

*Happy New*



*Year 2023*



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# BUILT ENVIRONMENT

BI-MONTHLY PUBLICATION OF INDIAN BUILDINGS CONGRESS



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## From President's Desk



In the present day scenario, to minimise the damage to the nature, sustainability of the surroundings including construction is the key word being talked about. For ensuring sustainability, the reduction on consumption is necessary. Small strategic interventions, aligned with traditional knowledge, attitudes and practices can immensely help to reduce consumption.

The virtue of aparigraha helps us learn to take only what is truly necessary and no more. One should not try to keep or try to possess anything beyond the very necessities of life, or that which is required immediately. The traditional principles of minimalism/ aprigraha, karseva, ahimsa, satvik eating, yoga ayurveda, naturopathy and the vocation of recycling and repair of used materials and equipment indicate an ingrained mindset and commitment for the environment.

Reducing the consumption and minimising waste can help in maintaining the purity of nature for the future generation. For ensuring minimum waste, we need to adopt 5R strategy of waste management i.e Refuse, Reuse, Reduce, Recycle and Recover which requires change of mindset of the community.

At the first place we should refuse to waste. The consumers may be incentivised to re-use the waste like construction & demolition waste, reusable paper, steel, wood, ceramic, bottles, bags, utensils, glass, earth etc. When the waste is inevitable, efforts should be made to reduce/ minimise the waste. Various waste can be recycled into a useful product. C&D waste can be recycled for various structural and non-structural uses. The waste also has potential to yield energy, fuels and raw materials for industry, buildings, roads etc. The organic waste can produce bio-gas which can be used as a fuel or electrical energy.

The experience of Swachh Bharat Mission (SBM) has shown that besides a robust plan, legal framework and financial allocations, the success of a mission hinges upon small interventions, involving the local community and changing the behaviour of the people.

Campaigns, such as clean and green city, waste recycling, saving water and energy, planting trees, pollution reducing plant species in waste land etc. not only help in rejuvenating and preserving the nature but also help citizens to come together and take pride in the traditional culture. The behaviour change at grassroots and abandoning endangering habits can bridge the environmental gap between rich and have nots.

Technology plays an important role in involving community's pursuit by creating participatory on-line platforms to facilitate small interventions that can make a big difference which include and benefit everyone and every place in the process of development.

(Vijay Singh Verma)

## 101<sup>st</sup> GC Meeting and Technical Seminar



Dignitaries on the Dais during Inaugural Function

101st GC meeting and Technical Seminar on “Durability and Safety Aspect of Buildings” was organized jointly by Indian Buildings Congress, Bihar State Chapter, Building Construction Department, Bihar and Bihar State Building Construction Corporation during 5-6 November 2022 at Gyan Bhawan in Samrat Ashok Convention Centre, Patna.

Shri Nitish Kumar, Hon’ble Chief Minister was the Chief Guest of the inaugural function. Shri Tejaswi Prasad Yadav, Hon’ble Dy Chief Minister; Shri Ashok Choudhary, Hon’ble Building Construction Minister and Shri Sanjay Kumar Jha, Hon’ble Water Resource Minister and Public Relations also graced the occasion. Shri Kumar Ravi, Secretary, Building Construction Department; Shri V.S. Verma, President, IBC & Former E-in-C, M.P.PWD; Shri Pradeep Mittal, Immediate Past President, IBC; Shri O.P. Goel, Founder President and Former DG (W), CPWD; Shri Rakesh Kumar, Chairman, Bihar State Chapter of IBC and Vice President, IBC and E-in-C, BCD, Patna; and Shri V.R. Bansal, Honorary Secretary, IBC & Former Chief Engineer, MCD were among the dignitaries on the dais. The dignitaries on the dais were welcomed by presentation of sapling. The function was attended by large number of professionals and stake holders

involved in the construction industry who came from different places from across the country.



Lighting of Ceremonial Lamp by the Chief Guest, Shri Nitish Kumar, Hon’ble Chief Minister, Bihar

Inaugural Function started by lighting of ceremonial lamp by the Chief Guest of the function, Shri Nitish Kumar, Hon’ble Chief Minister who was also joined by the dignitaries on the dais.

Shri Nitish Kumar, Hon’ble Chief Minister of Bihar while addressing the gathering informed that he also did engineering graduation from the then Bihar College of Engineering now NIT, Patna. Addressing the participants, he said he was very happy to know that building engineers in large number from all parts of

the country have arrived to attend Technical Sessions of the IBC. The CM urged the building engineers to visit the iconic buildings, specifically Bihar Museum and Sardar Patel Bhawan built by the Bihar Government in the recent years. He further stressed upon the need of



Shri Nitish Kumar, Hon'ble Chief Minister, Bihar  
Addressing the gathering

continuous maintenance of all public infrastructure- be it the government buildings or roads or bridges and apprised that he has directed all the departments concerned to ensure proper and continuous maintenance of infrastructure and has asked them to recruit the required number of new engineers and employees to ensure proper and regular maintenance of the government buildings as well as roads and bridges across the state.

He also sought the suggestions of the experts for effective and proper maintenance of buildings, roads and bridges for implementation in the state.



Book on History of Patna Architecture & IBC Souvenir being released  
by the Hon'ble CM and the Dignitaries on the Dais

The Hon'ble CM also released the Souvenir on the occasion and a book on History of Patna Architecture written by Sh Arun Singh. The dignitaries on the dais



Sapling being presented to Hon'ble Shri Nitish Kumar



Memento being presented to Hon'ble Shri Nitish Kumar



Sapling being presented to Hon'ble Shri Tejashwi Prasad Yadav

were felicitated by presentation of Memento and Sapling.

The Welcome address was delivered by Shri Vijay Singh Verma, President, IBC and Former E-in-C, M.P., PWD. In his address, the President IBC, while thanking the Chief Guest for sparing his valuable time to inaugurate the function, informed about the social, cultural, religious and educational heritage of Bihar. He further informed about the necessity of durability and safety of the buildings. He informed that faulty design, inadequate earthquake safety measures, adoption of inappropriate technology, inappropriate fire prevention, detection and fire-fighting systems, non-wearing of safety gears during construction by workers and negligence coupled with poor maintenance are the major contributory factors for the accidents to take

place in buildings during construction, maintenance and operation besides fast deterioration.

He apprised that concrete is the main construction material in today's scenario. Fast deterioration of concrete infrastructure has emerged as one of the most severe and demanding challenges facing the construction industry. The problem is particularly serious in reinforced concrete structures where corrosion of reinforcing steel can impair their safety. Carbonation and chloride-induced corrosion are two major causes of deterioration of concrete structures. Freezing & thawing, alkali aggregate reactions and alkali-silica reaction also represent big challenges to the durability and long-term performance of many concrete structures. Due to corrosion of steel reinforcement, concrete expansion occurs which finally lead to severe cracking and concrete gets deteriorated. The limited knowledge of the field, performance of corrosion-



Shri Vijay Singh Verma, President, IBC delivering Welcome Address

damaged structures and the lack of systematic approaches for their inspection, maintenance and repair contribute to the increase of their life-cycle costs, and result in the loss of functionality and safety. The poor durability and premature service life of many concrete structures represent not only technical and economic problems; this is poor utilization of natural resources and hence also presents sustainability and ecological problems.

The durability and safety aspect of the buildings has taken a front seat in the present-day scenario. He expressed the deliberations in the seminar will bring out the innovative ideas for more durable, safer, greener and sustainable building infrastructure with a view to encourage the construction industry for adoption in design, construction, maintenance, operation and management of buildings. During the inaugural function a documentary on state of art mega projects of Bihar was also played.

Shri O.P. Goel, Founder President, IBC and former DG (W), CPWD, in his address, apprised the gathering about the purpose of founding the Indian Building Congress



Shri O.P. Goel, Founder President, IBC and Former DG (W), CPWD, addressing the gathering

and informed that the IBC is a body setup to promote and encourage the science and practice of conceiving, planning, designing, constructing and maintaining built environment which includes standards, innovative and new materials and reviewing and making suggestions to the Government for various improvements. This is achieved by expression of collective ideas of members belonging to all disciplines connected with built environment. The recommendations given by a collegium of all such professionals have acceptability by the society and the Government.

He expressed his happiness that the 101<sup>st</sup> Meeting of Governing Council & Seminar on the topic 'Durability and Safety aspects in Buildings' is being organized at Patna. He also expressed that the IBC Chapter at Patna is one of the most active Chapters of the IBC and holds activities continuously. He said that the buildings are an essential attribute for any developmental activity. The quality of construction has to be optimum to suit the requirements and match the users and owner's concept. There are environmental issues and controls which needs to be enforced. The other parameters which gain importance are need for conservation of resources and environmental concerns, energy efficiency, safety, particularly against earthquakes and fire, the durability and ease for maintenance. There have been many new innovations in the field. There is an opportunity to realize the true potential and bringing professionalism for ensuring durability and safety aspects in buildings. He expected the deliberations in Seminar will lead to conclusions and recommendations which would suggest remedial measures to ensure durability safety in buildings.

Shri Pradeep Mittal, Immediate Past President, IBC in his address stated that the Hon'ble Chief Minister in his address has already detailed out the excellent developmental works done in Bihar. He expressed his gratitude to Bihar Government for having made historic arrangements 10 years back at the time of



**Shri Pradeep Mittal, Immediate Past President, IBC, addressing the gathering**

setting up Bihar Chapter of IBC then again in 2018 when the annual session of IBC was held at Patna. Bihar has always been at the fore-front to encourage IBC. He also recalled that Hon'ble Chief Minister had allotted a flat for accommodating the Bihar Chapter of IBC from where it is still functioning. Further he appreciated the concern expressed by the Hon'ble Chief Minister for proper maintenance of the buildings.

Shri V.R. Bansal, Honorary Secretary, IBC, in his address thanked the IBC Bihar Chapter, BCD Patna and Bihar State Building Construction Corporation for organizing the 101<sup>st</sup> GC meeting of IBC and Seminar and informed that Bihar is one of the ancient Janpads of India which find its reference even at the times of Ramayana and Mahabharata. Further citing the names of Lord Budha and Guru Gobind Singh ji, Sh. Bansal stated that in nutshell, every corner of Bihar is spread with places of historical importance. The people of



**Shri V.R. Bansal, Honorary Secretary, IBC, addressing the gathering**

Bihar are known for their work culture, intelligence and hard work and are on the fore-front in giving the development of the country its rightful direction.

He further informed that in the last few years, by combining its heritage with sustainable materials and use of the some of the most sophisticated machineries

and technologies, Bihar has achieved many milestones in construction of new and modern buildings and referred to Gyan Bhawan, Sardar Patel Bhawan and Bihar Museum as examples. He further mentioned that under-construction Budha Smriti Stupa is using sandstones and interlocking technique which is again a right blend of ancient and modern technologies. Many more projects of the similarly high standards are underway in the State.

However, the new technologies and the newer construction materials having low life-cycle cost used in the buildings poses new challenges such as the durability and the safety of the structure from both, natural as well as man-made disasters for which solution needs to be found. He complemented the IBC's Bihar chapter for aptly selecting the most relevant topic for the Seminar as "Durability and Safety Aspect in Buildings". The Hony. Secretary wished that the delegates will be enriched by the deliberations in the seminar by the experts in the field. The recommendations emerging out of the seminar will bring out solution to such challenges and will help in framing the appropriate policies for the benefit of the industry.

Shri Kumar Ravi, Secretary BCD, Patna, in his address, said that due to shortage of land, the buildings are being raised vertically which requires provision of earthquake safety measures besides multiple services like, lifts, air-conditioning, fire-fighting and many other equipment for comfort and convenience of users.

Planning, designing and integrating all such services in a building is a very complex issue. Maintenance of such buildings is also complex. The topic of today's seminar has been kept keeping in view the challenges being faced by the stake holders. The construction of buildings in the present-day scenario with multiple services and smart gadgets to fulfil the aspirations of the users has become challenging. The Engineers and technocrats have to make efforts to meet this challenge.



**Shri Kumar Ravi, Secretary, BCD addressing the gathering**

He expected the newly recruited Engineers as well as those who are already in service to get benefit from the Seminar. He also mentioned that recommendations flowing out of the deliberations in the seminar will be placed before the Government for its consideration to implement.



**Shri Sanjay Kumar Jha, Hon'ble Minister of Water Resources and Public Relations, Govt. of Bihar, addressing the gathering**

Shri Sanjay Kumar Jha, Hon'ble Minister of Water Resources and Public Relations, Govt. of Bihar, in his address informed that the history of country is incomplete without the history of Bihar. He mentioned that the Bihar Museum is far better than the Washington museum. He further said that his department has fulfilled two important tasks. It has constructed rubber dam on river 'Falgu' in Gaya for ensuring availability of water in river for the full year and to lift the river water from Ganga during floods for making available drinking water to each household of Rajgir, Gaya and Bodhgaya. He further informed that this arrangement of making available drinking water for each household is being made by the end of November, 2022.

Shri Ashok Choudhary, Hon'ble Building Construction Department Minister, Government of Bihar in his address apprised the audience that for the economic development, infrastructure of roads, highways and buildings is necessary. Keeping this in view, the construction of 'The Samrat Ashok Convention Centre and 'Sardar Patel Bhawan' has been constructed in Patna. The era of the present Chief Minister is Golden era for construction work in Bihar. Many iconic buildings have been constructed. He urged the engineers to give their suggestions for new technologies for construction and effective maintenance. He said the study of remains of Harappa town planning, Egypt, Mesopotamia, Mughals & Mauraya architecture of buildings reveals about the socio-economy of culture of state of those period and the earlier civilization and dynasties. He said that infrastructure development is the foundation of the



**Shri Ashok Choudhary, Building Construction Minister, Government of Bihar, addressing the gathering**

economic development. The buildings constructed in Bihar are considered as reflection of the state culture. He complemented IBC for selecting the topic of Seminar which was very relevant in modern times. He informed that Bihar chapter of IBC was opened in 2013 after consent of the visionary Hon'ble CM Shri Nitish Kumar ji. He appreciated the vision of IBC in dissemination of knowledge on built environment to the society. The best part of IBC is that it is not the society of Civil Engineers alone, but it brings together expert of diverse discipline alongwith all stake holders involved in built environment.

Shri Tejashwi Prasad Yadav, Hon'ble Deputy Chief Minister, Bihar, in his address, said that many new construction techniques are being used by Bihar Govt in its projects. Techniques for construction of earthquake resistant building having rainwater harvesting, measures for conservation of water and fire



**Shri Tejashwi Prasad Yadav, Hon'ble Dy. Chief Minister, Bihar addressing the gathering**

prevention, detection and fire-fighting have been used in the recently constructed iconic buildings. Although Bihar is a state which is financially not that sound but yet we are far ahead in use of new construction techniques.

Bihar is using all available new technologies in its projects. He further said that the Government is soon bringing land pooling policy to overcome the shortage of housing and proper urban development.



The city's necessary infrastructure is being planned and developed keeping in view the future growth of next 25 years. Being the Minister of Urban development, he would ensure to make development of roads, sewerage lines and street lights before construction of housing is taken up. Survey work has been done so as to develop separate areas away from the residential pockets for planning and setting up industry, educational institutions, markets etc. He emphasized the need of special status for the Bihar state and special package in addition to adequate financial assistance to local bodies for its overall development.

Shri Rakesh Kumar Engineer-in-Chief BCD presented the Vote of thanks. He thanked the Hon'ble Chief Minister, Govt. of Bihar; Hon'ble Deputy Chief Minister for having consented to become Chief Guest of the inaugural function and sparing his valuable time to inaugurate the function. He thanked the Hon'ble Minister of Water Resources and Public Relations; Hon'ble Building Construction Department Minister for sparing their valuable time to join the inaugural function and to address the gathering. He further thanked the Secretary, BCD, for his co-operation, untiring hard work and micro monitoring in making the function successful. He thanked Shri V.S. Verma, President, IBC and all other office bearers,



Vote of Thanks being presented by Shri Rakesh Kumar  
Engineer-in-Chief BCD

Governing Council Members, Office Bearers of Bihar Chapter of IBC; all other members and delegates who took the pains to come from length and breadth of the country to attend the event, encouraged the organizers and made the event successful. He also thanked all the administrative and technical staff who assisted in making the arrangements to make the event successful. He also thanked the print and electronic media for covering the event. At the end he thanked one and all in making the event successful.

At the end of the inaugural function, IBC song was played



View of Audience

### NEW BOOK RECEIVED IN IBC LIBRARY

**Title** : Housing for Elderly and Differently -Abled  
**Author** : Krishna Kant  
**Publisher** : Notion Press, No. 8, 3rd Cross Street, CIT Colony,  
Mylapore, Chennai, Tamil Nadu-600004  
**Price** : 450/-

Review: India has over 81 million people who are above 60 years of age and are regarded as Senior Citizens. This book tries to fill in the existing vacuum in the field of housing for elderly and physically incapacitated people and covers various aspects of housing for elderly and differently abled persons. The topic has been very lucidly explained in a systematic and methodical way with number of diagrams and sketches and check lists highlighting various steps that can be taken to ensure comfortable living, safety and security of elders and persons with special needs. Useful tips have been given for Care providers. Separate chapter included for those suffering from Alzheimer and Dementia detailing related issues. Adoption of Universal Designs recommended for the houses being taken up to minimize modification at a later date.

This book will be useful to professionals in construction industry and individuals looking for better living conditions in their golden years.

A copy of the book 'Housing for Elderly and Differently-Abled' was presented by Shri Krishna Kant to IBC. The same is thankfully acknowledged.

## Inauguration of the Exhibition

An exhibition was also organized in which manufacturers of products related to Built Environment, New Technologies and Machineries participated. A section of exhibition was also dedicated to showcase the traditional handicraft and rural products of Bihar.

Exhibition was inaugurated by Shri Kumar Ravi, Secretary, BCD, Govt. of Bihar. The participants and visitors took keen interest in the products displayed in the exhibition.



Shri Kumar Ravi, Secretary,  
Inaugurating the Exhibition



Shri Kumar Ravi, Secretary  
Interacting with Exhibitors



Visit to Exhibition by  
Hon'ble Ministers

## Technical Session-1



Dignitaries on the dais during Technical Session-1

First Technical Session was held in the afternoon of 5<sup>th</sup> November 2022. The Session was Chaired by Dr. K.M. Soni, Former Additional DG, CPWD and Co-Chaired by Shri Anil Kumar, Chief Architect, BCD. The Chairman, Co-Chairman were welcomed on the dais with bouquet of flowers by Shri Ram Babu Prasad, SE, BCD. The authors of papers were welcomed on the dais with bouquet of flowers by Shri Santosh Kumar, CE (Quality), BCD. The Chairman welcomed the authors and invited them to present their paper. Three papers were presented in first session by the authors.

1<sup>st</sup> paper was presented by Shri Sanjay Pant, DDG (Standardisation-2) of Bureau of Indian Standards on the topic 'Safety Provisions in Indian Standards and National Building Code of India 2016-The Philosophy and Approach'.

He made a detailed presentation on Indian standards and National Building Code as a tool for ensuring safety. He said that provisions contained in the relevant BIS Codes and National Building Code-2016 for ensuring safety and durability of buildings should be strictly enforced.

He deliberated on ensuring health safety during planning of building like appropriate orientation, natural lighting & ventilation and functionality having bearing on hygiene and health of the occupants including workers in the industrial units.

On fire safety he informed the increased importance in view of complexities encountered in high-rise buildings and installations built to meet the challenging requirements of today. Indian standards have been developed in the vast

area of fire safety covering provisions and guidelines on fire safety of various types of buildings including residential, educational, industrial etc and their further sub-categories. On structural safety he informed the codes are available to take care of all types of possible loadings, forces and effects likely to be encountered by the building during its life cycle affecting its structural strength, stability and durability. On public safety, he informed that safety during construction is very important area to which BIS has also given attention for which number of codes covering aspects like safety during excavation, blasting, tunnelling, deep foundation work, while working at height, handling of materials likely to cause harm etc. have been formulated.

He also mentioned that all the relevant aspects and provisions specific to buildings, have been inbuilt and interwoven in the National Building Code of India-2016, which is a single document and can be effectively used as an instrument for helping in regulating the building activity in the country and thereby implementation of safety aspects dealt with in Indian Standards. The whole Code has been built around four pillars of safety, namely (i) structural safety (ii) health safety (iii) fire safety, and (iv) public safety (encompassing electrical/services safety during construction).

He further mentioned that safety is an ongoing issue. The BIS is fully aware of its responsibilities towards the issue and, therefore, as a part of the continuous programme, the various safety codes are being reviewed from time to time as also new standards are being formulated specially dealing with the topical issues such as safety of tall concrete buildings, cyclone shelters, tsunami code, seismic hazard map based on probabilistic approach, landslide hazard mitigation etc.

2<sup>nd</sup> Paper was on the topic 'Fire Safety in Buildings' presented by Shri R.C. Sharma, Former CFO, Delhi. In his presentation, he touched upon the provisions contained in National Building Code in respect of all the fire related facilities to be incorporated at the time of construction in the new buildings as major modifications post construction are exorbitant time consuming and may not be feasible. He stressed the need of understanding the Fire Engineer's perspective for helping in reduction of fire incidents so that there is minimum loss of property & life in the event of any fire incident. He advocated the integrated approach of Architect and engineers of all the required disciplines for planning, designing, construction and maintaining a building which is a pre-requisite for enforcing the provisions of the NBC. In the event of fire incident, most of the death takes place due to suffocation on account of smoke & gases.

He further mentioned that the Architect has a role in designing fire- safe buildings by use of minimum inflammable materials in construction. There should be built-in safety measures like compartmentation/segregation of different areas on each floor of building so as to confine accidental fire to the place of origin. Provision should be made for early detection of fire for timely action, prevention of spread of smoke, hot

gases & fire to other parts of the building through built-in facilities for compartmentation, smoke dampers for centrally air-conditioned buildings. Built-in natural or mechanical smoke venting facility should be provided for every part of the building. Well distributed and protected means of escape i.e. staircase or other facilities like refuge floors connected to safe staircases or large capacity lifts, serving each refuge floor and fire suppression facilities besides first aid facilities should be provided.

He emphasized the need of providing automatic fire and smoke detection facilities like Automatic Smoke Alarm; Automatic Heat Alarm; Infra-Red/UV Alarm; Beam Detectors; Automatic Smoke Venting/Management; Automatic tripping of Air Conditioning through Fire/Smoke Alarm; Automatic closing or opening of Doors for evacuation; Automatic actuation of Foam or clean agents; Fire suppression system and Automatic communication to Fire Services in the buildings.

The automatic fire & smoke detection systems should also be supported with Public Address System; Fire Control Room; Fire Evacuation Plan; Manually operated electric Fire Alarm System; Talk back facility; Fire Lifts; Pressurization of Staircases/Lift shafts/Fire Fighting Shaft; Stand by Generator; Under Ground & OH Water Storage Tanks & Fire Pump House; Illuminated Exit Signages; Natural/Mechanical Ventilation.

He mentioned that despite providing the best facilities in the buildings, fire do take place. He therefore advised that fire fighting facilities like Hose Reel; Wet Riser/Down comer/ Dry Riser with Pumps; Sprinkler System with Pumps; Drenchers; Medium Velocity Water Spray/Emulsifier; Smoke Curtains for compartmentalization of large spaces; Fire Hydrants; Water Mist should be provided in the buildings as per provisions made in part-4 of NBC. He also emphasized the importance of fire and safety provisions, safety through structural design, execution of works as per structural safety requirements and responsibility of owner, construction safety, safety provisions for electrical installations, plumbing, drainage, solid waste management and gas pipe lines and Periodic inspection and occupancy renewal certificate of buildings for ensuring safety of the occupants.

3<sup>rd</sup> Paper in Technical Session was presented on topic "Causes of Deterioration of RCC Structures including Durability Aspects" by Shri Anil Kumar Sharma, Former Special Director General, CPWD. He explained the causes of deterioration of materials could be due to variety of factors which included the slow natural deterioration processes chemical or physical or combination of the two or to any other manmade/ calamity related physical or chemical impact to cause overstressing, crushing or disintegration. Reinforced concrete being the main construction materials also faces the deterioration due to similar causes. The RCC being porous, the interconnected porosity, in the presence of aggressive chemicals, plays an important role. By and

large, plain concrete by itself is a durable material but it can not be utilised for the modern structural applications. The concrete is being utilised as a composite structural material in combination with steel reinforcement. It is this composite, which has not proved to be durable due to large number of factors which include quality of water and materials used in preparation & variations in the production, service loading conditions and subsequent attack by environmental factors. Well constituted, properly compacted and cured, RCC is considered substantially durable if as long as the capillary pores do not become interconnected pathways leading to surface of concrete. The external symptom of deterioration of RCC range from cracking to spalling of concrete and frequently involved corrosion of reinforcement. In almost all such cases, penetration of water and/ or aggressive chemicals during the service life of the structure is the primary reason for the problem. Carbonation, chloride ingress, leaching sulphate attack, alkali-silica reaction and freeze-thaw are the known responsible natural cause of deterioration.

He mentioned, it is difficult to generalise the causes of deterioration due to interacting nature of various factors, he therefore, explained the causes of deterioration of RCC with the help of three simplified holistic models. He stated low permeability of concrete is the key to its durability which is controlled by factors like water-cement ratio, degree of hydration of hardened cement paste, quantum of air voids, presence of micro cracks and cyclic reversal thermal stresses due to ever changing temperature gradient. He mentioned capillary porosity in concrete increase with increase in w/c

ratio. Macro cracking in concrete is responsible for free travel of aggressive chemicals into the concrete. The macro cracking in concrete could be due to improper placement of concrete, settlement cracks of fresh concrete, intrinsic sulphate attack, Alkali aggregate reaction, heat of hydration, bursting pressure of increased volume of corroded reinforcement on concrete and excessive loading.

The concrete protects the steel reinforcement due to high level of alkalinity of its cement paste in its contact. Even in well designed and properly constituted dense concrete mix, the loss of alkalinity of cement paste (or to say loss of durability of reinforced steel) does take place over a period of time, which is primarily due to its porous structure. Reinforcement corrosion and eventual loss of durability is caused when it loses its passivity due to carbonated cement paste in its vicinity. Besides the carbonation induced deterioration, there could be presence of excessive concentration of chlorides in cement paste which could be responsible for corrosion of reinforcement. He therefore emphasised the quality of concrete should be ensured by use of appropriate quality constituent including water, compaction, proper concrete cover and curing.

At the end of Technical Session-1, the Chairman thanked the presenters for their inspiring and thought-provoking presentations.

Shri Rakesh Kumar, E-in-C, BCD felicitated the Chairman, Co-Chairman and authors by presenting memento and shawl.



Memento being presented to Shri Sanjay Pant



Shawl being presented to Shri Anil Kumar

## Cultural Programme (5<sup>th</sup> November, 2022)

In the evening of 1st day of the event, a cultural programme was organized. Programme started with lighting of ceremonial lamp by Shri Kumar Ravi, Secretary, BCD, Govt. of Bihar. Ms. Monali Thakur, the

famous bollywood singer and other artists performed the dance and songs depicting rich culture of Bihar. Cultural programme was followed by dinner.

### Glimpses of Cultural Programme



## Obituary



Shri K.K. Madan, Former DG (W), CPWD & Past President, IBC left for his heavenly abode on 11<sup>th</sup> November, 2022. He was Life Member of Indian Buildings Congress for last many years. He was also Member of UPSC and very active member of IBC. His contribution to the Indian Buildings Congress, as President for one year, can never be forgotten. Indian Buildings Congress deeply mourns the sad demise of Shri K.K. Madan and prays to the Almighty to grant "Sadgati" to the departed noble soul.

## Technical Session-II



Dignitaries on dais during Technical Session – II

2<sup>nd</sup> Technical Session was held in the forenoon of 6<sup>th</sup> November, 2022. The Session was Chaired by Dr. Krupesh A. Chauhan, Prof. NIT Surat and Co-Chaired by Sh. B.K. Mehra, Former Advisor, BSDMA. On the dais, the Chairman, Co-Chairman were welcomed by Shri S.P. Prabhakar, CE (Patna), BCD and the authors of papers were welcomed by Shri Tarini Das, CE (North), BCD with floral bouquet. The Chairman welcomed the authors of papers and invited them for presentation of their paper. Four papers were presented by the authors in Technical Session-II.

1<sup>st</sup> paper was presented on the topic “Durability Design of Concrete Structures- National and International Scenario” by Dr. P.N. Ojha, Joint Director & Head, Centre for Construction Development and Research NCCBM, Ballabgarh, Haryana. In his opening remark of the presentation, he mentioned that Concrete deteriorates with time and results in gradual decrease in performance over time. The time dependent degradation of concrete can be intrinsic to the concrete. Thus durability design by nature is a multilevel task i.e. at whole structure level, at a level of structural elements and at material level.

At level of structure as a whole, durability design is done by selecting service life of the structure for given environmental condition and arriving at rational structural element assemblage and their layout so that the resultant performance of the structure can always be maintained to an expected level. At the level of structural element, the

durability design is about fulfilling the selecting design service life through more specific technical requirements such as section details, concrete cover thickness, material properties etc. At the third level, concrete mix is designed appropriately both in order to satisfy the specific material properties transferred from durability consideration and other structural design consideration such as design for structural loads or fore etc. The structural design focuses on the structure’s ability to resist the mechanical load imposed on the structure whereas durability design focuses on structure’s ability to resist the environmental impact and associated deterioration and degradation imposed on the structure during its entire life span. He mentioned, modelling of environment and deterioration mechanisms is being developed on a probabilistic basis allowing reliability based service life design.

So far in IS 456: 2000, the standard practice is to design concrete structures on the basis of deemed to satisfy approach which ensures durability on the basis of parameters like minimum cover, crack width control, maximum spacing of rebars, minimum concrete grade, minimum cement content, maximum w/c ratio, selection of cement and cementitious material etc. Most of these limiting values largely based on short –term experience obtained for significantly less severe exposure condition, considering reference design life of 50 years. He mentioned unlike to IS 456: 2000, THE FIB Bulletin 34: Model Code for Service Life Design (EN 1990:2022) and other

international standards have made provisions to select the design service life. Eurocodes prescribes the durability related requirements for concrete both on the material level and on structural level. The environmental actions are defined into different environmental classes and intensity degrees according to the respective deterioration mechanism. He also explained the durability design of concrete against Carbonation induced Reinforcement Corrosion, Chloride induced Reinforcement Corrosion, Sulphate Attack, Alkali Aggregate Activity, Freeze Thaw. He thus emphasised the need for suitable and reliable performance based approaches which can relate to the shortcomings of the traditionally prescriptive design methods for concrete durability.

2<sup>nd</sup> paper was presented by Dr. K.M. Soni, Former, Additional Director General, CPWD, on the topic “Durability and Safety in Construction”. In his presentation he explained that the corrosion of reinforcement is the main reason of deterioration of RCC. Reason of corrosion though may be varying from site to site but he listed a few reasons such as excessive w/c ratio, quality of cement, chlorides in water, quality of reinforcement, environmental factors, fire incidence and poor quality of construction. Least importance given to maintenance is another reason which leads to distress in RCC due to exposed atmospheric adverse conditions, leakage and seepage, corrosion, decayed strength of concrete, cracks in the structure. Perennial negligence of maintenance and repair makes the structure unsafe. He mentioned that to include the durability in the design, codes specify the provisions for addressing factors like carbonation, chloride ingress, leaching, sulphate attack, alkali silica reaction and freezing thawing.

Durability of concrete gets affected due to the reasons: Unawareness of design, specifications and construction techniques by site engineers; Not implementing or compromising specified design criterion during structural design; Not implementing or compromising specified criterion of the design during its execution i.e. selection of materials, their mixing, placement, compaction & curing, both by contractor and engineers; Not implementing specified criterion of maintenance, repair and replacement and Change of specified conditions and assumptions of the design criterion either during its construction or maintenance period. He gave a detailed account of aggressive chemicals, Alkali Silica reaction, sea water exposure and freezing and thawing which are the major causes of deterioration. For improvement of durability, high performance concrete and self compacting concrete was also explained by him in his presentation. He emphasised the need of well designed, well executed concrete during its execution and well maintained during its service life to ensure water tight and durable concrete of the structure. He also discussed the symptoms and causes of Durability Distress of the concrete structures, safety in

construction, structural safety and durability, and workers safety.

3<sup>rd</sup> paper was presented by Shri Ram Babu Prasad, Superintending Engineer (Design), BCD on the topic “Post Fire Structural Mitigation of RCC Frame Building-A Case Study”. Fire is one of the most severe hazards that building structures may experience during its life time. If a structure is damaged by fire, it is necessary to thoroughly investigate and evaluate the reusability of the damaged structure.

In his presentation, he informed that the fire broke out in Visvesvaraya Bhawan (also known as Technical Secretariat) located at Bailey Road, Patna, Bihar, on 11<sup>th</sup> May morning hours in part-2 area of 5<sup>th</sup> floor and spread to the part-3 area through the corridors and all the inflammable materials such as paper, plastics, wooden items helped in escalating the fire. The fire lasted for more than a couple of hours before it could be extinguished with water stream sprayed from fire tenders. The site investigation was conducted jointly by a team of experts from IIT Patna and BCD officials on 13<sup>th</sup> May, 2022. After visual inspection, non-destructive tests which included neutralisation test of concrete, UPV and rebound hammer tests were conducted on various damaged structural elements. The objective of the test was to evaluate the residual capacity of the structural elements and consequently to determine the degree of retrofit required to regain the original structural capacity.

The building consisted of 7<sup>th</sup> floors. The fire had affected the 5<sup>th</sup> floor part-2 and part-3 and 6<sup>th</sup> floor part-3 which had experienced significant distress in beams, columns and slabs. The strength of the affected members was assessed through RHT, UPV and concrete core tests which revealed that the strength of the structural members, beams, columns and slabs was affected mostly on 5<sup>th</sup> floor part-2 & 3 and 6<sup>th</sup> floor part-3 due to the fire. The equivalent cube strength obtained from the core tests ranged from 6.00 to 14.3MPa. Site inspection and laboratory tests revealed that the structural members suffered significant reduction in the strength and hence needed appropriate restoration and retrofitting measures.

With the help of images and drawings he explained the retrofitting measures for the affected structural members, that were taken post fire after assessment of the strength in Visvesvaraya Bhawan. The measures included, removal of entire plaster and loose concrete, sandblasting to expose concrete and to clean off the reinforcing bars, application of anticorrosive treatment layer on exposed reinforcement, surface cracks repairing by PU Based epoxy-injection mortar grouting, Placement of additional longitudinal reinforcement of Fe500 grade (4 Nos. 16mm dia bars one at each corner and 12 nos. 12 dia bar distributed equally on each face of columns duly tied with 10mm dia confining steel @ 100mm C/C), 100mm thick all-round

RCC jacketing with M25 grade Concrete of columns, C5-Carbon fabric reinforced cementitious matrix (FRCM) for flexural strengthening beams and slabs as per the recommendations of ACI Code 549.4R-20. He informed that as per the detail analysis done, the target original strength was achieved by retrofitting of columns, beams and slab as per the recommendations of IS 15988-2013 & ACI 549, 4R-20

4<sup>th</sup> paper was presented by Ms. Usha Batra, Former, Special Director General, CPWD, on the topic “Green and Net Zero Buildings”. In her presentation she gave an account of the existing global warming and the rising CO<sub>2</sub> emission scenario which is being experienced by everyone of us through natural disasters, floods, torrential rains, cloud bursts, sliding glaciers, landslides, cyclones and abnormal rise in atmospheric temperature. All these are result of over exploitation of the natural resources, deforestation and wastage.

There has been exponential rise in demand of energy. The generation of energy to meet the ever rising demand of the society is getting costlier and becoming scarce in its availability. Thus the need is being felt to reduce the dependency on the conventional energy sources. There is a need to save energy and to use the non-renewable resources intelligently. She said, building construction uses huge amount of natural resources, energy and water and at the same time responsible for 50% air pollution, 42% green house gases, 50% water pollution, 48% solid waste and 50% chlorofluorocarbons. Since to meet the need of growing population, there is greater need of construction, the available alternate she suggested is to go for greener construction which is the need of the hour. She mentioned, green buildings preserve precious natural resources, utilizes them optimally, make use of materials made from waste to a greater extent and improve our quality of life. List of few important green building features and the advantages thereof was also discussed which included, efficient use of energy, water & other resources, use of renewable energy, pollution and waste reduction by promoting re-use and recycling, good indoor environment air quality, use of materials

that are non-toxic, ethical and sustainable, consideration of environment and quality of life in design, construction and operation with emphasis on the design that enables adaptation to a changing environment.

She also emphasized the adoption of principles of 3RS i.e Reduce, Reuse and Recycle for construction of greener buildings. She explained the important passive features besides, energy efficient envelope, improvement of thermal performance, water conservation, adoption of green building materials, methods for improving air quality, energy saving through behavioural change and sensors, exploitation of non- conventional energy from sources like high performance solar panels placed on roof top and facia of the buildings for planning of Net Zero green buildings. She detailed out a case studies of Indira Paryavaran Bhawan and Atal Akshay Urja Bhawan, HQ (MNRE) in respect of successfully constructed existing Net Zero Buildings.

At the end of Technical Session-II, the Chairman thanked the presenters for their inspiring and thought provoking presentations.

Shri Rakesh Kumar, E-in-C, BCD felicitated the Chairman, Co-Chairman and authors by presenting memento and shawl.



Memento being presented to Dr. K.M. Soni



Shawl being presented to Dr. P.N. Ojha



Memento being presented to Ms. Usha Batra



Shawl being presented to Shri Ram Babu Prasad

At the end of Technical Sessions, Question-Answer Sessions on the topic were discussed.



Question-Answer Sessions in Progress



## Author's Gallery



Sanjay Pant



R.C. Sharma



Anil Kumar Sharma



Dr. P.N. Ojha



Dr. K.M. Soni



Usha Batra



Ram Babu Prasad

## Congratulation



IBC Congratulates Lieutenant General Arvind Walia on assuming the post of E-in-C, of Military Engineer Service at the Integrated Headquarters of MoD (Army). Lt Gen Walia has previously commanded an independent squadron in the desert sector, a regiment in Jammu and Kashmir and an Engineer Brigade along the Western Front. He has also commanded the MEG & Centre in Bengaluru. He was also an instructor at the College of Defence Management in Sikandrabad and the National Defence College in Delhi. The renowned officer has also held prestigious staff appointments including as Brigade Major of a Mountain Brigade, Director in Engineer-in-Chief's Branch at the Integrated Headquarters of MoD (Army), Brig Q in a Strike Corps and Chief Engineer of a Command.

## Congratulation



IBC Congratulates Prof. R. Pradeep Kumar on joining as Director, CSIR-CBRI, Roorkee. He did BE in Civil Engg. from the V.C.E. (Osmania University), Hyderabad; M. (Tech.) in Structural Engineering from IIT, Kanpur and Ph.D in Earthquake Engineering from the University of Tokyo, Japan. He researched different areas in Earthquake engineering and structural dynamics, analysis and design of RC structures, numerical simulation of non-engineered buildings, development of awareness raising tools for earthquake disaster mitigation, collapse analysis of structures. Before joining as Director, CBRI, he was Professor and Head, Earthquake Engg. and Research Centre at IIIT Hyderabad.

## Valedictory Session



Dignitaries on dais in Valedictory Session

After the end of Technical Session-II, Valedictory Session was held. Shri Rajesh Kumar Singh, Joint Secretary, BCD, Bihar was the Chief Guest of the Valedictory Session. Other dignitaries included on the dais were Shri Rakesh Kumar, E-in-C, BCD; Shri V.S. Verma, President, IBC; Shri Pradeep Mittal, Immediate Past President, IBC; Shri O.P. Goel, Founder President, IBC; Shri C. Debnath, Vice President, IBC & Chairman, Institution of Engineers; Shri V.R. Bansal, Honorary Secretary, IBC; Shri P.S. Chadha, GC. Members & Former Advisor (Tech.) IBC and Shri Tarni Das Chief Engineer (North) BCD. The dignitaries on the dais were welcomed by presenting floral bouquet.



Shri Rajesh Kumar, Joint Secretary, BCD, addressing in the Valedictory Session

Shri Rajesh Kumar, Joint Secretary, BCD, in his welcome address welcomed and thanked all the dignitaries on the dais, GC members for sparing their valuable time to come to Patna to join the 101st GC meeting of IBC and Seminar and in making the event successful. He also thanked the technocrats and administrative staff joining the event for their hard work in making

the event successful. He expressed the hope that the recommendations out of the deliberations in the seminar will be beneficial to all the stake holders and particularly to those who have recently joined on their first appointment. He further mentioned that BCD is doing lot of good work in the field of construction in Bihar by using latest technologies.

### Recommendations:

Shri P.S. Chadha, G.C. Member, & Former Advisor (Tech.), IBC briefed about the papers presented by the seven eminent authors in the seminar and read out the Recommendations of the Seminar for consideration of all stake holders in the industry and for implementation by Central / various State Governments. The recommendations read out were as under:

- 1) The State of Art BIS codes and National Building Code should invariably be adopted and implemented in field to ensure planned development of city infrastructure and built environment which will withstand the onslaught on their safety during various man-made and natural disasters.
- 2) Safety considerations are of immense importance and need to be kept in mind at all stages such as planning, designing, construction, operation and maintenance of civil engineering projects. During this process, aspect like orientation, lighting, ventilation, fire safety and safe design of structure, electrical and other services should also be considered.
- 3) Renewal of 'Safe occupancy Certificate' for high rise and special structures (like bridges) every 3 to 5 years as prescribed by NBC Code 2016 should be invariably adhered to for avoiding calamities such as recent failure of a suspension

bridge in Gujarat where precious lives were lost.

- 4) Experience shows that most of deaths in fire incidents in the past have taken place due to



Shri P. S. Chadha, G. C. Member & Fmr. Consultant (Tech.)  
IBC presenting the Recommendations

smoke and gases caused due to fire & leading to death due to suffocations. Examples are 93 deaths in AMRI hospital at Kolkata and 59 deaths in Uphar Cinema, Delhi. Therefore control and management of smoke needs top priority. Appropriate venting of smoke and heat prevent fast spread of fire and makes it easy for fire men to gain entry and douse the fire in building.

- 5) Fire is one of the most severe hazards that a building may experience during its life time. If a structure is damaged by fire – A decision whether to retrofit the damaged component or to demolish it shall be based on a thorough investigation including visual inspection of the damaged structure and various test such as neutralization test of concrete, non- destructive test, concrete core test etc.
- 6) All products to be used in finishing of the building, specially with respect to false ceiling, acoustic treatment and ACP etc. should be standardized with suitable fire rating.
- 7) It is really alarming that some RCC structures constructed 20 to 25 years back are either being pulled down due to their bad condition or are being renovated / rehabilitated at enormous cost. It is, therefore, very necessary to follow an integrated approach of safe structural design, good quality of construction and appropriate maintenance practices to make structures durable during their designed service life.

- 8) Few tests for checking the durability of concrete such as Rapid chloride ion prevention test, chloride Diffusion test, accelerated corrosion test, permeability test, concrete resistivity tests etc. should be invariably carried out during the construction.
- 9) Global warming due to over exploitation of natural resources, deforestation and wastage of materials is alarming and therefore there is need to construct Green Buildings which preserve natural resources, utilizes them optimally, make use of materials made from waste to a greater extent and improve quality of life.
- 10) While constructing green buildings, efforts should be made to produce Net-Zero building where total amount of energy used on annual basis is more or less equal to the amount of renewable energy created on site.



Shri O.P. Goel, Founder President, IBC &  
Former DG (W), CPWD addressing the gathering

Shri O.P. Goel, Founder President, IBC in his address stated that the 2 days programme was very well organized. He mentioned that this was the first major event post Covid times being organized by IBC. The two days programme has been a great success. The tone of the Seminar was set by the Inaugural function where the Hon'ble Chief Minister, Hon'ble Dy. Chief Minister, Hon'ble Water Resource & public relations Minister and Hon'ble Building Construction Minister had addressed the gathering. The brief advice given by the Hon'ble Chief Minister about maintenance of the buildings has been well received by the media and the message spread not only in Bihar but all over the country. Top experts in the field have shared their knowledge through their presentation of papers which have enriched the knowledge off all stake holders and particularly of younger generation who can make use of the information. He also conveyed his personal gratitude to the Secretary, BCD and Sh Rakesh Kumar, E-in-C, for having made the excellent arrangements for the event.

Shri Pradeep Mittal, Immediate Past President, IBC in his address mentioned about the earlier event of IBC which was organized by the Bihar Government in a very grand manner at Patna, the memories of which still remain in the heart of many. He also mentioned about the organizing of Annual Session 2018 of IBC at Patna by the Bihar Government. Very useful recommendations have flown out of the deliberations in Seminar as were read out by Shri Chadha, Former Advisor, IBC. He emphasized importance of reading of National Building Code and other codes for proper



**Shri Pradeep Mittal Immediate Past President IBC addressing the gathering**

understanding and implementation to get maximum benefit for ensuring durability and safety of the buildings. He also thanked the Hon'ble Chief Minister for impressing upon the need of proper and adequate maintenance of the buildings. He expressed the need of adopting new improved technology, Green and Net Zero Buildings to tide over the current scenario of global warming and CO<sub>2</sub> emission. He also expressed the hope that Bihar Government will organize the IBC events in future also on the same or higher scale.

Shri C. Debnath, Vice President, IBC and Chairman, Institution of Engineers (India) in his address while thanking all the dignitaries mentioned the 2 days programme has been organized very nicely and systematically.

He mentioned that the presence of the Hon'ble Chief Minister alongwith his Dy. Chief Minister and two other Ministers show the feeling of the Government for the engineers in the State. He mentioned that he is connected with the Engineering community of the Bihar for the last 30 years and very much aware of the marvelous work done by them in the development of the state. He mentioned that he was fortunate to have attended the IBC's programme in 2013 and 2018 at Patna. He mentioned that recommendations of seminar when circulated to the Governments of different states will pave the way for recognition of good work done by IBC.



**Shri C. Debnath, Vice President, IBC and Chairman, Institution of Engineers (India) addressing the gathering**

Shri V.R. Bansal, Honorary Secretary, IBC in his address while thanking the dignitaries informed that we have had two very engaging session of technical talk where 7 eminent speakers presented their papers giving an in-depth knowledge on durability and safety aspects in Buildings. On the Special request of BCD,



**Shri V. R. Bansal, Honorary Secretary, IBC addressing the gathering**

a presentation on Green Building was presented by Mrs Usha Batra, SDG, CPWD at a very short-notice. The presentation by all the speakers were very informative and engrossing which is evident by the fact that though both the session ran close to three hours each, all the participants remain seated throughout the sessions. The interactive Question-Answer Session also showed how attentive the participants were during the proceedings. He thanked both the speakers as well as the participants for making the technical seminar a grand success and the IBC Bihar Chapter and BCD, Bihar for hosting the 101<sup>st</sup> GC meeting and the Technical Seminar.

Shri V.S. Verma, President, IBC, while thanking everyone



**Shri V.S.Verma, President IBC  
addressing the gathering**

involved in making the event successful, mentioned that the topic chosen for the Seminar was very close to his heart and the recommendations flowing out of the Seminar will benefit the Nation as a whole. He deplored the poor quality of buildings and infrastructure being constructed which is a matter of concern for the society. He mentioned that though there is adequate knowledge of technology but still there is gap in understanding and its implementation at the ground which needs to be reduced for ensuring good quality and longevity of the infrastructure. He also stressed the need to increase the pace of the development for improvement of the overall life of the citizens. He thanked all the presenters, delegates, participants for sparing their valuable time to attend the event. He thanked Shri P.S. Chadha, Former Consultant (Technical), IBC for presenting the recommendations. He thanked Shri Rakesh Kumar, E-in-C, BCD and all the organisers of the event for their hospitality and arrangements in making the stay of participants comfortable. He thanked Shri V.R. Bansal, Honorary Secretary for remaining very active throughout in making the event successful. He praised the young Engineers for their participation and take away from the event which would help them in utilisation of the same in the development of the State of Bihar. He wished Bihar Chapter to conduct more such programmes for the benefit of the stakeholders.

Shri Rakesh Kumar, while concluding the Session, thanked all the participants. He informed that in recent past, there has been huge damage due to fire in Vishweshwera Bhawan, which necessitated the deliberations on the technologies for its rehabilitation to ensure durability and safety of the structures. On the suggestions of Shri Ram Babu who led the rehabilitation works of the damaged Vishweshwera Bhawan, the present topic of the Seminar was selected so as to disseminate the knowledge among all the stake-holders for effective handling and execution of Building projects. He complemented the authors on



**Shri Rakesh Kumar, E-in-C, BCD and Vice President, IBC  
concluding the Session**

their technical talk/presentation on Safety provisions in NBC-2016, Fire safety and Fire services, Causes of deterioration in RCC Structures and their remedies, Current status and future provisions in Design of Concrete Structures, Safety and Durability in building construction and presentation on Rehabilitation of Vishweshwera Bhawan. He also thanked Shri Rajesh Kumar Singh, Joint Secretary, BCD for having extended his help in making the event successful.

Shri Tarini Das, Chief Engineer, BCD, North Bihar while presenting the Vote of Thanks, complemented the advice given by the Hon'ble Chief Minister in



**Shri Tarini Das, Chief Engineer, BCD, North Bihar  
presenting the Vote of thanks**

his inaugural address regarding proper and effective maintenance of the buildings to maintain their lifecycle for ensuring the building to serve its purpose for which it is meant and also comfort of occupants of the building. He expressed that the deliberations were quite helpful in motivating the participants in their better understanding of durability and safety aspects of the structures. He profusely thanked Shri Kumar Ravi, Secretary, BCD for his extra-ordinary effort and approach in making the event successful. He thanked Shri Rakesh Kumar, E-in-C, BCD for his threadbare planning and successful execution of minutest details

of the event. He thanked Shri V.S. Verma, President, IBC for having accepted the invitation. He thanked Shri V.R. Bansal, Hony. Secy, IBC for his guidance in making the event successful. He thanked all the dignitaries, authors, delegates, all members of the organising team, support staff, Press and media in making the event successful.

After the Technical Session the GC Members visited the exhibition held during the event and they appreciated

products and machinery. There after a group photo was taken at Sabhyata Dawar situated in the complex near the bank of holy river Ganga.

As advised by the Hon'ble Chief Minister Shri Nitish Kumar, the organizers of the event took the GC Members for a visit to the iconic buildings-Bihar Museum and Sardar Patel Bhawan built by the Bihar Government in the recent years.



GC Members visiting the Exhibition



Group photo of GC Members at Sabhyata Dawar



Visit of GC Members to Bihar Museum at Patna



Visit of GC Members to Sardar Patel Bhawan at Patna



## Cultural Programme (6<sup>th</sup> November, 2022)

In the evening of 2<sup>nd</sup> day of the event also a cultural programme was organized. Ms. Maithili Thakur, famous folk and devotional singer along with other

artists performed the cultural programme depicting rich culture of Bihar. Cultural programme was followed by dinner.

### Glimpses of Cultural Programme



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## 101<sup>st</sup> Governing Council Meeting



101<sup>st</sup> Governing Council Meeting in Progress

The 101<sup>st</sup> meeting of Governing Council of IBC was held on 6<sup>th</sup> November, 2022 at Meeting Hall of Gyan Bhawan, Patna, Bihar. About 40 Governing Council Members including Permanent and Special Invitees were present. The following important decisions were arrived at during the Council Meeting.

- The minutes of the 99<sup>th</sup> and 100<sup>th</sup> Meetings of the Governing Council were approved.
- All the GC members were requested to use their good offices in realizing the arrears from the Institutional members of their state or in their area of influence.
- GC ratified the enrolment of 85 Individual Members (M.No. ML9407 to 9491) and 2 Institutional Member (IM90211-90212) enrolled after 100<sup>th</sup> GC meeting. GC also ratified enrolment of members contained in two additional lists, one recommending 15 Life members (M.No. ML9492 to 9506),

8 Student Members (M.No.80339 to 80346) and 1 Institutional Member (M.No. IL 90213) and other recommending 13 Life Members (M.No. ML9507 to 9519) enrolled in 3<sup>rd</sup> EC Meeting.

- GC unanimously approved the Bye-Laws & Regulations for State/Local Chapters of IBC as approved by the Executive Committee.
- GC approved the proposal of increase in the quota of women representatives from existing two to four out of the existing limit of 16 members to be co-opted to GC.

IBC also applauded the achievement of two of its GC members, Sh. SB Vasava, Secretary, Roads and Buildings Department, Govt. of Gujarat, GC member of IBC and the Chairman of our Gujarat Chapter, being elected as the President, Indian Roads Congress; and Sh. Chinmay Debnath, Vice-President, IBC as the President-elect of Institution of Engineers (India).

### Representation of IBC in International Conference on Construction and Demolition Waste Management held at Hyderabad

On the request of the organisers, Urdhva Management Pvt. Ltd “International Conference on Construction and Demolition Waste Management” held on 7<sup>th</sup> December, 2022 at Hyderabad under their brand name “Recommerce” was supported by the Indian Buildings Congress without any financial commitment. The IBC was represented in the conference by Shri K.L. Mohan Rao, the Executive Member of Indian Buildings Congress. The objective of Recommerce is to develop a sustainable ecosystem for all recycling business.

Such gathering provides an abundant opportunities for connecting professionals, the businessmen and other stake holders with industry experts while strengthening professional relationships and networks. The Chief Guest of the event was Dr. Rajiv Sharma, IAS (Retd.), Chairman, Telangana State Pollution Control Board and Chief Advisor to Govt. of Telangana; and the Guest of Honour was Smt. Neetu Kumari Prasad, IAS, Commissioner, Commercial Tax Deptt., and Member Secy. TSPCB, Govt. of Telangana.

In the seminar, the following eminent professionals dealing with the C&D Waste made their presentations:

- a. Mr. Kaushlendra Nath, MD, Resilient Energy India Ltd. on “C&D Waste Management-An Overview”



- b. Ms Vidya Nair, CEO, Picson Construction Equipment Pvt. Ltd. on “Machinery and Equipments for C&D Waste Recycling
- c. Mr. Raghu Ram, Project Manager, C&D waste, GHMC on “Sustainable Management of C&D Waste-A review of Hyderabad”
- d. Mr. G Jagdishwaran, MD, Helix Infrastructure Consultants Pvt. Ltd. on “Quantification and Classification of C&D Waste Treatment and Management”
- e. Mr. Nikhil Bugalia, Asstt. Professor, BTCM on “Low Carbon and Lean Construction”

Besides, there was a panel discussion on the topic with eminent professionals as panellists.

The Following are the Recommendations of the Conference:

1. The use of recycled products should be promoted in a wider application and the use of technology to track and improve collection efficiency.
2. Identify existing dumps and prepare a comprehensive plan to maximise recycling. Boost R&D in this direction.
3. Integration of public work contractors work in Standard Schedule of Rates.
4. Evaluate materials on basis of their durability and reusability. Durable materials can increase the life cycles of structures and significantly reduce the need for construction and demolition.
5. Piles of concrete, bricks and metal waste should not be allowed to be deposited in water bodies, low lying areas and green belts which increases the risk of loss of forests, landslides and floods.
6. We should ensure that C&D waste is not mixed up with other waste.
7. National level workshops on C &D waste for the development of cluster-level corporations should be conducted to bring awareness.
8. At projects where 20 tons per day or 300 tons per month waste is generated, generators should submit proper waste management plan before starting work and ensure proper segregation of C &D waste into streams such as concrete, soil, steel, wood, plastics, bricks and mortar.
9. Provide incentives to waste generators for managing C&D waste.



Sh. K.L. Mohan Rao, during Question Answer Session



Shri K.L. Mohan Rao, presenting memento to the participant

10. Penalize non-complying waste generators.
11. Severe penalties should be imposed on the vehicles dumping C &D waste illegally.
12. Local bodies should ensure a proper system to record the generation and recycling rates which could enable them to analyze the problem with a more scientific approach.
13. To set up a mobile app-based monitoring system where waste generation can regularly update C&D waste management status and volumes. Organize random checks to confirm the status.

14. Collaborate with National Skill Development Authority to train local youth on C & D waste management and make it mandatory for waste generators to hire such individuals as C&D waste managers.
15. Set up window to address grievances of residents staying in and around the sites. This will also help provide useful information on irregularities.

16. Set up platforms and markets to donate or auction of components that can be recovered in intact forms like doors, windows and panels, and glass. This will further boost the circular economy.
17. Encourage the usage of recycled construction materials.

## Activities of State/Local Chapters

### Chhattisgarh State Chapter-Raipur

#### Meeting on “Draft Development Plan 2031 of Raipur” held on 18<sup>th</sup> Nov. 2022

Indian Buildings Congress (IBC) Chhattisgarh State Chapter organized a meeting on ‘Draft Development Plan 2031 of Raipur’. The event was conducted by the IBC’s Hon’ble Chairman of Er. Salil Rai Shrivastava and Hon’ble Secretary Dr. Govardhan Bhatt. Shri Sandeep



Meeting in Progress

Bangde (Addl. Director, Directorate of Town and Country Planning) was the Chief Guest and Speaker of the Session. He started the session by introducing the history of development of Raipur which was followed by future draft development of Raipur that consisted of several topics like Innovative materials HVAC, Impact of RERA on Housing, Smart buildings, green buildings, Solar energy, Concrete, Seismic issues, Swamitva yojana by Govt, Concrete Road Construction with ferrocement, Introduction to new product in structure rehabilitation.

The main concern discussed was the Urban Planning of Raipur by 2031 which includes several topics like mobility plan, traffic surveys, sustainable development and many more and how all these plans can cop-up with the population explosion effectively. The audience was well engaged in the session and over 60 attendees tried to make the best out of their experience. The workshop served as an excellent platform for technophiles to nurture their young minds toward the proposed Draft Development Plan of Raipur by 2031.

### Seminar - “Internal Curing of Concrete – from Basics to Advance”

Indian Buildings Congress Chhattisgarh State Chapter in association with Ambuja Knowledge Centre (Adani Cements) organised a Seminar on “Internal Curing of Concrete – From Basics to Advance” at Ambuja Knowledge Centre, Raipur on 25th November, 2022. Dr. S. V. Deo, Associate Professor (Civil Engineering), NIT Raipur was the key note speaker who made the presentation in the Seminar.

Dr. S. V. Deo informed that the internal curing provides a modern twist on good curing practice by providing water to the cementitious matrix after setting. Internal curing improves the performance of concrete by



Presentation during Session

increasing the reaction of the cementitious materials. However, unlike conventional curing that supplies water from the surface of concrete, internal curing provides curing water from the aggregates within the concrete. This is very beneficial since the depth that external water can penetrate is limited for any concrete, while in internal curing water is dispersed throughout the depth of the concrete. Dr. S. V. Deo also discussed on Super-Absorbed Polymer (SAP) which is an effective internal curing material for reducing autogenous shrinkage and improving cracking resistance. Internal curing by SAPs is based on the release of water from a reservoir within the SAP into the microstructure; thereby the cement matrix maintains a high relative humidity (RH) over time.

### Lecture on “Thermal Comfort of the Buildings” held on 13<sup>th</sup> Dec., 2022

Indian Buildings Congress (IBC) Chhattisgarh State Chapter organized a lecture on ‘Thermal Comfort of Buildings’. The event was conducted by the IBC’s Honorary Chairman Er. Salil Rai Shrivastava and Honorary Secretary Dr. Govardhan Bhatt. Dr. Nisha Netam, Assistant Professor, NIT, Raipur was the Speaker of the Session. She started the session explaining the thermal comfort of the buildings and further explained its relevance and importance. The lecture included some important topics like traditional vs modern buildings, thermal comfort assessment, embodied energies, green roof, etc. The presentation highlighted the importance of thermal comfort and how it could be the game changer for the sustainable development as it saves lot of energies. More than 30 participants attended the workshop, and a large number of the audience was actively involved. The lecture provided technophiles with a fantastic venue to cultivate their interest in the suggested thermal comfort of the buildings.



Lecture on “Thermal Comfort of the Buildings” in progress

### Himachal Pradesh State Chapter – Shimla 1<sup>st</sup> Annual General Meeting Himachal Pradesh

The First Annual General Meeting of Himachal Pradesh Chapter of Indian Buildings Congress (IBC) was held in the Conference Hall, HP PWD Headquarter, Nirman Bhawan, Nigam Vihar, Shimla on 14<sup>th</sup> Dec., 2022. At the outset of meeting, Er. Ajay Gupta, E-in-C, HP PWD, Shimla welcomed Shri V.R. Bansal, Honorary Secretary, IBC & former Chief Engineer, MCD and all the invitees presented in the First Annual General Meeting.

Shri V.R. Bansal, Honorary Secretary, IBC & former Chief Engineer MCD briefed about the Vision and Objectives of the Organisation. He informed that the



1<sup>st</sup> AGM at Shimla, Himachal Pradesh

Indian Buildings Congress was founded in 1992 and registered as society under the Societies Registration Act 1860 on 29<sup>th</sup> March, 1993 with the aim to build a living environment which is sustainable, affordable, eco-friendly, energy efficient, cost competitive and technology driven meeting the needs of Indian Population. Presently Indian Buildings Congress has more than 120 Institutional Members and 286 Student Members. Himachal Pradesh has become 28<sup>th</sup> member State Chapter of IBC on 14<sup>th</sup> Dec., 2022.

In the esteemed presence of Honorary Secy. Shri V.R. Bansal, IBC and Er. Ajay Gupta, E-in-C, HP PWD, election were held to elect the Management Committee of Himachal Pradesh Chapter of IBC and following office bearers were unanimously elected:-

Chairman-Er. Ajay Gupta, E-in-C, HP, PWD; Vice Chairman- Ar. Rajeev Sharma, Chief Architect, HP PWD; Member Secretary- Er. Suresh Kapoor, Superintending Engineer, HP PWD; Treasurer - Er. Umesh Sharma, Executive Engineer (R&B), HP PWD; Members - Er. Anil Sharma, Superintending Engineer, HP PWD; Er. Amit Sharma, Executive Engineer (Mech.), HP PWD; Er. Deva Nand Sharma, Executive Engineer (Design), HP PWD; Er. R.S. Rana, Executive Engineer, (Electrical Division-I), HP PWD; Er. Neelam Gupta, Executive Engineer (Design), HP PWD.

The Honorary Secretary congratulated the Management Committee on formation of Himachal Pradesh Chapter of IBC and wished for its growth and success. The Chairman-cum-Engineer-in-Chief assured the Indian Buildings Congress that all their efforts would be made to increase the membership and activities of IBC in Himachal Pradesh with the active support of Govt. of Himachal Pradesh.

The meeting ended with Vote of Thanks to IBC.

## Kota IBC Chapter

### Meeting of Management Committee

Meeting of Management Committee of Indian Buildings Congress, Kota Local Chapter was held at Circuit House, Kota on 18<sup>th</sup> Dec., 2022. The collective suggestions on agenda of meeting and points agreed upon are:

1. Members of Management Committee emphasized the need to increase the enrolment of the membership by driving a campaign by Kota Local Chapter.

The decision taken in this regards was as follows:-

- Shri Suresh Kumar Bairwa will help in enrolling

IBC members in Kota Distt.

- Shri Vijay Kumar Jain will help in enrolling IBC members in Bundi Distt.
- Shri Ashok Kumar Sanadhya will help in enrolling IBC members in Baran & Jhalawar Distt.

The Management Committee requested all other existing IBC members to help in enhancing the membership base.

2. Presentation and site visit of under construction River Front Corridor on Chambal River in Kota: Date of site visit will be intimated shortly. Shri R.K. Gaur will coordinate with river front executing authority.
3. Presentation and site visit on salient features of under construction Modern Animal & Bird Clinic near Bada Ke Balaji, Baran: It will be arranged and coordinated by Shri Ashok Kumar Sanadhya (EE PWD, Baran). (The date will be informed soon, and it was also decided that the visit will be along with family.)
4. A presentation will be given by Shri Piyush Goyal (Architect) on the main features of “Devnarayan Pashupalak Awasiya Yojana”, built by UIT Kota.
5. Shri P.K. Jain suggested for site visit of tree plantation (about 50 thousand) done by various organizations and RAC Jawans in rocky area of RAC Ground Kota by using the water from nearby nallahs.
6. Site visit of under construction Central Vista and Parliament House in New Delhi with the kind help of Hon’ble Speaker Shri Om Birla Ji. (probably in the month of February 2023 after getting permission from competent authority, as suggested by Shri Manish Kumar Jain, Architect & valuer).
7. Technical site visit of under construction Unique Oxy Zone City Park Kota suggested by Shri Dharendra Mathur.
8. To drive the activities of the local chapter, the following suggestions regarding fund raising were agreed upon.
  - Executive members will contribute Rs. 5000.00 per year as donation.
  - Each member of the Kota Local Chapter will voluntarily contribute Rs. 2000.00 per year as donation.
9. To consider building construction material and other construction material exhibition every three or six months with coordination of vendors as suggested by Shri Manish Kumar Jain and Shri Piyush Goyal.
10. Shri Piyush Goyal has suggested considering the campaign from the local center to transfer basic technical skills to grassroot level contractors.

## National News

### Robot Scavenger

India has enacted two laws – the Employment of Manual Scavenging and Construction of Dry Latrines Prohibition Act, 1993 and the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 – to eventually eradicate the practice of manually cleaning, carrying and disposing human excreta and garbage from sewers. Yet, manual scavengers across India still clean sewers at great risk to their lives. Most of the time, they are not provided with the mandatory safety gear by their employers, largely municipal agencies, making them vulnerable to fatal accidents. Even a protective cap is a luxury for most of them, let alone jackets, gloves and masks. As a consequence, many die from inhaling poisonous gases accumulated inside manholes, oxygen depletion, heat stress or from falling down the pit.

Bandicoot, the robot, thus, is a ray of hope. It only requires a person to operate it from a safe distance. The 80-kg robot lifts the heavy metal cover on its own, drops its arm into the manhole, scoops out the solid waste and dumps it in a bucket. “All operations can be viewed on a monitor, the robot can also be used to check the sewage apart from jetting the sewer lines” Govind explained.

Genrobotics plans to teach manual scavengers to operate the robot with the aim of rehabilitating them. “Bandicoot will make the life of manhole cleaners safer, it will help them earn a decent living without fear of losing jobs and lives. Bandicoot will ensure manholes in India will remain clean without losing human lives” Govind said.

The robot has already successfully completed a trial run in Thiruvananthapuram, unclogging five manholes filled with plastic, filth, medical waste and sediments. The robot takes 15 minutes to clean small sewers and around 45 minutes to unclog bigger ones. Approximate cost of one robot is Rs 10 lakh but the price will come down when it is mass produced.

Following the successful trial, the Kerala Water Authority has decided to use Bandicoot to clean all sewers in Thiruvananthapuram.

### Longest Sea Bridge in India

The Mumbai Trans Harbour Link (MTHL) is a 22km-long sea bridge being constructed at a cost of Rs. 17843 crores over the Mumbai Harbour in the Mumbai Metropolitan Region (MMR), Maharashtra, India. When completed, the MTHL will become the longest sea link in India. 85% of the funding for construction



The Mumbai Trans Harbour will begin at Sewri in South Mumbai and Nhava Sheva in Navi Mumbai

of the MTHL is being done by the Japan International Co-operation Agency (JICA).

The Mumbai Metropolitan Region Development Authority (MMRDA) is constructing the bridge, which will connect central Mumbai and Navi Mumbai, a planned township located on the opposite shore of the city. The MTHL project will provide a critical link between the two urban areas and quick access to the southern part of Navi Mumbai. It will also foster the growth and socio-economic development of the mainland and its surrounding areas. The work of bridge construction started in April, 2018, while it is likely to be completed in September, 2023.

The MTHL will be a six-lane (three on each side) expressway bridge across Mumbai Bay. Of the total length, approximately 17km will be over the sea and 5km will be viaducts on land on either side.

The bridge will start at Sewri in Mumbai and end at the Chirle area in Raigad Division. A three-level interchange is planned at Sewri, where the Eastern Freeway and the Sewri-Worli East-West connector will connect with MTHL.

The MTHL will feature approach sections, interchanges, intelligence transport system (ITS) and the other amenities required for a marine bridge. The traffic conditions on the stretch will be monitored and managed from the traffic control centre with the help of CCTV cameras and related facilities installed on the stretch. Variable message signs (VMS) will also be installed to display appropriate information for the bridge users. The MMRDA will install noise and vision barriers on a 6 km section of the MTHL. The vision barriers are intended to block the view of the BARC from the MTHL, while the noise barriers are intended to protect the movement of flamingos and migratory birds at the Sewri mudflats.

The MMRDA also stated that it would declare nearly 2 km of the MTHL on the Sewri side as a "silent zone", as well as near schools and other sensitive areas on the Navi Mumbai side of the MTHL. Construction equipment being during the project have been fitted with silencers to reduce the potential impact of noise on migratory birds such as flamingos. The project utilized reverse circulation drilling methodology which helps reduce noise levels and helps speed up construction in marine areas. A 5.6 km long temporary access bridge had been built to transport equipment and workers for the construction of the MTHL which would be converted into a bird-watching platform to view flamingos and other birds.

The MTHL is being constructed in three sections. The first section includes the construction of the 10.38km-long bridge section across the Mumbai Bay and Sewri interchange, while the second includes the building of the 7.8km-long bridge section across the Mumbai Bay and Shivaji Nagar interchange. The third section includes the construction of the 3.61km-long viaduct, including interchanges at State Highway-54 and at National Highway-4B near Chilre, Navi Mumbai.

The bridge will feature the first use of orthotropic decks in India. Decks with different stiffnesses in longitudinal and transverse directions are called 'orthotropic'. If the stiffnesses are similar in the two directions, then the deck is called 'isotropic'. The steel deck-plate-and-ribs system may be idealized for analytical purposes as an orthogonal-anisotropic plate, hence the abbreviated designation "orthotropic." The special steel decks will enable the bridge to have longer spans than possible with regular girders. About 4 km of the bridge length will be built with steel spans and the rest will use concrete. The MMRDA chose to use steel spans in these sections to eliminate the need to construct pillars to support the bridge which could hinder the movement of ships in the area. This 4 km section includes a 180 meter long steel span, which is the longest steel span in India. The shortest steel span on the MTHL is 110 meters long. The foundations for the MTHL will be 47 metres at its deepest points in order to support the weight of the bridge. An automated girder launching system was utilized to lay the bridge's foundation, marking the first time the system was used in India. The MMRDA stated that the construction work would generate 115,419 man-months of employment.

### India's First Electric Double-Decker Bus

Union Minister of Road, Transport and Highway Shri Nitin Gadkari launched India's first electric double decker bus in Mumbai on 18th Aug., 2022.

On the occasion, Shri Nitin Gadkari said, "There is a need to transform the country's transport system from a long-term perspective. With focus on reforming urban transport, we are trying to build a low footprint and high passenger density integrated EV mobility ecosystem. Government's vision and policies are supportive towards EV adoption with growing consumer demand for greener solutions. I would like to congratulate Switch Mobility, subsidiary of Ashok Leyland, for being the one to revive the double decker and remain committed to introducing new technologies for the benefit of passengers and society, at large."



Electric Double-Decker Bus

The new electric double-decker bus is the world's first – semi low floor, air conditioned, electric double-decker with wider door on rear overhang and a rear staircase. The bus will have a lightweight aluminium body construction, which offers higher passenger-to-weight ratio and a competitive cost per km, per passenger.

The electric double-decker bus can ferry nearly twice the number of seated passengers as a comparable single decker bus with just 18% increase in kerb weight.

With contemporary styling and feel-good interiors and exteriors, the double decker boasts of wide front and rear doors, two staircases and an emergency door complying with the latest safety standards. The AC offers effective cooling in India's hot climatic conditions, while the optimized seating for 65 passengers is the maximum number of seats to be offered in the given footprint. Each seat has a lightweight cushion and the interiors come with car like comfort for passenger convenience. This state-of-the-art electric double decker serves as an ideal solution for urban commuting, as they occupy less road, terminal and depot floor space per seated passenger.

Powering Switch EiV 22 is a 231 kWh capacity, 2-string, liquid cooled, higher density NMC chemistry battery

pack with dual gun charging system. This enables the electric double decker to have a range up to 250 kms for intra city applications.

## अफोर्डेबल कार (इलेक्ट्रिक कार)

मध्य प्रदेश के सागर स्थित एक इंजीनियरिंग कॉलेज के छात्र हिमांशु पटेल ने 5 महीने के अथक प्रयास से अपने लिए बहुत ही अफोर्डेबल कार (बिजली की कार) निर्मित कर ली है।

इस छात्र ने जो इलेक्ट्रिक कार बनाई है वह बहुत ही सस्ती है। इस कार को एक बार पूरा फुल चार्ज करने के बाद यह कार 185 किलोमीटर का सफर तय करती है। इतना ही नहीं हिमांशु पटेल का यह भी दावा है कि यह कार 50 किलोमीटर प्रति घण्टा की रफ्तार तक पहुंच सकती है। जिस तरह से लगातार पेट्रोल के दाम बढ़ कर आसमान छू रहे हैं उस स्थिति को देखते हुए इस कार को भविष्य की सवारी नाम दे सकते हैं। इस इलेक्ट्रिक कार में ड्राइवर सहित 5 लोग बहुत ही आराम से बैठ सकते हैं।

इस इलेक्ट्रिक कार को एक बार पूरा चार्ज होने में केवल 4 घण्टे का वक्त लगता है और इसे एक बार पूरा चार्ज करने में 30 रुपये का



अफोर्डेबल कार (इलेक्ट्रिक कार)

खर्च आता है। इस कार में रीमोट कंट्रोल स्टार्ट और स्टॉप फीचर भी मौजूद है। इस कार में, इलेक्ट्रॉनिक स्पीड मीटर, बैटरी, पावर मीटर, फास्ट चार्जिंग, इलेक्ट्रिक सेप्टी एवं एंटी थेफ्ट एलार्म जैसे कई और भी फंक्शन मौजूद हैं।

इस इलेक्ट्रिक कार के बारे में सबसे कम कीमत केवल 2 लाख रुपये खर्च होने का दावा किया जा रहा है।

## सौर ऊर्जा से चार्ज हो सकेंगे इलेक्ट्रिक वाहन

इलेक्ट्रिक वाहनों की ओर लोगों का रुझान बढ़ा है। सरकार भी पर्यावरण संरक्षण के लिए इन्हें प्रोत्साहित कर रही है, लेकिन ई-वाहनों की बढ़ती संख्या के बीच चार्जिंग स्टेशन बनाना बड़ी चुनौती है। आई.आई.टी. बीएचयू के पावर इलेक्ट्रॉनिक्स विभाग के एसोसिएट प्रोफेसर डॉ. आर.के. सिंह ने ग्रिड पावर मैनेजमेंट सिस्टम के रूप में ऐसी तकनीक विकसित की है, जिससे इलेक्ट्रिक वाहन बिजली के साथ सौर ऊर्जा से भी चार्ज किए जा सकेंगे।

डा. सिंह बताते हैं कि यह ग्रिड पावर मैनेजमेंट सिस्टम अपनी तरह का पहला प्रयोग है। यह हाइब्रिड मोड में है। इसमें आर्टिफिशियल

इंटेलीजेंस (ए.आई.) का प्रयोग किया गया है। इसकी सहायता से यह पहले वाहन को चार्जिंग में लगाते ही उसके लिए आवश्यक ऊर्जा के बारे में जानकारी देता है। यदि वाहन की बैटरी में पर्याप्त ऊर्जा है तो सिस्टम पहले सौर ऊर्जा से ही वाहन को चार्ज करता है। यदि अधिक ऊर्जा की जरूरत होती है, तो सिस्टम बिजली से चार्जिंग करता है।

डा. आर.के. सिंह बताते हैं कि वाहनों की चार्जिंग में परंपरागत बिजली का उपयोग होने से इसकी खपत बढ़ती जाएगी। ऐसे में कोयले के जलने से बढ़ने वाला प्रदूषण भी बढ़ेगा। सौर ऊर्जा पर आधारित यह सिस्टम पर्यावरण संरक्षण को बढ़ावा देगा। अभी प्रयोग के तौर पर जो सिस्टम बनाया है, उसकी क्षमता छह किलोवाट है।

सौर ऊर्जा आधारित इस चार्जिंग सिस्टम की कीमत कम से कम रखने का भरपूर प्रयास किया जा रहा है। इसके निर्माण में लगने वाली सबसे महंगी चीज सोलर पैनल है। अभी इसे प्रायोगिक तौर पर तैयार किया गया है, लेकिन जब औद्योगिक स्तर पर बनाया जाएगा तो यह पैनल काफी सस्ता पड़ेगा।

डॉ. आर. के. सिंह बताते हैं कि इससे रोजगार सृजन को भी बढ़ावा मिलेगा। इसे सड़क किनारे से लेकर घर तक कहीं भी स्थापित किया जा सकता है। औद्योगिक स्तर पर परिष्कृत करने के बाद चार वाहनों को चार्ज करने वाला यह सिस्टम एक छोटे पोर्टेबल स्टेबलाइजर के आकार में होगा। स्टेशन स्थापित करने के लिए एक साथ कई बॉक्स लगाए जा सकते हैं। एक बार स्थापित कर लेने के बाद इसमें कोई विशेष लागत नहीं आती। इसे सामुदायिक स्तर पर पंचायत भवन आदि पर भी लगाया जा सकता है, जहां से गांव के सारे रिक्शे चार्ज किए जा सकते हैं।



स्मार्ट ग्रिड पावर मैनेजमेंट सिस्टम दिखाते आई.आई.टी. बीएचयू के प्रो. आर. के. सिंह

## International News

### New Glass Battery, Invented by John B. Goodenough

At the age of 57, John B. Goodenough invented the lithium battery which powers all our smart phones, tablets and laptops- as well as electric cars. 37 years later at the age of 94 now, John alongwith Maria H. Braga, an associate professor at the University of Porto and a senior research fellow at Cockrell School of Engineering at The university of Texas has unveiled a new, ultra-efficient, low cost battery which uses sodium or lithium coated glass electrolyte and lithium or sodium metal electrodes. The glass battery is a type of solid-state battery.



John B. Goodenough who invented New Glass Battery

The battery is constructed using an alkali metal (lithium or sodium foil) as the negative electrode (anode), and a mixture of carbon and a redox active component, as the positive electrode (cathode). The cathode mixture is coated onto copper foil. The redox active component is either sulfur, ferrocene, or manganese dioxide. The electrolyte is a highly conductive glass formed from lithium hydroxide and lithium chloride and doped with barium, allowing fast charging of the battery without the formation of metal dendrites.

The publication states the battery operates during discharge by stripping the alkali metal from the anode and re-depositing it at the cathode, with the battery voltage determined by the redox active component and the capacity of the battery determined by the amount of the alkali metal anode. This operating mechanism is radically different from the insertion (intercalation) mechanism of most conventional Li-ion battery materials.

Braga and Goodenough stated they expect the battery to have an energy density many times higher than current lithium-ion batteries, as well as an operating

temperature range down to  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ); much lower than current solid-state batteries. The electrolyte is also stated to have a wide electrochemical window. The battery's design is safer than lithium-ion batteries, as the use of a flammable liquid electrolyte is avoided. The battery can also be made using low-cost sodium instead of lithium.

The authors claim the battery has a much shorter charging time than Li-ion batteries—in minutes rather than hours. The authors also state they tested the stability of the alkali metal/electrolyte interface over 1,200 charge cycles with low cell resistance; [1] the specification for Li-ion batteries is usually less than a thousand. The new glass battery will power our future solar powered and electric vehicles, homes and industries.

### World's First Flying Bike

A startup from Japan named AERWINS Technologies launched a flying bike on Sept. 15, 2022 at the Detroit Auto Show in the United States of America. This bike looked similar to the bikes we have seen in the Star Wars. After seeing this bike's debut, people called it “the future of urban mobility”. This flying bike was first showcased in Japan during an Auto Show last year in October.



Flying Bike

The video of the Star Wars look alike flying bike was shared on Twitter and the netizens were really surprised after seeing it land after a flight. The XTURISMO hoverbike can fly for 40 minutes at a top speed of up to 62 miles per hour (100 Km per hour). This flying bike has gone out on sale in Japan and the CEO of the company has said that in 2023, they will sell a tweaked version of it in the United States. The bike is priced at \$777,000 which is roughly Rs 6 crore in Indian currency but as per the company's CEO, a lite version of the hoverbike will be launched for \$50,000 by 2025 and it will be an all-electric model.

Detroit Auto Show's co-chair took the first flight and said that it was “comfortable and “exhilarating”. He further added that it felt like the bike came out of a sci-fi movie. The co-chair said that while flying the bike he



felt that he came out of the Star Wars and started riding the bike as a 15 year old. With further advancement in the technology setting up regulation for flying bikes, and increase in demand, the prices may come down, which will solve the problem of congestion on roads to an extent.

## Birds Inspired Solution to Counter Noise by High Speed Bullet Trains in Japan

By 1990, the increasing speed of bullet train in Japan over the years though thrilled the passengers and reduced the travel time but it also began to pose a new



Low Noise Pantograph Inspired by Owl

challenge: that of noises. One was the result of a sort of whirlwind rushing over the pantographs where the train derived its energy from overhead electric wires. A solution was found by the engineers and inspiration came from owls, or rather their wings. Comb-like serrations on the edge of the bird's primary wing feathers break down air rushing over the wing. This muffles sound and allows them to fly silently. Japanese scientists began to prototype pantographs using this mode. In 1994, a new pantograph, dubbed the "wing-graph", which mimicked the owl's wing structure replaced the traditional design.

The other problem was more complicated. The shape of the train's face caused a cushion of air to build up as it entered a tunnel. When it exited, a booming sound was produced that disturbed people in the vicinity and the wildlife in the area. Again the solution came from a bird. The head engineer, who was also a keen birdwatcher, and his junior had noticed that kingfishers dived into



Kingfisher's Beak Shaped Nose of Bullet Train to reduce noise

water at high speed from a great height but created a minimal splash. It struck them that the shape of the bill allowed this seamless transition. The engineers found that the kingfisher's bill was unique, with the both the upper and lower beak having a triangular cross-section with curved sides.

Testing by the design teams confirmed that the kingfisher's bill was the most efficient shape and a series of prototypes were built and tested, with a train nose very close to the kingfisher bill being adopted. In 1997, the 500-Series Shinkansen train was able to run at its maximum speed (300km/hour, which was a world record for that time) while also meeting strict noise standards of 70 dB. Thus the new models inspired by the kingfisher and owl not only reduced noise but also air resistance, resulting in twin benefits: of reducing energy consumption and cost savings.

## सौर ऊर्जा से चलने वाली कार हवा से कार्बन सोखेगी

दुनियाभर के कई देश वाहनों से होने वाले प्रदूषण से परेशान हैं। यह जलवायु परिवर्तन के बड़े कारणों में से एक है। अब इस समस्या से निपटने के लिए नीदरलैंड की 'आइडहोवन यूनिवर्सिटी ऑफ टेक्नोलॉजी' के छात्रों की एक टीम ने सौर ऊर्जा से चलने वाली अनोखी कार बनाई है। यह कार हवा से कार्बनडाईऑक्साइड को सोख लेती है। छात्रों का दावा है कि सौर ऊर्जा से चलने के कारण इस कार से प्रदूषण नहीं होता है। कार को 'जेम' नाम दिया गया है, क्योंकि ये 'जीरो इमिशन मोबिलिटी' वाहन है। इस कार में क्लिनट्रॉम लीथियम आयन बैटरी का उपयोग किया गया है और इसके ज्यादातर पार्ट्स 3डी प्रिंटेड हैं। इस कार में 22 किलोवॉट की मोटर लगाई गई है और अधिकतम एफिशियंसी प्राप्त करने के लिए रिजनरेटिव ब्रेकिंग का उपयोग किया गया है। कार में दो फिल्टर लगाए गए हैं, जो 32 हजार किलोमीटर के सफर में दो किलोग्राम कार्बनडाईऑक्साइड सोख सकते हैं।

कार का डिजाइन भी 'बीएमडब्ल्यू कूपे' जैसा है। छात्रों ने अभी इसका पेटेंट नहीं करवाया है। इसको बनाने वाली टीम यह उम्मीद कर रही है कि बड़ी कार बनाने वाली कंपनियां इस कार से प्रेरणा लेकर इस तरह की और भी कारें बनाएंगी, जो भविष्य में और बेहतर तरीके से काम कर सकेंगी।

इस कार को बनाने वाली 35 छात्रों की टीम इसे 'डायरेक्ट एयर कैप्चर टेक्नोलॉजी' कहती है। इस इलेक्ट्रिक कार के हुड और छत पर सोलर पैनल लगाए गए हैं, ताकि इससे सौर ऊर्जा का भरपूर उपयोग किया जा सके।



सौर ऊर्जा चालित कार

# Do's and Don'ts of Post-Tensioned Slabs

Excerpted By A.K. Goyal  
CGM (Engg.), NBCC India Limited

Post tension slab is a combination of conventional slab reinforcement and additional protruding high-strength steel tendons, which are consequently subjected to tension after the concrete has set. This hybridization helps achieve the formation of a much thinner slab with a longer span devoid of any column-free spaces.

The installation of post tensioning tendons in the concrete and stressing requires skilled labour and personnel who are certified in doing the tensioning works.

In this short article, we would share do's and don'ts in laying of post-tensioned slab.

## 1. HTS Strand Storage–Good Practice

- Check that the coil of strand you are about to use, complies with the specifications.
- If the coil is to be placed on as suspended slab, check with the contractor or form worker that the place where you want to place the coil is suitable and capable of carrying the weight of the coil and place extra form props under the designated area if necessary.
- After the designated area has been checked and declared structurally sound, place the coil of strand in the area, facing the right direction for uncoiling and choc kit firmly in position to prevent the coil of strand from moving.
- Place all necessary safety barriers and bunting in the appropriate locations where the strand will be travelling.
- Place the dispenser around the coil of strand with the front being placed on the same side of the coil from which the strand will be pulled from.
- Ensure the end of the strand which is to be passed through the eye of the dispenser is in a position so it will not be trapped in when you have tightened the dispenser.
- When all the bindings and straps have been removed, locate the end of the strand in the center of the coil of strand and feed it through the eye of the dispenser. Care must be taken during this operation and subsequent feeding out of the strand, as some energy is stored in the coil of strand that may cause the strand to propel from the coil of strand without warning.
- When feeding out the strand do not drag it across the ground during the strand pushing operation, especially while damp conditions prevail. This could cause extreme friction during the installation and stressing operations

## 2. Tendon Installation

- Check that the structural drawings used, are current and correct for the tendons that have been installed.
- Check the anchorages & Recess formers have not been moved from their designated positions and re-tighten the

anchorage fixing bolts if necessary.

- Check that anchorages are securely fixed to maintain their position and prevent ingress of concrete slurry into the anchorage's during the concrete pour.
- Check that each tendon has got the correct number of strands in them.
- Check that tendons are accurately located and secured in accordance with the structural drawings and there are no unintentional deviations or abrupt changes in the tendon alignment, especially near the anchorages.
- Check the tendons are correctly profiled and secured.
- Check that there is sufficient strand protruding from the anchorages to allow for proper gripping of the stressing jack that will be used during the stressing operations a minimum of 350 mm jacking length for anchorage pocket & 500 mm for pan box stressing.
- Check that space available immediately behind the anchorages is sufficient to attach the stressing jack and carry out the stressing operations without obstructions.
- Check duct is inserted into anchorage correctly.
- Check all the joints in the ducting and sealing of the end anchorages are sealed correctly, to prevent ingress of concrete slurry during the concrete pour.
- Check the anti-bursting reinforcement is in accordance with the structural drawings and in the correct position. Should there be any doubts about its adequacy, notify senior personnel. Concrete is weak in tensile situations and if the bursting reinforcement is incorrectly located, fixed or missing the concrete may burst or split during the stressing operations.
- Check the dead-end length is sufficient for the right bond strength to develop (minimum 850 mm)

## 3. Stressing of Tendons

- Check that the structural drawings you are using, are correct and current for the project.
- Check that the concrete has attained the specified compressive strength. Never commence stressing if the concrete has not reached the required compressive strength without specific approval from the design engineer.
- Check the structural drawings and specifications for the stressing sequence and jacking load, which is usually expressed in kilo newtons (KN). The maximum allowable jacking load should not exceed 75 % of the ultimate tensile strength of the strand. Never change the stressing sequence or jacking load without the Design Engineers approval.
- Check the stressing jack you are going to use has a current calibration certificate.
- Establish the hydraulic gauge pressure versus the specified jacking load in KN using the calibration graph or pro-rata the relevant figures of the calibration certificate. Always have your calculations verified by your Engineer.
- Do not use any equipment unless properly instructed. Familiarize yourself with the equipment's operational and

safety functions.

- Check that the equipment and power leads are in good operational conditions.

#### 4. Grouting of Tendons

- Firstly, the system employed by Freyssinet is called a bonded system meaning the strand is bonded to the slab by grouting.
- Grouted post-tensioned tendons prevent the failure of the complete tendon due to local damage/failure as a result of accidental coring, failure of live end and dead-end anchorages and/or wedges. The loss of force in the tendon in this case will be local and the remainder of the tendon retains its force.
- Grouted post-tensioned tendons offer more ultimate strength for the concrete section at flexure through the concept of strain compatibility and more conventional reinforcement would have been designed for ultimate capacity if the tendons were not to be grouted. So, grouting of bonded post-tensioned tendons is important to provide the ultimate capacity assumed at the design stage. Every tendon must be grouted continuously from end to end to ensure there are no air pockets.
- Check the specification for the water/cement ratio by weight of the grout. By using the following formula determine the quantity of water in liters to use per kg of cement.

Litres of water per kg of cement = kg of cement x the water / cement ratio figure. i.e. If the water/cement ratio by weight is expressed as 0.4, Then 20 kg cement x 0.4 = 8 litres of water.

- Check the specification requirements for grout additives and grout sample testing, and ensure the correct additive and equipment is available.

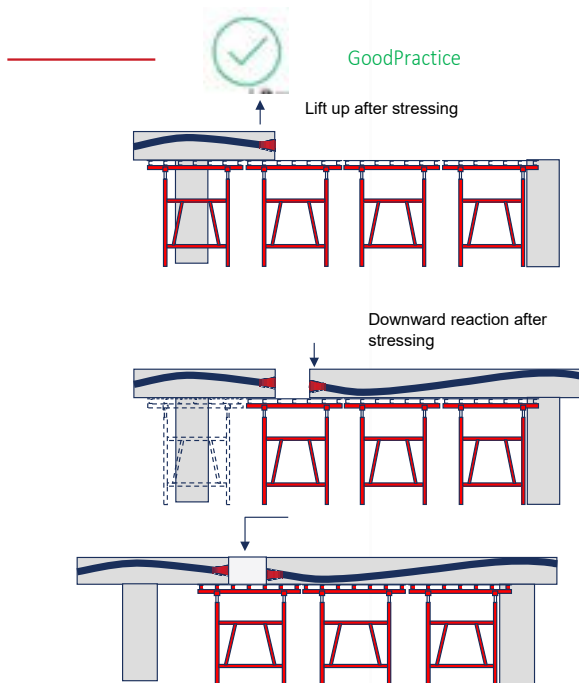
- Check there are enough water supplies to carry out the grouting operations and it is suitable for grouting. Generally, if the water is not suitable for drinking it is not suitable for grouting.
- Check that the grout vents are clear. If they are blocked clear them before commencing the grouting operations. If required by the specifications flush out the tendons with water or compressed air.
- Check that the grout hoses and grout spear is clear and free of old grout from previous grouting operations. Also check grout pump for any object which may cause a blockage or damage to the grout pipe.
- Check the cement for freshness. Cement should be less than one month old and stored dry conditions. Should the cement show signs of having been stored in damp conditions or have any lumps of hard cement in it, they should be rejected.

#### 5. Common Construction Malpractices

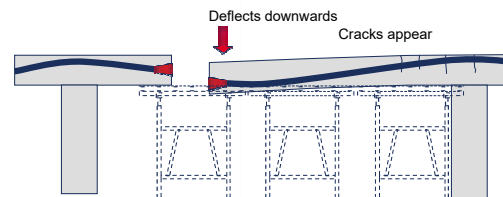
- Early stripping of form work prior to stressing.
- Stripping of pour strip formwork prior to casting of adjacent pour and pour strip.
- Absence of back propping when construction load is greater than design live load of slab.
- Inadequate vibration at tendon anchorage zone and/or badly prepared end formwork with excessive grout leaks.



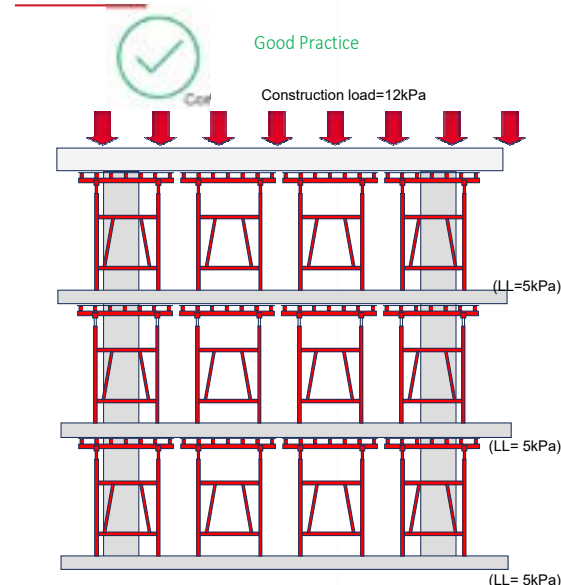
#### Stripping of Pour Strip Formwork



Danger Create Failure/Accident



#### Back Propping



**List of New Individual Members of IBC enrolled**  
**IBC Welcomes the following New Members enrolled during 06/11/2022 to 06/01/2023**

S.No.	M.No.	Name	Qualification	Designation	Department	City	State
1	ML-9492	Shri Suresh Kumar Dubey	B.E. (Civil)	Former Chief Engineer	CSPGCL	RAIPUR	Chhattisgarh
2	ML-9493	Shri Surjya Kr. Debbarma	B.E. (Civil)	Superintending Engineer		AGARTALA	Tripura
3	ML-9494	Ms. Neha Rathore	B.Tech., M.Tech.	Assistant Engineer	MP PWD	BHOPAL	Madhya Pradesh
4	ML-9495	Shri Suraj Kumar Garg	B.Tech. (Civil)	Project Manager	UP State Bridge Corporation Ltd.	MUBARAKPUR	Uttar Pradesh
5	ML-9496	Ms. Shobha Khanna	B.E. (Civil), M.E. (Strct.)	Former Superintending Engineer	MP PWD	UJJAIN	Madhya Pradesh
6	ML-9497	Shri Rajesh Kumar Asthana	B.Sc., DIC, B.Tech. (Civil)	Former Assistant Engineer	UP PWD	LUCKNOW	Uttar Pradesh
7	ML-9498	Shri Bhagat Sundardas Sukhdeorao	B.E. (Civil)	Superintending Engineer	Maharashtra PWD	AURANGABAD	Maharashtra
8	ML-9499	Shri Ram Sugreeva	B.E. (Civil Engg.)	Superintending Engineer	UP PWD	GOMATI NAGAR	Uttar Pradesh
9	ML-9500	Shri Karmber Singh	M.Tech.	Executive Engineer	UP PWD	GREATOR NOIDA	Uttar Pradesh
10	ML-9501	Shri Ajay Kumar	M.Tech.	Assistant Engineer	UP PWD	MEERUT	Uttar Pradesh
11	ML-9502	Shri Gauranga Charan Sahu	B.Tech. (Civil), M.Tech. (Civil)	Chief Engineer (Buildings)	Works Department	CUTTACK	Odisha
12	ML-9503	Shri P. Srinivas	B.E. (Civil), PIE	Superintending Engineer	Karnataka PWD	Kalaburagi	Karnataka
13	ML-9504	Shri Vemuri Venkata Ranga Rao	Ph.D (Str) Engg.	Tech. Director	Vishwa Samudra Engg. (P) Ltd.	KHAIRATABAD	Telangana
14	ML-9505	Shri Ravindra Gangwar	B.Tech. (Civil)	Head Technical	Engineering Construction Solutions	JAIPUR	Rajasthan
15	ML-9506	Shri Vishwanath Shukla	AMIE (I) Civil	Executive Engineer	Irrigation & Water Resources Department	GORAKHPUR	Uttar Pradesh
16	ML-9507	Shri J.T. Radha Krishna	B.Tech. (Civil)	Executive Director	Airports Authority of India	MUMBAI	Maharashtra
17	ML-9508	Shri Swamy Mahesha Ajjampura	B.E. (Civil), FIE, EDPM, PGD	General Manager (Project)	Airports Authority of India	CHENNAI	Tamil Nadu
18	ML-9509	Shri Sujeen Raja	B.Arch., M.Tech.	Manager (Architect)	Airports Authority of India	CHENNAI	Tamil Nadu
19	ML-9510	Md. Mukhlis Akhatar	M.Tech. (Strct.)	Manager (Engg. Civil)	Airports Authority of India	NEW DELHI	Delhi
20	ML-9511	Shri Santosh Kumar Bharti	B.Tech. (Civil)	Manager (Engg. Civil)	Airports Authority of India		Uttar Pradesh

21	ML-9512	Shri Yadaiah Munnooru	AMIE (Civil)	General Manager (Engg. Civil)	Airports Authority of India	NEW DELHI	Delhi
22	ML-9513	Shri Satish Prajapati	B.Tech. (Civil)	Junior Engineer	Airports Authority of India	NEW DELHI	Delhi
23	ML-9514	Shri Manish Jonwal	B.E. (Civil)	Manager (Engg. Civil)	Airports Authority of India	GURGAON	Haryana
24	ML-9515	Ms. R. Mini	M.Tech., MBA	DGM (Engg. Civil)	Airports Authority of India	NEW DELHI	Delhi
25	ML-9516	Shri Sunil Kumar	B.Tech.	AGM (Engg. Civil)	Airports Authority of India	NEW DELHI	Delhi
26	ML-9517	Shri Arun Kumar	B.Tech. (Civil), MBA	AGM (Engg. Civil)	Airports Authority of India	NEW DELHI	Delhi
27	ML-9518	Shri Ashish Yadav	B.Tech.	Assistant Engineer	UP Irrigation Department	LUCKNOW	Uttar Pradesh
28	ML-9519	Ms. Pushpa Rani	B.Tech. (Civil Engg.)	E.O.	SBC BCD	PATNA	Bihar

### List of New Student Members

S.No.	M.No.	Name	Qualification	Designation	Institute	City	State
1.	SM-80339	Shri Gulshan Dewangan	Pursuing B.Tech. (Civil Engg.)	Student	NIT Raipur	Durg	Chhattisgarh
2.	SM-80340	Shri Rishab Choubey	Pursuing B.E. (Civil Engg.)	Student	NIT Raipur	Raipur	Chhattisgarh
3.	SM-80341	Shri Shubham Gupta	Pursuing B.Tech. (Civil Engg.)	Student	NIT Raipur	Balaghat	Madhya Pradesh
4.	SM-80342	Shri Tinkel Deshmukh	Pursuing B.Tech. (Civil Engg.)	Student	NIT Raipur	Raipur	Chhattisgarh
5.	SM-80343	Shri Rahul Dewangan	Pursuing B.Tech (Civil Engg.)	Student	NIT Raipur	Champa	Chhattisgarh
6.	SM-80344	Shri Manish Kumar Rathore	Pursuing B.Tech. (Civil Engg.)	Student	NIT Raipur	Raipur	Chhattisgarh
7.	SM-80345	Shri Shreyas Popat Malshikare	Pursuing B.E. (Civil Engg.)	Student	NIT Raipur	Raipur	Chhattisgarh
8.	SM-80346	Shri Naveen Kumar Yadav	Pursuing B.Tech. (Civil Engg.)	Student	NIT Raipur	Raipur	Chhattisgarh

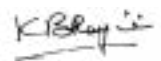
### List of New Institutional Members

S.No.	M.No.	Name	Qualification	Designation	Institute	City	State
1.	IL-90213	Shri J.S. Saran	B.E. (Hons.), M.Tech., MBA, LLB	General Manager (Tech.)	Madhya Pradesh Buildings Development Corporation Ltd.	BHOPAL	Madhya Pradesh

## From Editor-in-Chief Desk

### Manholes – A Death Trap

1. We often come across in the newspapers about the death of labourers while cleaning of the sewerlines. For cleaning of sewerlines, labourers enter through the manhole. There is always a foul smell emanating out of the open or leaking manholes which is due to the presence of gaseous substances in the sewer system, produced by the decomposition of sewage. This gaseous substance is a combination of hydrogen sulfide, ammonia, methane, esters, carbon mono-oxide etc. and is generally obnoxious. The labourer going inside the sewer without due precautions and safety equipment generally get affected by this gaseous mixture, resulting in gas poisoning, or asphyxiation arising from gases which sometimes may prove to be fatal.
2. The issue has been duly taken note of and deliberated at highest level and the Ministry of Urban Development has come up with SOP for cleaning of sewers and septic tanks. Based on these, different departments dealing with cleaning of sewers have come up with their own Standard Operating Procedures. It is mandatory for all concerned dealing with cleaning of sewer lines to follow these guidelines. However, still, such mishaps do occur, many a times resulting in loss of precious lives. It is necessary to deal with the issue in such a manner that such mishaps do not occur.
3. It is, therefore, desirable that supervisory staff and contractors to whom the job is assigned should be given proper training and should be sensitized. Besides, it should be ensured that only trained supervisors and contractors are assigned this task. If it is necessary to create special cell and a pool of contractors, the authorities should take suitable administrative initiatives to help in dealing with this issue.
4. Labourers who attend to this job, should also be specially identified. In fact, they should not only be given the special training but even the equipment/machinery to be used should also be made available, besides, the equipment/machinery should be in working condition before the job is undertaken. Similarly, power supply, if required should be available uninterrupted and with a back-up. These are small precautions which will avoid fatal accidents.
5. For methodology and implementation for such hazardous job there should be recorded norms and instructions. Engineer-in-Charge should be aware of availability of written instructions. In fact these norms and instructions should be part of practical training of Engineers and supervisors. If possible, a separate leaflet should be made available to Engineers, supervisors/contractors and the labourers who has to do the work. For administrative reasons, a record of such initiative should be kept at Junior Engineer level.
6. For this purpose, there should be short term training programmes by agencies. Even IBC can organize such programmes on specific request by any agency. We sincerely hope that loss of life is fully avoided and sewerlines remain clean.



(K.B. Rajoria)



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