hazaribagh, Jharkhand
245.	4726	Verification of Quality of concrete laid and compacted in RCC members of structures of Unit #2 using Non Destructive Evaluation (NDE) techniques at NTPC-North Karanpura, Hazaribagh, Jharkhand.	M/s Bharat Heavy Electricals Limited C/o NTPC Limited, North Karanpura Super Thermal Power Project, Hazaribagh, Jharkhand
246.	4727	Third Party Quality Assurance / Audit for Work of Remolding & Covering of Drain (length 400 mtr, Clear Width 0.75m, depth 1.00m and covering with RMC M-25) from Goyal Timber Shop to Varsha Cosmetic Shop in Durga Park Dabri Road in Ward No. 129\NGZ.	M/s Executive Engineer, (Project) NGZ, South Delhi Municipal Corporation, Najafgarh, New Delhi

Sl. No	SP No.	Project Title	Sponsor
247.	4730	Third Party Quality Assurance / Audit for Work of Improvement and Development of Anarkali Road from H. NO. 20 New Layalpur to H. No. 18, Govind Park by Pdg. RMC in Ward 232/AC-60.	M/s Executive Engineer, (M)-I, Shahdara South Zone, East Delhi Municipal Corporation, Geeta Colony, New Delhi
248.	4733	Third Party Quality Assurance / Audit for Work of Reconstruction of Boundary Wall (for the Length of 278.30 mtr) in SDMC Primary School Sagarpur Old in Ward No. 131/NGZ.	M/s Executive Engineer, (Project) NGZ, South Delhi Municipal Corporation, Najafgarh, New Delhi
249.	4735	Assessment of existing Chimney (One No) covering field and laboratory study using Non Destructive Testing and Partially Destructive Testing Techniques and Suggestion for Technically Feasible Corrective Measures to Carryout Repair, Restoration & Retrofitting. KWPCCL Raigarh.	M/s Paharpur Cooling Towers Limited, Kolkata, West Bengal
250.	4737	Distressed Assessment and Preparation of Specifications for Special Repair of Cooling Towers at Pragati Power Station-I.	M/s Pragati Power Corporation Limited, IP Estate, New Delhi
251.	4757	Carrying out Certain ND Tests, i.e. UPV, Rebound Hammer, Concrete Core Test over Damaged Portion of RCC Pier at Dul Hasti Dam in Kishtwar Distt. J&K.	M/s NHPC Limited, Dul Hasti Power Station, Distt Kishtwar, J&K
252.	4766	Third Party Quality Assurance / Audit for Work of Construction of Boundary Wall with Gate and Grill, Providing Sewer Line, Permanent External Finish, Tile Flooring, Aluminum Work for Opening and Development of Open Compound with Water Harvesting Arrangement for Community Hall at Sector-9, Rohini in Rohini Zone.	M/s Executive Engineer (Project-I)/Rohini Zone, North Delhi Municipal Corporation, Rohini, Delhi
253.	4767	Third Party Quality Assurance / Audit for Work of Improvement Development of Main Road Samaspur from E-56 to Gali No. 7, F-Block in Pandav Nagar by Pdg. RMC in W. No. 220/AC-57 Shah (S) Zone in Patparganj.	M/s Executive Engineer, (M-IV) Shahdara (South) Zone, East Delhi Municipal Corporation, Shakarpur, Delhi
254.	4774	Detail Investigation of RCC Foundations of Steel Structure Chimney (2 Nos) & HRSG Boiler Foundation (2 Nos) in Plant at NTPC Faridabad.	M/s NTPC Limited, Faridabad Gas Power Station, Village-Mujedi, Faridabad
255.	4778	Third Party Quality Assurance / Audit for work of "Improvement Development of Boundary wall, development of open space, construction of guard room and UG tank with pump house etc. at M&CW center Shivpuri in ward no. 231 Shahdara South Zone".	M/s Executive Engineer, (Pr)-I Shahdara South Zone, East Delhi Municipal Corporation, Krishna Nagar, Delhi

Sl. No	SP No.	Project Title	Sponsor
256.	4779	Water Permeability Testing of Concrete Samples prepared using Penetron Mix for Construction of Additional Office Complex for the Supreme Court of India, Adjoining Pragati Maidan, New Delhi Package III plus Including Balance for RCC Structure & Basement Finishing Work, Internal & External Services (Civil) & Extend Development Work (Civil).	M/s JMC Project India Limited, Supreme Court Site Additional Office, Pragati Maidan, New Delhi
257.	4791	Assessment of fire damage and Repair & Restoration/ Strengthening Measures for Fire Affected Area of Third Floor of D Block in AG Office Premises, Hyderabad.	M/s Deputy Accountant General (Admin.), Office of Principal Accountant General, Saifabad, Hyderabad
258.	4797	Condition Assessment Study using Non Destructive & Partial Destructive Evaluation Technique of Major Bridge No. 6 of East Central Railway at Patna, Bihar.	M/s East Central Railway, Construction Organization, Digha Ghat, Patna, Bihar
259.	4798	Condition Assessment Study using Non Destructive & Partial Destructive Evaluation Technique of Major Bridge No. 7 of East Central Railway at Patna, Bihar.	M/s East Central Railway, Construction Organization, Digha Ghat, Patna, Bihar
260.	4803	Third Party Quality Assurance / Audit for Work of “Construction of drain [--] by pdg RCC item from H. No. D-80 to C-69 in Ghazipur Dairy Farm, SSZ in Dallapura”.	M/s Executive Engineer (Project-II), Shahdara South Zone, East Delhi Municipal Corporation, Shakarpur, Delhi
261.	4814	Third Party Quality Assurance / Audit for Work of “Construction of Boundary Wall & Earth Filling in M C Pry. School Khera Dabar (Length 275 mtr Width 0.23 mtr) in Ward No. 133/NGZ”.	M/s Executive Engineer (Project), NGZ, South Delhi Municipal Corporation, Dhansa Stand, Najafgarh, Delhi
262.	4830	“Evaluation of Concreting Material & Concrete Mix Proportion (1 No)” Civil Works of Ref: PO:5500022954, 960,962, 4200043089 for Supply Erection Commissioning of New MVW system at Telangana STPS Ramagundam (3X200MW & 3X500MW) Awarded to M/s Sterling and Wilson Pvt. Ltd	M/s NTPC Ltd Telangana STPP (2X800MW), PO: Jyothi Nagar Ramagundam, Karimnagar
263.	4832	Third Party Quality Assurance / Audit for Work of “Providing Glazed Tiles in Rooms & Verandah, Roofing System with Heat Resistance & Drainage, Frit Wash, Window Panes, Kota Stone in Rooms & Verandah in One Block Consisting of Four Rooms and Staircase of RHS Block of Newly Constructed School and Ground Development Works Such as Sewer Line, Drainage System, Interlocking Paver on Passage and CC Pavement in Plinth offsets, Kota Stone in Steps & Septic Tank at M C Pry. School Tajpur Ward No. 203, Central Zone”.	M/s Executive Engineer, (Project-II), Central, South Delhi Municipal Corporation, Under Sewa Nagar Flyover, New Delhi

Sl. No	SP No.	Project Title	Sponsor
264.	4856	Ultrasonic Pulse Velocity (UPV) Testing of TG Deck Slab and its Supporting RCC Columns of Unit #3 of Nabinagar Super Thermal Power Project (3X660MW) at Shivanpur, Distt. Aurangabad, Bihar.	M/s Gannon Dunkerley & Co. Limited, Okhla Industrial Area, Phase-1, New Delhi
265.	4917	Carrying out certain ND Tests i.e. UPV, Rebound Hammer and Concrete Core Test over RCC structural elements at Trishul Dream Homes Ltd site at Sector-84, Faridabad.	M/s Trishul Dream Homes Ltd, Sec-84, Near Apee Jay School, Faridabad, Haryana
266.	4920	Evaluation of 1 No Fine Aggregate (River Sand) for Sample for Township Package of NTPC Gadawara Super Thermal Power Plant.	M/s NTPC Limited, Gadawara Super Thermal Power Project, Narsinghpur, Madhya Pradesh

CENTRE FOR QUALITY MANAGEMENT, STANDARDS AND CALIBRATION SERVICES (CQC)

267.	4210	Assistance in NABL Accreditation.	M/s TSPL, Mansa, Punjab
268.	4351	04 days Training Workshop on Laboratory Management System and Internal Audit as per ISO/IEC 17025: 2005.	M/s TSPL, Mansa, Punjab
269.	4328	Development of Cement Standards for Calibration of X-ray Analyzer.	Dalmia Cement (Bharat) Limited
270.	4335	Development of Clinker Standards for Calibration of XRD.	M/s Calcom Cement India Limited, Umrangshu
271.	4330	Calibration of Lab Equipment of Coal Testing Laboratories (5 nos.).	Northern Coal Field Ltd, Singrauli, Madhya Pradesh
272.	4457	Calibration of Laboratory Equipment of Material Testing Laboratories.	M/s Gujarat Engineering Research Institute, Gandhinagar
273.	4256	Interlaboratory Comparison Study at QC Laboratories for Proficiency Testing.	M/s Reliance Cement Company, Mumbai
274.	4615	Quality Audit of Coal Testing Laboratory.	M/s Nabha Power Limited, Rajpura
275.	4565	Laboratory Assessment and Proficiency Improvement Study for Quality Control Laboratory of Four Cement Plants.	M/s Zuari Cement Limited
276.	4405	Development of Clinker Standards for Calibration of XRD.	M/s Dalmia Cement Bharat Limited, Belgaum

Appendix - IV

Research and Development Programme 2017-18

Sl. No.	Project No.	Project Title	Date of Commencement	Target Date of Completion
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I PROJECTS UNDER SWACHCHHTA ACTION PLAN

1	COB-06	Investigations on high volume fly ash blended cements	July 2015	March 2018
2	ENV 17	Best Practices for Reduction of NO _x and SO ₂ Emissions for Indian Cement Industry	April 2016	March 2019

II PROJECTS UNDER DCCI

3	COB 07	Investigations on Portland Limestone Cements and their performance characteristics	April 2016	March 2018
4	FBR 14	Development of chemical formulations for enhancing and achieving desired properties of cements	April 2016	March 2018
5	ENV-18	Water Footprint Assessment Study For Cement Plants	April 2016	March 2018
6	COB-09	Development of Reactive Belite Cement Using Low Grade Lime Stone and different dopants	April 2017	March 2020
7	COB-10	Improving The Performance of Composite Cement By Separate Grinding of Constituents	April 2017	March 2020
8	FBR-15	Improving The Reactivity of Fly Ash and Their Effect on Cement And Concrete Performance	April 2017	March 2019
9	WAU-14	Improvement of Fly Ash Quality, Through Chemical / Mineral Doping In Coal During Its Generation In Thermal Power Plant, and Study Its Effects In Cement And Concrete.	April 2017	March 2022

Sl. No.	Project No.	Project Title	Date of Commencement	Target Date of Completion
10	WAU-15	Investigations of Multi Component Blended Cements Using Limestone, Calcined Clay and Other Mineral Additives	April 2017	March 2020
11	PRP-06	Application of CFD in Indian Cement Industry	April 2017	March 2019
III PROJECTS UNDER “PROJECT BASED SUPPORT TO AUTONOMOUS INSTITUTIONS”				
12	COB 08	Performance evaluation of cement samples by mechanical mixing and keeping fixed w/c ratio for compressive strength determination vis a vis as per Indian standard test procedures	April 2016	March 2018
13	CON-12	Development of guidelines for design of high performance concrete mixes for specified long service lives using latest available ultrafines and admixtures	April 2016	March 2018
14	SOD-09	Studies on the effectiveness of different repair systems for repair, restoration and strengthening of corrosion damaged structures	April 2016	March 2019
15	CTM-01	Development of Cost-effective Concrete Road Technology for Rural Roads	April 2016	March 2019
16	CTM-02	Development of Geopolymer Concrete For Application In Pavements and Precast Concrete Construction	April 2017	March 2020
17	CON-14	Development of Ultra High Performance Concrete (UHPC)-including use of Nano Technology for UHPC	April 2017	March 2020
18	CON-15	Enhancing The Utilization of Construction and Demolition Waste and Other Waste Based Aggregates In Concrete Structures and Pavements	April 2017	March 2020

Sl. No.	Project No.	Project Title	Date of Commencement	Target Date of Completion
19	SOD-10	Effect of Supplementary Cementitious Materials (SCM's- Single And Multi Blends) on Service Life of Concrete Structures Including Studies To Improve Green Cements To Meet Durability/Service Life Requirements	April 2017	March 2020
20	CTM-03	Use of Advanced Electronics in Construction And Condition Assessment of Concrete Structures	April 2017	March 2020
21	CTM-04	Model low cost housing sustainable technology for Mass EWS & LIG/MIG housing schemes- using precast / prefab systems with emphasis On maximization of waste based materials	April 2017	March 2020
22	CLS-02	Development of calibration methodologies with improved accuracy	April 2017	March 2020
23	SOD-11	Experimental study on shear and compression design of high strength concrete including effect of fibre on enhanced durability and fire resistance	April 2017	March 2019

Appendix - V

NCB Patents Filed during 2008-2017

Sl.No.	Application No.	Title	Name of Inventors
1.	1995/DEL/2008	A process for Preparation of Ordinary Portland cement	Sh M Vasudeva Dr M M Ali Dr D Yadav Dr J M Sharma
2.	2235/Del/2012	A process for preparation of synthetic slag from low grade limestone and dolomite	Sh A Pahuja Dr M M Ali Sh P S Sharma Sh S K Chaturvedi Sh S K Aggrawal Dr V P Chatterjee Dr D Yadav Sh Tashi Tshering Sh Udai Kaflay
3.	2598/DEL/2014	Marble dust as mineral additive in the manufacture of ordinary Portland cement	Sh A Pahuja Dr M M Ali Sh P S Harma Sh S K Aggrawal Sh Ashish Goyal
4.	2599/DEL/2014	Mineralizing effect of “barium sludge- an industrial byproduct” in the manufacture of ordinary Portland cement	Sh A Pahuja Dr M M Ali Dr V P Chatterjee Sh S K Chaturvedi Sh S K Aggrawal
5.	634/DEL/2015	Rationalizing formulations and curing conditions for improving properties of hardened Geopolymeric Cement	Sh Ashwani Pahuja Dr M M Ali Dr R S Gupta Dr S Vanguri Dr V Liju

S.No.	Application No.	Title	Name of Inventors
6.	1195/DEL/2015	Investigations on the use of limestone mine reject on the properties of OPC clinker and resultant cement	Sh Ashwani Pahuja Dr M M Ali Dr V P Chatterjee Sh S K Chaturvedi Sh S K Agarwal
7.	1194/DEL/2015	Process for the Preparation of sulphoaluminate - belite cement utilizing high magnesia / dolomitic limestone	Sh Ashwani Pahuja Dr M M Ali Sh P S Sharma Dr V P Chatterjee
8.	1196/DEL/2015	Nanosilica blended ordinary Portland cement compositions with improved performance characteristics and a process thereof	Sh Ashwani Pahuja Dr M M Ali Dr S Harsh Sh Suresh Vanguri Dr Varsha Liju
9.	1964/DEL/2015	Method for rapid estimation of Na ₂ O and K ₂ O in different types of cement and raw materials	Sh Ashwani Pahuja Dr M M Ali Sh S K Chaturvedi Sh S C Sharma
10.	201611029136	Fast process for determining expected 28-Day Compressive Strength of Concrete Made With Portland Pozzolana Cement (PPC)	Sh V V Arora Sh Suresh Kumar Sh M K Mandre
11.	201711000524	A Process for Preparing Tile	Sh Ashwani Pahuja Sh S K Chaturvedi Dr S Harsh Dr R S Gupta Dr S Vanguri Dr V Liju Sh M N K Prasad Bolisetty

Finance and Accounts

Finance

CONTRIBUTIONS

Ministry of Commerce & Industry Grant

During the year 2016-17, Plan Grant of 600 lakhs, Non-Plan Grant from Cement Cess of 1460 lakhs were received.

FOREIGN EXCHANGE

During the year 2016-17, the Council earned Foreign Exchange amounting to US\$ 11427 towards Training Fee, Testing Charges, Sponsored R & D Contribution, Seminar Delegate Fee, Technical Exhibition etc.

AUDITORS

M/s K S Aiyar & Co., Chartered Accountants, Mumbai were the Auditors of the Council for the year 2016-17.

Accounts

The Accounts for the year 2016-17 duly audited by the Auditors of the Council are given at Annexure (Balance Sheet as at 31st March 2017 and Income & Expenditure Account for the year ended 31st March 2017).

K. S. AIYAR & CO.
CHARTERED ACCOUNTANTS

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INDEPENDENT AUDITOR'S REPORT**To the members of National Council for Cement and Building Materials****Report on the Financial Statements**

We have audited the accompanying financial statements of National Council For Cement and Building Materials, which comprise the Balance Sheet as at March 31, 2017 and the Income and Expenditure account for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

The Council's Management is responsible for the preparation of these financial statements that give a true and fair view of the financial position and financial performance in accordance with the Accounting Principles generally accepted in India. This responsibility includes the design, implementation and maintenance of internal control relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal controls relevant to the Council's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Emphasis of Matter

a) Reference is invited to Note No. 9 of Schedule N with regard to No provision is made on accounts of Rs. 25.02 Lakhs for R & D Contribution Outstanding.

Opinion

In our opinion and to the best of our information and according to the explanations given to us, except for the effects of the matters described in the emphasis of matter paragraph, the financial statements give a true and fair view in conformity with the accounting principles generally accepted in India:

- in the case of the Balance Sheet, of the state of affairs of the Society as at March 31, 2017; and
- in the case of the Income and Expenditure, the excess of Income over Expenditure of the Society for the year ended on that date.

For K.S. Aiyar & Co.
Chartered Accountants

RAGHUVIR M. AIYAR
Partner
M.No. 038128

Place: Mumbai

Date: 04th Sept, 2017

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS

BALANCE SHEET AS AT MARCH 31, 2017

	Schedules		As at March 31, 2017 (Amount in Rs.)		As at March 31, 2016 (Amount in Rs.)
SOURCES OF FUNDS					
Capital Fund	A	68,076,145		68,076,146	
Reserves and Surplus	B	421,539,218		381,553,901	
Building Fund		4,500,000		4,500,000	
Gratuity Fund		219,705,145		172,050,839	
Provision For Leave Encashment		170,476,514		139,013,037	
Capital Grant from Govt of India	C	442,383,777		477,147,079	
Current Liabilities & Provisions	D	210,428,733	1,537,109,532	141,738,794	1,384,079,796
Total			1,537,109,532		1,384,079,796
APPLICATION OF FUNDS					
Fixed Assets					
Gross Block	E	759,384,244		876,564,392	
Less: Depreciation		400,893,646	358,490,598	498,081,018	378,483,374
Net Block					
Gratuity Fund Investment					
(Fixed Deposit / Savings Bank / Interest Accrued)		128,801,232		153,539,495	
Leave Fund account		132,224,078	-	135,668,901	
Current Assets Loans & Advances					
R&D Contribution Outstanding		6,521,808		6,959,805	
Sundry Debtors	F	17,005,791		3,690,573	
Loans and Advances (unsecured and considered good)		103,350,588		95,740,005	
Cash and Bank Balances	G	755,692,160	1,143,595,657	559,349,811	954,948,590
FDR In lien			15,785,039		29,973,768
Interest Accrued on Bank Deposits			19,238,238		20,674,064
Total			1,537,109,532		1,384,079,796
Significant Accounting Policies	M				
Notes on Accounts	N				

The Schedules referred to above form an integral part of the Balance Sheet.

This is the Balance Sheet referred to in our report of even date.

For and on behalf of
K.S. Aiyar & Co.
Chartered Accountants

Raghuvir M. Aiyar
Partner
M.No. 38128
Mumbai
Date: 04th Sept, 2017

Sd/-
S K Chaturvedi
Joint Director (Finance & Accounts)

Sd/-
Ashutosh Saxena
Director General -Actg.

Sd/-
Dr S Chouksey
Chairman
Board of Governors NCB

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED MARCH 31, 2017

	Schedules	For the Year Ended March 31, 2017 (Amount in Rs.)	For the Year Ended March 31, 2016 (Amount in Rs.)
INCOME			
Research & Development Contribution	H	198,482,443	158,617,590
Other Income	I	171,746,615	186,857,405
Grant-in-Aid (Revenue) from Ministry of Commerce & Industry	J	206,000,000	165,500,000
		576,229,058	510,974,995
EXPENDITURE			
Employee's Cost	K	446,244,074	317,288,040
Travelling & Conveyance (Including Overseas Travelling)		8,279,130	8,651,204
Laboratory Stores, Raw Materials		11,411,820	10,425,740
Symposia & Seminars		1,524,989	12,106,288
Training Programmes		3,441,857	3,138,356
Repairs and Maintenance		8,876,256	5,483,177
Other Expenses	L	37,332,325	30,561,546
Depreciation			26,960,425
Add. Provision of Depreciation of previous Year		53,896,592	
Less: Transfer from Capital Grant from Govt of India		34,763,302	17,524,276
		19,133,290	9,436,149
		536,243,741	397,090,500
Surplus for the year transferred to Reserve Fund		39,985,317	113,884,495
Significant Accounting Policies			
Notes on Accounts			

The Schedules referred to above form an integral part of the Income and Expenditure Account.

This is the Income and Expenditure Account referred to in our report of even date.

For and on behalf of
K.S.Aiyar & Co.
Chartered Accountants

Raghuvir M. Aiyar
Partner
M.No. 38128
Mumbai
Date: 04th Sept, 2017

Sd/-
S K Chaturvedi
Joint Director (Finance & Accounts)

Sd/-
Ashutosh Saxena
Director General -Actg.

Sd/-
Dr S Chouksey
Chairman
Board of Governors NCB

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS
SCHEDULES FORMING PART OF THE ACCOUNTS AS AT MARCH 31, 2017

Particulars	As at March 31, 2017 (Amount in Rs.)	As at March 31, 2016 (Amount in Rs.)
<u>SCHEDULE - A</u>		
Capital Fund		
As per the last Balance Sheet	68,076,146	68,076,146
Includes UNIDO Equipment valued at Rs 20,187,535 (Previous Year Rs 20,187,535) (Refer Note 3 (b) of Schedule M)		
	68,076,146	68,076,146
 <u>SCHEDULE - B</u>		
Reserves and Surplus		
As per the last Balance Sheet	381,553,901	267,669,406
Add: Surplus for the year	39,985,317	113,884,495
	421,539,218	381,553,901

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS
SCHEDULES FORMING PART OF THE ACCOUNTS AS AT MARCH 31, 2017

Particulars	As at March 31, 2017 (Amount in Rs.)	As at March 31, 2016 (Amount in Rs.)
<u>SCHEDULE - C</u>		
Capital Grant from Govt of India		
As per the last Balance Sheet	477,147,079	434,671,355
Add: Plan Grant received during the year	-	60,000,000
	477,147,079	494,671,355
Less: Grant transferred to Income & Expenditure Account to the extent depreciation charged during the year on assets purchased out of capital grant	34,763,302	17,524,276
	<u>442,383,777</u>	<u>477,147,079</u>

SCHEDULE - D

Current Liabilities and Provisions

Retention & Security Money	15,960,028	17,801,347
Other Liabilities	194,468,705	123,937,447
	<u>210,428,733</u>	<u>141,738,794</u>

SCHEDULE - E

**NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS
DEPRECIATION AS AT 31 MARCH 2017**

(Amount in Rs)

Particulars	GROSS BLOCK										DEPRECIATION										NET BLOCK	
	Cost upto March 31, 2001	Cost from April 1, 2001 to March 31, 2016	Total cost as at March 31, 2016	Addition During the Year 2016-2017	Disposal/ Adjustment out of cost before 2001 2016-2017	Disposal/ Adjustment out of cost after 2001 2016-2017	Total cost as at March 31, 2017	On Old Assets Up to March 31, 2001	On Assets from April 1, 2001 to March 31, 2016	Op.Bal Depreciation as at April 1, 2016	Rate %	On Assets Prior to 1 April 01 during the year 2016-2017	Rate %	On Additions after 1 April 01 2016-2017 (Amt)	Deprecia- tion/ Adjustment on cost before 2001 2016-2017	Dep./ Adj. on cost after 2001 2016-2017	Total Depreciation as at March 31, 2017	WDY As at March 31, 2017	WDY As at March 31, 2016			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
LAND (FREE HOLD)	3,924,748	-	3,924,748	-	-	-	3,924,748	-	-	-	-	-	-	-	-	-	-	3,924,748	3,924,748			
VEHICLES	833,717	5,365,103	6,198,820	-	-	6,198,820	750,509	3,894,113	4,644,622	20.0	16,642	20.0	460,941	20.0	460,941	5,122,205	1,076,615	1,554,198				
COMPUTER INCLUDING ACCESSORIES	44,595,017	44,595,017	44,595,017	129,000	-	44,724,017	-	43,573,941	43,573,941	-	-	-	60.0	690,046	-	690,046	44,263,986	460,031	1,021,076			
FURNITURE AND OFFICE EQUIPMENTS	10,263,037	24,754,597	35,017,634	3,065,917	20,063,695	18,017,856	9,377,068	12,184,765	21,561,833	10.0	88,597	10.0	2,351,153	17,678,437	6,323,146	11,694,710	13,455,801					
LABORATORY EQUIPMENT	79,479,641	352,229,468	431,709,109	58,468,631	158,778,002	331,999,738	72,468,330	297,898,102	370,366,432	10.0	701,131	10.0	41,726,791	133,405,527	279,388,827	52,010,911	61,342,677					
MOBILE QUALITY CONTROL LABORATORY	-	5,268,489	5,268,489	-	-	5,268,489	-	5,105,565	5,105,565	-	-	-	20.0	32,585	-	32,585	5,138,150	130,339	162,924			
CENTRE FOR CONTINUING EDUCATION	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
BUILDINGS	1,922,707	42,119,827	44,042,534	-	-	44,042,534	1,106,262	5,703,848	6,870,110	2.5	20,411	2.5	956,967	7,847,489	36,195,045	37,172,424						
OTHER SERVICES	535,144	24,826,311	25,361,455	-	-	25,361,455	520,218	626,867	1,147,085	10.0	1,493	10.0	618,365	1,766,943	23,594,512	24,214,370						
LABORATORY PROJECTS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
BUILDINGS	27,973,919	84,961,934	112,935,853	-	-	112,935,853	16,205,478	9,435,881	25,641,359	2.5	294,211	2.5	2,587,499	28,523,069	84,412,784	87,294,494						
CAPITAL WORK IN PROGRESS	142,148,598	142,148,598	142,148,598	-	-	142,148,598	-	-	-	-	-	-	-	-	-	-	142,148,598	142,148,598				
BUILD (PG) UNDER CONST.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
OTHER SERVICES	10,046,554	5,849,746	15,896,300	-	-	15,896,300	9,752,758	3,845,556	13,598,294	10.0	29,380	10.0	3,012,691	16,640,365	(744,065)	2,298,006						
STAFF HOUSING	8,386,427	-	8,386,427	-	-	8,386,427	4,839,700	-	4,839,700	2.5	88,668	2.5	209,661	5,138,028	3,248,399	3,546,727						
PILOT PLANT FACILITIES	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
BUILDINGS	778,010	-	778,010	-	-	778,010	439,722	-	439,722	2.5	8,457	2.5	-	448,179	329,831	338,288						
EQUIPMENT	301,399	-	301,399	-	-	301,399	292,357	-	292,357	10.0	904	10.0	-	293,261	8,138	9,042						
Total	144,684,407	732,119,090	876,564,393	61,661,548	-	178,841,697	759,384,244	115,752,402	382,328,616	498,081,018	170	52,646,698	151,083,964	400,893,647	358,490,597	378,483,374						

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS
SCHEDULES FORMING PART OF THE ACCOUNTS AS AT MARCH 31, 2017

Particulars	As at March 31, 2017 (Amount in Rs.)	As at March 31, 2016 (Amount in Rs.)
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SCHEDULE - F

Sundry Debtors (Unsecured and Considered Good)

More than three years

-

Others

17,005,791

3,690,573

17,005,791

3,690,573

SCHEDULE - G

Cash and Bank Balances

In Fixed Deposits

715,772,465

492,773,469

In Saving Accounts

39,890,966

66,424,264

Cash in hand including postage imprest

27,593

150,941

UNESCO Coupons (US Dollar 132.10)

1,137

1,137

755,692,161

559,349,811

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS
SCHEDULES FORMING PART OF THE ACCOUNTS FOR THE YEAR ENDED MARCH 31, 2017

Particulars	As at March 31, 2017 (Amount in Rs.)	As at March 31, 2016 (Amount in Rs.)
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SCHEDULE - H

Research and Development

Sponsored Research and Development Contribution	198,482,443	158,617,590
	198,482,443	158,617,590

SCHEDULE - I

Interest	73,430,690	65,180,423
Sale of Publications	8,150	13,270
Standardisation, Calibration, Testing and Technical Services	68,544,661	61,574,671
Symposia & Seminars	10,267,532	36,750,175
Training Programmes	15,170,085	17,910,043
Miscellaneous Receipts	610,346	243,007
Licence Fee (Housing Colony)	559,057	757,585
National Awards for Energy Efficiency	3,768,600	454,000
Foreign Exchange Fluctuation	(612,506)	51,731
Advertisement	-	58,500
TIS Fees	-	-
Proficiency Improvement Programme in Coal Test	-	-
PROFICIENCY IMPROVEMENT PROG IN LIMESTONE TEST	-	3,864,000
	171,746,615	186,857,405

SCHEDULE - J

Grant from Ministry of Commerce & Industry

Towards Plan Grant	60,000,000	80,000,000
Less: Towards Capital Expenditure	-	60,000,000
	60,000,000	20,000,000
Towards Non-Plan Grant from Cement Cess	146,000,000	145,500,000
Grants from Ministry of Environment	-	-
	206,000,000	165,500,000

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS
SCHEDULES FORMING PART OF THE ACCOUNTS FOR THE YEAR ENDED MARCH 31, 2017

Particulars	As at March 31, 2017 (Amount in Rs.)	As at March 31, 2016 (Amount in Rs.)
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SCHEDULE - K

Employee's Cost

Establishment Charges	350,164,711	264,754,543
Contribution to Provident Fund & other Fund	18,742,597	17,970,303
Gratuity (Refer Note 4 of Schedule - M)	74,788,654	32,299,518
Social Security & Welfare	2,548,112	2,263,676
	446,244,074	317,288,040

SCHEDULE - L

Other Expenses

Rent, Rates and Taxes	3,161,083	2,709,254
Electricity and Water Charges	11,025,791	11,000,136
Postage, Telegrams & Telephones	2,100,003	1,924,228
Publications	289,942	228,896
Stationery & Miscellaneous Stores	2,604,726	2,038,472
Books, Periodicals and Membership Fee	924,369	720,920
Exhibition, Publicity and Advertisements	1,954,506	1,092,209
Legal Expenses	224,688	239,640
Patents	78,100	207,580
Audit Fees - Statutory Auditors	75,000	75,000
Bank Charges	61,042	67,939
Insurance of Assets	810,461	687,047
Sundry Expenses	10,679,259	7,270,576
Collaborative Assistance in R&D and Exchange Programmes & Consultants Fee	3,343,355	2,299,649
	37,332,325	30,561,546

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS

SCHEDULES FORMING PART OF THE ACCOUNTS AS AT MARCH 31, 2017

SCHEDULE – M

SIGNIFICANT ACCOUNTING POLICIES

1. The accounts are prepared on a going concern basis as per the historical cost convention.
2. **Recognition of Income:**
 - (a) Income from Sponsored Research & Development Contribution is accounted for on the basis of the percentage of work completed during the year.
 - (b) Other Incomes, other than Technical Services Fees, are accounted for on accrual basis.

3. **Fixed Assets:**

- a) Fixed Assets are recorded at cost and for the better presentation of financial statements, the Council has decided to change the depreciation rates prospectively i.e., new rate will be applied only to the additions made from the financial year 2001-02 onwards and are depreciated on written down value basis at the following rates:

	<u>Old Rates</u>	<u>New Rates</u>
	% p.a.	% p.a.
* Vehicles	20	20
* Office Furniture and Equipment	10	10
* Laboratory Equipment	10	25
* Laboratory Projects Services	10	25
* Building including Staff Housing	2.5	2.5
* Computers	-	60

Depreciation has been provided on assets for whole year irrespective of the date of addition.

- b) (b) Fixed Assets include Laboratory Equipment and Energy Bus received free of cost & custom duty from the United Nations Industrial Development Organisation (UNIDO). The value adopted in the accounts is as per customs CIF assessment upon import or at value advised by UNIDO and the corresponding credit for this amount is included under Capital Fund (Refer Schedule A) ₹ 19,564,057 for Laboratory Equipment and ₹ 623,478 for Energy Bus. The title to these assets has been transferred to Government of India and the further transfer of these fixed assets from the Ministry of Commerce & Industry, Government of India to the Council is pending. However, the Council provides depreciation on these fixed assets in accordance with the rates noted in para 3 (a) above.
4. Liability for Gratuity and Leave Encashment is provided for on the basis of actuarial valuation.
5. **Accounting for Government Grants:**
 - a) Government Grants for purchase of specific assets have been accounted for under head 'Capital Grant from the Government of India' and shown in the Balance Sheet.
 - b) Other Grant of Revenue nature received from the Government have been accounted for as Income for the year under the Income and Expenditure Account.

NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS

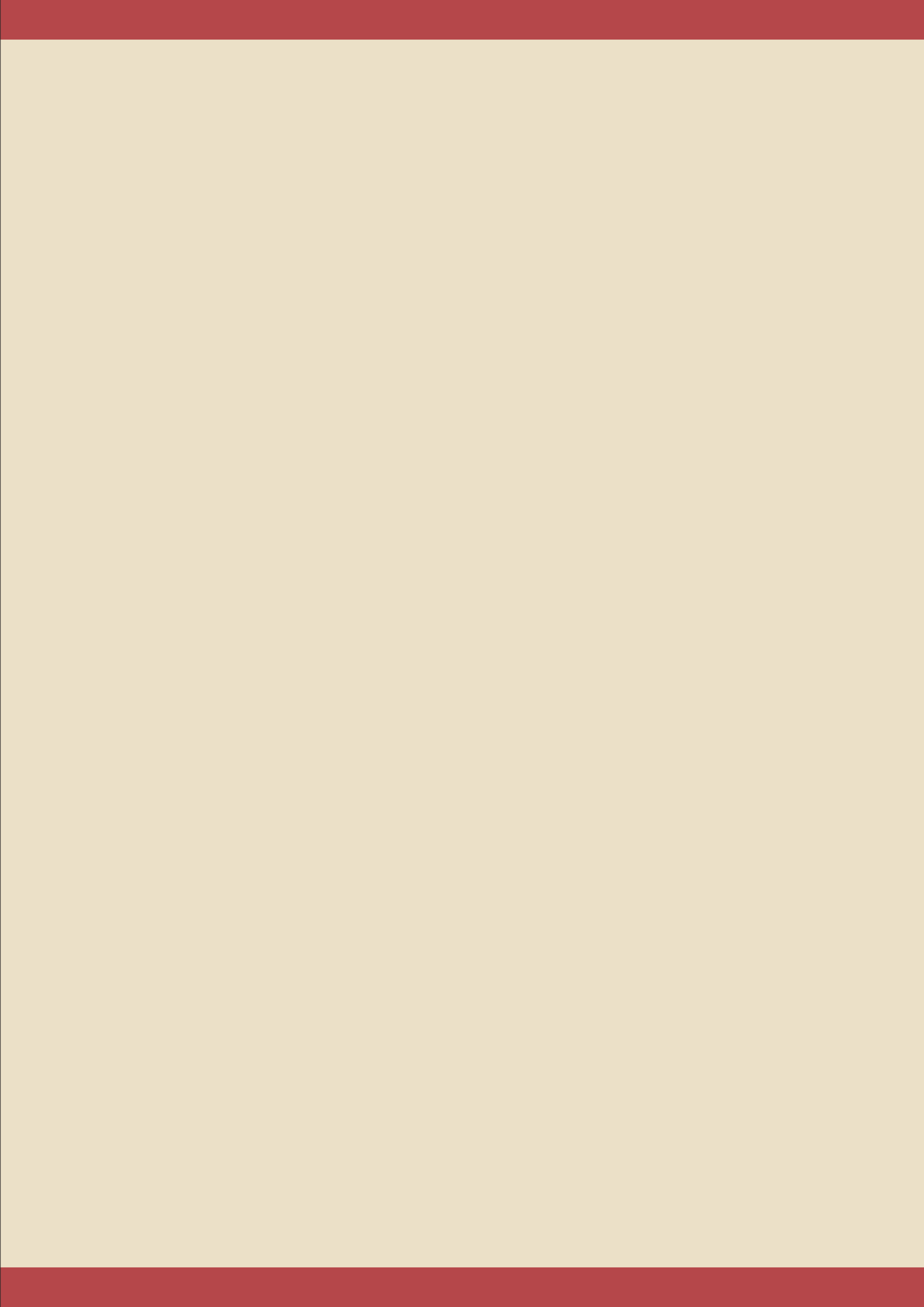
SCHEDULES FORMING PART OF THE ACCOUNTS AS AT MARCH 31, 2016

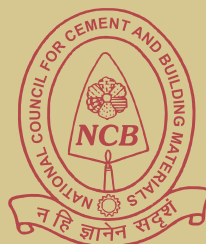
SCHEDULE – N

NOTES ON ACCOUNTS

1. Purchases made during the year in respect of laboratory stores, raw materials, miscellaneous consumable stores, publications, tools and accessories are charged to the Income and Expenditure Account and closing stock of these items has not been ascertained or accounted for, as per the decision of the Board of Governors.
2. Fixed Asset Register is being updated with the complete details along with value which is to be reconciled with the Accounts. Physical verification of the Fixed Assets has been carried out in each Centre/Group.
3. Contingent liabilities not provided for in respect of:
 - a. Claims not acknowledged as debts by the Council, the liability of which is not ascertainable as pending in various Courts.
 - b. Claim for interest by the Andhra Pradesh State Government. in 1998, for delay in payment for purchase of Land (amount not intimated).
4. Gratuity Fund Investment has a balance of Rs. 12,88,01,232. There is a shortfall of Rs. 9,09,03,913 in the “Gratuity Fund Investment Account” as compared to the “Gratuity Fund account” as at 31st March 2017.
5. The Council has got an actuarial valuation of the leave encashment for and upto the year ended 31st March 2017 and the liability computed is Rs. 17,04,76,514/-.
6. An amount of Rs. 631,976 has been deposited with Hon’ble Delhi High Court in connection with a case filed by a former employee. Necessary adjustment will be made after the decision of the Hon’ble Court.
7. The encashment of valuation of UNESCO Coupons of US \$ 132.10 are subject to ascertainment and confirmation.
8. R&D Contribution Outstanding of Rs. 72,60,900 has been arrived after adjusting R&D Contribution received in advance of Rs. 17,02,26,000/-
9. No provision is made the accounts of Rs. 25.02 Lakhs for R & D Contribution Outstanding
10. Previous year’s figures have been regrouped and rearranged wherever necessary so as to conform to this year’s classification.







NATIONAL COUNCIL FOR CEMENT AND BUILDING MATERIALS
34 Km Stone, Delhi-Mathura Road (NH-2), Ballabgarh-121 004, Haryana, INDIA